Instruction manual SMART PRO

CO_2 incubators

model: **ILC 180, ILC 260**

Before using the equipment, please read carefully this instruction manual!

Version 1.20

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PN-EN ISO 9001
ISOCERT CERTYFIKAT

CE

Manufacturer's address:

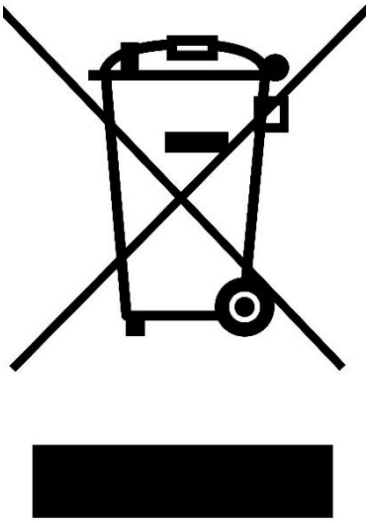
POL-EKO® A.Polok-Kowalska sp.k.
ul. Kokoszycka 172 C
44-300 Wodzisław Śląski
Country of origin: Polska

	As the manufacturer of this device, we want to assure you that we have taken every step to ensure it meets your expectations and provides reliable performance over a long period of use. We are constantly improving our products and expanding our offerings, so we welcome any suggestions you may have regarding additional features or operational enhancements. Please feel free to visit our website at www.pol-eko.com.pl for more information.

	The manufacturer takes every possible measure to eliminate post-production contamination. However, small oily residues from material processing, such as contact between tools and the processed parts, may still be present. To remove these residues, use a soft cloth or paper towel dampened with warm water and a degreasing solution.

As a manufacturer, we inform you that we took the necessary measures to ensure that this device fully meets your expectations and is reliable for a long period of use. Due to the continuous improvement of our products, as well as the expansion of our offer, any suggestions regarding additional functions and equipment functioning are welcome. Visit our homepage www.pol-eko.com.pl/home-en/

Equipment disposal



This equipment is marked with the crossed out wheeled bin symbol to indicate that this equipment must not be disposed of with unsorted waste. Instead it's your responsibility to correctly dispose of your equipment at lifecycle -end by handling it over to an authorized facility for separate collection and recycling. It's also your responsibility to decontaminate the equipment in case of biological, chemical and/or radiological contamination, so as to protect from health hazards the persons involved in the disposal and recycling of the equipment. For more information about where you can drop off your waste of equipment, please contact your local dealer from whom you originally purchased this equipment.
By doing so, you will help to conserve natural and environmental resources and you will ensure that your equipment is recycled in a manner that protects human health.

Thank you!

Contents:

1. SAFETY INFORMATION

ILC SMART PRO CO_2 incubators offer optimal growth conditions for cell cultures, at approx. 37ºC. The unit allows for precise control of temperature and CO_2 concentration.

The incubator can be loaded only with materials and substances which cannot explode, burst or ignite (which do not form any toxic or explosive vapours at set temperature). Potentially explosive gas-air mixtures can't be formed, neither in the working chamber nor in the direct vicinity of the incubator. The unit should not be used to sterilize samples. The sterilisation program in the menu only sterilizes the inner chamber.

CO_2 incubator is not classified as a medical device according to Medical Device Directive 93/42/EEC. Do not use it to sterilise medical devices.

The meaning of information symbols

	**CAUTION** This symbol indicates a potential risk and alerts you to proceed with caution.
	**CAUTION** This symbol indicates important information and the recommendations to follow.
	**CAUTION** This symbol indicates risks associated with hot surfaces.
	This symbol means that a given field / window can be moved in the direction shown in the picture.

To guarantee your security and the longevity of the unit, please comply with the following rules:

1.	**The unit cannot be installed:** • outside, • in unventilated recesses, • in damp places or places which can be easily flooded, • near flammable or volatile substances (any potentially explosive areas), • near acids or in corrosive environments.
2.	**It is forbidden to:** • store inflammable or explosive substances inside the unit, • touch the inner door and glass door handles, and the inner surfaces after a sterilization process, • touch live parts of the unit, • operate the unit with wet hands, • put water vessels on the unit, • climb or put any objects on the unit, • overload the shelves (the maximum load is described in technical data), • place objects on the bottom of the chamber.
3.	**You should:** • ensure sufficient ventilation, • place samples in such a way to provide proper air circulation in the chamber, • open the door for the shortest period of time to reduce temperature fluctuations, • always check that the doors are closed, • use only earthed mains to avoid electric shocks, • unplug the power cable holding the protective cover and not the cable itself, • disconnect the unit from the mains before undertaking any repairs or maintenance works, • protect the power cable and the plug from any damage, • disconnect the power plug before moving the unit, • disconnect the power plug if the unit will not be used for a long period of time, • disconnect the unit if it has any visual faults.

Failure to comply with the above recommendations may result in damage to the device or deterioration of technical parameters, as well as loss of warranty.

1.1. Avoiding electrical shock

The electric installation should meet the following conditions:

	**The unit is powered by AC 220-240V/ 50-60Hz. It must be connected to an earthed mains socket.**

The electric installation should be secured by a circuit breaker 16 A characteristics B.

1.2. General safety instructions on installing and operating the CO_2 incubator

1.2.1. *Indications for using pressure cylinders*

	• **During the operation of the CO_2 incubator, small amounts of CO_2 enter the room which in high concentration can be life-threatening. The unit does not emit CO_2 when the power supply is switched off and the gas cylinder valves are closed.** • **The CO_2 incubator can't be operated near concentrated acids or corrosive vapours.** • **The workplace must be properly ventilated.**
	• **Emergency shutdown of the CO_2 dosing: close the gas cylinder valve.**

The amount of dispensed CO_2 is regulated by a microprocessor controller. If the chamber door is open during CO_2 dosing, the gas will be automatically cut off.

- Together with a pressure cylinder with compressed gas, the user should be given a safety data sheet for the gas and instructions for its use.
- The ventilation performance in the room must ensure level of gas concentrations in the room below the limit values. High concentration of CO_2 (>4 Vol.-%) - risk of death by suffocation.
- During gas intake from the gas cylinder, check the pressure level regularly.

Characteristics of carbon dioxide

Carbon dioxide (CO_2) is a colorless and odorless gas, therefore it is practically imperceptible. CO_2 is heavier than air and soluble in water.

Warning signs on the bottle containing CO_2:

Non-flammable and non-toxic gases

Pressurised gas

Product ID: Carbon dioxide (100%)
Chemical formula: CO_2
Application of the substance: General industrial applications

1.2.2. *Location requirements*

To prevent the accumulation of gas above the permissible concentrations in the room, natural or mechanical ventilation should be provided. In addition, a natural or mechanical installation must be provided to prevent the oxygen concentration from falling below 19.5%.

Observe the occupational exposure limit OEL for CO_2 set by national authorities (formerly maximum permitted workplace concentration). Check compliance when operating all chambers located in the room.

	It is recommended to use a control and measurement equipment for measuring CO_2 concentration in rooms with a CO_2 incubator.

1.2.3. *Hazards when working with CO_2*

	**Carbon dioxide in elevated concentration causes shortness of breath, circulation problems and ultimately death. Avoid breathing gas.**
	**The bottle with compressed gas may cause cryogenic burns or injury (extremely cold liquid and/or high pressure gas).**

1.2.4. *Presonal protection / first aid*

In the event of gas leak:
Leave the room immediately, warn other people and ventilate the room if possible.

Respiratory protection:
In an atmosphere where there is a lack of oxygen (excess of carbon dioxide), use a self-contained breathing apparatus or a face mask with a positive pressure air supply. Respirators with air filters will not provide protection.

Inhalation problems:
Move the victim to fresh air. CO_2 gas is heavier than the air and accumulates e.g. at the floor. If breathing has stopped or is difficult, give aided respiration. Oxygen administration may be indicated. In the event of cardiac arrest, a trained person should immediately begin cardiopulmonary resuscitation.

In life-threatening emergencies:

1) protect yourself with a breathing apparatus,
2) remove the victim from the contaminated area,
3) call a doctor,
4) start CPR.

1.2.5. *User's responsibility*

The user is obliged to:

1) be familiar and comply with applicable health and safety rules, regulations for handling CO_2 and to train operators properly,
2) secure the unit against access by unauthorized persons,
3) keep the unit in perfect condition,
4) follow the maintenance schedule,
5) ensure that operators use appropriate personal protective equipment,

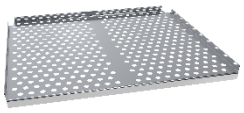
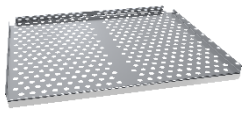
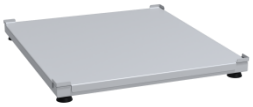
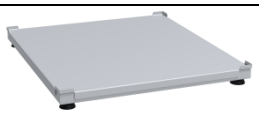
6) share the user manual and CO_2 safety data sheet with operators working with the unit.

2. PACKAGE CONTENTS

CO_2 incubators in SMART PRO version are delivered with:

Description	Quantity
CO_2 incubator	1
rack for shelves	1
water pan	1
stainless steel perforated shelf	3
key to the lock	2
power cable with EU plug	1
3 m pressure hose with pre-assembled hose nozzle for a quick connector and a hose clamp to connect the gas hose to the pressure reducer	1
silicone plug to close the access port	2
Lab Desk program (in the internal memory of the equipment)	1
LAN cable [pcs.]	1
Quality Control Certificate [pcs.]	1
Instruction manual (in the internal memory of the equipment)	1
Quick start guide	1

Additional accesories can be ordered separately.

Options description	Image	Quantity	Code
Additional perforated stainless steel shelf, max shelf load 30 kg		1	05-1200-3031-1001800
ILC 180/PP Additional reinforced perforated stainless steel shelf (max. shelf load 30 kg)		1	05-1200-3061-1001800
ILC 260/PP Additional reinforced perforated stainless steel shelf (max. shelf load 30 kg)		1	05-1200-3031-1002600
ILC 180/AD Stacking adaptor		1	05-1200-4202-1018002
ILC 260/AD Stacking adaptor		1	05-1200-4202-1026002
ILC 260/STN Base on castors		1	05-1200-4202-1026001

ILC 180/STW Support frame on castors (height: 800 mm)		1	05-1200-4202-1018003
Replacement CO_2 gas filter		1	03-0304-0100-0000008

ILC 180 / 260 SMART PRO is stackable. Two units can be stacked on top of each other with the **stacking adaptor**, saving valuable space in the laboratory.
The stacking adaptor prevents heat transmission, shocks and vibrations transferring from one chamber to another.

	**A maximum of two incubators of the same capacity can be stacked.**

The **base on castors** allows the incubator to be easily moved from one location to another, it is also recommended to avoid dirt from the floor potentially contaminating the chamber.

The **CO_2 gas filter** is a consumable part (see section 10.7).

3. BEFORE THE FIRST USE

The manufacturer sends the device protected by cardboard profiles and foil. The device **should be transported in an upright position** and the package should be secured against sliding during transport.

	**After receiving the device, visually assess its condition and equipment in the presence of the person delivering the goods. A courier company is responsible for any damage caused during transport.**

	**After transporting the device at a temperature below 10°C, wait at least 2 hours before connecting it to the mains.**

On the surface of unit's components made of stainless steel, slight discoloration may occur. It is a result of the technologies used in the production of metal sheet in accordance with the requirements of PN-EN 10088-2 standard and it is not a defect of the unit.

The place of installation of the unit should meet the following conditions:

- Ambient temperature between +18°C...+28°C
- Ambient relative humidity < 60%
- Low dust environment
- Appropriately ventilated according to its size
- Placed on a hard and stable surface
- Placed at least 100 mm away from the wall
- Height of the room must be at least 300 mm greater than the height of the unit
- Keep away from direct sunlight
- Kept away from any heat sources
- Not designed to be built-in e.g. within wall recesses
- Placed near a mains socket 220-240V 50-60Hz.

When after storage in a cold location you transfer the chamber to its warmer installation site, condensation may form. Before start up, wait at least one hour until the chamber has attained ambient temperature and it is completely dry.

- **If you don't comply with the above recommendations, the unit may get broken or it may worsen the technical parameters such as:**
- **temperature fluctuation,**
- **temperature variation,**
- **power consumption,**

and may result in loss of warranty.

Electric installation

	**Power supply of the equipment is indicated on a rating plate on the unit. Connect the device to a socket with ground in order to avoid electric shocks in case of the unit's failure.**

The installation should be protected by a 16A slow-blow fuse and equipped with a residual current device.

3.1. Setting up the chamber

Set up the chamber with a spirit level (not included). The unit has been equipped with levelling feet. Please use them to level the unit after it has been placed in its final location (if needed).

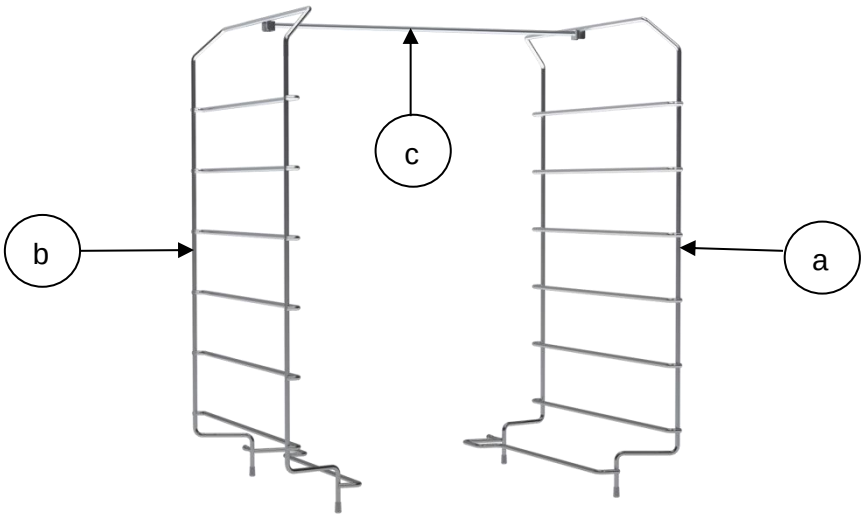
Adjustable feet

ILC 180 and ILC 260 is stackable. You can stack two units with the stacking adaptor and save place in the laboratory.

2x ILC 180 **2x ILC 260**

3.2. Shelf / water pan installation

The unit is equipped with a rack for shelves.



Perform the following steps to assemble the rack for shelves, water pan and adjust shelf height:

1. Install the part (a) of the rack as close as possible to the right wall of the chamber.
2. Install the part (b) of the rack as close as possible to the left wall of the chamber.
3. Connect the part (a) with the connecting rod (c). Note: the pin of the rod must be directed towards the door.
4. Connect the part (b) with the connecting rod (c). Note: to lock the connecting rod rotate the pin downwards.
5. Install the water pan on the bottom and position it equally between the rack.
6. Slide a shelf onto the required frame level. The shelf rack is now correctly installed!

Perform the above steps in reverse order to clean the chamber.

3.3. Water pan

Please make sure that the water pan is placed on the chamber's bottom (equally between the rack). Below the water pan there is a cold spot of the chamber which prevents formation of water condensation.
Fill the water pan only **with deionized (demineralized) water** up to the filling level marked by the pressed inner edge (volume:1,5 liter).

It is recommended to clean and refill the pan 2-3 times a week. For emptying and cleaning remove the water pan.
Operate the chamber only with deionized (demineralized) water. Conductivity from 1µS/cm up to a maximum of 20µS/cm. Water which is in equilibrium with the CO_2 in the air and has a conductivity < 1µS/cm (ultrapure water) may cause acid corrosion due to it´s low pH.

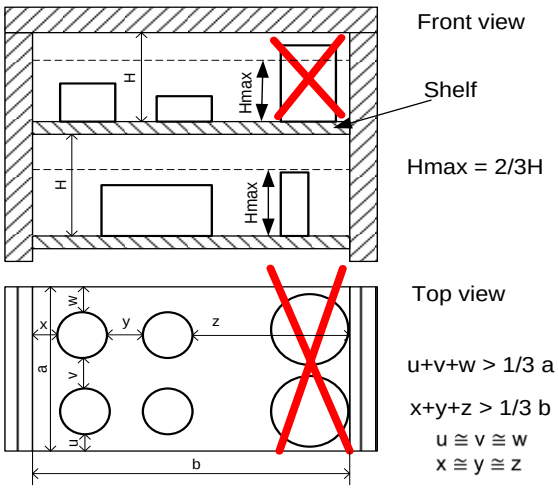
Any corrosive damage that may arise following the use of water of deviating quality or by additives is excluded from the liability agreement.
If required, you can add microbiologically inhibiting substances such as copper chips, copper sulfate or EDTA in a concentration of 1 to 5 mmol/l.
Empty the water pan before moving the unit. In case of the contents spilling, immediately dry the chamber carefully and completely.

3.4. Remarks on the placement of samples

To provide proper air circulation and stable conditions in which the samples are stored in the chamber, it is necessary to keep the following rules:

- the max height of the samples should not exceed 1/3 of the space between the shelves,
- approx. 1/3 of the width and depth of the shelf should remain empty, while the distances between the samples, as well as between the samples and the wall should be approximately equal.

The picture below is an example of the placement of samples in the chamber.



Following the above rules will provide best optimal parameters of temperature fluctuation and variation.

3.5. Closing chamber door

The unit has been equipped with a 2-point lock. To close the door, turn the handle to the vertical position, push the door gently then turn the handle to the horizontal position. If the door has not been closed properly, an alarm will sound. Closing the door correctly reduces energy consumption and ensures the specified temperature variation and fluctuation.

3.6. Internal glass door

To open or close the internal glass door use the installed plastic handle. Always use safety gloves to protect yourself and minimise the risk of getting burnt when the temperature inside is high.

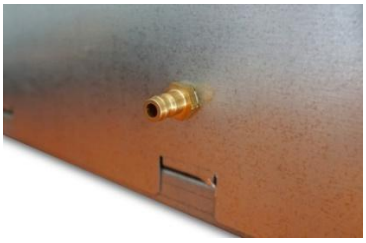
	During sterilization process the inner chamber of the incubator is hot (do not touch the glass door or inner parts of the chamber).

3.7. Connection of the CO_2 gas cylinder

The manufacturer supplies the unit with a 3m pressure gas hose with pre-assembled hose nozzle for quick connector and a hose clamp. This hose is used to connect CO_2 cylinder.

To establish the gas cylinder connection to the chamber:

1. place the CO_2 cylinder vertically and attach it to the wall with a special clamp, rope or chain,
2. ensure the correct CO_2 output pressure of 1,5-2 bar (use a pressure reducer),
3. connect the supplied gas hose to the pressure reducer of the gas cylinder or central gas supply and secure the connection with the supplied hose clamp,
4. connect the pre-assembled hose nozzle of the gas hose to the quick connector on the chamber rear,



5. slowly unscrew the valve of the gas cylinder while checking low leakage connection.

Leak test

It´s important that all gas connections will be checked for leaks after the incubator is connected to the gas cylinder. This can be done with a leak spray or with a solution of dilute soap.

	**The gas outlet pressure CANNOT exceed the indicated value of 2,5 bar. The pressure above this value will result in chamber damage.**
	**Before connecting, check the outlet pressure on the pressure reducer of the cylinder. Adjust the outlet pressure to 1,5 – 2,0 bar above the ambient pressure.**

Only use the supplied hose nozzle to connect to the quick connector. Otherwise, the quick connector may leak, and/or it may become impossible to connect the original hose nozzle. In this case, please contact POL-EKO® Service.

	**The CO_2 gas cylinder is <u>NOT</u> supplied with the CO_2 incubator. The purchase, transport and connection is the responsibility of the user.**
	**The gas connections must be installed by qualified personel who is trained in handling the respective gases and is familiar with the required safety measures.**

- Opening the gas cylinder valves is only permitted when the cylinder has been connected to the chamber.
- Pressure level is checked by the controller regularly. When the CO_2 pressure is low, an alarm occurs on the screen (“CO2 Pressure low Start”).

	**Open the gas cylinder valve slowly to avoid pressure surges.**

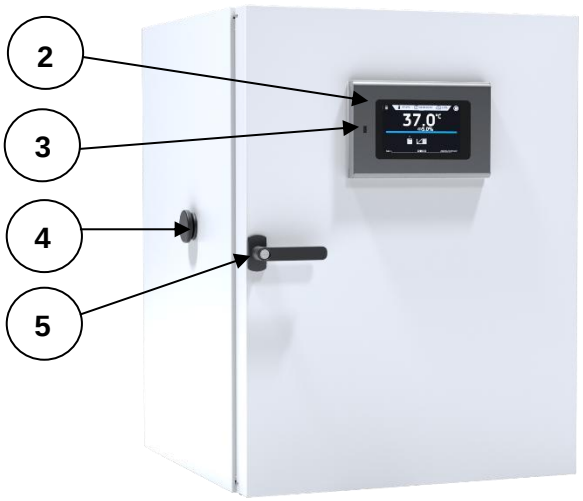
	Always close the valve even with apparently empty cylinders; screw on the cap when not in use. Return gas cylinders with closed valve.

4. DESCRIPTION OF THE UNIT

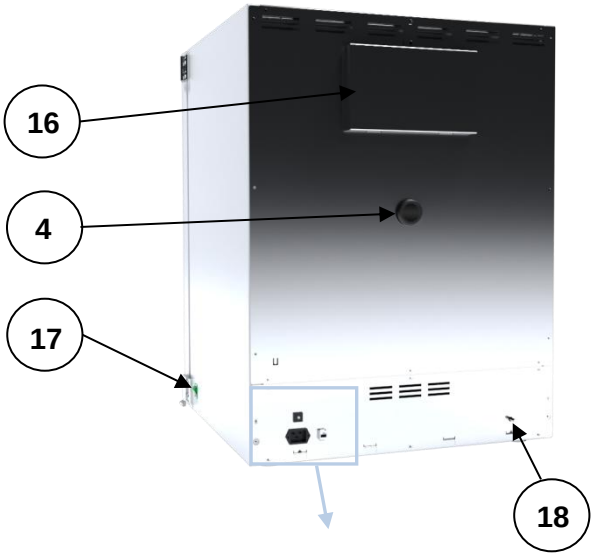
SMART PRO models are equipped with a PID microprocessor temperature controller and a 7 inch colour touch screen with a resolution of 800x480.

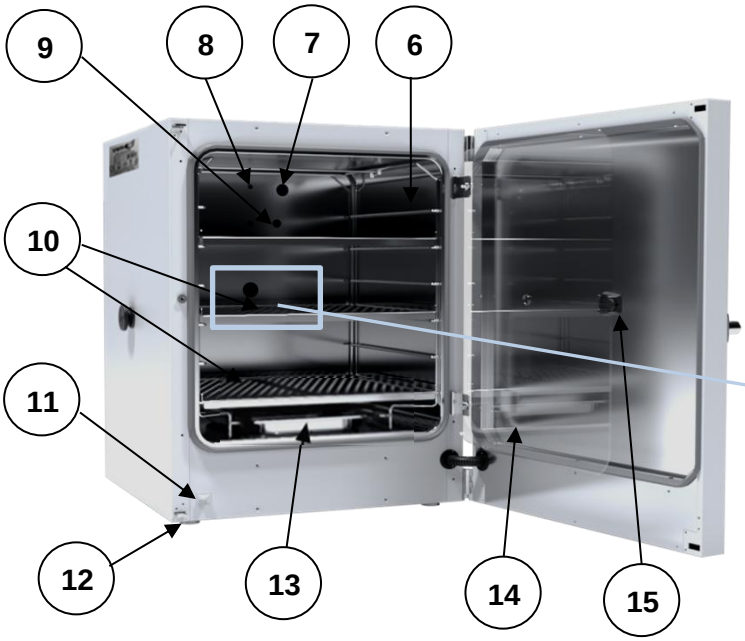
4.1. Design of ILC incubators

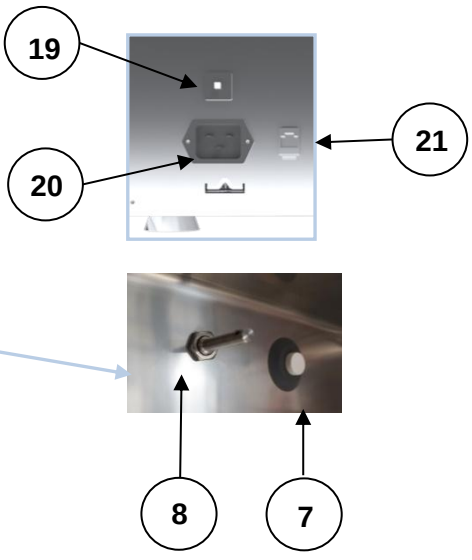
Front view



Rear view







(1) Nominal plate
(2) 7” touch screen controller
(3) USB port
(4) Access port (ϕ30 mm)
(5) Door handle with a key lock
(6) Rack for shelves
(7) CO_2 infrared sensor
(8) CO_2 gas mixing head
(9) Temperature sensor PT 100
(10) Stainless steel perforated shelves
(11) Open door sensor
(12) Height adjustable feet
(13) Water pan
(14) Inner glass door
(15) Glass door handle
(16) Inspection cover for CO_2 sensor and filter
(17) Main power switch
(18) CO_2 hose connector
(19) 10A fuse
(20) Main power socket
(21) LAN

5. UNIT EQUIPMENT

5.1. Internal glass door

Internal glass door is a standard equipment in ILC incubators. To open and close the door use the plastic handle attached to the glass.

