

## Manual

### Cell Oven for Stress Relaxation EB 21, EB 22 and EB 21 LTHTP

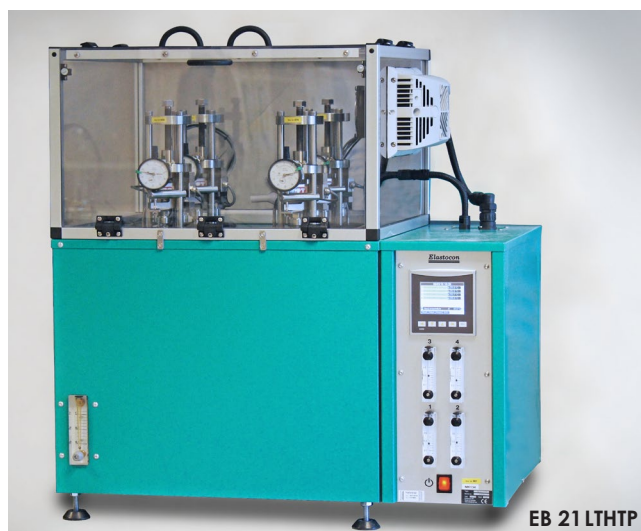
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Technical documentation supplied  
on USB flash drive



# 1. Setting up the Cell Ageing Oven

Place the Ageing Oven on a stable and horizontal bench.

Connect the oven to a grounded mains outlet, according to the type label on the oven. We recommend the use of an Earth Leakage Detector.

## 2. Running the Cell Ageing Oven

### 2.1 Starting

Switch on the power (red switch).

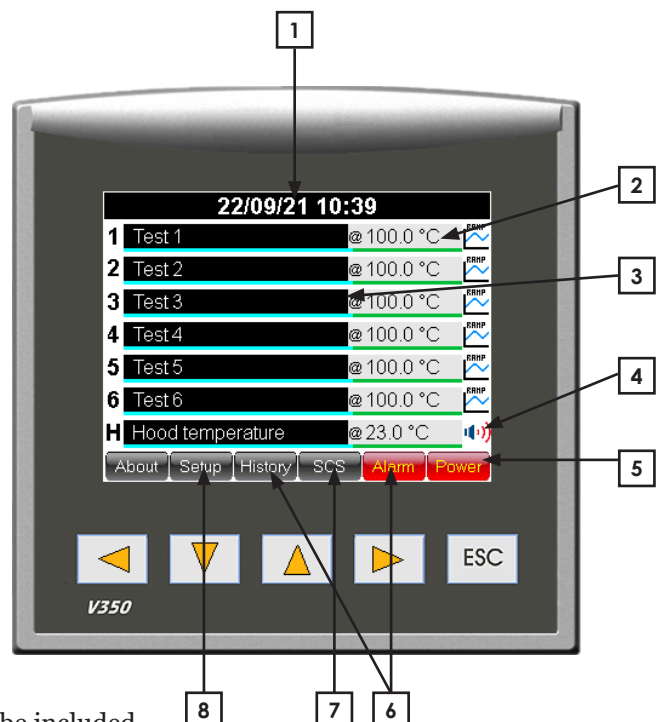
Reset the power failure and alarm, see 2.2.4 and 2.2.5.

Set the temperature on the PLC, see 2.2.1.

### 2.2 Settings

#### Explanation

1. Date & time
2. Temperature set for this cell
3. Test name
4. Alarm Buzzer on or off
5. Power Failure
6. Alarm and History – tap this symbol and the alarm history will be visible on the PLC screen
7. SCS – multiple cells will be shown as slides shifting in a sequence with enlarged displays
8. Set up for
  - date & time
  - communication with software
  - calibration offset



The oven has a touch controlled screen. A touch pen will be included.

**Note:** Do not use sharp objects to touch the screen.  
This can cause damage on the screen.

## 2.2.1 Temperature and test time setting

Tap on the temperature actual value to set the test temperature, see figure 2.2.1.a.

On the next screen tap on the set value box on the right side of the *SetT* text, see figure 2.2.1.b.

A numeric keyboard will show (see figure 2.2.1.c). Type in the set temperature with the numeric keyboard and finish with a tap on the return button.

While still on this screen (see figure 2.2.1.d), the test time can also be set in hours and minutes and the test time started to count down.

Hours and minutes are separated in two different boxes. To fill in the hours tap in the box on the right side of the text Test time [xxxx h].

A numeric keyboard will show. Type in the time in hours followed by a tap on the return button.

To set the test time minutes repeat the same procedure but instead of a tap on the xxxh box, tap on the xxxm box

To start the test time count down at this point, tap on the hour glass symbol.

The time will now start countdown. This time can only be changed when the hour glass symbol to the right is stopped. To stop the test time count down, tap and hold the hour glass symbol pressed for >3 seconds. A stopped test time count down will indicate with a red stretch over the hour glass symbol.

When the test time is stopped the test time in hours and minutes can now be changed.

The count down time can be stopped and started at any time. The test time will return to the last time entered every time the test time is stopped.

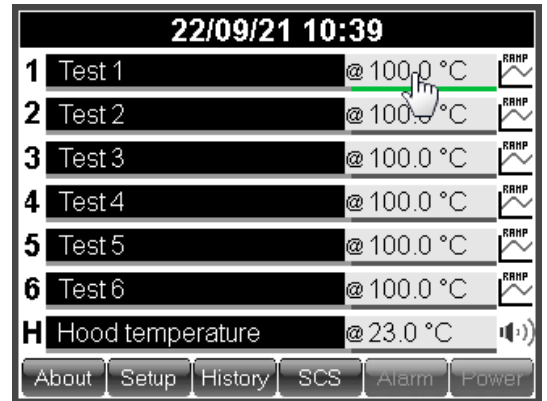


Figure 2.2.1.a – Temperature setting.

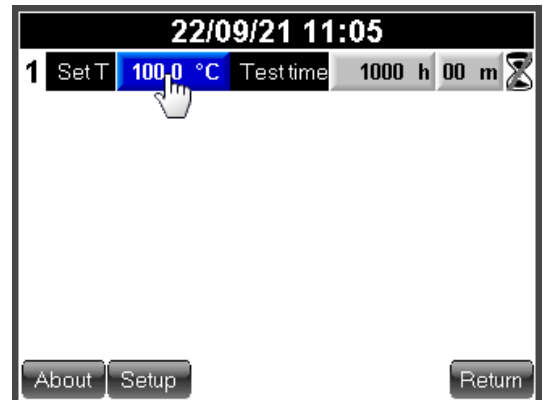


Figure 2.2.1.b – Temperature setting.

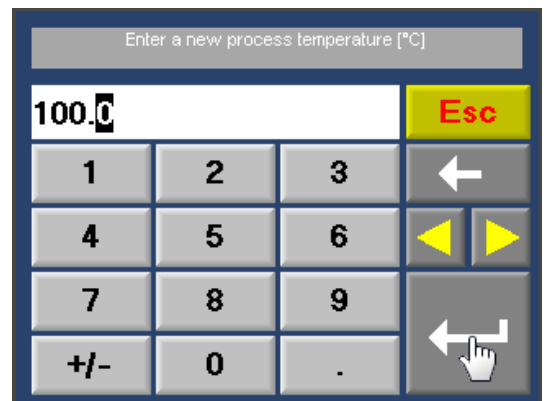


Figure 2.2.1.c – Temperature setting.

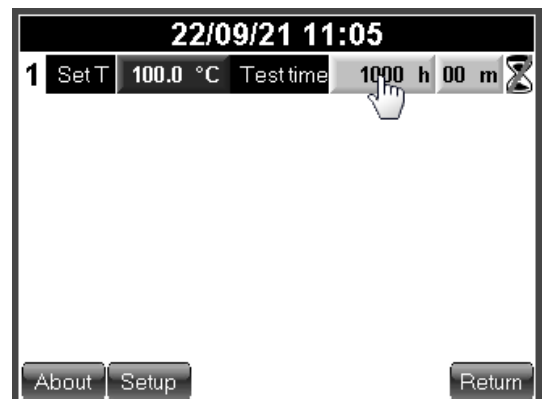


Figure 2.2.1.d – Test time.

### 2.2.2 Test name

From the main screen, tap on the name field that corresponds to the oven cell channel (see figure 2.2.2.a).

Type the test name from the touch screen keyboard (see figure 2.2.2.b). One test name row on the screen can hold up to 40 characters.

1. Use the white arrow buttons on the upper left corner to swap between different keyboard character layouts.
2. Tap on the *Enter* button to finalize the test name input.
3. To re-enter any character on the same test name row, it is possible to correct any character in the test name with a tap on any of the white left or right arrow buttons in the lower left and right corner on the screen.
4. To cancel any input changes, tap on the *ESC* button and return to the previous screen.

### 2.2.3 Power failure

#### Power failure during a test

If the test time is running when a power failure occurs, the oven temperature and test time counters will continue from the time when the power failure occurred, when the power is resumed.

#### Power failure indicator

When the power is resumed after a power failure during a test with temperature control at set point and test timer running, the screen will lit up a power failure button.

Tap on the *Power Failure* button to see more information and to reset the power failure, see figure 2.2.3.a.

A new screen will show, see figure 2.2.3.b.

This feature will give the operator information about duration of the power failure and temperature deviation caused by the power failure. The power failure button will remain until the button *Clear & Exit* is tapped.

### 2.2.4 Set up screen (user)

#### Password

A password is needed to enter the set up mode.

Tap on the *Setup* button on the main screen to enter the password screen for set up, see figure 2.2.4.a.

Default password is: 1111



Figure 2.2.4.a – Password.

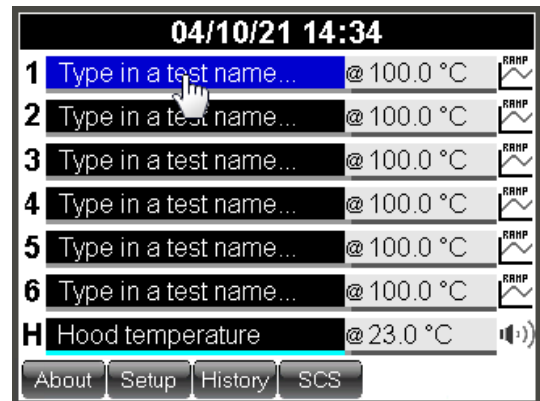


Figure 2.2.2.a – Test name.



Figure 2.2.2.b – Test name.

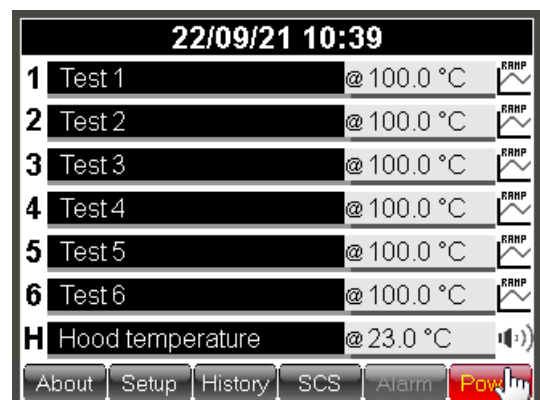


Figure 2.2.3.a – Power failure.

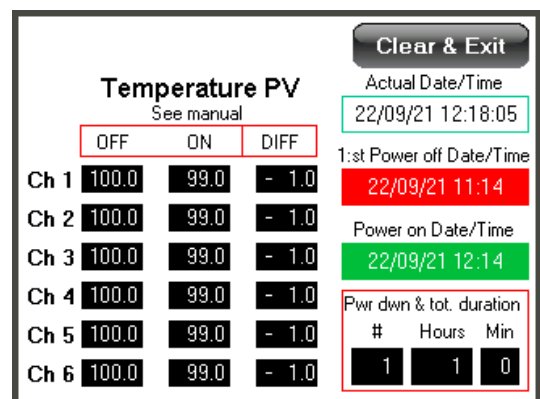


Figure 2.2.3b – Power failure.

### IP-address

In the Set up mode an IP-address can be typed in to establish a communication with a PC-software e.g. monitoring program. Tap on the *IP-addr.* field to enter an IP-address, see figure 2.2.4.b.

The *IP-addr.* field is divided into smaller fields.

The oven main power must be switched off and on (restart) for the IP settings to refresh and initiate.

### Temperature offset

In the set up mode the offset is adjusted according to calibration. When a re-calibration is done, values may have to be adjusted again.

An individual offset value can be added to both the temperature-indicator and -controller.

### Standby temperature

The operator can in this *Set up* also preset a standby temperature. That means when the test timer has reached 0:00, the oven will be set to this pre-set temperature. To access the standby temperature setting, tap on the control box below *Stdby*, see figure 2.2.4.c.