	**During operation, when the temperature inside the chamber is high, do not touch the internal components and glass doors, as there is a risk of burns. Use protective gloves to protect yourself against the effects of burns from hot components.**

	We do not recommend installing and removing internal glass door. Incorrect assembly or disassembly may result in damage to the glass and injury to the user.

5.2. Door lock

All devices have a key lock. The key lock is situated in the door handle. Two keys are supplied with the device (hung on the back of the device).

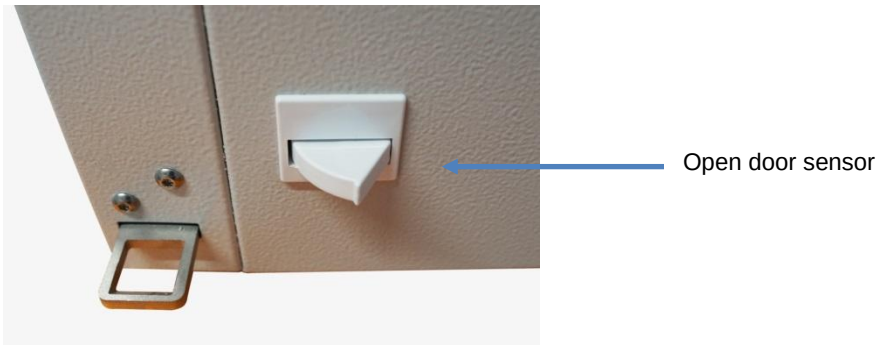
5.3. Access ports for external sensor

Two Ø30 mm access ports located on the left wall and on the rear can be used to insert external sensors, which have been secured with silicone plugs. The plugs should cover the access ports while the unit is operating. If multiple cables have been inserted through the access port and if it is not possible to use the plug, secure the access port with adhesive tape. If you leave the access port open, it may affect temperature variation and fluctuation within the chamber.

5.4. Open door alarm

All units have been equipped with an open door sensor. If you open the door, the icon: 

will appear (the number above the icon presents open door counter. Press the icon to cancel the counter. The counter is also cancelled by turning of the device). If the door remains open longer than the time set by the user (30 s, 1 min, 2 min, 5 min, 10 min) an acoustic signal, red pulsating alarm bar and *„open door"* alarm with active status will appear.



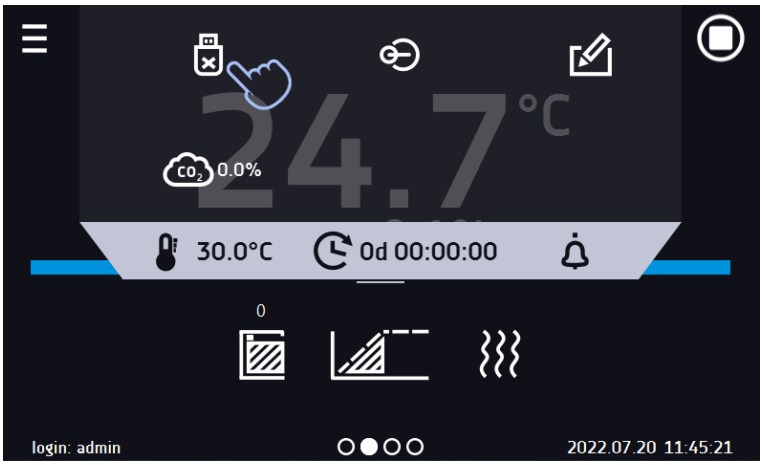
5.5. USB port

The USB port on the front panel is used only to transfer data from the device's internal memory to the flash drive. To do this insert the flash drive into the USB port on the front panel and then:

- go to the main menu ☰,
- go to the data record ,
- press and choose type of the file: *.csv, or *.plkx.
- press . Data has been copied.

	After copying the data to the USB flash drive, before removing it from the USB socket, it should be unmounted by pressing the icon in the top drop-down list If the pendrive is not unmounted after connecting to the computer, a message about pendrive damage may be displayed with a repair proposal, when actually the pendrive is not damaged

Figure 1 Unmounting USB flash drive



Data saved in the * .csv file can be opened in a spreadsheet. Data saved as * .plkx can be opened in the Lab Desk program (standard equipment). This program allows, among others, for data preview in the form of a table or a graph. It also allows you to prepare a statistic report for a selected range of data, see *Section 6.1.*

5.6. LAN port

Each unit can be connected to the Ethernet network or directly to the computer with a LAN cable. Premium Control software enables to create programs and send them to the unit remotely, read data (saved data and event log), create graphs and make reports. With this feature, equipment can be controlled and monitored remotely. It is also possible to connect several units at the same time and control them from one computer.

6. DEVICE OPERATION

This symbol means that a given window can be moved in the direction shown in the picture.

6.1. External memory (USB flash drive)

The external memory (USB flash drive) allows to copy: instruction manual, data record, event log and service log from the device memory. Before first use the USB flash drive should be formatted in the FAT 32 file system. Insert the device in the USB slot on the front of the device next to the display. Wait a few seconds, the correct reading is indicated by the message *„USB flashdrive connected"* at the bottom of the screen.

	USB slot is used to connect **only** a flash memory – a pendrive or a card reader with a memory card. Connecting any other device (e.g. external hard drive) without consultation is not authorized by the manufacturer and may damage the USB slot.
	After copying the data to the USB flash drive, before removing it from the USB socket, it should be un-mounted (see Section 5.5.).

6.2. First boot

During the first startup, a wizard appears on the screen allowing you to configure settings such as:

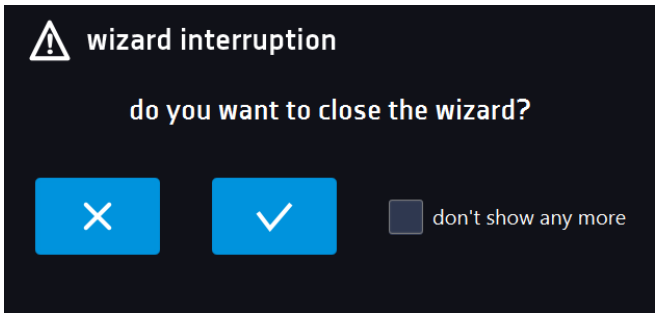
- language selection
- downloading the manual
- connection to a computer network
- setting the time zone and time
- connection to the LabDesk Cloud cloud service

Figure 2 Settings wizard

It is recommended to complete the entire wizard, but you can interrupt it at any time by pressing ✕
You can then choose one of the options:

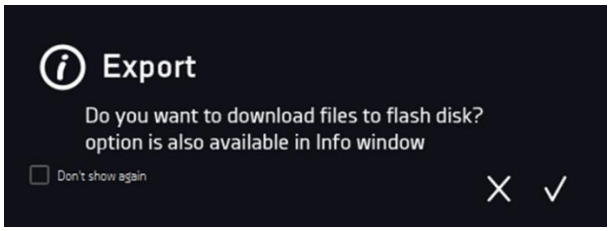
- one-time closing – the wizard will be displayed again during the next launch
- check the option so that the wizard will no longer appear the next time you run it
- return to the wizard

Figure 3. Wizard interruption



During the first boot, the screen will display information about saving the "Download" folder (with instruction manual in pdf format) on the USB flash drive. In order to do it, insert the USB flash drive and wait a second to detect the hardware, then press ✓.
If you press ✕ you quit downloading the folder. The window will appear again during the next boot. You can tick *„Don't show again"* so that the window will not be displayed after switching on the device. You can always download the *„Download"* folder in the Info submenu. More information Section 6.14.

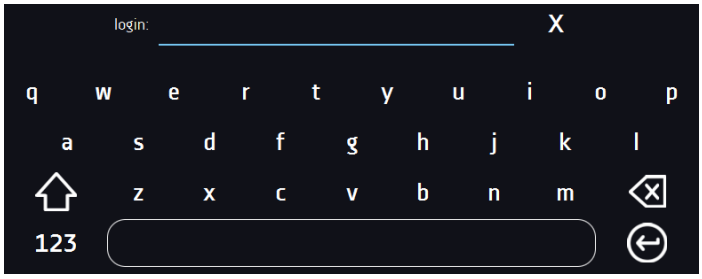
Figure 4 Downloading files



6.3. Using the keypad

When operating the device, sometimes it is necessary to enter alphanumeric characters (e.g. when logging into the system, entering the user name, etc.). In such cases, a keyboard appears on the display screen. In addition to the standard letters, it contains symbols that correspond to the computer keyboard.

Figure 5 Keypad



 Deleting the entire text

 Changing to capital letters (it´s matters when entering login and password).

 Changing to numbers and special characters.

 Changing to letters.

 Deleting the entered character.

 Confirming the entered text / closing the keypad.

	Sometimes entered characters can be hidden (then they are replaced with „* ”). This happens when classified information is entered (e.g. when a user enters a password).

6.4. User logging in

Setting device parameters is only possible by the logged in user. To log in, press  in the main screen. The login window will appear:

login: from 1 to 10 characters
password: from 1 to 10 characters

Factory default login parameters:
login: admin
password: leave the password field blank

Factory user: Super Admin

Figure 6 *Login panel*

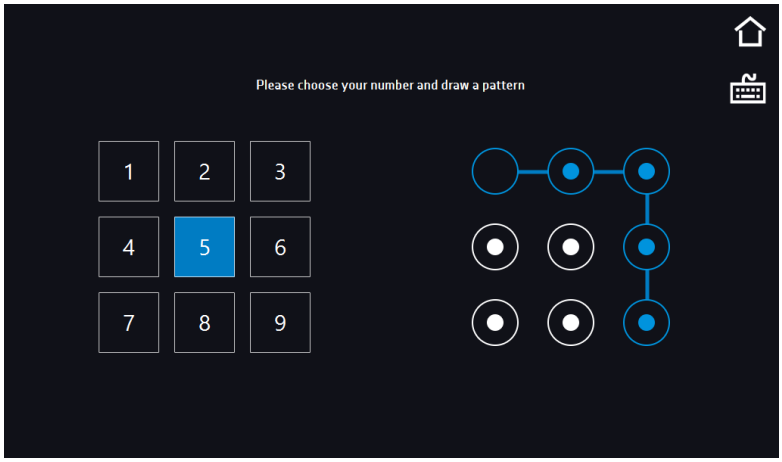
 - switching to login using a pattern

It is recommended to set a password for the Administrator account during the first start-up and write it down in a safe place to avoid unauthorized persons interfering with the device settings.

	Please remember or write down the password because it is not possible to delete the Admin account password. If you lose your password, please contact the manufacturer's service. Password deletion is not possible

Instead of a text password, you can choose to log in using a pattern. to do this, press the buton  , select the number and then draw the pattern. The pattern is not set by default. For detailed information on creating a pattern, see section 6.15.1. Creating/editing a user.

Figure 7. Creating a login template



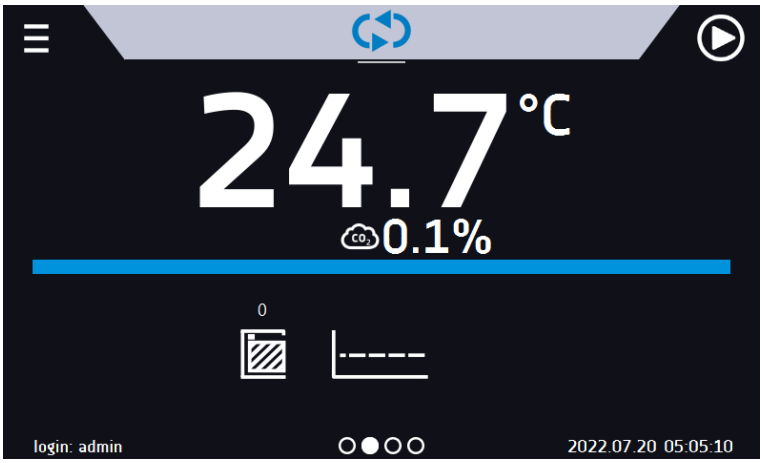
For information on user account types, see Section 6.15.

Logout: in the main menu, press  . Automatic logout, see Section 6.16.

6.5.  *Main screen*

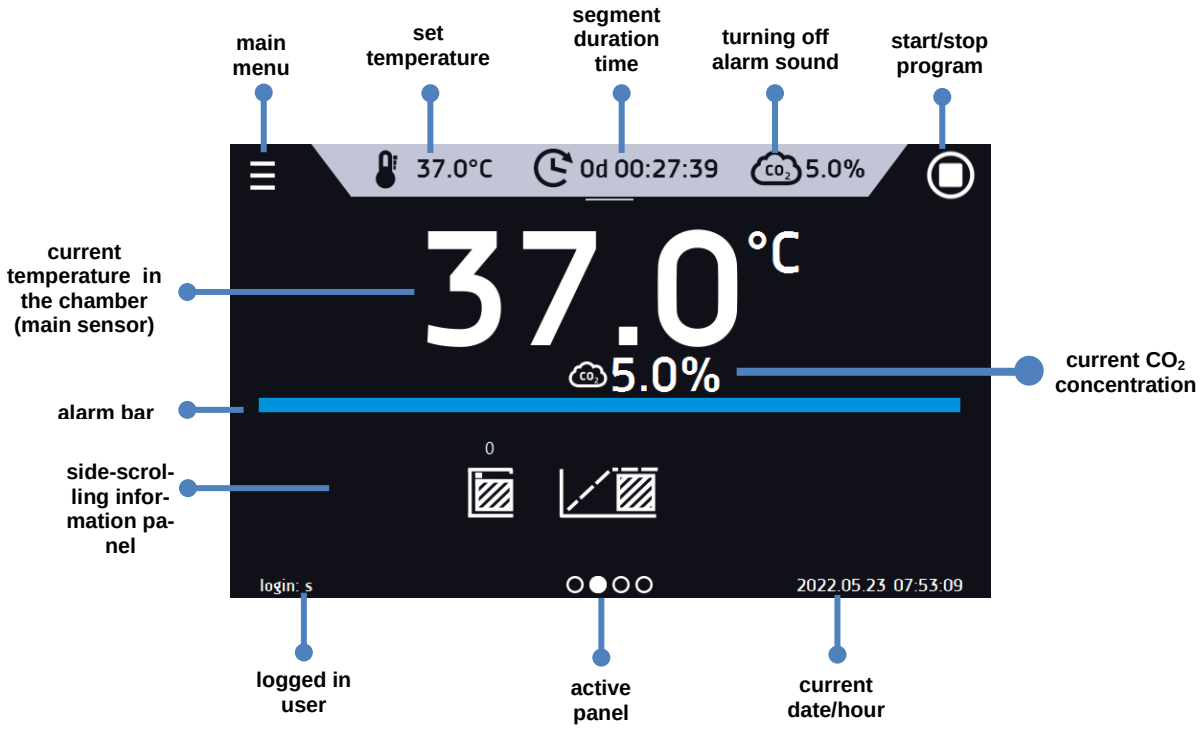
After switching on the device, the main screen appears. It contains the information about the device status. After starting the program, additional information appears on the screen.

Figure 8 Main screen (program is switched off, no user is logged in)



From this point, any action requires logging in.

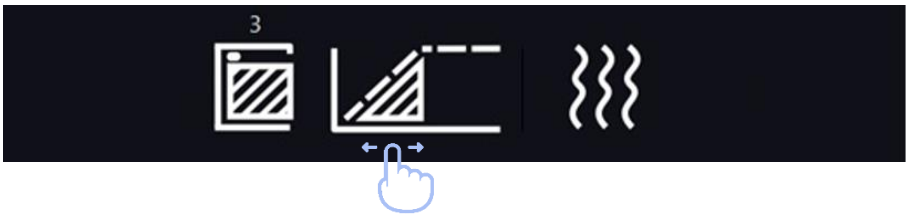
Figure 9 Main screen – running program in ILC



6.5.1. *Information panel*

There are four different windows in the information panel. Switching between them is done by swiping the finger left or right.

Figure 10 Information panel



The icon indicates information about which window is active.

6.5.1.1. Alarms panel

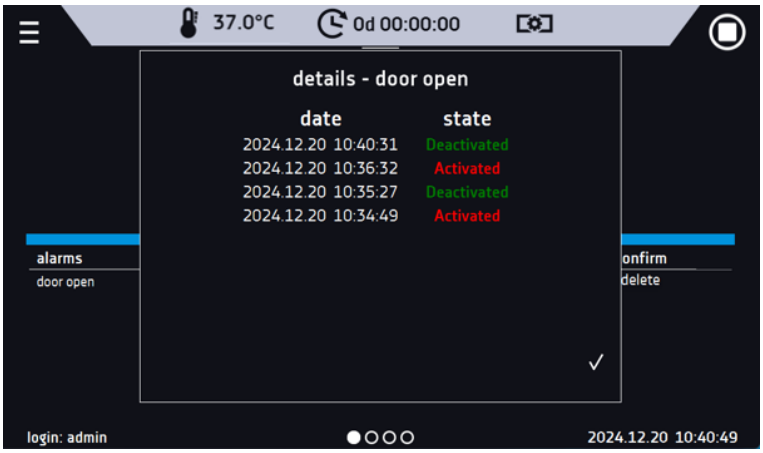
On the first page of the information panel there's alarms panel.

Figure 11 Icon: Alarms panel

In the alarms panel there's a list with active alarms or the alarms that have occurred but have not been confirmed. When the alarm is active, the alarm bar is red and the alarm event is displayed in the list with the status *"active"*. When the alarm event stops, the state changes to *"inactive"*.

- "**delete**" button – confirms and removes the alarm from the list (only inactive alarms can be deleted),
- "**confirm**" button – confirms an alarm,
- "**details**" button – displays a preview of all instances of selected alarm.

Figure 12 Alarm details

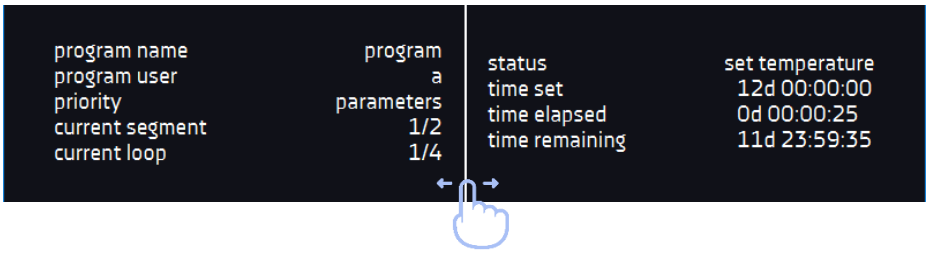


With more alarms, a button appears on the right side of the list and allows you to enlarge the view to full screen.

6.5.1.2. Status panel

The status of the device is displayed descriptively on the third page of the information panel.

Figure 13 Status - description



program name	the name of running program
user	name of the user to whom the program is assigned
priority	of time or parameters
current segment	currently running segment / total number of segments in the program
current loop	currently performing cycle/ total number of cycles to perform
status	stage of device operation, e.g. reaching or maintaining of set temp.
time set	set time of running segment
time elapsed	elapsed time since the segment has started
time remaining	remaining time until the end of the segment

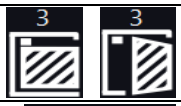
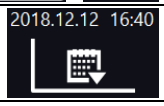
6.5.1.3. Status panel – protection and alarms

On the fourth page of the information panel there is an information about the protection class along with the set protection temperatures as well as an alarm for the upper and lower temperatures. This information is associated with a running or finished program. To set protection parameters, go to the *Section 6.7.1.*
For information on protection classes, see *Section 6.7.4.* The second part of the panel (on the right side) displays information about set upper and lower alarms. To set alarms, see *Section.6.18*. Value „-" means the alarm is off.

Figure 14 Status – protection and alarms

6.5.2. *The meaning of icons and symbols*

icon	function
	The icon allows you to go to the main screen.
	Automatic return to the home screen. Factory setting: disabled.
	The icon allows you to go to the main menu.
	Automatic logout. Factory setting: disabled.

	Automatic screen lock. Factory setting: disabled.
	Unmounting the USB flash drive before removing it from the USB socket.
	Icon is visible only when the chamber is heating up.
	Going to the menu to create, edit, delete and start programs.
	Available when the program is running Clicking the icon allows you to quickly change the set temperature (Quick Change function).
	When the program is running, click the icon to quickly change the time of program duration (Quick Change function). Indicates the time that has elapsed from the program start.
	Countdown of the time remaining to the end of the program.
	Turning off of the alarm sound (open door alarm, exceeding temperature range). Critical alarms (i.e. damage to the temperature sensor, temperature protection, etc.) continue emitting a sound.
	User message. Clicking on the icon allows you to enter a message.
	The icon appears in the event log and symbolizes entered user message.
	The arrow icon allows navigation between: segments, program parameters and summary.
	Closed door, open door. The number above the icon presents open door counter. Press the icon to cancel the counter. The counter is also cancelled by turning of the device.
	The program will start on the given date / time. Schedule or start delay activated.
	Ramp status: Chamber is currently heating up
	Set temperature is reached.
	Starting the selected program. In the list of programs - the program is running.
	Stopping the program.
	Adding a new program to the program list. The limit is 40 programs.
	Editing the selected program from the list. In the program list, a new program has been created but not approved yet.

	Removing selected program from the list.
	Canceling adding or editing of the program. Canceling changes.
	Editing individual program segments (the program can have max. 6 segments).
	Immediate start of the program selected from the program list.
	Delayed start of the program from the list of programs. The program starts according to the set date and time.
	Going to the SMART program (Quick Program function).
	The active STM function (Smart Temperature Monitor) informs about the problem of achieving or maintaining the set temperature. • white color – function active, program is stopped • blue color – function active, program running • red color – warning about problems with achieving or maintaining the set temperature

6.5.3. *Upper expandable and configurable menu*

When the program is running, in the upper part of the main screen there's a bar menu with parameter icons (temperature, time, CO_2 concentration, quick note and mute function). These parameters can be quickly changed (Quick Change).

After swiping your finger down you will see icons for all parameters which can be quickly changed (*see* *Section 6.9*). Among the options available in the bar you will find the following icons:

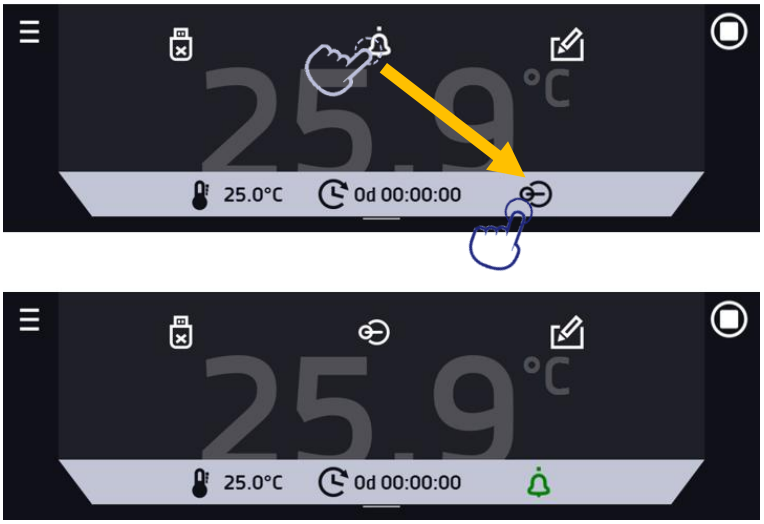
-  USB flash drive unmounting – more information *Section 5.5*.
-  Quick Note – more information *Section 6.5.4*.
-  mute option. Critical alarms (i.e. damage to the temperature sensor, temperature protection, etc.) continue emitting a sound, see *Section 6.18.2*.
- Quick Change (more information Section 6.9.) of:
  -  program duration time
  -  set temperaturę
  -  set CO_2 concentration

Figure 15 Upper expandable menu when the program is running

Figure 16 Upper expandable menu when the program is stopped

Positions available on the upper bar can be personalized. Just drag the selected icon to a new location.