A zero value in this control means that it is not active and after the test timer timeup the oven will remain at the same temperature as during the test.

A higher value than zero represents the temperature set value. Eg. if the operator sets the standby control to 30, the oven will go to 30 °C after the test time has reached the end. Minimum set value (SV) for the oven is 30 °C, see figure 2.2.4.d.

The oven has no cooling. The temperature will just cool off naturally. The cooling time depends on the room ambient temperature.

### Real time clock

Tap on the real time clock control to set time and date, see figure 2.2.4.e.

This is the system time and date and this time/date stamp will be included to all alarm and time critical information visible on the screen.

Use the numeric keyboard to set a new time and date.

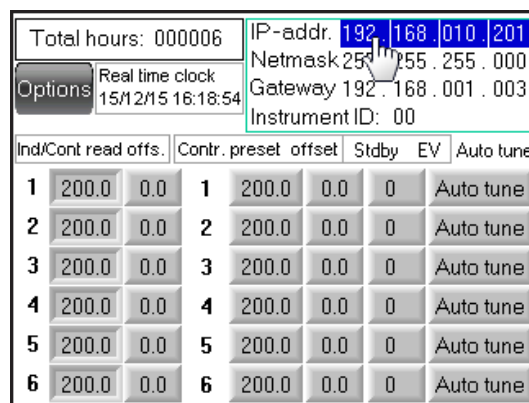


Figure 2.2.4.b – IP-address.

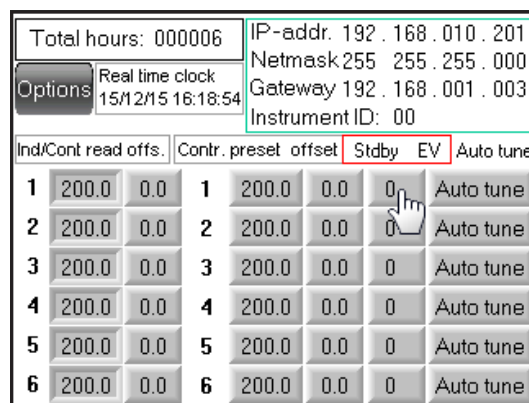


Figure 2.2.4.c – Standby temperature.



Figure 2.2.4.d – Standby temperature.

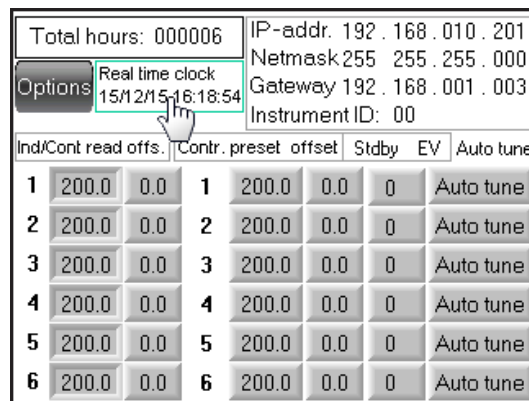


Figure 2.2.4.e – Real time clock

## 2.2.5 Alarm

Alarm is activated at:

- high temperature in the test chamber, +1 °C from set value
- low temperature in the test chamber, -1 °C from set value
- high temperature of the controller, +5 °C from set value <sup>1)</sup>

<sup>1)</sup> This alarm will be reset automatically when the temperature is within tolerance from set value again.

Error code	Problem cause	Remedy
<b>001–006</b> Cell 1–6	Oven cell is too warm.	The alarm will be reset when the alarm has been acknowledged and the cell has cooled down.
<b>007–012</b> Cell 1–6	Temperature difference between set value and process value $\pm 1$ °C.	Wait until the temperature is within range to acknowledge the alarm.
<b>013</b>	Low pressure from airpump.	Check the airpump filter and function.
<b>014</b>	Shinko Communication Timeout.	Contact support.
<b>015</b>	Low battery.	Replace backup battery in OPLC (contact support).
<b>016–021</b> Cell 1–6	Loop break controller #.	Broken temperatur sensor, call for service.
<b>022–027</b> Cell 1–6	Temperature difference between set value of controller and actual value +5 °C.	Acknowledge the alarm. When temperature is within range the alarm will be reset. If the alarm is not reset contact support.

Coloured lines on PV and SV display indicates alarm status.

- A red line above PV display = PV temperature differs +1 °C from SV temperature.
- A light blue line below PV = PV temperatures differs -1 °C from SV temperature.
- A red line above SV = SV differs +5 °C from actual controller temperature.
- A green line below SV = PV temperature is within  $\pm 1$  °C from SV temperature.

*SV temp. diff. alarm to general alarm collection list and flashing alarm button will only be active for running channels (active count down meter).*

Alarm will activate a buzzer and/or a flashing red Alarm button.

The buzzer can be switched on and off by a tap on the buzzer symbol.



If the alarm button starts to flash, go through the check list in chapter 2.2.5 Alarm to identify the alarm and address the problem for proper action.



Buzzer on



Buzzer off



## Acknowledge any alarm

To acknowledge any alarm, tap on the button Alarm.

**Figure 2.2.5.a.** All active alarms can be seen on this screen. Press the magnifying glass to the right side of the alarm ID 00 in the alarm group list to view all active alarms in that group.

This oven will present all active alarms in the group named ID 00.

All the alarms in this group are divided into two levels depending on how serious the alarm is.

First level will reset the alarm automatically, but still requires an acknowledgement to be cleared from the alarm list.

Second level must always be acknowledged by the operator manually.

**Figure 2.2.5.b.** To acknowledge an alarm, press the magnifying glass to the right of the chosen alarm.

**Figure 2.2.5.c.** Press the button *Ack* and the alarm will be reset.

Any alarm that is reset automatically will remain in the alarm list until a normal condition is met. The red *Alarm* button will however switch from flashing to a fixed state.

Alarm that still persists will show up again after the acknowledge procedure.

Press the *Esc* button several times to return to main screen.



The *History* button will show a record of all previous alarm.