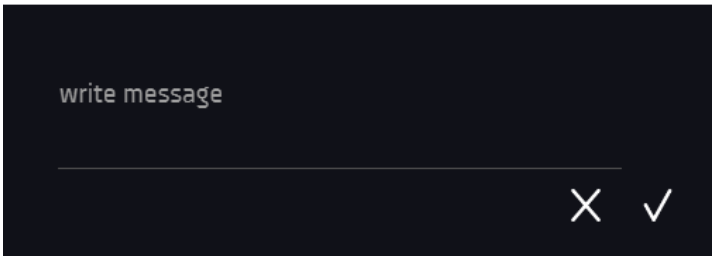
Figure 17 Changing icon's position



6.5.4. *Quick Note – user's message*

During equipment's operation, the user can save messages in unit's memory with information about: the date of inserting a new sample, observed changes in the samples, the place of sampling, etc. To enter a message you must first log in and then press the icon in the main screen in upper menu. Click on „*Write a message*". Using the keypad, enter the message and confirm it with the button . Once entered, a message cannot be changed. Entered notes can be seen in the event log, they are symbolized by the icon . More information *Section 6.13.*

Figure 18 User's message



6.5.5. *Alarm bar*

The alarm bar is a quick visual information about the device status. The colour of the bar indicates the status of the device:

– blue - the device is working properly

– red bar and pulsating frame – active alarm

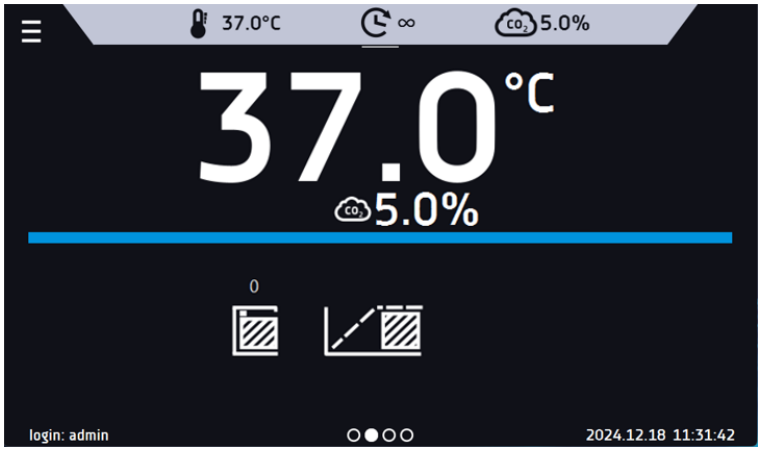
6.6. *Quick Program*

Quick program allows you to quickly start the program from the main screen position without having to enter to the menu .

Quick program has several features that guarantee its uninterrupted operation:

- you can not set the duration of the program - time is always set to infinity,
- if the display fails, the program continues,
- after the power supply is resumed (after its failure), the program continues,
- to prevent the program from stopping accidentally, the STOP button was removed from the main window.

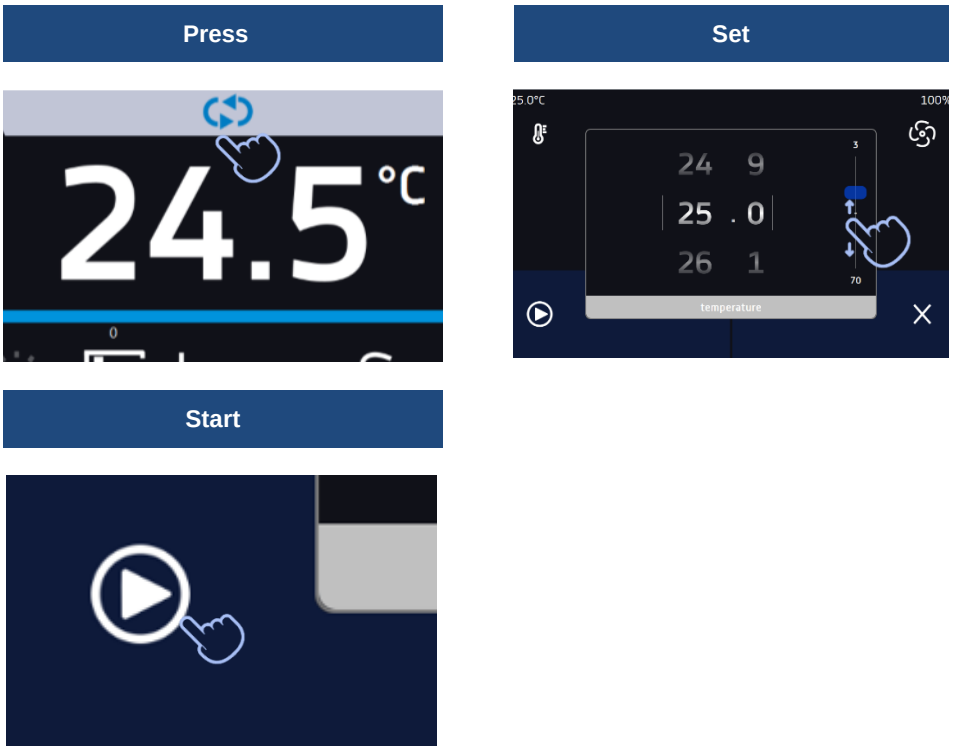
Figure 19 Quick program



In order to go to **Quick program**, first you have to log in (if none of the users is logged in, the icon of Quick program will be inactive - grayed out). Then click the icon in the main screen. By clicking the appropriate icon you can set the temperature.

Clicking the icon starts the program in continuous mode (time set to infinity).

Figure 20 Starting the Quick Program

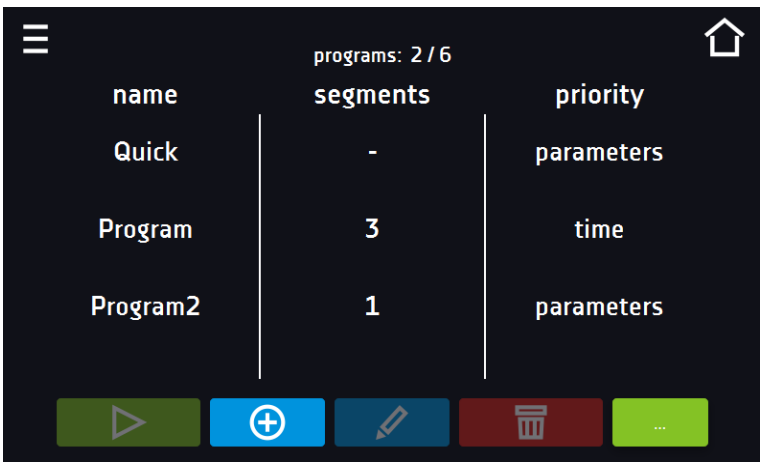


Stopping a Quick program has been made difficult on purpose (this prevents the program from being stopped accidentally) – to stop a program, you have to:

1. go to the menu ,
2. click the program window ,
3. keep pressing STOP button for 5 seconds.

After configuriation of the Quick Program, it appears in the programs list. Quick Program is displayed at the top of the list by default. Moreover, it cannot be deleted and cannot be assigned to a user of the User type.

Figure 21 Quick program on programs list



In Quick Program editing mode, you can change:

- settings of the data recording interval,
- settings of the protection class.

Temperature protection

The highest protection class available for the device is set. The protection values depend on the set temperature:

- set temperature < = 15°C: lower protection = set temperature – 2°C, upper protection = 30°C
- set temperature > 15°C: lower protection = set temperature – 5°C (max 20°C) , upper protection = set temperature + 5°C (min. 30°)

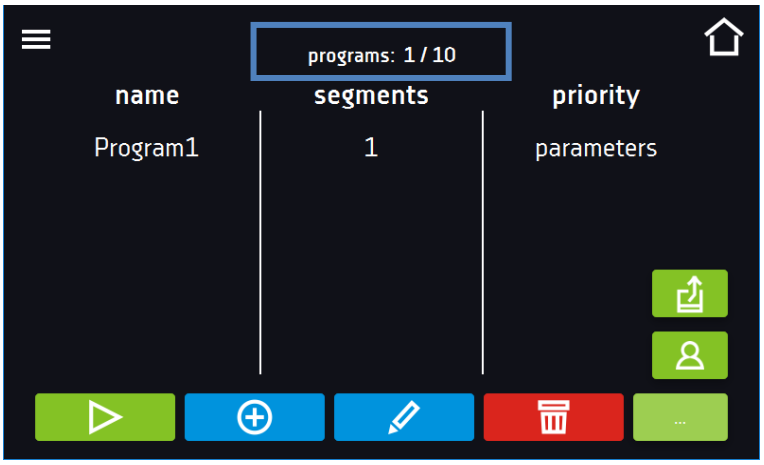
When the program is running you can change the temperature by pressing the icon . During next launch of the **Quick program**, your previous settings will be remembered.

6.7. Programs

Press the icon of main menu , and then press . In this panel you can run the selected program, add a new one, edit the program, delete it or share it with another user and download the program from a USB flash drive. The number of programs that can be created depends on the limit assigned by the **Super Admin** user. More information on the rights and configuration of account types (Super Admin, Admin, User) see *Section 6.15.*

	Start the selected program.
	Stop the program.
	Add a new program.
	Edit the selected program.
	Delete the selected program.
	Download program from USB flash drive.
	Share the selected program with the user type account.

Figure 22 List of programs



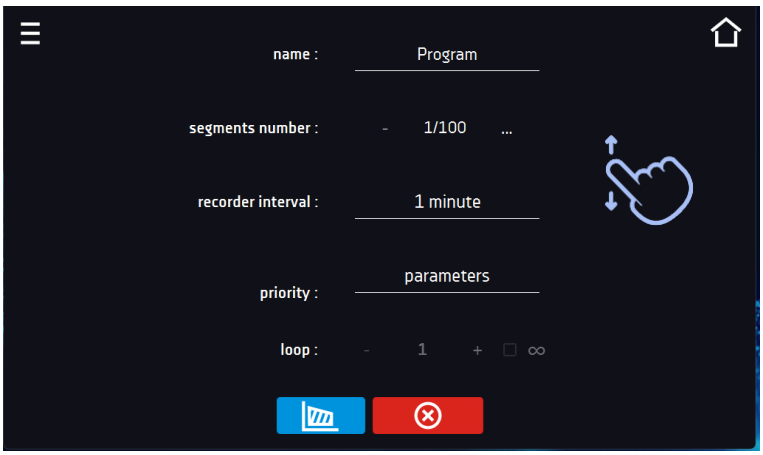
Information on the number of created programs / the maximum number of programs that the user can create is at the top of the screen (programs: 1/10).

6.7.1. *Creating / editing a program*

Press the button  or  and a panel with program parameters will appear.
In this panel you can set:

- **Program name** – after clicking, the keypad will appear and you will be able to enter the program name,
- **Segments number** – max. 100 segments
- **Interval** – frequency of saving the data in the data record (1 min, 2 min, 5 min, 10 min, 15 min, 30 min, 1 h),
- **Protection class** – more information *Section 6.7.4.*
- **Priority** – the priority of time or parameters, more information *Section 6.7.5.*
- **Loop** – the number of program repetitions, more information *Section 6.7.6.*

Figure 23 Program parameters



 Cancels adding or editing of the program

 Going to the edition of program segments

	With more parameters, the window can be scrolled up and down.

6.7.2. *Segments edition*

For each program, you can set maximum 100-segment time-temperature profiles that allow you to gradually increase or decrease the incubation temperature of the samples. This can e.g. protect the sample from so-called thermal shock.
Example of program operation with programmed segments (parameters priority):
Program 1
segment1: temp. 30°C, time 2 hours (after reaching the temperature 30°C, it is maintained for 2 hours)
segment2: temp. 40°C, time 3 hours (after reaching the temperature 40°C, it is maintained for 3 hours)
segment3: temp. 50°C, time 3 hours (after reaching the temperature 50°C, it is maintained for 3 hours)
segment4: temp. 40°C, time 2 hours (after reaching the temperature 40°C, it is maintained for 2 hours)
Press the buton  and the first program segment will appear.

In this window you can set:

- **temperature –** target temperature which the device is to achieve in this segment (needs to be minimum 2°C below the value for over temperature protection and minimum 2°C above the value for under temperature protection),
- **time –** the time of maintaining the set temperature ([d hh:mm]) in days, hours and minutes. It is possible to select continuous work ∞ in the last segment,
- **CO2** - CO_2 concentration to be achieved in the segment,

- **ramp time** – the time of reaching the set temperature ([d hh:mm]) in days, hours, minutes.

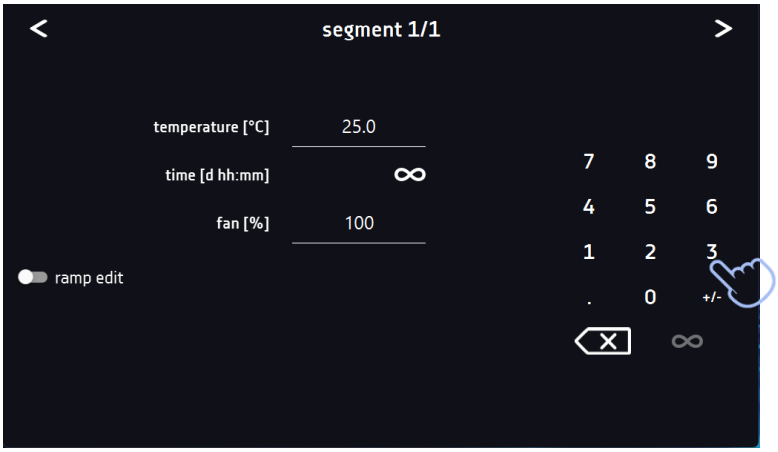
The active value is highlighted in blue. The item highlighted in red means that the value is out of range and you should enter another one, e.g. the temperature is above / below the operating range of the device or the protection temperature.

	Ramp time - setting a short time will not accelerate reaching the ramp, but the ramp will be reached in the shortest possible time depending on the set temperature, ambient conditions and the possibilities of the cooling or heating system in the device.

The ramp parameters are factory set in accordance with the manufacturer's instructions. If it is necessary to set individual parameters when reaching the segment temperature, activate the ramp edition field ramp edit and set your own values.

	With more parameters, the window can be scrolled up and down.

Figure 24 Program segment edition



The navigation between: segments, program parameters and summary is done by touching the icon < >..

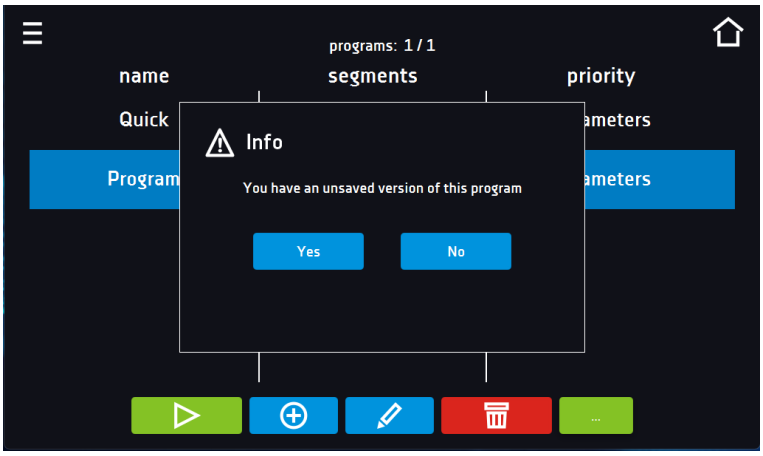
	If, when editing a program, you automatically return to the home screen or you are automatically logged out, the edited program will not be lost, but saved as a draft (see below).

After configuring all segments, a window with the security class is displayed. For class 3.1 (standard) you can set the protection temperature.

Figure 25 Security class 3.1.

After switching to the program edition, the information about the possibility of continuing changes in the program settings appears.

Figure 26 Info



6.7.3. *Summary of segments*

In the segments summary all segments can be seen along with introduced parameters:

- number of segments,
- temperature, duration time, target time of reaching temperature of a given segment,

Figure 27 The summary of the segment

Confirms and saves the changes.

Cancels the entered changes in the segments and goes to program parameters.

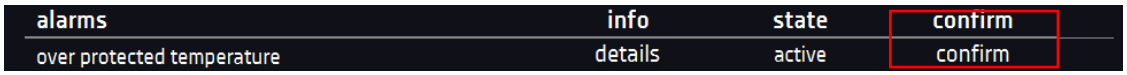
The fan efficiency is factory set to 100% and it cannot be changed.

6.7.4. *Protection class*

The device is factory-equipped with a protection **class 3.1 according to DIN 12880**. The user can set the temperature protection (upper limit) by himself and when the set temperature falls outside of this range, the power heater is switched off. When the temperature returns to within normal parameters, the equipment continues to work normally.

The set temperature in the segment cannot be higher than the over temperature protection minus 2°C, e.g. the over temperature protection is 39°C, therefore the maximum set temperature in the segment that can be set is 37°C.

Figure 28 Confirmation of protection alarm



6.7.5. *Priority*

Can be set in terms of:

Parameters:

In the program without ramp – the device starts the countdown of the segment time when the set temperature is reached.
In the program with ramp – first, the device counts down the time of the ramp and then proceeds to the segment countdown when the set temperature is reached. Regardless of whether the time of ramp elapsed.

It may happen that the device failed to reach the set temperature within the set time because the reaching time was too short. In such situation the reaching time will be prolonged and the segment's time count-down will start when the set temperature will be reached.

Time:

In the program without ramp – the device starts counting down the segment time when the program is started. Regardless of whether the temperature has been reached.
In the program with ramp – first, the device counts down the ramp time and after its expiry it proceeds to the countdown of the segment time. Regardless of whether the temperature has been reached.

It may happen that the time of reaching was too short and the device failed to reach the set temperature within the set time. Then the countdown of the segment time will start before reaching the set temperature. Thus, the actual time of device operating in the set temperature will be shortened.

6.7.6. *Loop*

The option is available if the number of segments is equal to 2 or more (maximum 100). When the program finishes the last segment, the device starts the program again from the first segment. You can define if the program should be carried out once (loop: 1) or multiple times (loop: 2 to 255). In order to set the program to be carried out continuously, tick the „∞" option. If the time of the last segment is set to infinity, it will be treated as infinite only in the last cycle. In other cycles it will be treated as 0.

Example:
Loop:3
segment1: temp. 30°C, time 2 h
segment2: temp. 35°C, time 2 h,
segment3: temp. 40°C, time „∞"

The device will run segment1 and segment2 three times and then will go to segment3 which will last indefinitely.

6.8. Starting the program

The created program can be started in two ways:

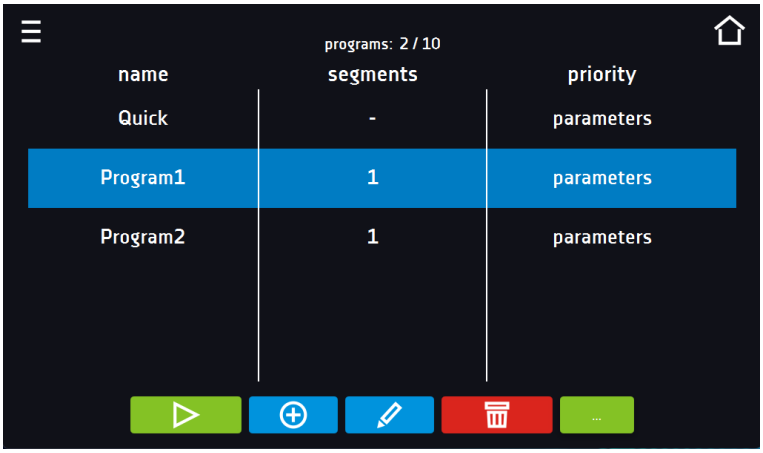
6.8.1. The first way

Go to the main menu and press the icon „programs”.

- Then select the program you want to activate and press „start” button .

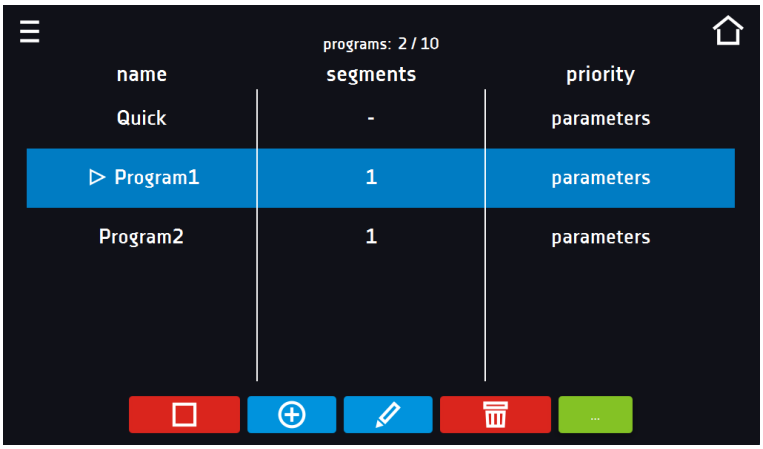
Figure 29 Main menu

Figure 30 Program management menu



If the program is running, the symbol appears next to the program name on the list. The symbol means that the program has been edited, but the changes have not been confirmed.

Figure 31 List of programs with the selected status



6.8.2. *The second way*

- In the main screen press the icon in the upper right corner  .
- Select the program you want to start. You have two additional options to start the program:


Immediate start of the program.


Scheduled program start according to the set date and time.

Figure 32 Main screen

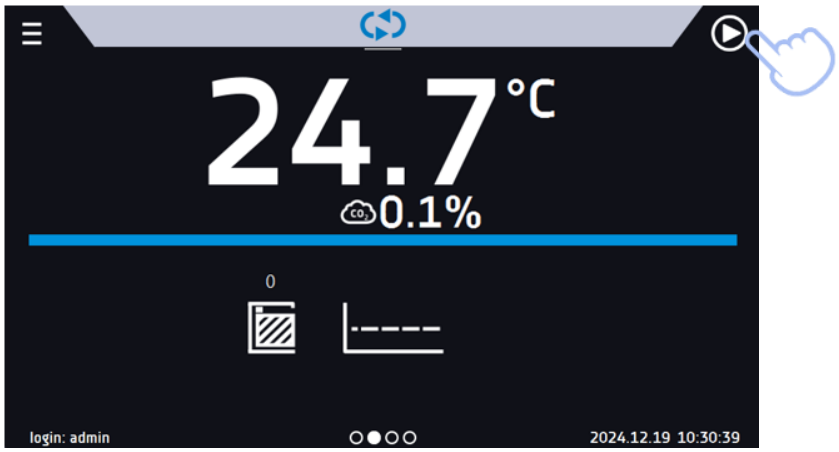
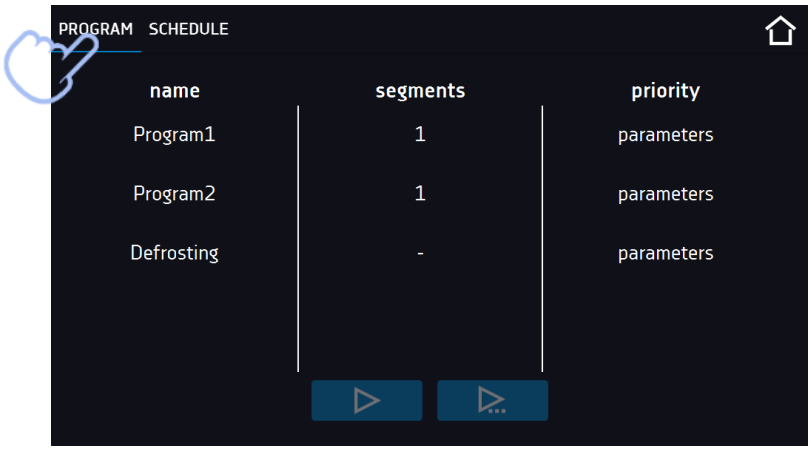


Figure 33 Selection from the program list



	It is possible to delay the program start (up to a maximum of 7 days). This is possible for the programs with time priority. Program segments that would last from the back date to the current date will be skipped.

If the program is running, the symbol ▷ appears next to the program name on the list.

6.9. *Quick Change of parameters*

	You cannot make a quick change (of time / temperature / CO_2) in a running program that belongs to another user. Information about the program owner can be found in the information panel (lower left corner).

	Although the ramp time has been included in the program, the Quick Change of parameters will take place immediately while the temperature is being reached.

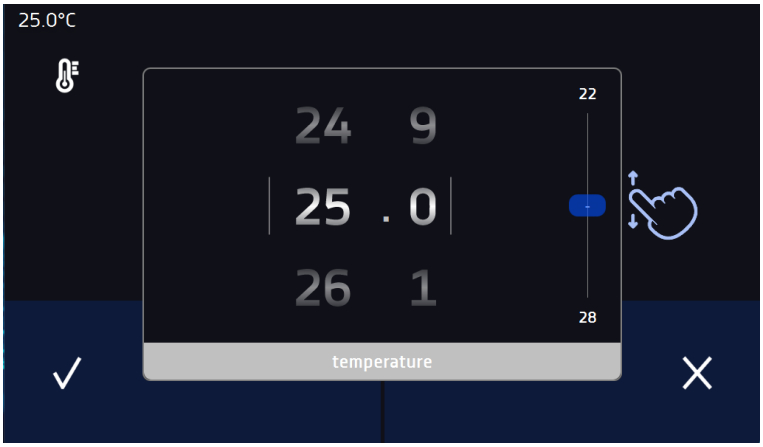
6.9.1. *Quick change of set temperature*

In order to quickly change the value of set temperature of a running program, press the icon in the main screen. The value of the temperature should be selected by scrolling the list up or down. Click ✓ to confirm the change. In the Quick Change program, the temperature protection is set automatically and the upper protection is the set temperature of +5°C, the lower protection is the set temperature of -5°C. **Please note that the CO2 incubator has a lower temperature range of 5°C above ambient temperature.**

The temperature can't be higher than the over temperature protection -2°C.