## 2.3 Set the air change rate

According to standards the air has to be changed during the test. ISO 188 Accelerated ageing, method A, requires an air change of 3 to 10 times an hour. The cells in the oven have a volume of 1,3 l/cell. This gives the following flow of air through the flow meters:

air change rate	
changes/h	l/min
3	0,07
5	0,11
7,5	0,16
10	0,22
12	0,27
15	0,32
17,5	0,38
20	0,43



Figure 2.2.5.a



Figure 2.2.5.b



Figure 2.2.5.c

For ageing of rubber materials we suggest to set the flowmeters to 0,15 l/min. Read the flow of the flowmeters at the center of the floats. The floats shall rotate slowly to show the correct reading.

**Note:** If the floats does not rotate properly check if the oven is placed horizontally.

## 2.4 Additional features for cell ovens

### 2.4.1 LTHTP-option (Low Temperature High Temperature Programmable)

The LTHTP feature can only be supplied with the EB 21 oven. In the LTHTP option the oven can be operated with programmed cycles from the maximum temperature of the oven down to 23 °C, with the use of cooling water. The temperature of the cooling water must not exceed 18 °C. The oven is equipped with pipes for water cooling, a flow meter and a magnetic valve to control the water flow and switch the cooling water on and off.

The water valve is controlled from the ramp option on the instrument touch screen. **See chapter 3. Programming of cycling temperatures**, for further instructions. Control of the water valve is set from the option [ON/off].

Set the water cooling flow meter to 0,2 l/min and run a temperature cycle. Fine tune the water cooling flow meter. Increase the water flow if the ramp from high to low temperature is slow and does not follow the set temperature. Decrease the water flow if the ramp from high to low temperature is too fast and ahead of the set value.

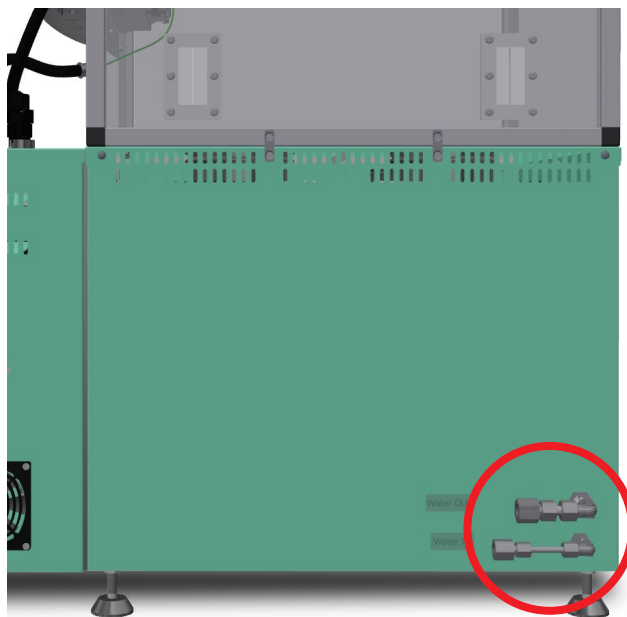
The LTHTP option has another feature in the instrument touch screen. To control the temperature close to room temperature it is essential that the water cooling is switched on. The temperature threshold for water cooling can be set from the Setup window/Options.

The default value is set at 30 °C, but can be adjusted between 20 and 50 °C.

To modify the threshold setting.

1. From the main screen, press the button **Setup**.
2. Type in the password 1111.
3. Tap the button **Options**.
4. Change the temperature setting in the control below.

Option out always active  
[when less than this SV] 30.0



**Figure 2.4.1** – EB 21 LTHTP water connection, which is found on the back of the oven, see the red circle above .



### 3. Programming of ramp with cycling temperatures

**Programming of cycling temperatures/ramp is an additional option.**

*If this addition is included in the oven the ramp button will be visible on the main screen.*

A temperature cycle is divided into segments. Each segment is known in this chapter as a ramp.

The ramp can be set within the same temperature interval as specified for the oven. The ramp is built up by 2 break points known as legs. There are 50 legs available to build ramps and create a full temperature cycle. See illustration on the next page (Leg-Ramp-Cycle).

Each leg can be used to set a new temperature or maintain the same temperature over a time period (duration). Duration up to 999 hours and 59 minutes, can be set to each leg.

#### Ramp button

Press the ramp button to enter the ramp function.

This button can be found on the main screen.

#### Legs

Ovens with more than one individually controlled temperature cell or chamber will have 50 legs available for each temperature cell or chamber.

Each leg consists of a time control (Time h:m) and one temperature set point control (Final Temp). An optional button [ON/off] is included to some ovens. The *ON/off* buttons will be described further on.

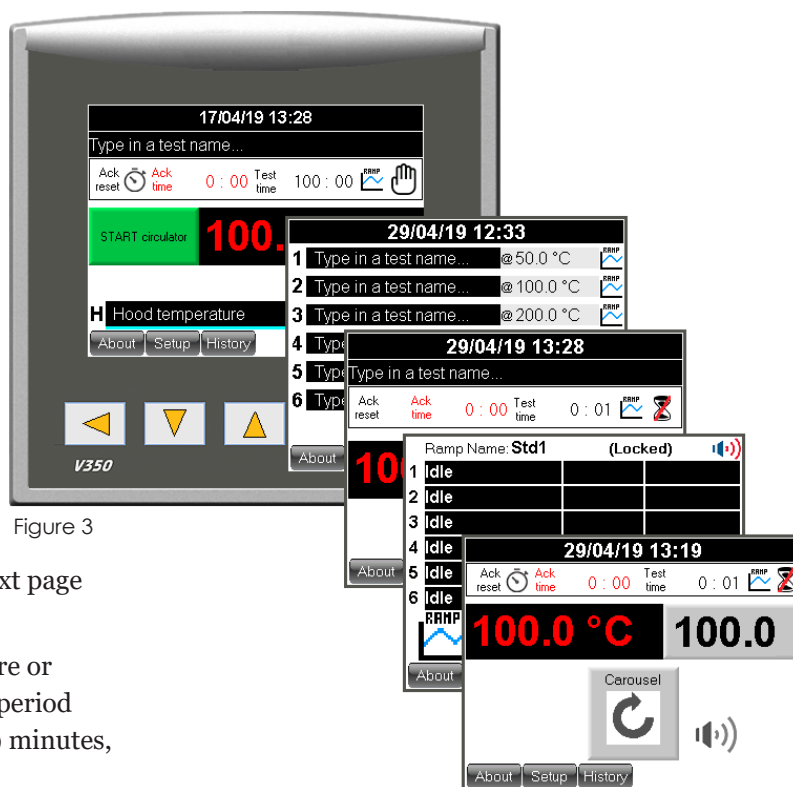


Figure 3

	Current lap	Temp	Lap(s)	Total [h:m]
	0	23.0	3	16:12

#### Leg at start of temperature cycle

If the temperature in the header (Temp) for the instrument is equal to the temperature set point in **leg 1**, that same temperature will be kept over the time duration set in **leg 1**.

On the other hand, if the temperature set value for the oven is lower or higher than the first temperature set point in **leg 1**, the temperature will increase/decrease towards the temperature set point typed in the **leg 1** control. The temperature increase/decrease-speed will be calculated to last over the time duration set in **leg 1**.

### 3.1 Leg when temperature cycle is running

When the ramp is started, each leg filled with information will be processed. Legs with time settings 0:00 will not be processed and will be skipped.

If the temperature set value in a leg (Final Temp) is equal to the temperature set point in the **following leg**, the same temperature will be kept over the time duration set in the **following leg**.

On the other hand, if the temperature set value for the leg is lower or higher compared with the following leg, the temperature will increase/decrease towards the temperature set point typed in the **following leg** control. The temperature increase/decrease -speed will be calculated to last over the time duration set in the **following leg**.

Ramp speed tolerances can be found in the specifications for the instrument.

The essential part of the leg function is that if the following leg is set with a different temperature (set value) than the previous leg, a ramp in temperature will be created. The duration for the ramp is always controlled by the following leg.

#### Button next

Press the button *Next* to show additional 13 legs available for the same temperature cell/chamber. There are three *Next* screens. A total of 50 legs are available.

Leg

Channel Ramp 1

Current lap	Temp	Lap(s)	Total [h:m]
0	23.0	3	16:12

EV	Time h:m	Final T
ON	1:00	23.0
off	1:42	125.0
off	1:00	125.0
ON	1:42	23.0
off	0:00	0.0
off	0:00	0.0

Leg 1

Leg 2

Leg 3

Leg 4

Leg 5

Leg 6

Ramp

Channel Ramp 1

Current lap	Temp	Lap(s)	Total [h:m]
0	23.0	3	16:12

EV	Time h:m	Final T
ON	1:00	23.0
off	1:42	125.0
off	1:00	125.0
ON	1:42	23.0
off	0:00	0.0
off	0:00	0.0

Leg 1

Leg 2

Leg 3

Leg 4

Leg 5

Leg 6

Cycle

Channel Ramp 1

Current lap	Temp	Lap(s)	Total [h:m]
0	23.0	3	16:12

EV	Time h:m	Final T
ON	1:00	23.0
off	1:42	125.0
off	1:00	125.0
ON	1:42	23.0
off	0:00	0.0
off	0:00	0.0

Leg 1

Leg 2

Leg 3

Leg 4

Leg 5

Leg 6

EV	Time h:m	Final T
off	0:00	0.0
off	0:00	0.0
off	0:00	0.0
off	0:00	0.0
off	0:00	0.0
off	0:00	0.0

Leg 7

Leg 8

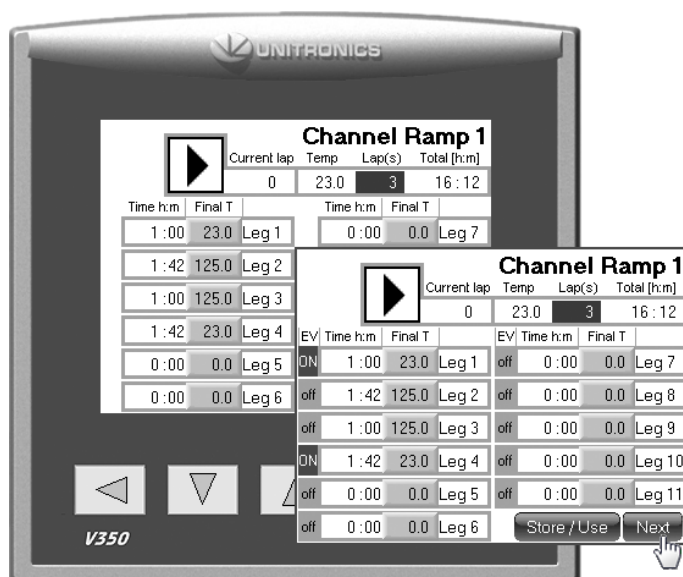
Leg 9

Leg 10

Leg 11

Additional 13 legs  
ure cell/chamber.  
total of 50 legs are

Store / Use	Next
-------------	------



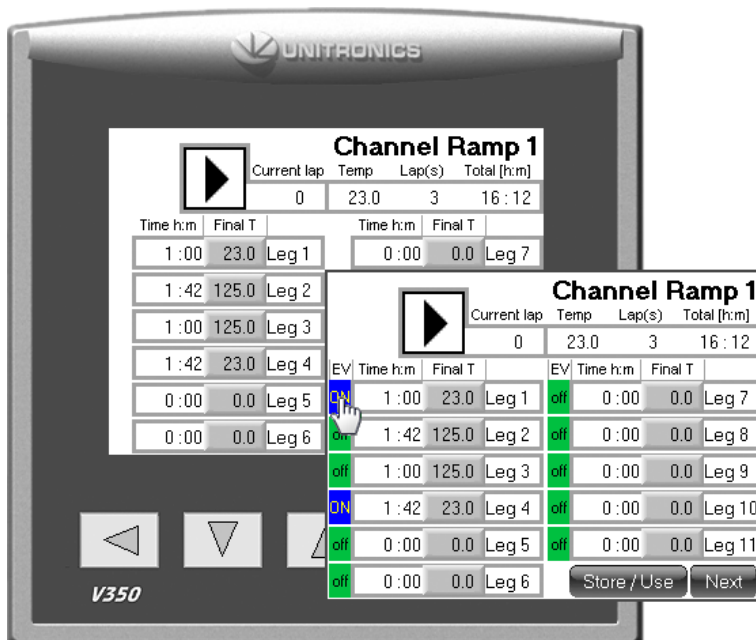
**Button [ON/off]** (optional)

This button is available on some instruments that require any type of mechanical action such as open/close valves for additional cooling or heating. These buttons are not visible if the instrument does not have this option. The button is included to each leg cluster and will only take action when the specific leg is running and a time has been set for that leg.

Press the button to give it a fix state.

ON = will activate the output (valve or control will be switched on when this leg is running).

off = no action will be taken and the output will remain off (valve or control will be switched off when this leg is running).