Figure 34 Quick change of set temperature

Figure 35 Quick change of set temperature



6.9.2. *Quick change of set time*

In order to quickly change the duration time of a running program, press the icon in the main screen. Select the number of days, hours and minutes by scrolling the list up or down. Click to confirm the change. To set the continuous work press ∞.

To change the way of displaying the time, press::

– to display the elapsed time

– to display the remaining time

To change only the way of displaying, you do not have to confirm it by .

Figure 36 Quick change of set time

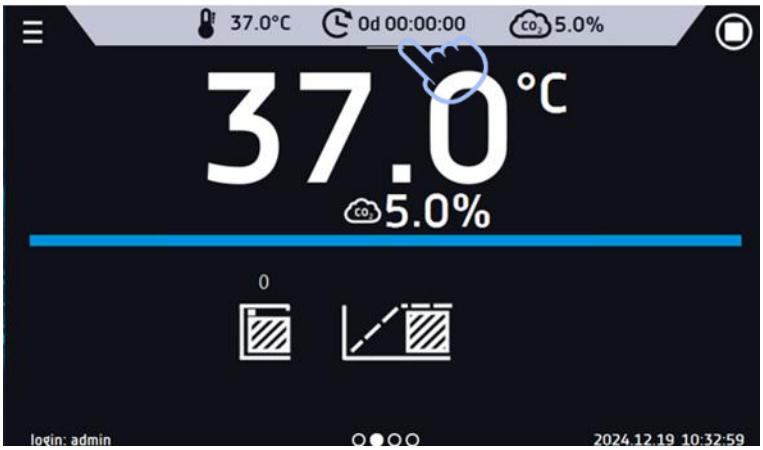
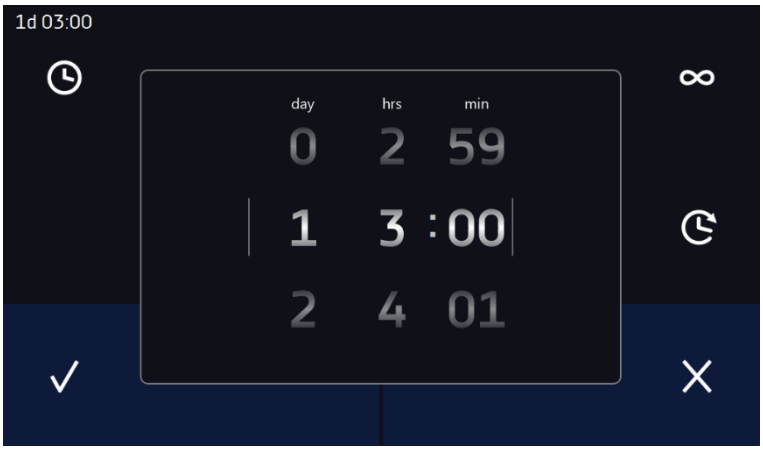


Figure 37 Quick change of set time



6.9.3. *Quick change of set CO_2 concentration*

In order to quickly change the set CO2 concentration, press the CO_2 icon in the main screen. Select the required CO2 concentration by scrolling the list up or down.

Confirm the change by pressing ✓.

Figure 38 Quick change of set CO_2 concetration

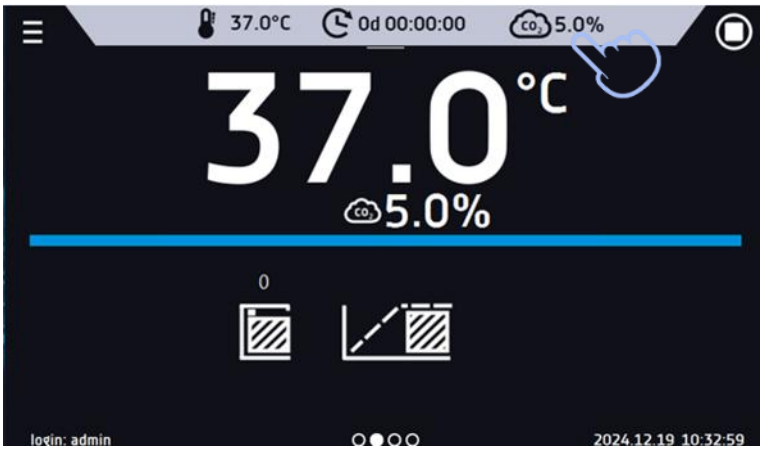


Figure 39 Quick change of set CO_2 concetration

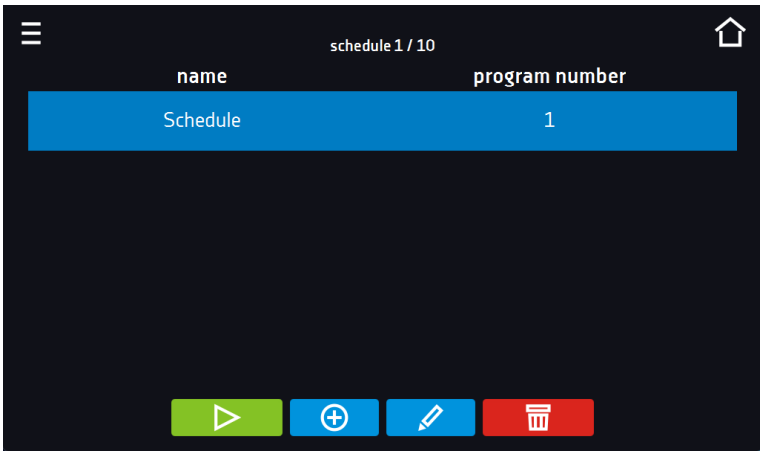
6.10. Schedules

The option allows creating a list of programs to be implemented in a given time. You can create several independent schedules. The schedules window contains a list of all created schedules of the logged-in user.

	Before you start creating a schedule, you must create programs that you want to include in it.

On the upper part of the screen there is information about the number of created schedules / the maximum number of schedules to be created (1/10).

Figure 40 List of schedules



 Start the schedule

 Stop the schedule

 Add the schedule

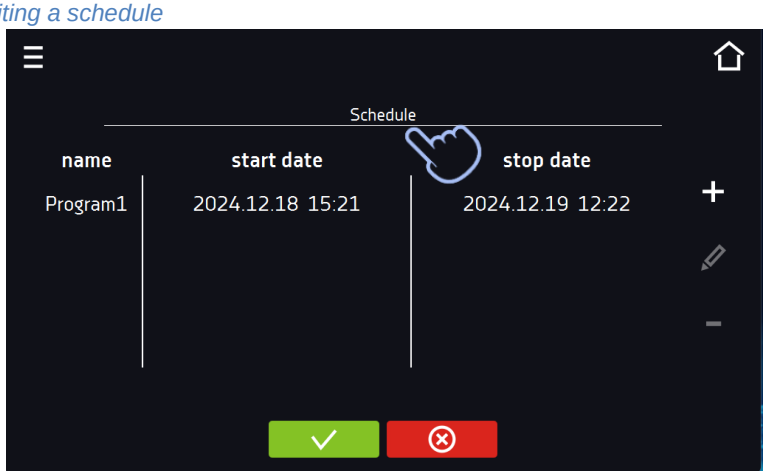
 Edit the schedule

 Delete the schedule

6.10.1. *Creating / editing a schedule*

To create / edit a schedule, press the button  or  . The panel with schedule parameters will appear on the screen. Press "Schedule" and use the keypad to enter the schedule name. The schedule may consist of up to 10 programs.

Figure 41 Creating / editing a schedule



 Add a new program to the queue (program must be previously created)

 Edit and make changes to the selected position

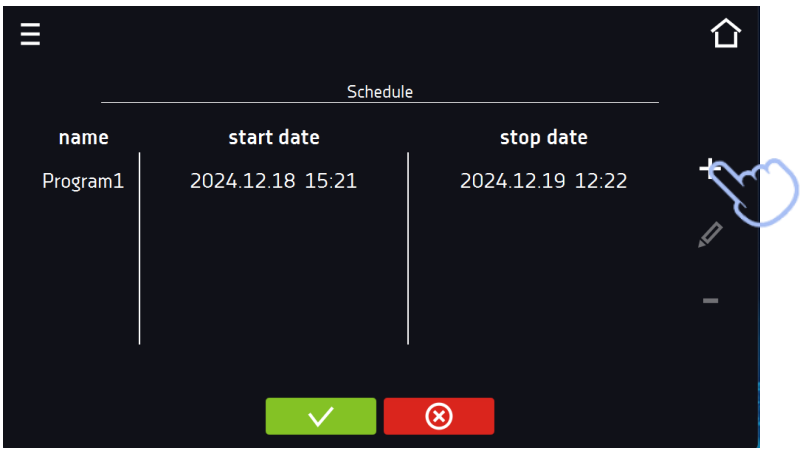
 Delete the selected position from the list

 Save the schedule

 Cancel instroduced changes

After pressing  *Figure* or  a window appears allowing you to select the program and the date and time of its start and end.

Figure 42 Adding a program to the schedule



Select a program from the drop-down list and press on the field next to the inscription "program". Information about the selected program will be displayed: number of segments, number of cycles, priority, temperature protection, upper protection, lower protection. This is only a preview of the parameters - it is not possible to change them in this window.

Figure 43 Selection of the program

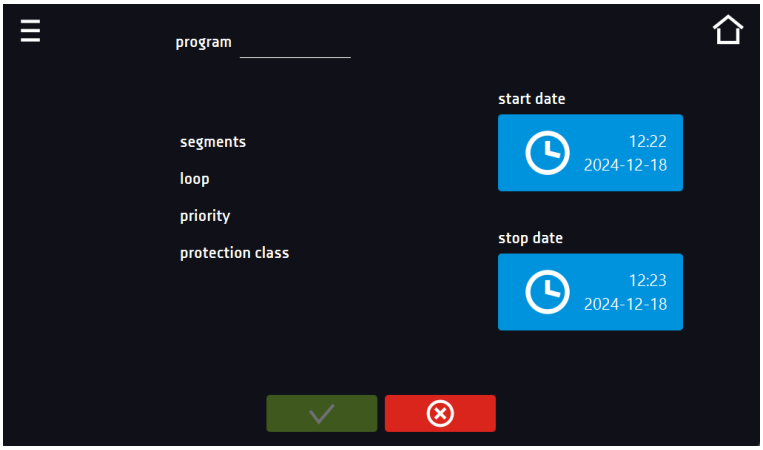
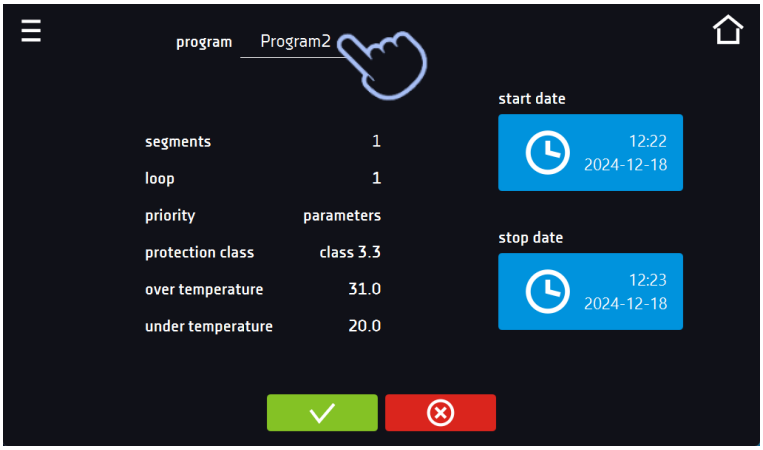
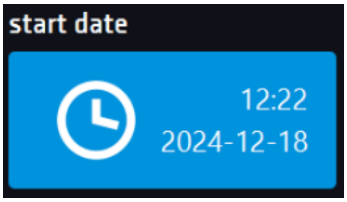


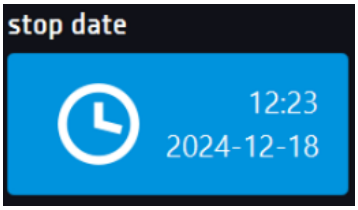
Figure 44 Information about the program



Press the 'start date' field and then set the date and time of program start.



Press the 'stop date' field and then set the date and time of the program end.



	You can assign up to 10 programs to one schedule. In total you can create ten schedules.

When creating a schedule, consider the following restrictions:

- the start time of the first program on the list cannot be earlier than the current date and time,
- the start time of the next program on the list cannot be earlier than the end time of the previous program,
- the program end time cannot be later than the start time of the next program,
- the end time of the next program does not have to coincide with the start time of the next one, there may be a break between them,
- if the program is not fully completed (due to setting a too short time of a schedule), it will be interrupted.

	When choosing time intervals, consider whether they are long enough for the selected program to be implemented. The duration of the program can be affected by: ambient conditions, samples and the program carried out immediately before it.

6.10.2. *Starting a schedule*

The schedule can be started in two ways:

6.10.2.1. The first way

- Press the icon of the main menu and then press the icon „schedule” .
- Then select the schedule you want to activate and press the start button. .

Figure 45 Main menu

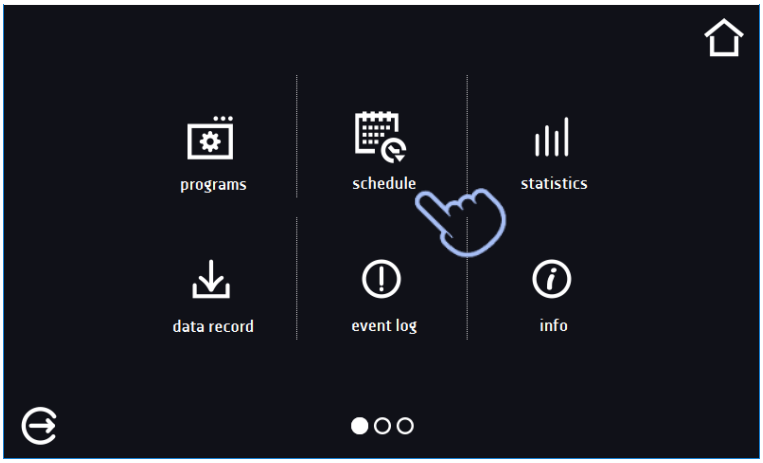
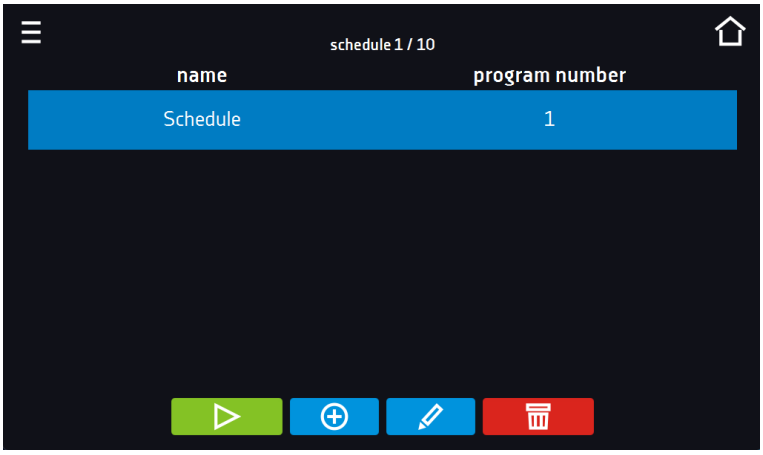


Figure 46 List of schedules



 Start the schedule

6.10.2.2. The second way

- In the main screen press the icon  *Figure*, then press the SCHEDULE inscription. The schedule selection window will be displayed.
- Then select the schedule you want to activate and press the button  .

	Please note that it is not possible to run a schedule in which all parameters refer to the past time.

Figure 47 Main screen

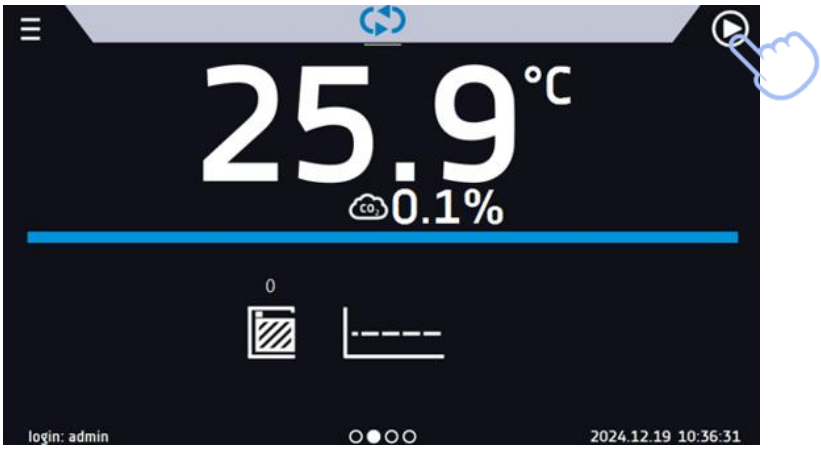
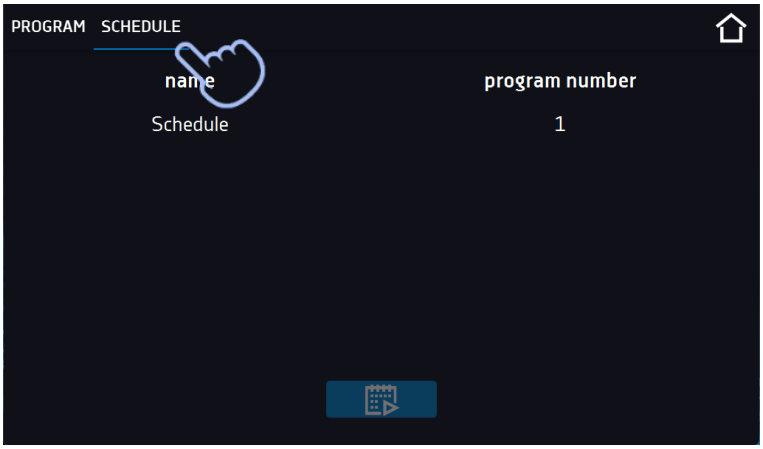


Figure 48 Selection of the schedule



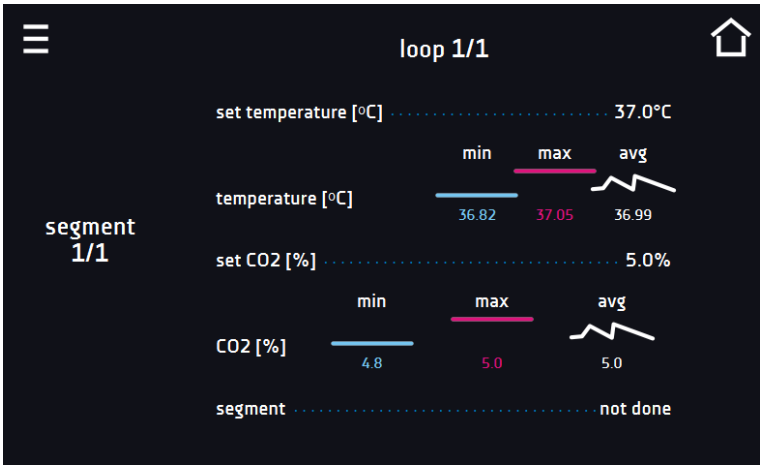
6.11. Statistics

Go to the main menu and press the icon . This panel displays statistics of the currently running program or program that has ended. Statistics are calculated separately for each segment. Data logging for calculation starts after 30 seconds from reaching the set temperature in the segment. Further data is registered every 1 minute.
The following information is available:

- **set temperature [°C] –** set temperature in the segment,
- **minimum temperature [°C] –** the lowest recorded temperature,
- **maximum temperature [°C] –** the highest recorded temperature,
- **minimum CO_2 [%] –** the lowest recorded CO_2 concentration,
- **maximum CO_2 [%] –** the highest recorded CO_2 concentration,
- **average CO_2 [%] –** average CO_2,
- **average temperature [°C] –** average temperature,
- **segment –** status of the segment:
- **in progress –** currently running segment (data is being constantly updated),
- **finished –** the segment has been completed,
- **interrupted –** the segment was interrupted by the user before the set time has elapsed,
- **segment 1/2 –** the number of the currently overviewing segment / number of the currently performed or completed segment. Navigating between the segments is done by swiping your finger up or down.
- **loop 1/1 –** the number of the currently overviewing cycle / number of the currently performed or completed cycle. Navigating between the cycles is done by swiping your finger left or right.

	You cannot overview the segment / cycle data that has not started yet.

Figure 49 Statistics



6.12. Data record

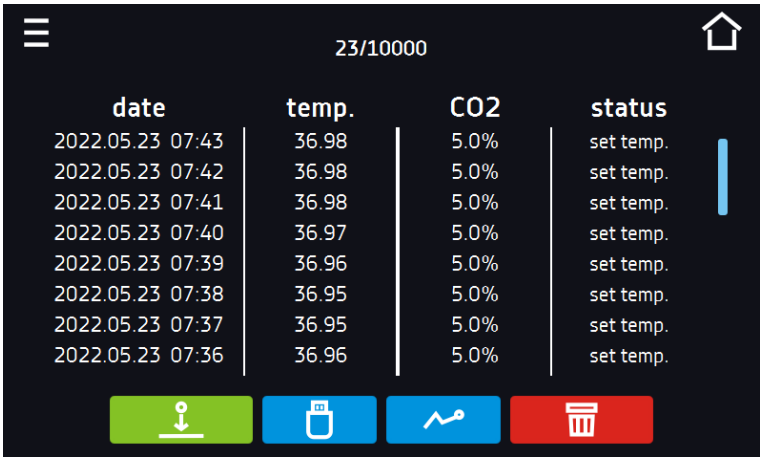
Go to the main menu and press the icon . Data record window contains the following information:

- time and date of sample registration [date],
- temperature value measured with the main sensor in the chamber [temp.].
- CO_2 concentration value [CO_2],
- status of the unit.

Each user can register 10 000 data records for the max period of 12 months. If all the memory cells are full, the oldest ones are overwritten. The data appears in the table in the order they were added, not in chronological order by the date. The most recently added record is at the top. The samples are only registered when the program is running. The frequency of registration depends on the program parameters settings.

When opening the data record, all data is downloaded. If the data download is interrupted by the user, press to continue downoading of the rest of the data.

Figure 50 Data record



Press to continue downloading data

Recording data onto the USB flash drive. .csv files are available - separated by semicolon when opening e.g. with a spreadsheet, .plkx - opening with the Lab Desk application

Before removing the USB flash drive from the USB port, it must be unmounted, see Section 5.5.

Displaying data as a graph, see Section 6.12.1.

Deleting data. Users with Super Admin privileges can delete all data, including those registered by other users.

If there is a lot of data, a progress bar appears on the display:

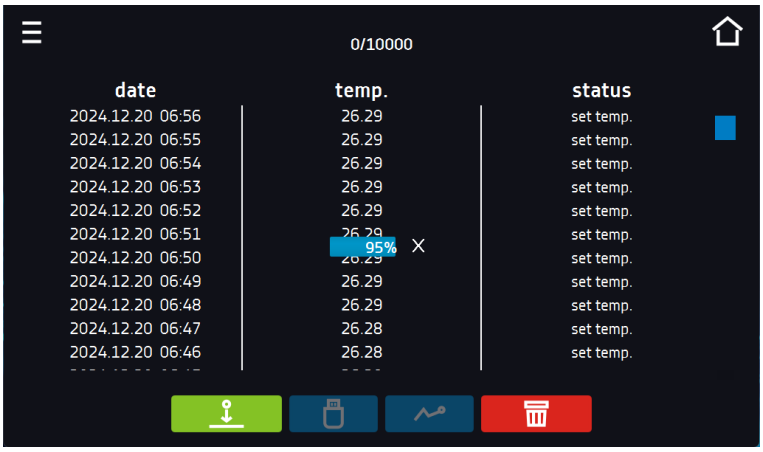
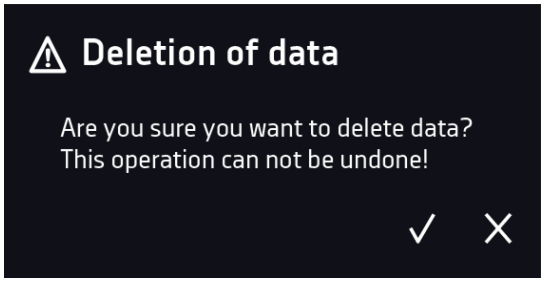


Figure 51 Deleting data



6.12.1. *Graph*

A graph can be generated from the data stored in the data register. The time during which the graph opens depends on the number of saved samples data. If the unit is equipped with additional sensors, press the selected graph twice.

Figure 52 Temperature and CO_2 concentration graph

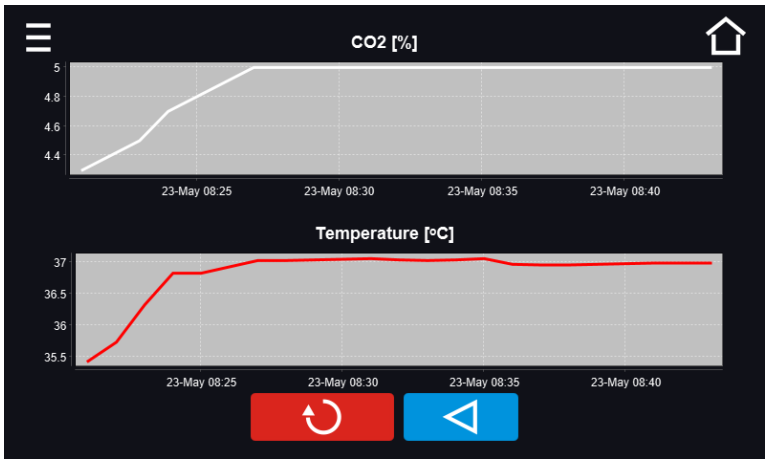
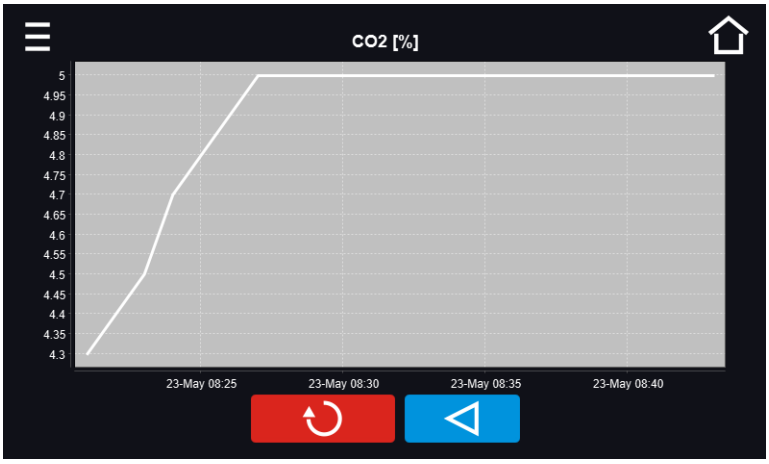
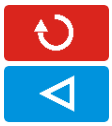


Figure 53 CO_2 concentration graph





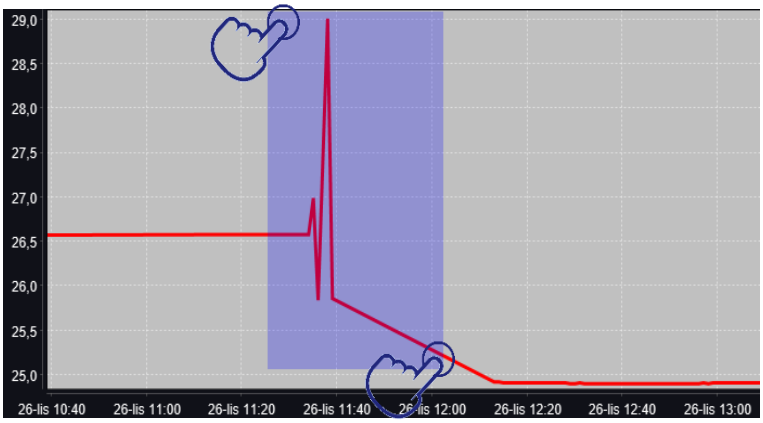
Returns to displaying the entire chart (undo all magnifications) / returns to the list of charts.

Returns to data register

The opening time of the chart depends on the number of saved data samples. The greater the number of saved samples, the longer this window will open.

You can enlarge a fragment of the chart. Press the graph anywhere and drag to the right and down simultaneously - enlarge in the same way as it is done on a smartphone. Swipe left to return the chart to normal size.

Figure 54 Enlarging a part of the chart



6.12.2. *Data storage directly on a USB flash drive*

The saved data (temperature, CO_2 concentration, date and time) can be saved directly on a connected USB flash drive. To do this, enable the option of saving data, see point *6.16* and. The USB flash drive must be connected to the USB socket located on the front of the equipment.

The date / time, temperature of the sensor installed in the chamber and indications of additional sensors in the unit (humidity, additional temperature sensor) are saved to the file. The frequency of saving to the file is equal to the frequency of saving the data in the register set in the program, see section *6.7.1. Creating / editing a program* (saving interval to the data register). Few comments can be found below:

- saving to the file takes place only when the program is running,
- data register is continued after power is restored,
- during registration, the USB flash drive can be removed but it is necessary to unmount it in the main window on the upper menu bar, see section *5.5. USB port*,
- registration is continued after reinserting the USB flash drive,
- a folder with the name consistent with the serial number of the device is created on the flash drive, all files are saved in it. The files are saved in the csv format (separated by semicolons), which can be read in a spreadsheet or notebook

	A	B	C
1	date	temp.	status
2			
3	23.03.2022 11:06	25.04°C	wait
4	23.03.2022 11:07	25.04°C	ramp
5	23.03.2022 11:08	25.04°C	ramp
6			

- the current measurement is saved to a file named measurements.csv,
- if the size of the current file exceeds 513 kB or the calendar month is changed, the current file is named in the format yyyy-mm_ measurements_0.csv, where 0 means the file number in the month, e.g. 2021-05_measurements_0.csv

6.13. Event log

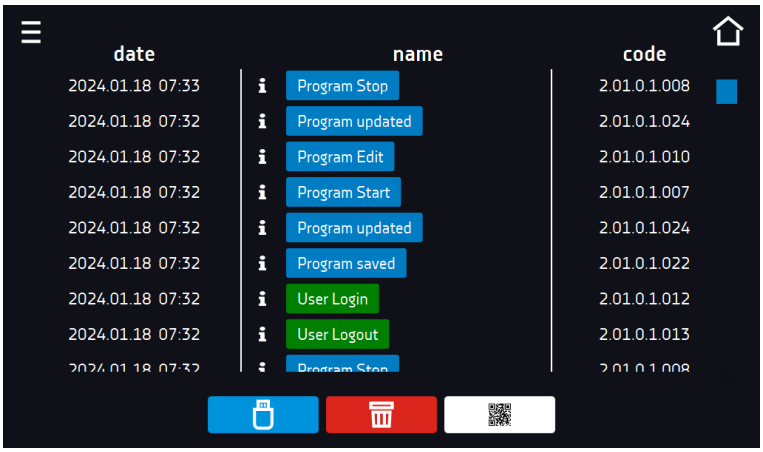
Data available for the following users *(see Section 6.15 Users)*:

- **Super Admin** who can overview, download to USB flash drive and delete all data,
- **Admin** who can overview, download to USB flash drive all data,
- **User** who can only overview all data.

The log can store up to 10,000 esvents. When the memory reaches its capacity, new data automatically overwrites the oldest entries.

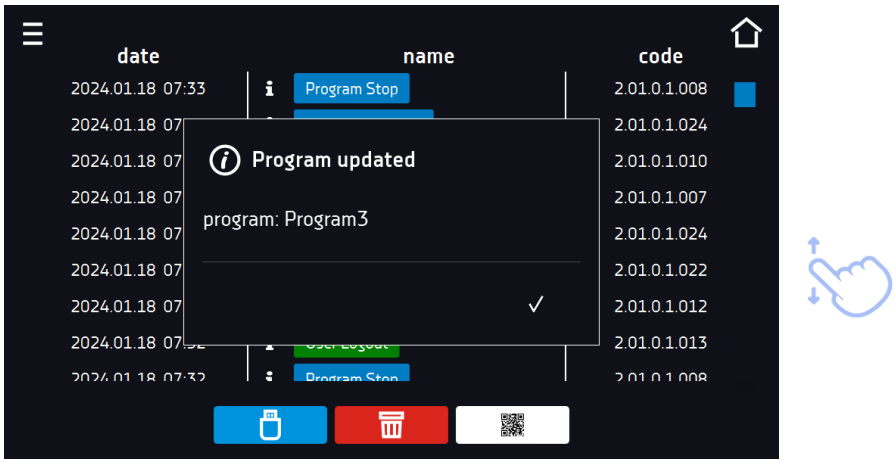
Go to the main menu and press the icon .The window displays information about registered events, alarms and errors.

Figure 55 Event log



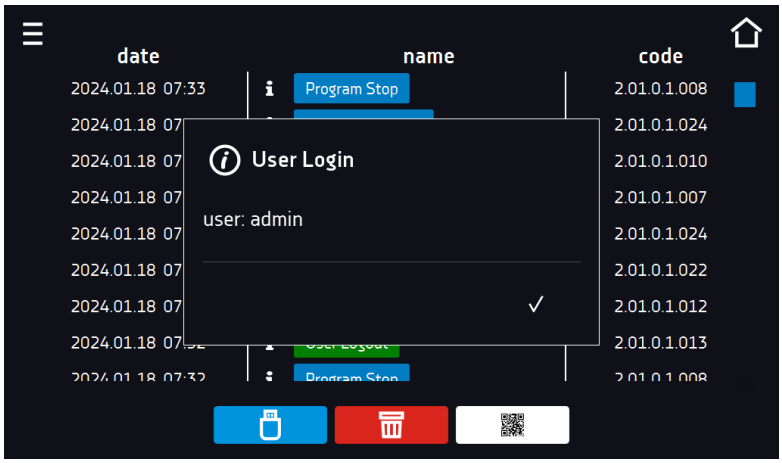
For program-related events, after pressing the event name, the program name is displayer.

Figure 56 Event log



For user-related events, after pressing the event name, it displays the login of the user to whom the event relates.

Figure 57. Event log



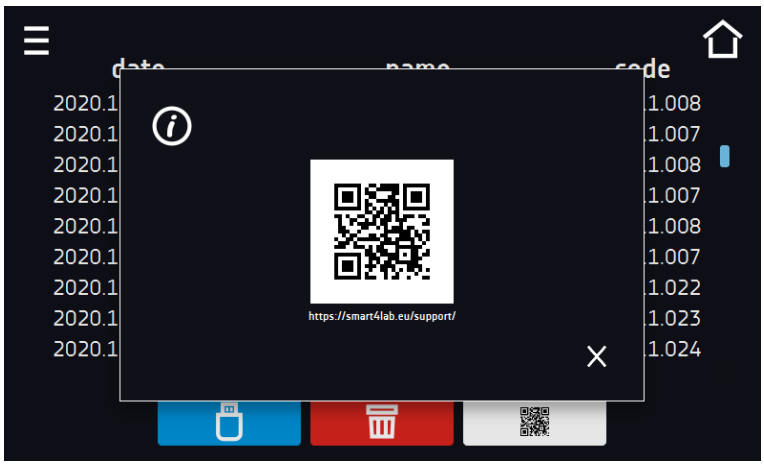
Recording data onto the USB flash drive. .csv files are available - separated by semicolon when opening e.g. with a spreadsheet, .plkx - opening with the LabDesk application

Before removing the USB flash drive from the USB port, it must be unmounted, see *Section 5.5*.

Deleting data

QR code – opens smart4lab.eu (in the "Support" tab there are explanations of some of the information appearing in the event log). Press the symbol and enlarge the code QR, and then scan it with your smartphone

Figure 58 QR code



The events in the event log are sorted chronologically. However, it may happen that the event "Program restarted" will not be displayed according to the chronology but the date and time of the event will be correct. This is not an error.

Before removing the USB flash drive from the USB port, it must be unmounted, see *Section 5.5*.

Information signs in the event log:

- Information event
- Message entered by the user
- Alarm event
- Error
- Warning

Possible events:

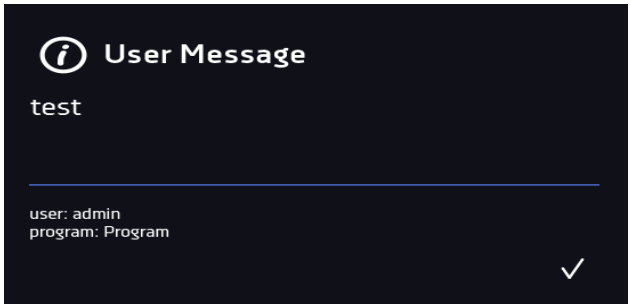
- **Date/time change** – data/time were changed
- **Device On** – the incubator is switched on (on the main switch)
- **Device Off** – the incubator is switched off (on the main switch)
- **Door closed** – the door is closed
- **Door opened** – the door is opened
- **Open door alarm start** – open door alarm has been activated
- **Open door alarm stop** – open door alarm has been deactivated
- **Over Protection Start** – over-temperature protection has been activated
- **Over Protection Stop** – over-temperature protection has been finished
- **Program Edit** – changing the program parameters
- **Program End** – program is finished

- **Program Restarted** – program has been restarted after power failure
- **Program Start** – starting the program
- **Program Stop** – stopping the program
- **Lower temp. alarm Start** – lower temperature alarm has been activated
- **Lower temp. alarm End** – lower temperature alarm has been finished
- **Upper temp. alarm Start** – upper temperature alarm has been activated
- **Upper temp. alarm End** – upper temperature alarm has been finished
- **Deleted Measurement** – user measurements have been deleted
- **Deleted All Measurement** – all measurements have been deleted
- **User added** – new user has been added
- **User updated** – user has been changed
- **User deleted** – user has been deleted
- **Program saved** – new program has been saved
- **Program deleted** – program has been deleted
- **Program updated** – program has been updated
- **Lower CO2 alarm Start** – lower CO_2 concentration alarm has been activated
- **Lower CO2 alarm End** – lower CO_2 concentration alarm has been finished
- **Upper CO2 alarm Start** – upper CO_2 concentration alarm has been activated
- **Upper CO2 alarm End** – upper CO_2 concentration alarm has been finished
- **CO2 Pressure low Start –** low CO_2 pressure alarm has been activated
- **CO2 Pressure low Stop –** low CO_2 pressure alarm has been finished
- **Sterilization program start –** sterilization program has been started
- **Sterilization program failed –** error or sterilization program has been stopped / interrupted (incomplete sterilization)
- **Sterilization program successful –** successful sterilization at 180ºC for 2 hours has been finished
- **Sterilization program completed –** sterilization program has been finished (37ºC in the chamber)
- **Start program cancelled, door is open –** sterilization start has been cancelled, the door is open

Quick note

To view message details, click User Message. In this window you can see the content of the message, the name of the user who entered it and the name of the program during which the message was written.

Figure 59 Details of user's message



6.14. Info

Go to the main menu and press the icon . The panel contains the following information:

- name of device,
- temperature range of the device,
- serial number of the device,
- Software version,
- manufacturer's address,
- manufacturer's website,
- QR code.

Figure 60 Info window (example)

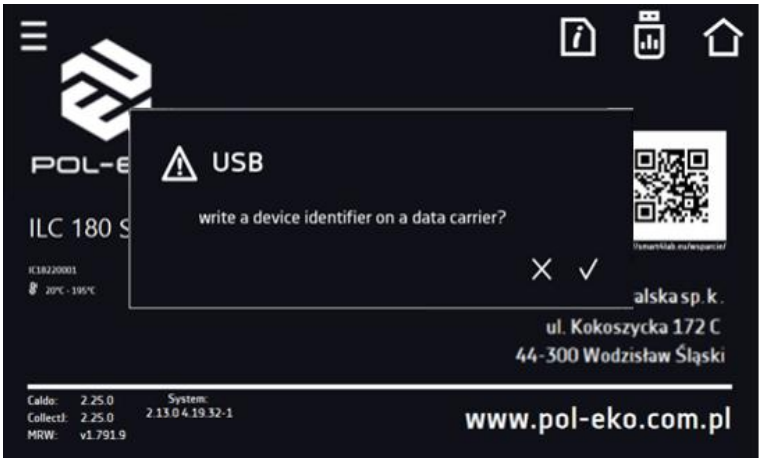
Press icon to save the “Download” folder (with instruction manual) on the USB flash drive. After inserting the flash drive into USB port wait few seconds until the information *“Flashdrive connected”* will appear on the display - for more information go to the *Section 6.1*. Press the icon to write the service data on the USB flash drive – contact the service department for more information. Press the icon ... to see additional information about software version.

Press to go to the main screen.

If a USB flsh drive is connected to the device, when entering the "Info" panel, a proposal to save configuration file will appear. This file is used to create an offline program in the Lab Desk application.

	Before removing the USB flash drive from the USB port, it must be unmounted, see *Section 5.5.*

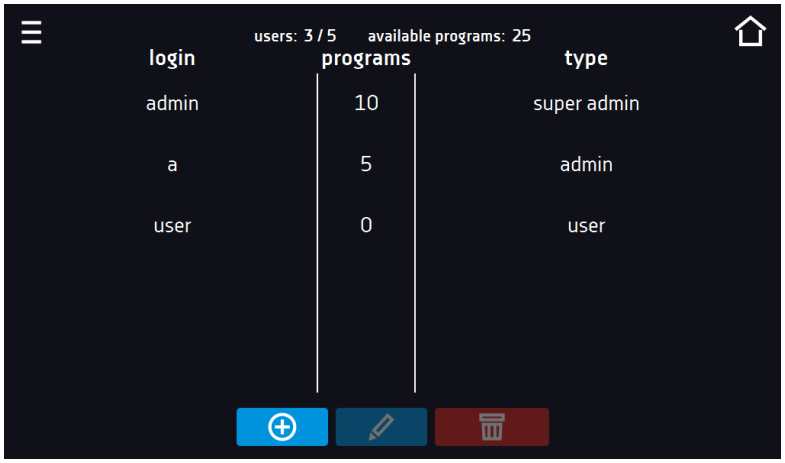
Figure 61 Saving configuration file



6.15. Users

Go to the main menu and press the icon . In this panel you can add a new user, edit an existing one or delete it.

Figure 62 Users list



Adding a new user

Editing selected user

Deleting selected user - his programs and data register will be deleted with the user.

At the top of the screen you can see information about:

- **users:** number of created users / total number of users to create (users 2/5),
- **available programs:** the number of free programs to be assigned to users.

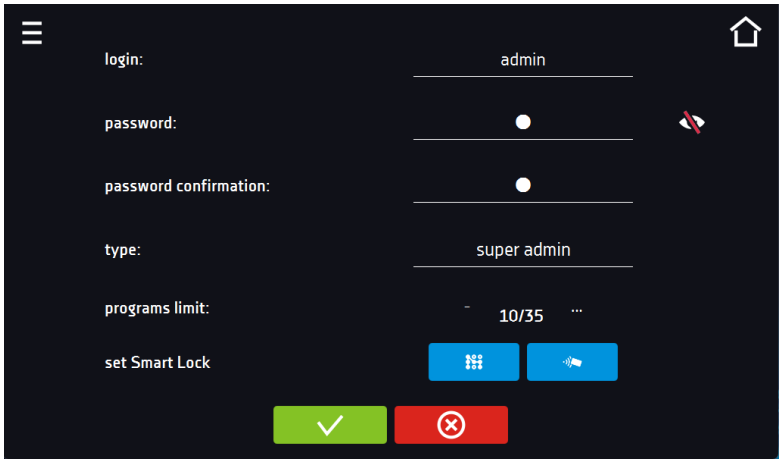
6.15.1. *Creating / editing a user*

To add or change user settings, press the button or , a panel with user data will be displayed.

You have to enter:

- **login** – user name,
- **password** – account password,
- **password confirmation** – you must enter the password again to confirm it,
- **type –** account type (Super Admin , Admin, User), for more information see *Section 6.15.2.*,
- **programs limit** – number of programs that can be created by the user / number of available programs (it's not possible to set a limit to the User).
- **Smart Lock** - selection of login using a pattern (additional option).

Figure 63 Editing a user



 User pattern for logging in, adding, changing and deleting a pattern

 Confirm and save the user.

 Cancel the changes made and return to the user list.

The device can have maximum 5 users. There are 40 programs available which can be freely distributed among users.

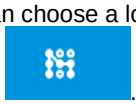
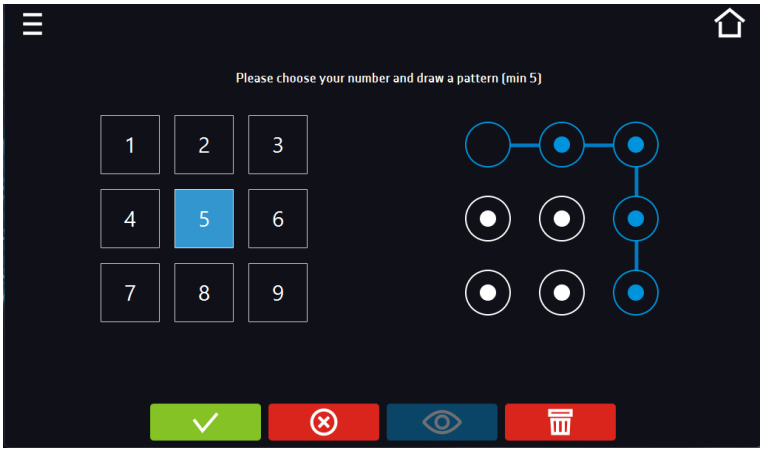
To log in, the User can choose a login in text form or a template. To enable the user to log in using a pattern, press in the Edit User window  . The pattern login window will appear.

Figure 64. Login using a template



 Confirm and save the user.

 Cancel the changes made and return to the user list.

 Pattern preview.

 Delete the pattern.

Adding or changing a pattern - select any free number and draw a pattern consisting of at least 5 points. Numbers that have previously been used by other users are unavailable.

A pattern can be assigned to a maximum of 9 users.

6.15.2. *Account types and their limits*

Three different types of users (accounts) are available: Super Admin, Admin, User. Each user has their rights and limitations described below in the *Table 1*.

Table 1 Right and limitations of the users

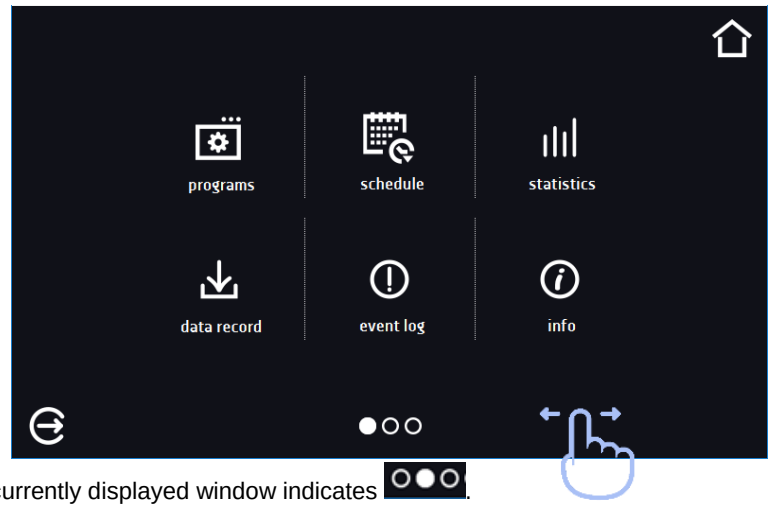
	Super Admin	Admin	User
Creating programs	✔	✔	✗
Editing programs	✔	✔	✗
Stopping your own program	✔	✔	✔
Stopping a program of another user	✔	✗	✗
Quick program	✔	✔	✗
Quick change of set time	✔	✔	✗
Quick change of set temperature	✔	✔	✗
Assigning a program to a user of the user type	✔	✔	✗
Creating a schedule	✔	✔	✗
Editing a schedule	✔	✔	✗
Defrost control	✔	✗	✗
Management of the illumination shelves in the unit (FIT version)	✔	✗	✗
Setting temperature measurement parameters	✔	✗	✗
Temperature value correction	✔	✗	✗
Setting the alarms	✔	✗	✗
Temporarily silencing the alarms	✔	✔	✔
Enabling / disabling the sound	✔	✗	✗
Saving a Quick Note	✔	✔	✔
Creating users accounts	✔	✗	✗
Changing user's settings	✔	✗	✗
Changing equipment's name	✔	✗	✗
Setting a time zone	✔	✗	✗
Changing the language	✔	✗	✗
Setting the automatic logout time	✔	✗	✗
System information preview	✔	✔	✔
Statistics preview	✔	✔	✔
WiFi settings	✔	✗	✗
LAN settings	✔	✗	✗
Setting e-mail reports	✔	✗	✗
Access to the archive	✔	✗	✗
Events preview	✔	✔	✔
Deleting events	✔	✗	✗
Copying data to a pendrive	✔	✔	✗
Data preview	✔	✔	✔
Copying data to a pendrive	✔	✔	✔
Displaying data as a graph	✔	✔	✔
Deleting your own data	✔	✔	✔

Deleting all data	✔	✗	✗
Reseting the open door counter	✔	✗	✗

Super Admin account

The Super Admin account has no limits. Has access to the program management menu and to the settings menu, go to the *Table 1*.

Figure 65 Menu available for Super Admin

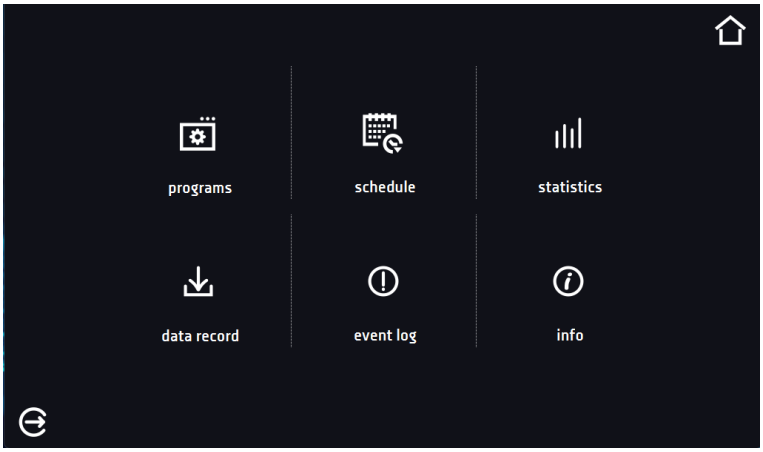


Information about the currently displayed window indicates .