## Ramp view header

The header is located on the first ramp screen. The header consists of one *Play (start)* button, *Current lap*, *Temp*, *Laps* and *Total [h:m]*.

The **PLAY (start)** button will execute the full temperature cycle(s). To start the temperature cycle, press the button *PLAY*. The play button will change its appearance to a stop button.

An additional button will now also appear. This button is the *PAUSE* button. Press the *Pause* button to pause the ramp. In this state the temperature will stop at the current processed set value. Press the *Pause* button again and the temperature ramp will continue.

To stop the ongoing cycle, press and hold the *STOP* button pressed until the process is stopped (about 3 seconds).

**Current lap** is an indicator. This indicator will show the current lap that is being processed.

When the temperature cycle is started, the *Current lap* indicator will show the current processing lap.

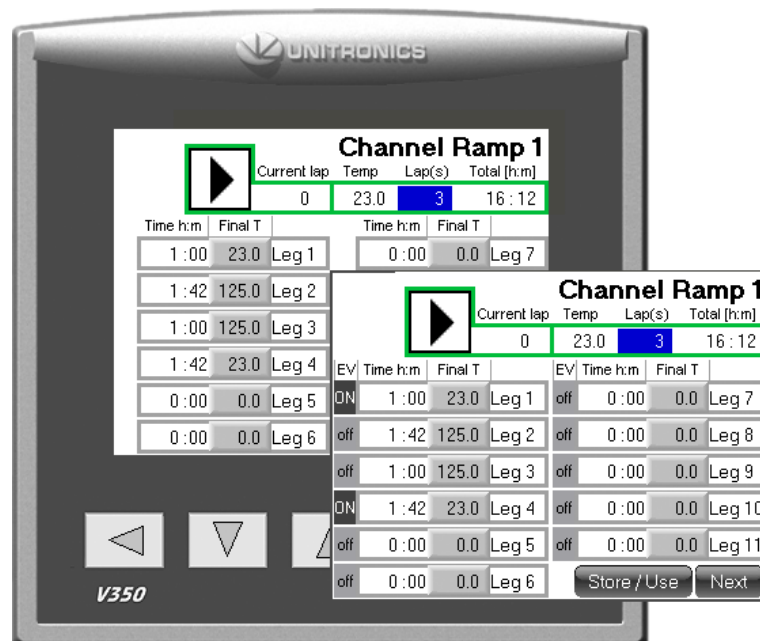
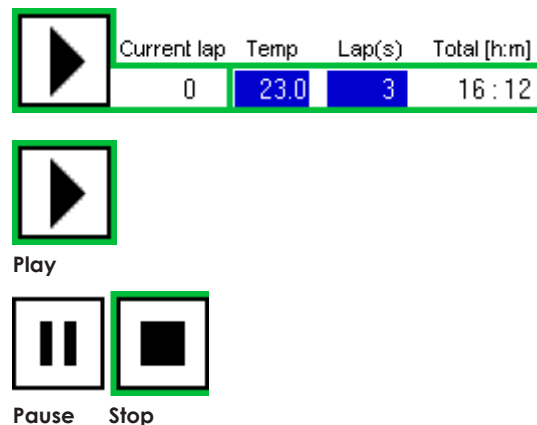
The **Temp** control is the same control as the set value (SV) control on the main screen of the instrument.

This control will also act as an indicator when the temperature cycle is started. The operator can then follow the temperature in this control as the cycle proceeds.

The **Lap(s)** is a control where the operator can set up a number of repetitions for the cycle.

**Total [h:m]** will calculate the total time of the temperature cycle. The time settings for each leg will be summed up. This time value is then multiplied by the number of laps typed in the header control laps to give the total time for the temperature cycle(s). The *Total [h:m]* indicator will show the remaining time for the full temperature cycle(s), when the temperature cycle is running.

For some software versions, the total time cannot show more than 9999 hours. In these cases, the indicator will show xxxx. The function will remain normal, but the total time is not possible to show.



## 3.2 How to Store/Use a programmed ramp

The total ramp generated can be stored into a memory *Bank*.

There are six individual memory banks to choose from.

Any stored ramp can be used for any heater cell/chamber in the same oven, **if the oven has more than 1 heater cell/chamber**.

The ramp program is write-protected and must be temporary unlocked to edit the ramp data or store a programmed ramp to file.

### ES 07-II

Locked state is indicated with the word *Locked* on the main screen.

#### Any other oven

Locked state is only indicated by disabled input controls on the ramp screen.

In the locked state, any pre-stored ramp can still be selected when the ramp screen is opened. Refer to point *USE* in this chapter.

The ramp edit mode will remain open until the ramp screen is closed and 1 minute has passed.

### Store

Notice that the file name for the stored ramp is fixed and the file names are always “RampDat1 for Bank 1”, “RampDat2 for bank 2” and so on.

The store button will save the current ramp into a file on the onboard SD micro card.

If the file is locked, then read the description below from point 1.

If the file is un-locked, then read the description below from point 5.

1. From the main screen, press the button *Setup*.
2. Enter password 1111+*Enter*.
3. Press the button *Options* (not for instrument EB 17).
4. Tick the box *Temporary unlock Ramp Store/Use* button.
5. Return to the main screen and press the *RAMP* button.
6. Prepare the ramp as wanted with temperature and time.

Temporary unlock  
☒ Ramp Store/Use button

The temporary unlock will stay unlocked while stepping between any of the four Channel Ramp# screens.

When changing to another screen except these, the temporary unlock will be cancelled and after 2 minutes the *Store/Use* button will then be locked automatically.

Store / Use

7. Press the button *Store/Use*.
8. If any memory *Bank* is empty, type in a new filename and press its *Store* button.

If a memory *Bank* is occupied, Press its *Store* button and choose to “overwrite” the old file.

Bank1 Std1 Store Use

A new file name can be given at all time before pressing the *Store* button.

## Use

The *Use* button will connect any of the ramps stored in any of the six memory banks to the Channel ramp in use.

If the oven has more than one temperature cell/chamber, any of these cells/chambers can be connected to any of the memory banks.

1. From the Ramp screen press the button *Store/Use*.
2. Press the button *Use* on any of the memory Banks.
3. Press the physical key *ESC* to return to the Ramp screen.
4. The file selected will now be loaded to the Channel in use.