Admin account

Has access to **programs menu**  and has rights and limitations in accordance with *Table 1*.

Figure 66 Menu available for Admin

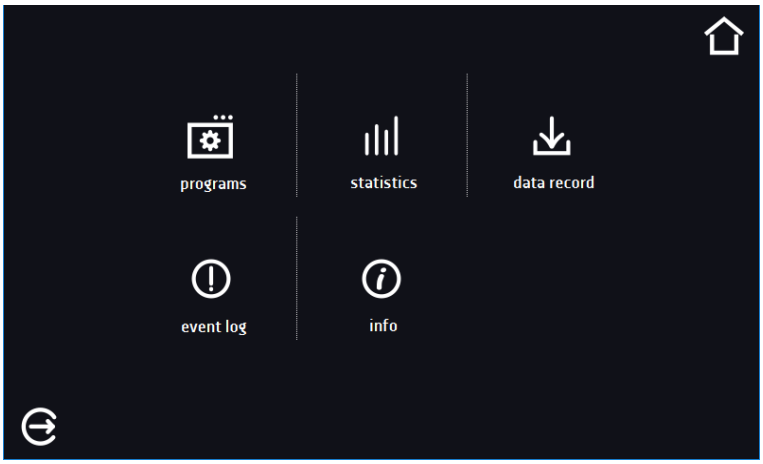


User account:

- has access to **programs menu**  , where User can start **programs** previously assigned to him, check their statistics (**statistics**, **data register**), check events history of the equipment (**event log**) and the information about the system (**info**),
- can´t create his own programs and schedules but start those which has been assigned to him by Super Admin,
- can´t stop or edit a program or schedule which wasn´t started by him,
- doesn´t have access to create or edit schedules,
- the program started by the User can be stopped by a user with Super Admin privileges.

Other rights and limitations of the User type account are shown in *Table 1*.

Figure 67 Menu available for User



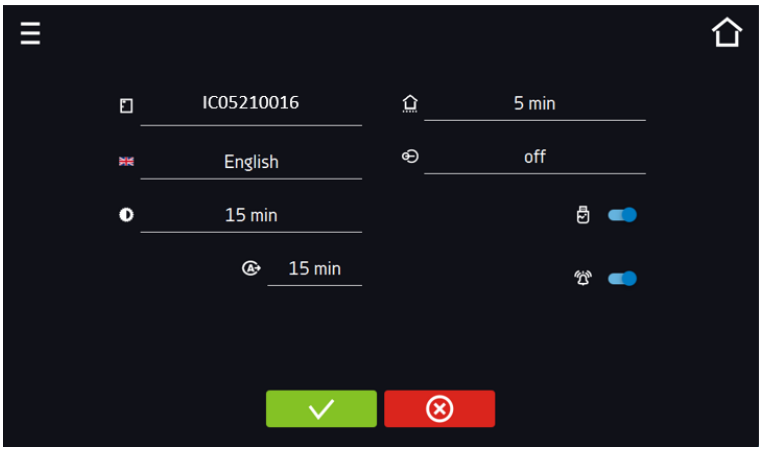
6.16. User settings panel

Go to the main menu and press the icon . In this panel you can:

	Change the name of the equipment – by default, the device serial number is entered.
English	Change the language in the equipment´s menu.
	Set the time after which the screen will be dimmed.
	Turn on/off the sound . Critical alarms will continue emitting a sound.
	Set the time after which the user will be automatically logged out. Available settings: off, 1 min, 3 min, 5 min, 10 min. Factory setting: enabled.
	Set the time after which the user will return to the home screen. Available settings: off, 1 min, 3 min, 5 min, 10 min.
	Set the automatic screen lock. Available settings: off, 5 min, 15 min, 30 min, 60 min. Factory setting: disabled.
	Enable / disable data register on a USB flash drive (connected to the USB port on the front of the unit).

	Only one feature can be enabled at the same time: automatic logout or automatic screen lock.

Figure 68 User settings panel



Confirms changes

Cancels the entered changes

6.16.1. *Unlocking the touch screen*

When the automatic touch screen lock is enabled *(Section 6.16)*, slide the blue circle into the white circle to unlock the screen.

Figure 69 Unlocking the touch screen

6.17. Time

Go to the main menu and press the icon . In this panel you can change the date and system time and time zone.

	The time and time zone must be set correctly during the first start-up.

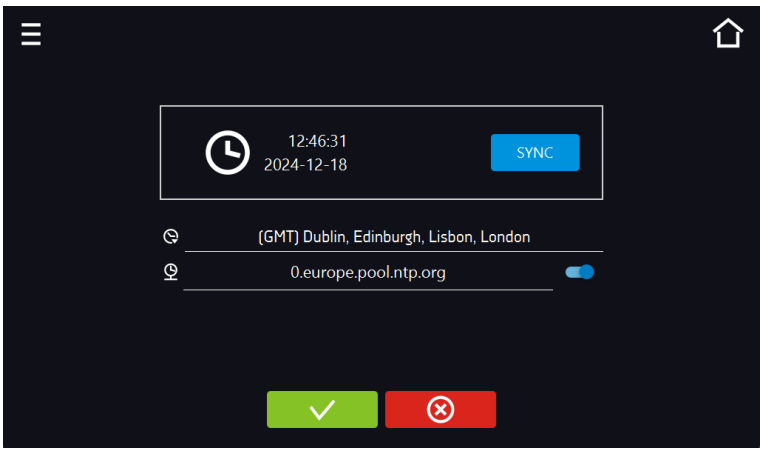
Change of the date / system time

	If the date / system time is changed to the later date / time comparing with the data and events which are stored in the memory, they will remain in the register. If the date / system time is changed to the earlier date than the date / time which is stored in the memory, they will be transferred to the archive

After changing the date/system time the device will be restarted.

To change the date / system time it is necessary to press in the window. The window will appear and you will be able to make changes.

Figure 70 Time change



If the unit is permanently connected to the internet, the time will be synchronized with the time server.
Time synchronization is performed:

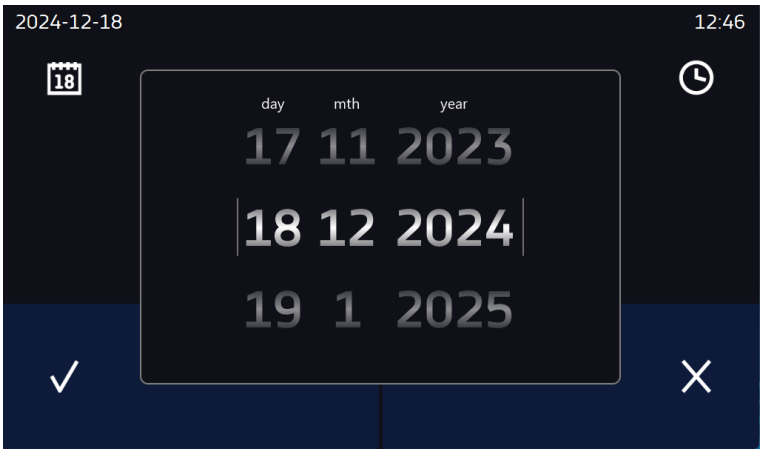
- manually using the button SYNC
- while enabling the automatic synchronization option and then every 12 hours ( )
- after starting the unit, then every 12 hours

If the time in the equipment was set incorrectly or it became out of sync with the period of use (which is natural), then if:

- automatic synchronization is turned on and the device is not connected to the internet but will be able to access the internet
- automatic synchronization is turned off and will be turned on, in addition, the unit is connected to the internet

the time will be synchronized with the NTP time server.

Figure 71 Date / time change



Confirms changes and restarts the device

Cancels the entered changes

Change of time zone

The change of time zone will not affect the date / time in data and events previously saved.

To change time zone, you have to press the buton in the window. Select the time zone from the drop-down list. After changing only the time zone, the device is not restarted.

Confirms changes

Cancels the entered changes

The same time zones on the device and computer are required for correct operation of the programs.

6.18. Alarms

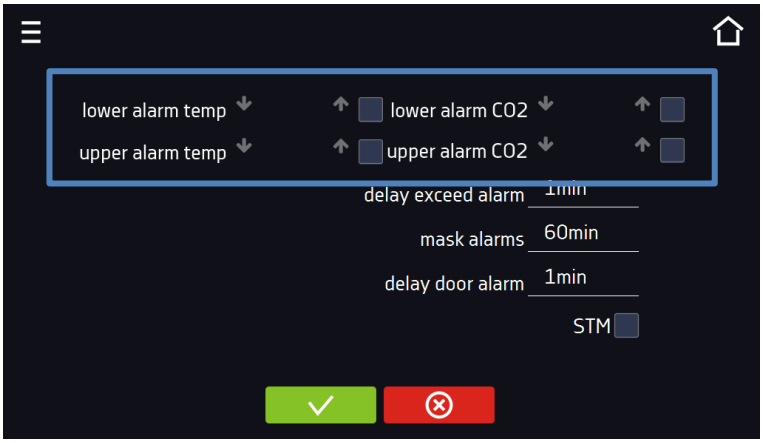
6.18.1. *Alarms when set parameters are exceeded*

Press the main menu icon , and then press . Here you can set parameters related to alarms

- **low alarm –** an alarm will be generated if the temperature drops below the set value by the value specified in this field,
- **high alarm –** an alarm will be generated if the temperature increases above the set value by the value specified in this field,
- **low CO2 alarm** – an alarm will be generated if CO2 drops below the set value by the value specified in this field,
- **high CO2 alarm** – an alarm will be generated if CO2 increases above the set value by the value specified in this field.

In the "lower alarm" field you can enter a value from the range of -0.5°C to -5°C, and in the "upper alarm" field from the range of 0.5°C to 5°C.

Rys. 72. Parameter exceedance alarms



Confirm the changes.

Cancels the entered changes

The upper and lower alarms can only be generated when the set temperature is reached.

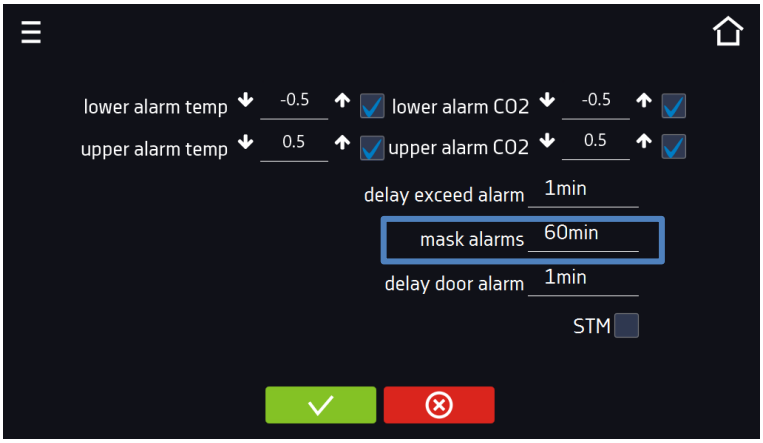
- **temperature alarm delay**:
  the alarm will be activated with a delay (1 min, 2 min, 5 min, 10 min, 15 min) after exceeding the permitted temperature.

6.18.1.1. Masking of parameter exceedance alarms

Masking of alarms when the set parameters are exceeded can be used when new samples are added to the chamber or samples are added to those already incubated. During these activities, the set parameters, i.e. temperature, may be exceeded and alarms may be activated - parameter exceedance alarms are set assuming that stable conditions prevail in the chamber (temperature) and the door is closed. After opening the door and placing the samples in the chamber, time is needed for the parameters to stabilize - the alarm masking function allows you to delay alarms when the parameters are exceeded.
The parameter exceedance alarm will be triggered with a delay (15 min, 30 min, 45 min, 60 min, 120 min, 150 min, 180 min) after inserting new samples. The time is counted from the last time the door was opened. Setting 0 s means masking is disabled.

If the door is opened during the parameter exceedance alarm, the ongoing alarm will not be "masked". Only the next alarm can be masked.

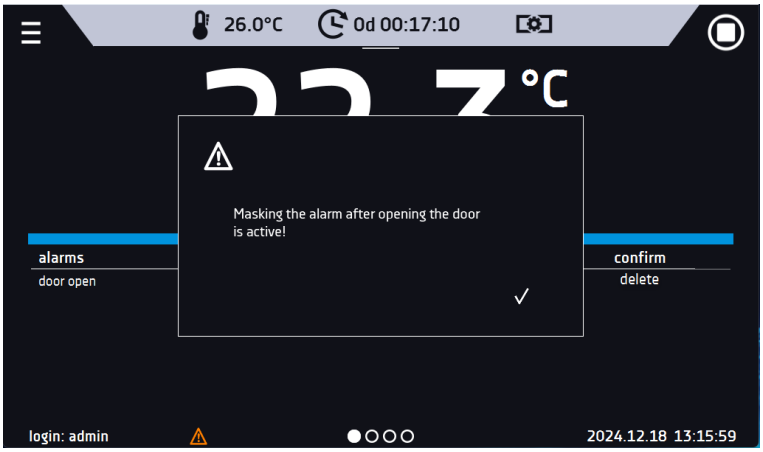
Rys.73. Alarm masking



Confirm the changes.

Cancels the entered changes

Rys.74. Alarm masking enabled

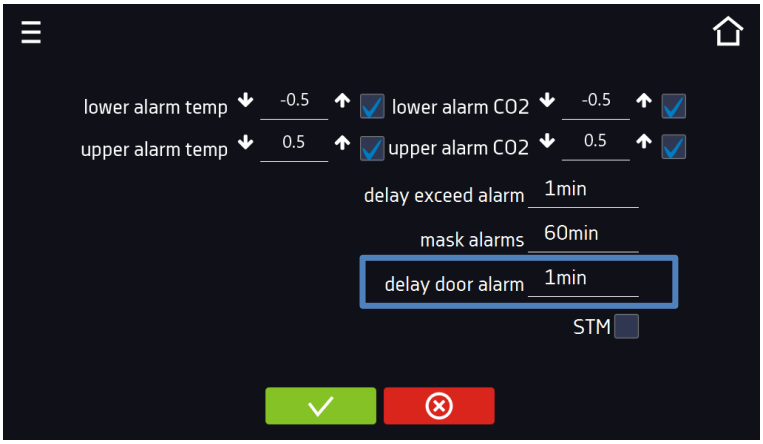


6.18.2. *Open door alarm*

All devices are equipped with an open door sensor. If the door is left open longer than the time set by the user, an acoustic signal, a red flashing alarm bar and a "door open" alarm with the status "active" will appear.

- **door open alarm delay**:
  The door alarm will sound when the door is open for the user-selected time
  (30 sec, 1 min, 2 min, 5 min, 10 min).

Rys.75. Open door alarm delay



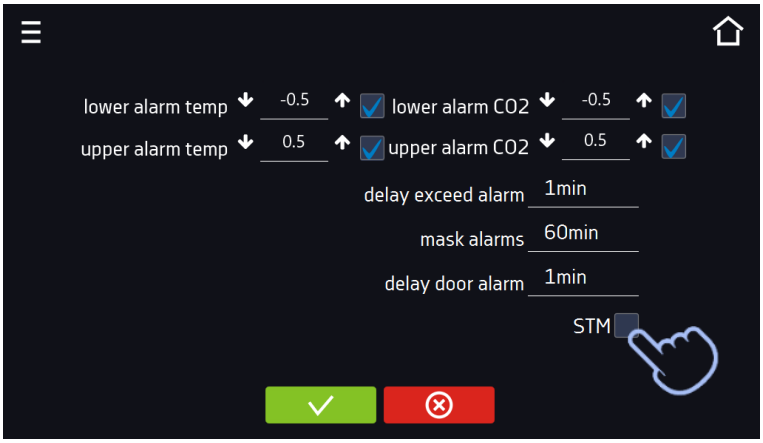
Confirm the changes.

Cancels the entered changes.

6.18.3. *STM function*

The STM (Smart Temperature Monitor) function informs the user if there is a problem in reaching or maintaining the set temperature. The user can enable/disable the function.
If the STM function is enabled, the STM symbol will appear on the screen next to the temperature of the main sensor.

Rys. 76. Włączenie/wyłączenie funkcji STM



Confirm the changes

Cancels the entered changes

The function status is indicated by color:

- no inscription – option disabled,
- white color – option enabled, program is stopped,
- blue color – option enabled (temperature monitoring), program running,
- red color – option enabled, warning about problems with achieving/maintaining temperature.

Figure 77. STM Function - option enabled, program is stopped

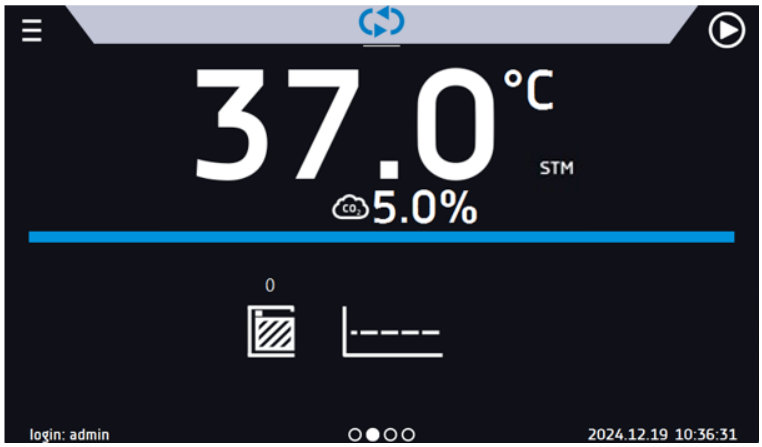


Figure 78. STM Function - option enabled (temperature monitoring), program running

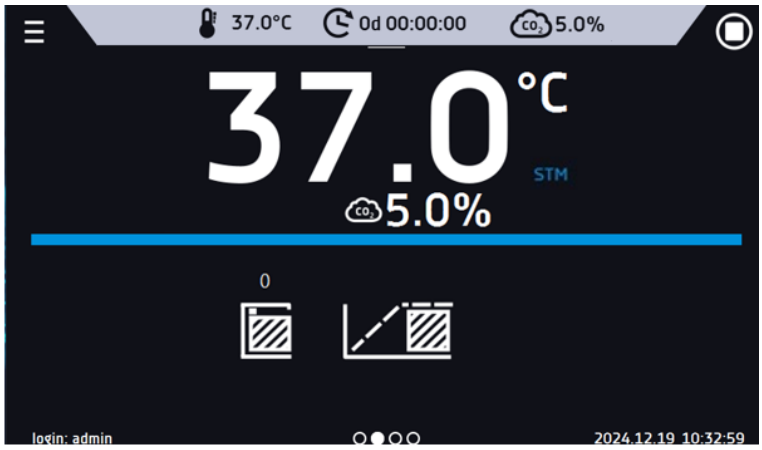
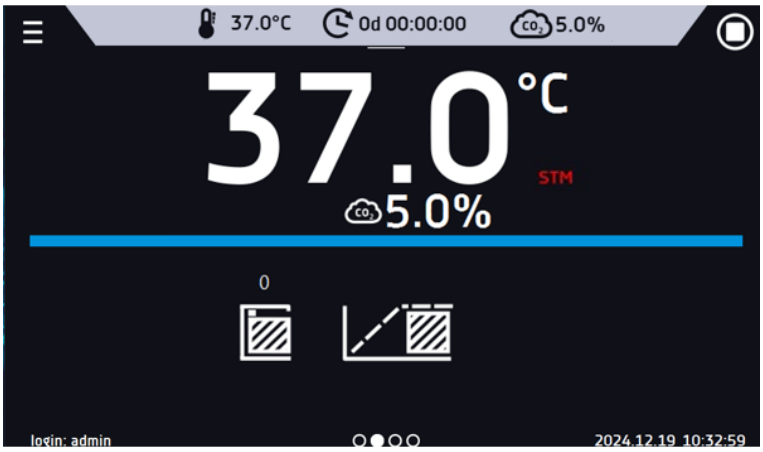


Figure 79. STM Function - option enabled, warning about problems with achieving/maintaining temperature



Possible causes of operation:

1. damaged heater,
2. the cartridge inserted into the chamber absorbs / releases too much energy.

If the color was red before opening the door, then the color changes to blue after opening the door.

If the function is activated (detection of problems with achieving/maintaining temperature):

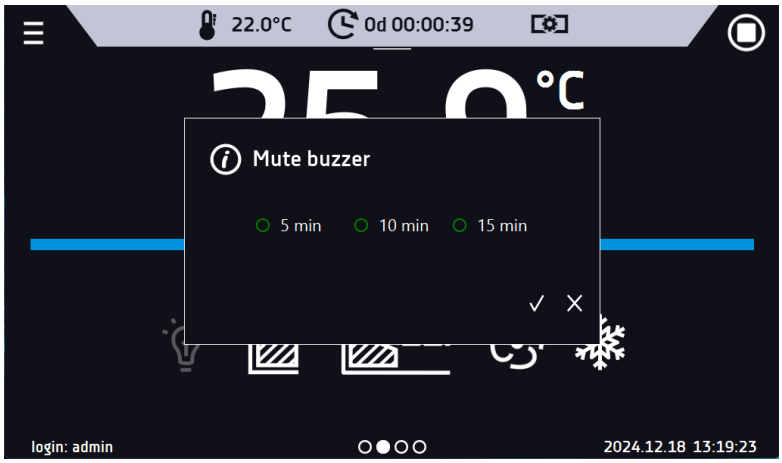
- the warning 4.00.0.1.009… appears in the event log.
- the color of the STM inscription changes to red and remains red throughout the disruption, segment change, and program shutdown.
- when the state changes from red to blue, an entry about the end of function 4.00.0.1.010 appears in the event log.

6.18.4. *Mute option*

The icon in the main screen in the upper menu allows temporary switching off of the alarms sound (open door alarm, exceeding temperature range), e.g. to avoid door alarm during planned loading of the samples into the chamber.

To set the mute time, press the icon and choose: 5, 10 or 15 minutes, however, the sounds of critical alarms (e.g. damage to the temperature sensor, over- and under-temperature protection) will be still emitted.

Figure 80 Mute function



6.19. Network

Go to the main menu and press the icon . In this panel you can change the settings for LAN or WiFi. Switch between LAN / WiFi network by pressing or .

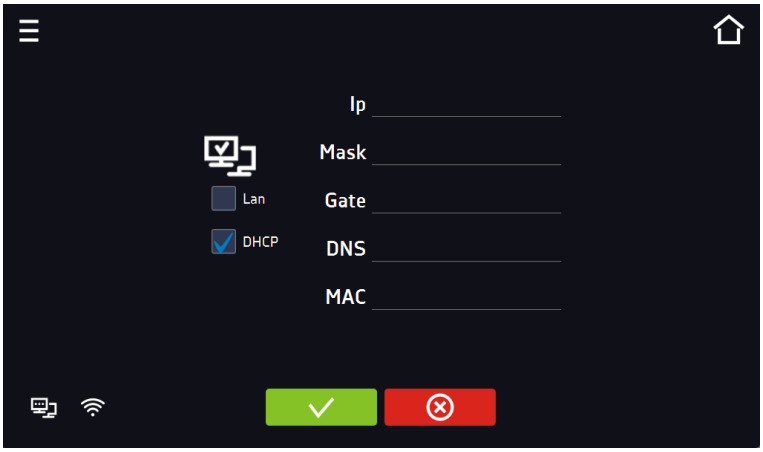
LAN settings:

- **IP** – the device's IP address
- **Mask** – an Ethernet network mask to which the device is connected
- **Gate** – Server's IP address or router's that manages the Ethernet network
- **DNS** – IP address of the domain name system
- **MAC** – the address of the network card, read-only
- **DHCP** – you can select if the server that allocates IP addresses is running on the local network. You can then skip setting IP, Masks, Gates

Device connected to the network

Device disconnected from the network

Figure 81 LAN settings



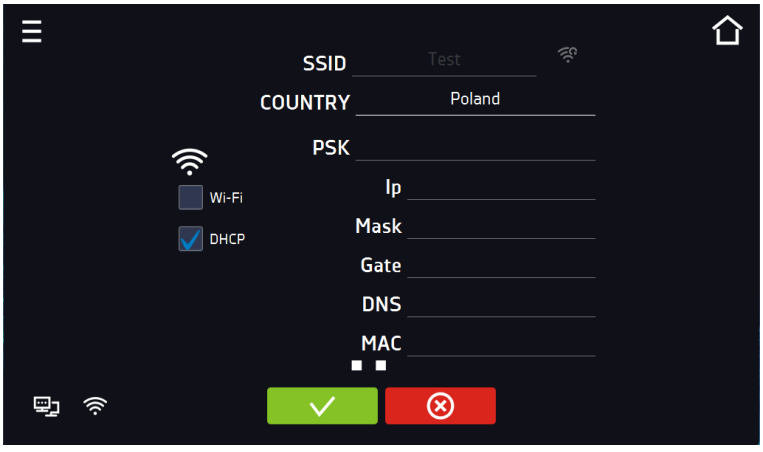
 Confirms changes

 Cancels the entered changes

WiFi settings:

-  – press to refresh network list,
- **SSID** – press to select network from the drop-down list,
- **COUNTRY** - select a country
- **PSK** – network password,
- **IP**, **Mask**, **Gate**, **DNS** – after a successful connection to the network these fields are automatically completed,
- **MAC** – physical address of the network card, read-only.

Figure 82 WiFi settings



 Confirms changes

 Cancels the entered changes

6.20. E-mail reports

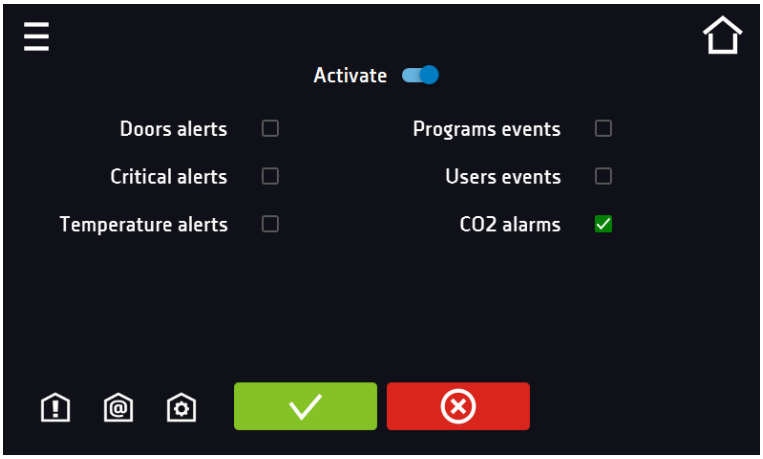
Go to the main menu and press the icon . In this window you can set the parameters needed to activate e-mail notifications.

In the panel there are three windows:

Selection of event types for which notifications should be sent.

- **Activate** – turning on/off e-mail notifications,
- **Doors alerts** – alarms triggered by an open door,
- **Critical alerts** – critical alarms (e.g. sensor damage),
- **Temperature alerts** – alarms caused by too high or too low temperature,
- **Programs events** – program-related events (e.g. adding, editing, deleting a program),
- **Users events** – events related to editing user settings (e.g. adding, editing, deleting users).
- **CO_2 alerts** - alarms caused by too high or too low CO_2 concentration

Figure 83 E-mail: events



Confirms changes

Cancels the entered changes

If the "activate" option at the top of the panel is not enabled, emails will not be sent!

Sender and recipients

- **Sender** – sender's e-mail address
- **Recipients** – recipients e-mail addresses, maximum 3

Figure 84 E-mail: Sender – Recipients

Confirms changes

Cancels the entered changes

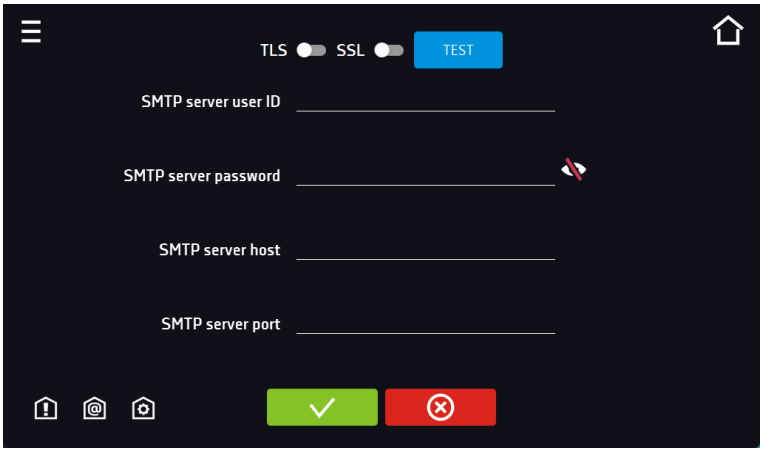
Configuration of the sender's e-mail account

In this window, enter your e-mail account details:

- SMTP server user ID
- SMTP server password
- SMTP server host
- SMTP server port

You can also choose the **TLS** or **SSL** encryption method (get more information from your email account provider).

Figure 85 E-mail: email account configuration



TEST Connection test

Confirms changes

Cancels introduced changes

	Before testing the connection, make sure that the device is connected to the network and has a properly configured network connection, see Section 6.19.

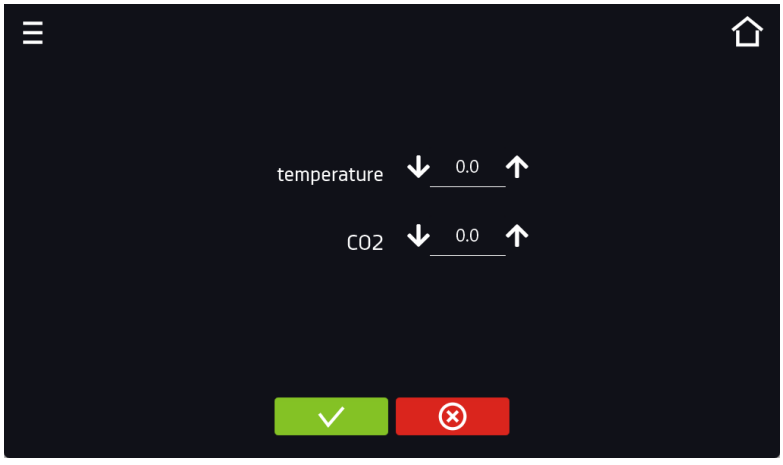
6.21. +/- Corrections

Go to the main menu ☰ and press the icon +/-. In this window you can correct:

- temperature value indicated on the display by adding the correction value. The set correction value applies to the whole temperature range of the device. For example, if the average temperature displayed by the device indicates 37,0°C and the average temperature measured by independent, external sensor indicates 37,5°C, the correction should be set on +0,5°C. The average temperature should be calculated from chosen period of time e.g. 30 min. The correction available range is between -5°C to +5°C.
- The CO2 concentration displayed on the screen can be adjusted by adding a correction value. The set correction value is applied throughout the entire operating range of the unit.
  For example: If the average CO2 concentration indicated by the unit is 5%, and the average concentration measured by an independent external sensor is 4.5%, the correction should be set to +0.5. The correction range is from -2.5 to +2.5.

	The device has been calibrated by the manufacturer in accordance with applicable norms. The temperature shown on the display corresponds with a great accuracy to the temperature near chamber's sensor. For the correct operation of the device it is not necessary to use User's calibration. The user is performing temperature correction **on his own responsibility** and must be aware of consequences of changing manufacturer's settings. If the equipment was calibrated, calibration certificate **loses its validity**.

Figure 86 User's correction



Confirms changes

Cancels the entered changes

6.22. Hot-air sterilization program

	Before starting hot-air sterilization: the entire interior must be **clean and dry**. No residue of e.g. samples, plastic or water can remain inside the chamber, empty the water pan (the rack, shelves, water pan and CO_2 sensor can stay inside the chamber, the blue plastic caps at the rack system are heat resistant and don´t need to be removed), close the inner glass door and the outer chamber door.
	**During hot-air sterilization do not touch the internal components and glass door, as there is a risk of burns. Use protective gloves to avoid burns from hot components.**
	First sterilization processes may cause an odour. It is not a quality defect. It is recommended to ventilate the room well during sterilization.

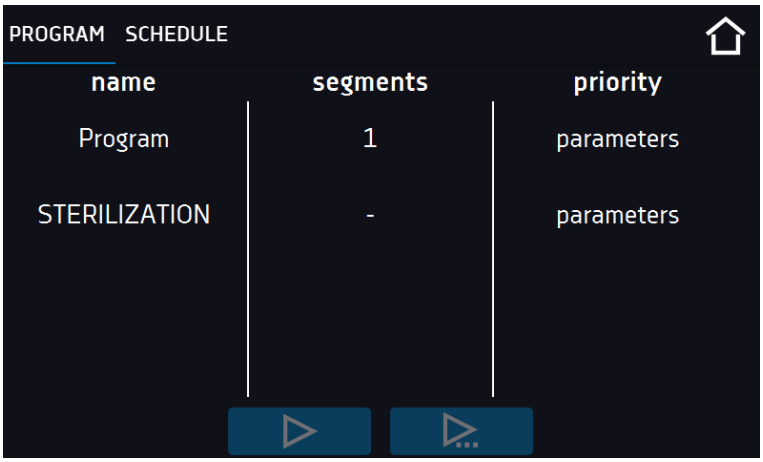
The CO_2 incubator is equipped with an automatically controlled hot-air sterilization program. The program is in the main screen under the  button (upper right corner).

The start of the program can be immediate or delayed.

 Immediate start of the program

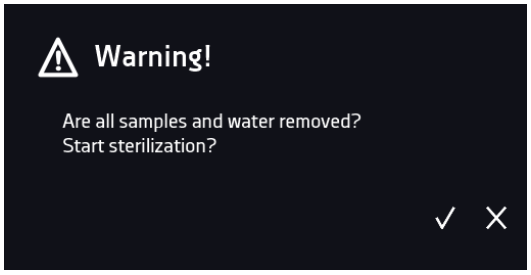
 Scheduled program start according to the set date and time

Figure 87 Sterilization program



Before running the program a confirmation prompt is displayed. Make sure that the water pan was emptied and all samples were removed from the chamber. Confirm the message. The program starts immediately or when the program delay time is over

Figure 88 Confirmation window



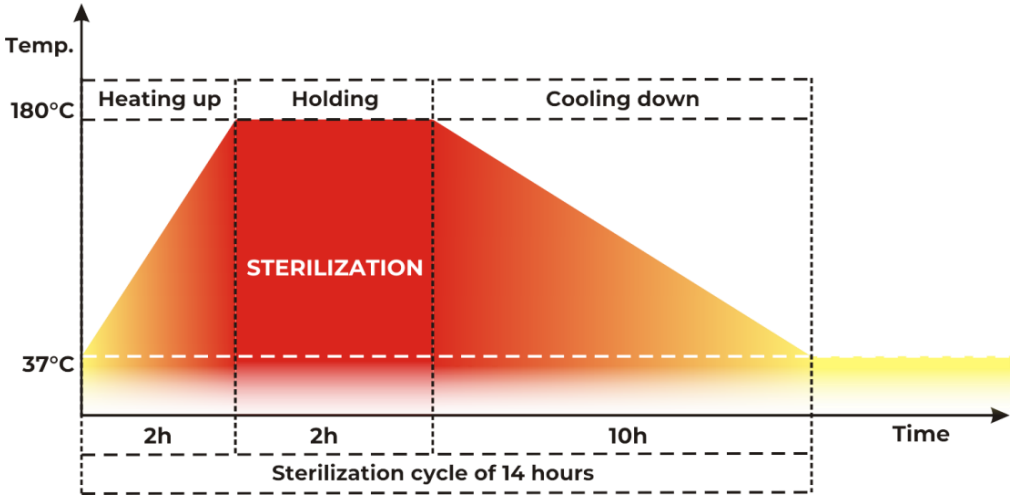
The program will take approx. 14 hours and consists of the following steps:

- **Heating up phase:** the inner chamber is heated up as fast as possible to the sterilization setpoint temperature
- **Holding phase:** setpoint temperature is kept for 2 hours

The sterilization setpoint temperature is set to 180°C. The duration of the heating up and holding phase is in total 4 hours. This ensures that the effective sterilization temperature is maintained on all internal surfaces for 2 hours.

- **Cooling down phase:** it takes around 10 hours until 37°C is reached.

Figure 87 Setpoint profile during the sterilization cycle



The phase of the cycle is indicated at the bottom of the screen by icons shown below.

 - heating up phase

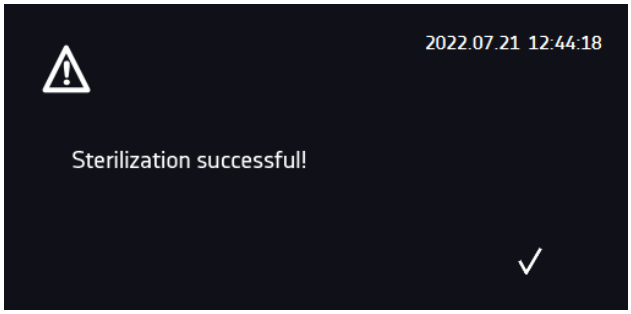
 - holding phase

 - cooling down phase

Temperature and time of the sterilization process cannot be changed. The CO_2 sensor can be hot-air sterilized inside the chamber.

After holding the temperature inside the chamber for 2 hours at 180°C the sterilization process is automatically finished. The information of successfully performed process pops up on the controller display *(Figure 89)*.

Figure 89 Successful sterilization



The total cycle of sterilization finishes when the temperture inside the chamber cools down to 37°C. Then, the information of completed sterilization appears. Confirm the message with the ✓ button.

Figure 90 Sterilization completed

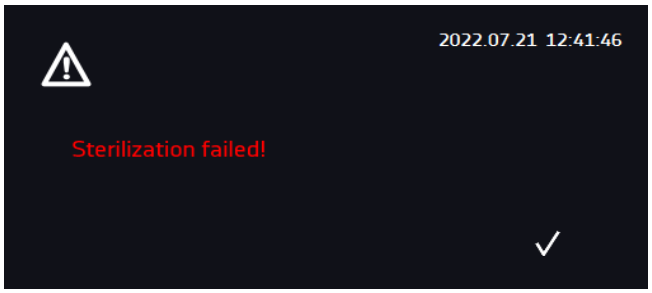
If during the heating up and holding phase:

- the program is stopped by pressing the ⏹ button,
- the external door is opened,
- the unit is turned off with the main power switch or in case of power failure,
- the unit's error occurs,

the sterilization is prematurely terminated. The information of incompletely performed sterilization pops up on the display and the event is registered in the Event log ("Sterilization failed").

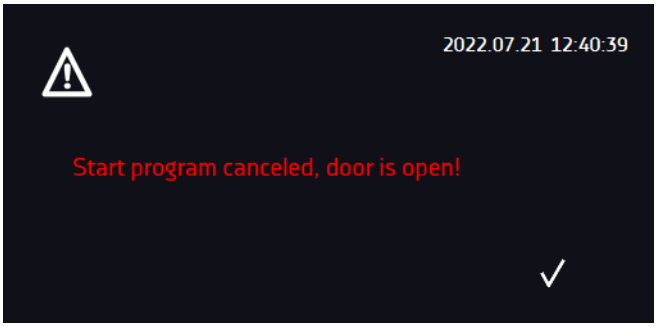
If the sterilization cycle was terminated prematurely, the germs inside the chamber might not be killed totally. It is recommended to repeat the sterilization.

Figure 91 Sterilization failed



If the door is open when the sterilization program is starting, the program won't start. The information of cancelled sterilization pops up on the controller display. Close the door and run the sterilization program again.

Figure 92 Sterilization start cancelled



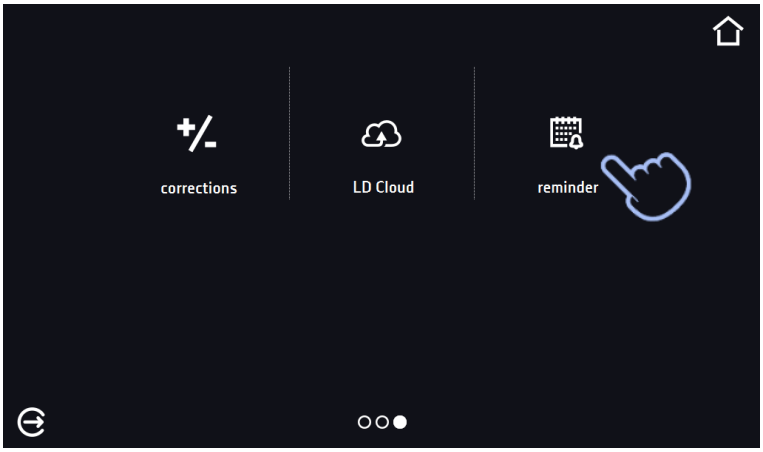
	Do not touch the glass door and the inner surfaces for approx. 10 hours after the prematurely terminated sterilization cycle.
	CO_2 control is deactivated during the sterilization process and will only be activated when temperature has cooled down to a value below 55°C.

The chamber during sterilization process can have negative impact on the other chamber. Therefore it is recommended to use the original stacking adaptor.

Setting a reminder to perform sterilization

You can set a reminder to perform sterilization in the program. From the main screen, press main menu  , and then  . Setting a reminder can only be done by Super Admin.

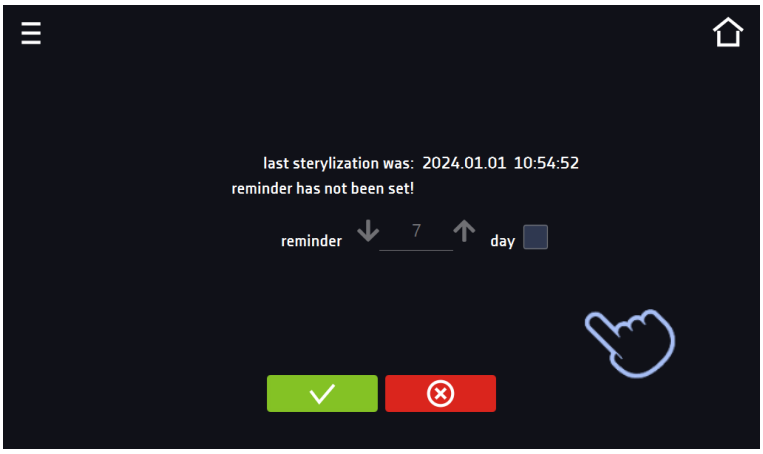
Figure 93. Main menu



It is recommended to sterilize the incubator before using it for the first time.

By default, the sterilization reminder is turned off, but the device remembers the date of sterilization performed by the manufacturer. To activate the reminder, press dn. The reminder can be set from 7 to 90 days.

Figure 94. Setting a sterilization reminder



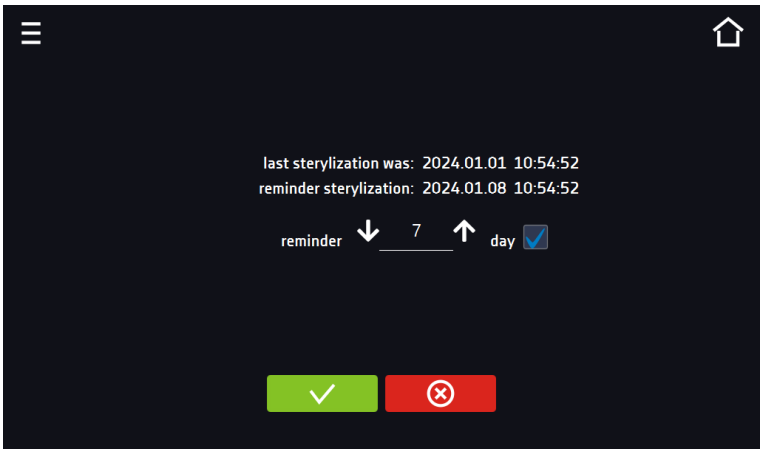
When sterilization is successfully completed, the last sterilization date will be automatically updated. The date will also be updated when sterilization is completed:

- before the set reminder date (when it is not yet active)
- after the set reminder date (when it is active)

• when the reminder is turned off.

If the sterilization reminder is turned on, the screen displays the date of the last sterilization and the date of the next sterilization.

Fig. 95. Date of previous and next sterilization



A reminder to perform sterilization is displayed in the form of an icon , located at the bottom of the main screen. Information about the active reminder appears on the screen.

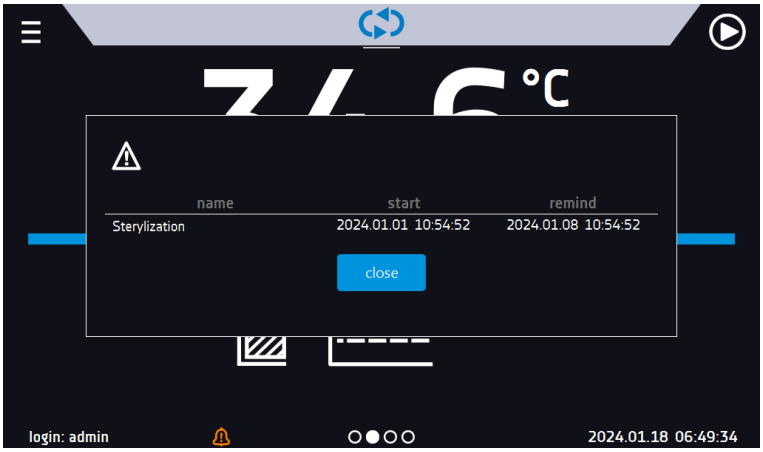
Rys. 96. Active sterilization reminder

A sterilization reminder also appears when the incubator is turned off before the reminder date and turned on after the reminder date. After successful sterilization, a message and an icon will appear disappear from the screen.

Reminder details

After pressing the icon detailed information is displayed:
• type of reminder
• start - start the countdown until the reminder is activated
• reminder - activation date of the reminder

Figure. 97. Reminder details



7. INTERFACE

7.1. MODBUS TCP

The device allows status monitoring using the MODBUS TCP communication interface.
Connection parameters:

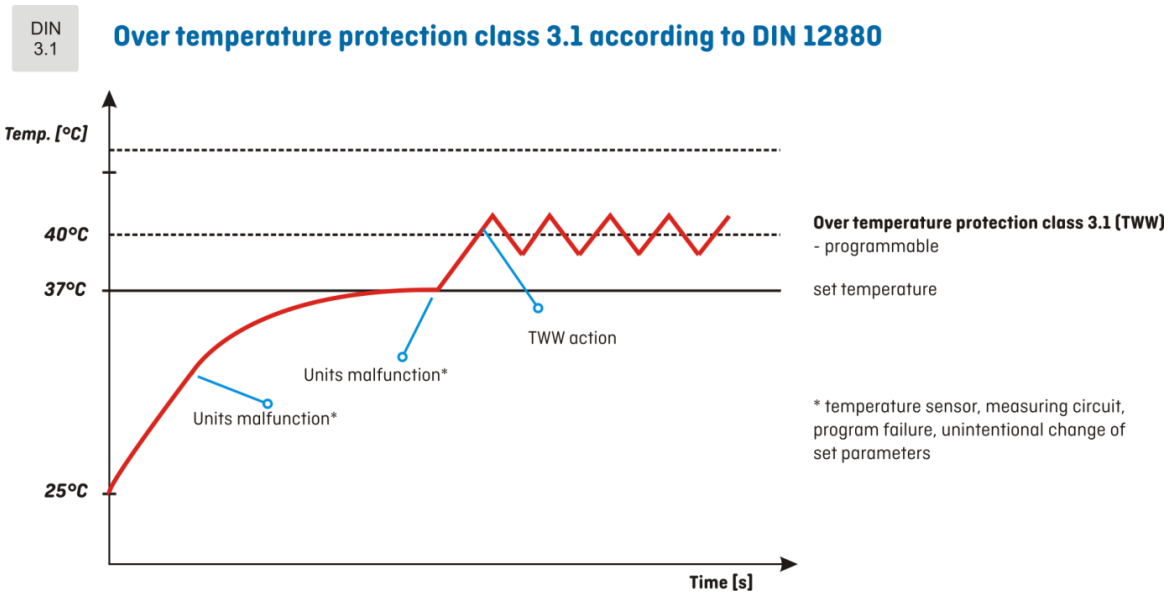
- IP address: same as device's (set in the panel Section 6.19.)
- port: 502

register INPUT REGISTERS function READ_INPUT_REGISTERS (0x30001)			
Address	Type	Multiplier	Description
0	int	10	temperature from the main sensor
3	bool	-	Open door
4	bit	-	b0 – door alarm b1 – upper temperature alarm b2 – lower temperature alarm b3 – over Protection b4 - under Protection b5 – main sensor error b6 – additional sensor error b7 – protection sensor error b8 – temperature sensors error b10 – hardware error b11 – MRW error
5	bit	-	b8 – error CO2 sensor b9 – communication error with CO2 sensor b10 – lower CO2 alarm b11 – upper CO2 alarm

8. TEMPERATURE PROTECTION

Temperature protection is included as standard. If damage occurs to the temperature controller or the user changes the temperature settings outside the limit, temperature protection will activate. Protection class 3.1 is a standard. The figure below shows how this works.

.



9. CONNECTING THE DEVICE TO A COMPUTER

Each device in the SMART PRO version can be connected to an Ethernet network or directly to a computer with a LAN cable (standard equipment). Using the Lab Desk program (standard equipment), you can program and monitor the operation of multiple devices with the SMART PRO controller. The features of the software have been described in a separate instruction manual.

10. CLEANING AND MAINTENANCE OF THE DEVICE

	**Disconnect the device from the power supply before carrying out any activities related to the cleaning! In the case of the battery back-up of the controller, also turn it off.**

Maintenance (cleaning of the housing and the chamber) should be carried out at least once a week (depending on the environmental conditions in the workplace).