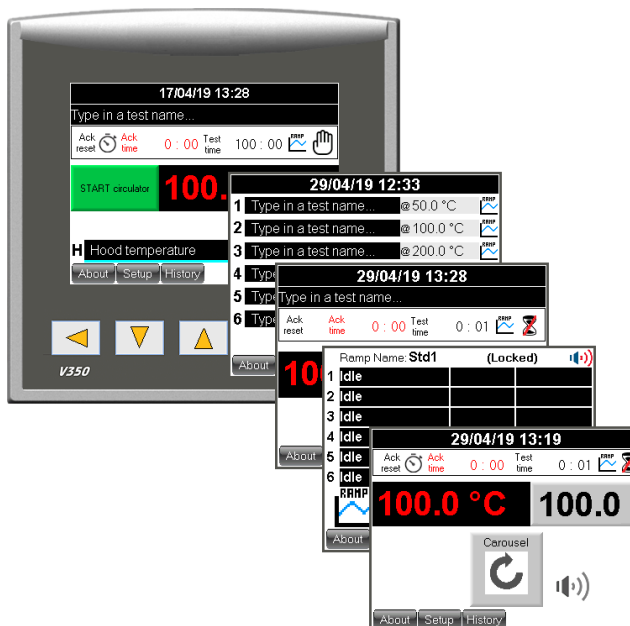
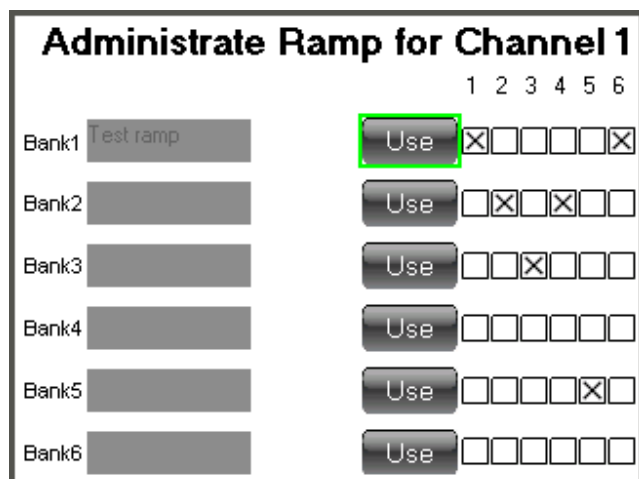
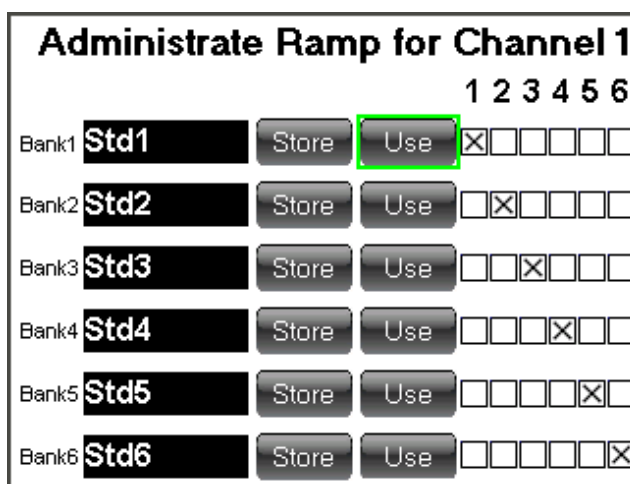
If the oven has more than one cell or chamber a matrix will be visible on the right side of the *Store/Use* buttons.

This matrix will show each channel and if it is connected to a ramp.

The maximum number of cells/chambers is six.

The example below shows that oven cell 1 was edited (Administrate Ramp for Channel 1) and ramp in “Bank1” is currently in use for this oven cell and so is the oven cell 6.

Oven cell 2 is using ramp data from “Bank2” and so is oven cell 4, oven cell 3 is using ramp data from “Bank3”, oven cell 5 is using ramp data from “Bank5”.





## Quick guide to initiate a ramp (temperature cycle) and run it.

1. From the main instrument windows press the ramp button symbol.
2. Fill in the header controls **Temp** and **Laps**.  
*Temp* is the standby temperature before the ramp (temperature cycling) is started and *Laps* multiplies the number of cycles to run.
3. Fill in the *Time* and *Final temp* for a number of legs to build all individual ramps in a full temperature cycle. Nine legs are available in the first ramp screen. Another 13 legs can be initiated in the next ramp screen. Press the button *Next* to enter the next ramp window. Four screens are available. First screen has 11 legs and the following screens have 13 legs per screen. 50 legs in total.

### Event buttons [EV]

(visible on instruments with this option)

To activate the event output, click and set the event *ON* for each leg that is supposed to activate the event output. Instruments with the LTP option will open the cooling water valve on any leg that has this option set to *ON*. This option is only available on the first temperature cell/chamber, if the instrument has more than one temperature cell/chamber.

4. When the full cycle has been programmed with all legs necessary, the total time will be calculated and shown in the header indicator **Total [h:m]**.
5. The temperature cycle can now be started. To start the temperature cycle, press the header button **PLAY** (Start).
6. The ramp symbol will start to blink on the main screen, when the main screen is restored automatically after two minutes or if the operator presses the ESC key below the screen to restore the main screen.



	Current lap	Temp	Lap(s)	Total [h:m]
	0	23.0	3	16:12

EV	Time h:m	Final T	
ON	1:00	23.0	Leg 1
off	1:42	125.0	Leg 2
off	1:00	125.0	Leg 3
ON	1:42	23.0	Leg 4



Total [h:m]
16:12



## Example of a temperature cycle:

Header Temp is set to 23 °C (or the standby temperature of your oven).

	Time	Temp	Option	Description
Leg 1	1:00	23	ON	‘ Temp will be kept at 23 °C for 1 hour. Option is ON to run an optional event.
Leg 2	1:42	125	off	‘ During 1 h and 42 min the temperature will rise to 125 °C. That represents a ramp speed of 1 °C/min. $125 - 23 = 102 \rightarrow 102$ minutes = 1 h and 42 minutes. Option is off to hold an optional event.
Leg 3	1:00	125	off	‘ The temperature will be kept at 125 °C for 1 hour. Option is off to hold an optional event.
Leg 4	1:42	23	ON	‘ During 1 h and 42 min the temperature will drop from 125 °C to 23 °C. That represents a ramp speed of 1 °C/min. $125 - 23 = 102 \rightarrow 102$ minutes = 1 h and 42 minutes. Option is ON to run an optional event.

Repeat this cycle three times: When *leg 4* is completed, the cycle will start over on leg 1. The total time for all cycles will be 16 hours and 12 minutes. The number of laps and remaining time can be followed on the indicators **Current lap** and **Total [h:m]**. After this time the ramp will stop and the temperature will remain on the last leg temperature set value if no standby temperature was set. In this example the oven will keep 23 °C when the ramp is complete.

*This is how the ramp window should look like according to the example above.*

It is possible set a standby temperature, if the last leg has a high temperature set point and the operator would like to end the temperature cycle with a low temperature. This can be done from the *Setup* screen.

**See chapter 2.3.6 Set up screen (Standby temperature).**

Channel Ramp 1									
		Current lap		Temp	Lap(s)		Total [h:m]		
		0		23.0	3		16:12		
EV	Time h:m	Final T		EV	Time h:m	Final T			
ON	1:00	23.0	Leg 1	off	0:00	0.0	Leg 7		
off	1:42	125.0	Leg 2	off	0:00	0.0	Leg 8		
off	1:00	125.0	Leg 3	off	0:00	0.0	Leg 9		
ON	1:42	23.0	Leg 4	off	0:00	0.0	Leg 10		
off	0:00	0.0	Leg 5	off	0:00	0.0	Leg 11		
off	0:00	0.0	Leg 6					Store / Use	Next

## 4. Prepare for a test

- Place the relaxation rigs in the oven, with the cables through the two back openings.
- Set the test temperature on the cell oven.
- Close the lids of the draught hood.
- Set the controller of the hood on 50 °C.  
(See chapter 2.2 Settings, explanation no. 10).
- Let the temperature stabilize in both the rigs and the hood.
- Set the controller for the hood about 2 to 2,5 °C lower than the indicated max temperature without cooling.

## 5. Temperature calibration

The instrument is at the delivery adjusted and calibrated according to the attached calibration certificate.

Calibration should be done annually.

## 6. Service and maintenance

The cell oven shall be cleaned on both the outside and inside, at regular intervals. The oven can be cleaned with water and a detergent or ethanol on the outside.

On the inside, most dirt is accumulated on the inside of the upper lid, by volatiles from the samples condensing. The lid can be cleaned with a suitable solvent such as ethanol or white spirit.

The most sensitive parts of the oven are the air filter and the air pump, which should be checked at least once a year.

## 7. Troubleshooting

When the oven does not work properly, check the following.

Problem	Problem cause	Remedy
No power.	No main power.	The main fuse, 6,3 AT, is placed in the connector for the mains lead on the back of the oven.
Black screen on power up.	No power to screen.	Open up the cover on the right side of the oven and check fuse F3 (2 AF). Refer to electrical drawings.
Alarm button flashing.	Any alarm.	See chapt 2.2.5 Alarm.

Check electric schematics for fuses. Before changing a defective fuse, check for any possible short circuit, causing the fuse to burn.

## 8. Safety

**Note:** Use gloves when the samples are placed in the oven or removed from the oven.

**Important!** For the best performance of the instrument, we recommend the following working environment:

- Standard laboratory temperature of either 23 °C  $\pm 2^\circ$  or 27 °C  $\pm 2^\circ$ .
- Humidity not more than 90 % RH  
– non condensing.
- Other environmental aspects: Pollution degree 2  
– Laboratory environment.

## 9. Technical specification

	EB 21	EB 22	EB 21 LTHTP
Temperature range, °C:	+40 to +200	+40 to +200	–
HT-version, °C:	+40 to +300	+40 to +300	–
LTHTP-version, °C:	–	–	+20 to +300
Temp. control, +40 to +100 °C, °C:	$\pm 0,5$	$\pm 0,5$	$\pm 0,5$
+101 to +200 °C, °C:	$\pm 1,0$	$\pm 1,0$	$\pm 1,0$
+201 to +300 °C, °C:	$\pm 1,5$	$\pm 1,5$	$\pm 1,5$
Temp. variation in time, °C:	$\pm 0,25$	$\pm 0,25$	$\pm 0,25$
Ramp speed, temp. rise, °C/min:	0,1 to 1	0,1 to 1	–
LTP option, temp. rise/fall, °C/min:	–	–	0,1 to 2
Temperature sensors:	Pt 100, 1/3 DIN	Pt 100, 1/3 DIN	Pt 100, 1/3 DIN
No. of temperatures:	4	6	4
Air speed, m/s:	<0,001	<0,001	<0,001
Air changes, changes/hour:	3 to 20	3 to 20	3 to 20
Useful volume, l:	4 × 1,3	6 × 1,3	4 × 1,3
No. of cells:	4	6	4
Dimensions, inner, dia × h, mm:	100 × 160	100 × 160	100 × 160
Dimensions, external, w × h × d, mm:	760 × 715 × 520	960 × 715 × 520	760 × 850 × 520
Weight, kg:	50	57	62
Voltage, V:	220 to 240/1/50 (110 to 120/1/60)	220 to 240/1/50 (110 to 120/1/60)	220 to 240/1/50 (110 to 120/1/60)
Power, W:	900	1300	900
Standards:	ISO 188 method A	ISO 188 method A	ISO 188 method A, ISO 3384-1 method A, and B, ISO 6914 method A

## Common specifications:

- The oven perform well inside the apparatus requirements in ISO 188, IEC 811 and other equivalent standards.
- The oven is controlled from a PLC (with a colour touch screen).
- Special design with controlled air exchange rate and low air speed.
- The casing consists of steel, painted with powder paint in bluegreen colour.
- The inner cells are made of aluminium.
- Temperature controller with 0,1°C setpoint (PLC).
- Fixed over temperature fuse.
- Flowmeters with needle valves, for setting the air exchange rate.
- The air speed is low and is dependent on the air exchange rate only, as specified in ISO 188 method A.
- Alarm for low air pressure (PLC).
- Built in air pump.
- Cooling channels in the casing for low surface temperature.
- Temperature controlled cooling fan for the electronics cabinet.
- Indication of power failure (PLC).
- Run-time meter (PLC).
- Countdown timer (PLC).
- Microfilter for the air which removes 99,99 % of all particles over 0,1 µm.

## Optional

**EB-P** Ramp function for temperature setting in the PLC.

**EC 11** Monitoring software.

**ED 04** Computer, PC.

**EB 07.01** Insert for ASTM (Test tubes).

## Support

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