INOX products are manufactured with stainless steel. When used in standard laboratory conditions they do not rust. However it is possible that stains (which may look like rust) form on the steel surface (e.g. due to the kind of samples that are incubated in the chamber). In such case we recommend using cleaning solution (to clean the stains) which is dedicated to this particular application, e.g. Pelox.

	**When cleaning stainless steel product with dedicated cleaning solution, one should pay attention to the suggestions and recommendations given in the instruction manual or in the safety data sheet of the cleaning solution.**

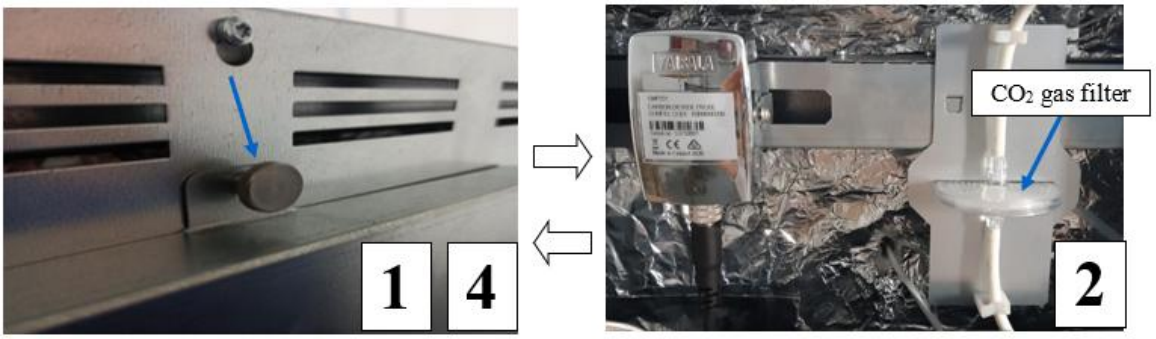
10.1. Replacing the CO_2 gas filter

The incoming gas passes through a sterile inlet filter when the device is in operation. This aseptic filter (particle size 0,2 µm) has a filtration efficiency of 99,99%. The gas cylinder and the supply hose can be a source of dirt. The filter prevents this dirt from accumulating in the gas inlet valve and in the hoses leading into the chamber.

POL-EKO® recommends to change the CO2 gas filter once per year when using gas with a technical grade of 99,5%.The changing intervals should be shorter when gas with less pureness is used.

A safe CO_2 gas filter replacement should be performed according the following procedure:

1. Turn off the unit and remove the cover on the chamber rear.
2. Remove the gas filter on both sides from the gas hoses and then install a new filter.
3. Check gas connections for leaks (e.g. with leak spray or dilluted soap solution). Run an exemplary program, adjusting 5% of CO_2 concentration. When no gas bubbles are observed after few valve openings, that can be heard (max. 1 minute of the program), the hoses are connected properly. Stop the program.
4. Reinstall the cover on the chamber rear.



10.2. Exterior cleaning

1.	The housing of the device should be cleaned at least once a week, depending on the working conditions.
2.	The housing and door should be cleaned with caution using a soft cloth dampened with water.
3.	Only mild cleaning products should be used to clean the device.
4.	Electrical parts should not get in contact with water or detergent.
5.	Clean **the touch screen** using a soft cloth or a foam for cleaning touch screens.
6.	**USB port** can be cleaned with a vacuum cleaner to prevent accumulation of dirt inside the port.

10.3. Interior cleaning

The interior of the incubators is made of stainless steel 0H18 acc. with DIN 1.4301. Stainless steel 0H18 also corrodes, but much less and slower than other types of steel. To slow down the corrosion process as much as possible, this type of steel requires regular maintenance and cleaning. Avoid aggressive cleaning agents and preparations based on chlorine and bleach, do not allow stainless steel to come into contact with non-alloy steel, unless you are dealing with ground steel, and avoid materials that may scratch the surface.

1.	Before cleaning the interior of the device, empty the chamber.
2.	Open the door of the device, if necessary wait till the chamber has cooled down, take out the shelves and start cleaning of the device
3.	To clean the device, use a lint-free, lint-free, soft cloth and water or water with a mild detergent.
4.	In the case of ground steel, movements should be made in the direction of grinding on the surface.
5.	If rust occurs: • slight discoloration – use household cleaners for stainless steel containing calcium carbonate or citric acid, • medium discoloration - clean with a 10% phosphoric acid solution; after cleaning, neutralize the acid with diluted ammonia or a mild alkaline detergent, • severe rust – use products for pickling and passivation of steel – for example Pelox FR-D After each cleaning, wipe the surface thoroughly with clean water.
6.	Having finished cleaning, you should allow the device to dry fully and instal all parts removed before cleaning.
7.	During cleaning you should make sure not to damage the temperature sensors which are located inside the chamber.

8.	To assure septic environment in the chamber it is recommended to clean the inner gasket with a 70% isopropylene.

10.4. Disinfection of the CO_2 sensor

The disinfection of the sensor can only be performed when the CO2 incubator is turned off. POL-EKO® recommends to wipe the sensor head with a lint-free cloth soaked with disinfectant. The disinfectant must be a non-corrosive, acid and chlorine-free alcohol based surface disinfectant or 96% pure alcohol. To sterilize the entire chamber use the hot air sterilization routine.

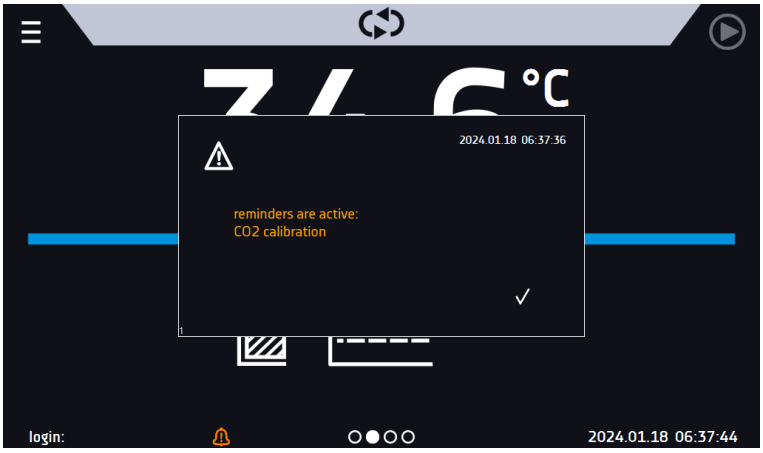
	NOTICE : Do not spray the sensor with any cleaning detergents or disinfectants which are not recommended by POL-EKO®!
	NOTICE: An unsuitable disinfection procedure can damage the CO2 sensor.
	NOTICE: It´s forbidden to spray the disinfectant directly on the CO2 sensor.

10.5. Reminder to calibrate the CO_2 sensor

By default, the program includes a reminder to calibrate the CO_2. sensor. The reminder appears one year after the first launch of the incubator. The message is displayed in text and graphic form using an icon on the bottom of the screen.

The date of the first calibration of the CO2 sensor is set automatically in the case of:
• completing the entire wizard - when setting the user's password at one of its last stages,
• closing the wizard with the "do not show" option selected,
• editing/adding a new user.

Figure. 98. Information about the need to calibrate the CO2 sensor



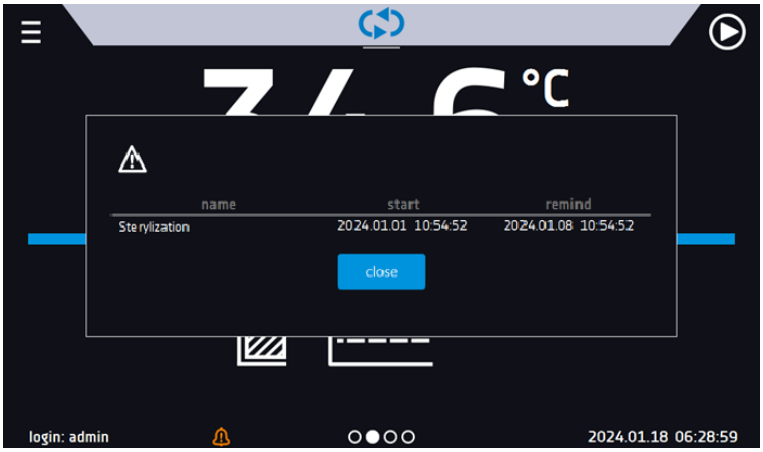
A reminder to calibrate the CO2 sensor also appears when the incubator is turned off before the reminder date and turned on after the reminder date.

Reminder details

After pressing the icon detailed information is displayed:
• type of reminder

• start - start the countdown until the reminder is activated
• reminder - activation date of the reminder

Figure. 99. Reminder details



To calibrate the CO2 sensor, contact an authorized service center.

Displaying a reminder to calibrate the CO2 sensor does not affect the operation of the incubator. This is an informational function only.

10.6. Cleaning the touch screen

The touch screen is exposed to dirt, so it must be cleaned regularly. To clean the touch screen, use a clean and dry microfiber cloth. It is a very delicate material and collects dirt well.

	Before using the cloth, **make sure that on the surface there are no crumbs or particles**. During cleaning, they can act like sandpaper and **scratch the surface of the screen.**

If the stains cannot be removed by dry cleaning, the cloth can be lightly dampened with water.

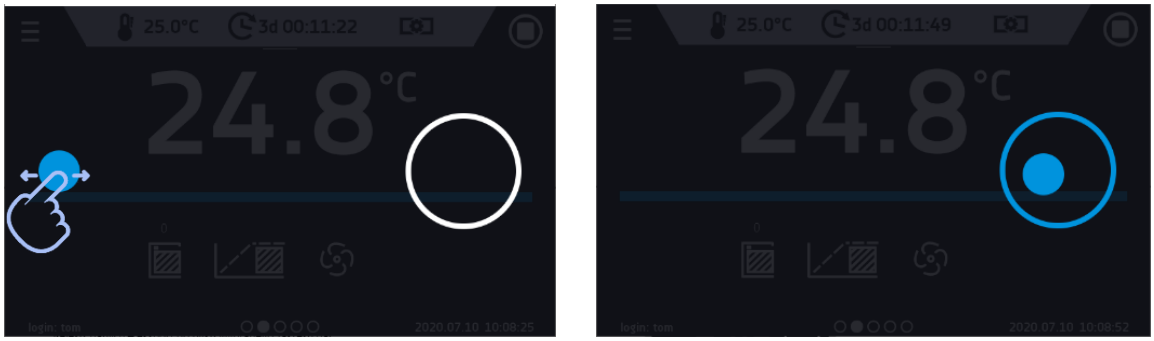
	Do not use paper towels to clean the screen as it may cause microdamages.

Before cleaning, lock the screen by pressing on the top drop-down list.

Figure 100 Locking the screen

The screen is ready to be cleaned. To unlock the touch screen, slide the blue circle into the white circle.

Figure 101 Unlocking the screen



10.7. Advice on how to safely store the device

1.	Close the CO_2 pressure cylinder valve and disconnect the CO_2 gas hose.
2.	Remove load from the chamber.
3.	Clean the chamber and empty the water pan.
4.	Before disconnecting the unit from the mains, the chamber **must be dried** (e.g. by door opening, chamber ventilating or chamber heating without the water pan). Turning the unit off without drying will cause water condensation in CO_2 sensor and its malfunction.
5.	Disconnect the incubator from the mains.
6.	Leave the inner/ outer doors and access port open to allow adequate ventilation.
7.	Store in temperature between 10°C and 50°C and relative humidity maximum of 70%.

10.8. Consumables

Consumables during normal operation are:

- silicone door seal - in all units,
- replacement of CO_2 gas filter

11. TROUBLESHOOTING

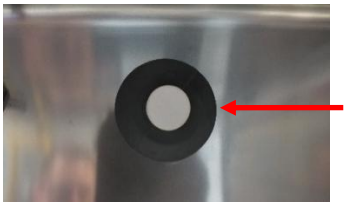
Before you contact Service Department:

1.	Make sure that the operation complies with the instruction manual of the device.
2.	Restart the device to make sure that the unit is not functioning properly. If it still does not work, disconnect the unit again from the mains and repeat the operation after one hour. Do the same with optional battery back-up of the controller.

Service

Visit the POL-EKO® website at: www.pol-eko.com.pl in order to:
• get full contact details of technical service
• access to POL-EKO® online catalogue, and information about accessories and related products
• receive additional product information and special offers
To receive information or technical assistance, contact the Service Department or visit the website: www.pol-eko.com.pl

11.1. Possible defects

Malfunction	What to check?	What to do?
The unit is not working	Check if the unit is plugged in correctly	Plug in the unit correctly
	Check if the circuit-breaker has tripped	Press the circuit breaker on the back of the device
	Check the voltage in the socket	Connect the device to a different socket, preferably from a different electrical circuit. Call a licensed electrician to check the electrical installation.
	Check if the power cable is broken	Change the cable
The unit is not heating up	Check if the door of the unit is closed properly	Clean the gasket
	Check if the fan is turned on	Set the fan operation in the program
	Check if the ambient temperature is within the permissible values given in the technical data table?	Adjust the ambient temperature to the value given in this manual
CO_2 measurement malfunction	Check if water is not condensed in the measuring tip of CO_2 sensor.	Remove the white filter from the measuring tip of CO_2 sensor (in the chamber) and let the tip to dry or run the program without water pan e.g. 50°C till the sensor is dry. 
CO_2 concentration is not rising	Check if the gas cylinder is not empty.	Replace the CO_2 cylinder.
	Check if the gas hose is not curved too much.	Straighten out the gas hose.
	Check if the CO_2 gas filter is not clogged.	Replace the filter.
	Check if the CO_2 gas filter was replaced according to schedule.	
	Check the CO_2 pressure on the pressure regulator (approx. 1,5-2 bar).	Adjust the pressure regulator for proper CO_2 pressure (approx. 1,5-2 bar).

12. WARRANTY CONDITIONS

POL-EKO® warrants that this product will be free from defects in material and workmanship for a period of two (2) years from date of the invoice. If a defect is present, POL-EKO® will, at its option and cost, repair, replace, or refund the purchase price of this product to the customer, provided it is returned during the warranty period. This warranty does not apply if the product has been damaged by accident, abuse, misuse, or misapplication, or from ordinary wear and tear. If the required maintenance and inspection services are not performed according to the manuals and any local regulations, such warranty turns invalid.

The device that is being returned must be secured by the customer in the event of any damage or loss. The warranty will be only limited to the situations listed above. IT IS EXPRESSLY AGREED THAT THIS WARRANTY WILL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND IN LIEU OF THE WARRANTY OF MERCHANTABILITY.

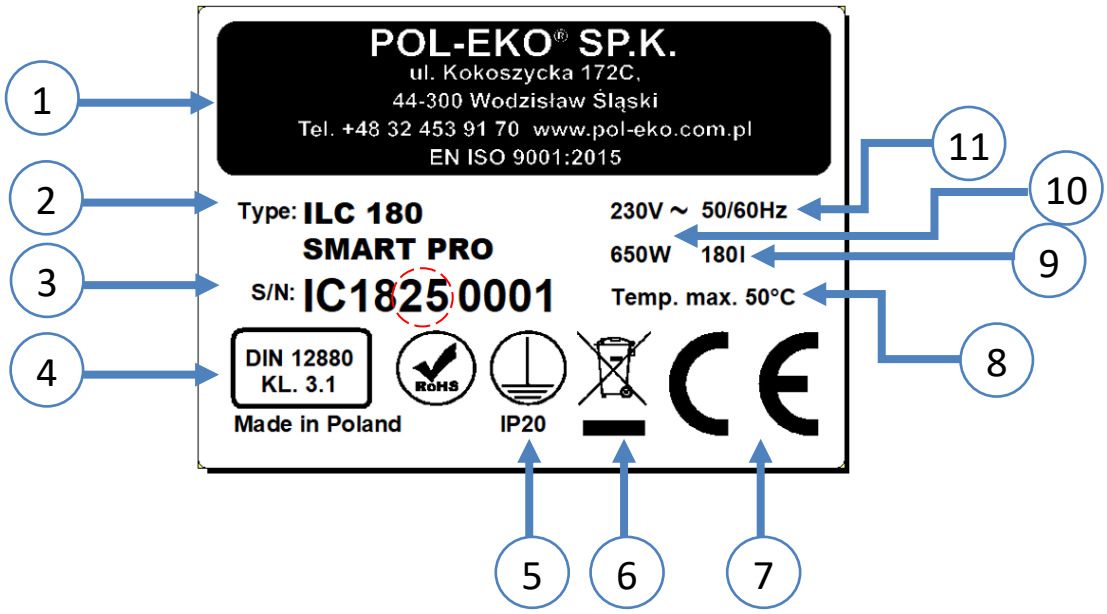
All complaints should be reported using the form available on the website http://www.pol-eko.com.pl/en/service

Compliance with local laws and regulations

The user is responsible for obtaining any approvals or authorizations required to launch and use the product. POL-EKO® shall not be liable for any negligence in the above matter except when the refusal to obtain authorization is caused by a product defect.

13. RATING PLATE

The rating plate is located on the left side wall in the upper left corner. Below there is an example of a rating plate:



1. Manufacturer's data
2. Type of device
3. Serial number (the two marked digits indicate the year of manufacture of the device)
4. Temperature protection class according to DIN 12880
5. Degree of protection against electric shock (class I: protection against indirect contact) and IP enclosure protection rating
6. Disposal of used device according to WEEE2
7. CE marking as confirmation of compliance with the directives
8. Temperature range of the device
9. Information about the device - capacity of the chamber
10. Information about the device - maximum power consumption,
11. Acceptable range of voltage and frequency of mains supply

The numbers marked with a red circle indicate the year of manufacture of the device.

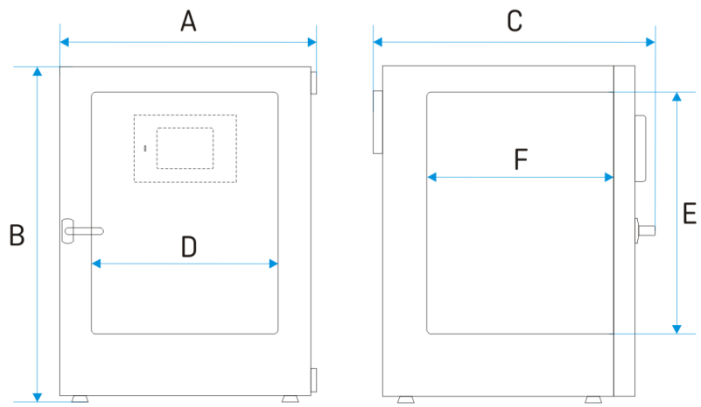
14. TECHNICAL DATA

Technical data are given with a tolerance of ± 5%, the working capacity of the chamber is always smaller. All the below technical data refers to standard units (without optional accessories).

		ILC 180 SMART PRO	***ILC 260 SMART PRO***
			
Air convection		natural (fan-less)	
Chamber capacity [l]		182	262
Working capacity[1)] [l]		135	205
Door type		double (external solid, internal glass)	
Temperature range [ºC]		+5ºC above ambient temperature…+50	
Temperature resolution [ºC]		every 0,1	
Humidity range [% rH]		90-95	
CO_2 range [Vol.-% CO_2]		0-20	
CO_2 resolution [Vol.-% CO_2]		every 0,1	
CO_2 measurement		IR	
Controller		microprocessor with a large 7“ full colour touch screen	
Interior		stainless steel to DIN 1.4301	
Housing		powder coated sheet	
Overall dims[2)] [mm]	A width	700	740
	B height	920	1070
	C depth	780	840
Internal dims [mm]	D width	560	600
	E height	650	800
	F depth	500	550
Max shelf workload [kg]		10	30
Max unit workload [kg]		30	50
Nominal power [W]		1700	1700
Weight [kg]		96	118
Temperature fluctuation[3)] at 37°C [°C]		< ± 0,1	< ± 0,1
Temperature variation[4)] at 37°C [°C]		< ± 0,3	< ± 0,4
Recovery time after 30 seconds door opening at 37ºC [min]		6	5
CO_2 recovery time after 30 seconds door opening at 5 Vol.-% CO_2 [min]		10	10
Energy consumption at 37ºC [Wh/h]		66	97
Power supply		230V 50-60Hz	
Sound level [db(A)]		42	44
Shelves (std./max.)		3/6	3/8
Warranty		24 months	
Producer		POL-EKO® sp.k.	

[1] does not include rack space
[2] depth doesn't include 50 mm of power cable
[3] fluctuation measured in the geometric center of the chamber
[4] in space, variation (K) calculated for chamber as:

$$K = +/- \frac{\bar{T}max - \bar{T}min}{2}$$



15. DECLARATION OF CONFORMITY

DEKLARACJA ZGODNOŚCI UE

EU DECLARATION OF CONFORMITY

POL-EKO®

Produkt:	***Product:***
Inkubator CO_2	CO_2 Incubator
Model:	***Model*:**
ILC 180; ILC 260	
w wersjach (*in version*):	
SMART PRO	
Nazwa i adres producenta:	***Name and address of the manufacturer:***
POL-EKO® A.Polok-Kowalska sp.k. ul. Kokoszycka 172 C, 44-300 Wodzisław Śląski Polska/Poland	
Niniejsza deklaracja zgodności wydana zostaje na wyłączną odpowiedzialność producenta.	***This declaration of conformity is issued under the sole responsibility of the manufacturer.***
Wymieniony powyżej przedmiot niniejszej deklaracji jest zgodny z odnośnymi wymaganiami unijnego prawodawstwa harmonizacyjnego:	***The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:***
RED 2014/53/UE RoHS 2011/65/UE & 2015/863UE WEEE 2012/19/UE	RED 2014/53/EU RoHS 2011/65/EU & 2015/863EU WEEE 2012/19/EU
Odniesienia do odnośnych norm zharmonizowanych, które zastosowano lub do innych specyfikacji technicznych, w stosunku, do których deklarowana jest zgodność:	***References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:***
RED	ETSI EN 300 328 V2.2.2: 2019 ETSI EN 301 893 V2.1.1: 2017 ETSI EN 301 489-1 V2.2.3: 2019 ETSI EN 301 489-17 V3.1.1: 2017 IEC EN 62368-1: 2018 BS EN 62311: 2008
LVD	PN-EN 61010-1:2011 PN-EN IEC 61010-2-010:2020-10 PN-EN 60529:2003/A2:2014-07
EMC	PN-EN IEC 61326-1:2021-10
RoHS	PN-EN IEC 63000:2019-01

Wodzisław Śl. 10.07.2024

Podpis / Signature:

Dawid Rybarz
Dyrektor Techniczny (CTO)

We produce:
- ❑ thermostatic cabinets
- ❑ laboratory refrigerators
- ❑ laboratory incubators
- ❑ devices with photoperiod and phytotron system
- ❑ drying ovens and sterilizers
- ❑ drying ovens with nitrogen blow
- ❑ laboratory freezers
- ❑ ultra-low freezers
- ❑ climatic chambers
- ❑ Caldera fluid and blanket warmers
- ❑ colony counters
- ❑ laboratory shakers
- ❑ stationary samplers
- ❑ Hydromat water dispensers
- ❑ Eurodrop stations
- ❑ FEKO+ waste water receipt station
- ❑ heating ovens
- ❑ cooled incubators
- ❑ fume hoods

We offer portable, laboratory and on-line equipment:
- ❑ pH-meters
- ❑ ionmeters
- ❑ dissolved oxygen meters
- ❑ conductivity meters
- ❑ photometers and spectrophotometers
- ❑ thermo reactors
- ❑ turbidity metres
- ❑ pH electrodes
- ❑ conductivity sensors
- ❑ oxygen probes
- ❑ heavy metals trace analyzers
- ❑ water baths
- ❑ autoclaves
- ❑ pH buffer solutions
- ❑ conductivity standards
- ❑ photometric tests
- ❑ laboratory accessories
- ❑ consumables

We organize:
- ❑ regional trainings
- ❑ individual trainings
- ❑ seminars

We provide:
- ❑ warranty and post-warranty service
- ❑ consultancy in the selection, maintenance and operation of laboratory equipment

POL-EKO LAB is Accredited by the Polish Centre for Accreditation (a member of ILAC) and provides accredited calibration of:
- ❑ thermostatic and climatic chambers (incubators, drying ovens, thermostatic cabinets, climatic chambers, freezers)
- ❑ water baths and thermo reactors
- ❑ autoclaves
- ❑ electric and electronic thermometers
- ❑ data loggers
- ❑ high temperature laboratory furnaces
- ❑ thermohygrometers
- ❑ laboratory sieves

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Calibration is confirmed with the issue of 'Calibration Certificate'.

Services outside the scope of accreditation:
- ❑ checking equipment for physicochemical measurements (meters and probes),
- ❑ carrying out IQ, OQ, PQ qualification procedures,
- ❑ mapping of temperature and humidity in the rooms

Additional information about the services of POL-EKO LABORATORIUM POMIAROWE can be found on the web-site www.polekolab.pl and by phone: 32 453 91 97

Manufacturer of control and measurement equipment for laboratory tests and technological processes, distributor in Poland of the following companies: HAMILTON, THERMO SCIENTIFIC, WTW, XYLEM.

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