Elastocon®

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# Manual

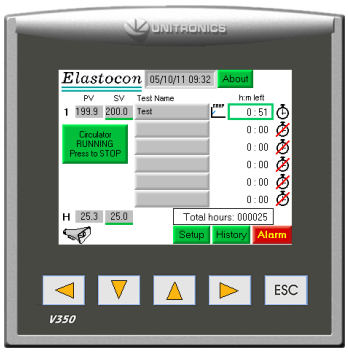
# Cell Oven for Stress Relaxation EB 17



## Contents



**Technical documentation supplied on USB flash drive**

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# 1. Setting up the Cell Ageing Oven and circulator

Place the Ageing Oven on a stable and horizontal bench. The height for this bench must correlate with the circulator choosen. (See instructions below for the circulator). Elastocon offers a table, **EB 17.04**, as an option.

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.

**Note:** Always compare the supply voltage and frequency on the instrument with the voltage distribution connected to the instrument before the power is switched on.

## Circulator

This is a step by step instruction for setting up the PRESTO circulator with the Elastocon EB 17 oven.

The circulator model described in this manual is
– Julabo PRESTO A80

Two kinds of instrument setups are possible. A layout with the circulator in line with the EB 17 oven. Another layout has the circulator placed perpendicular to the EB 17 oven. Both layouts will be described here.

The perpendicular placement requires a set of elbow tube connectors and these are ordered separately.

When the instrument is delivered together with the **EB 17.04** table, the table will be pre-adjusted in height. If no table is purchased, use a suitable bench and adjust the height according to the data below.

### Bench specifications are:

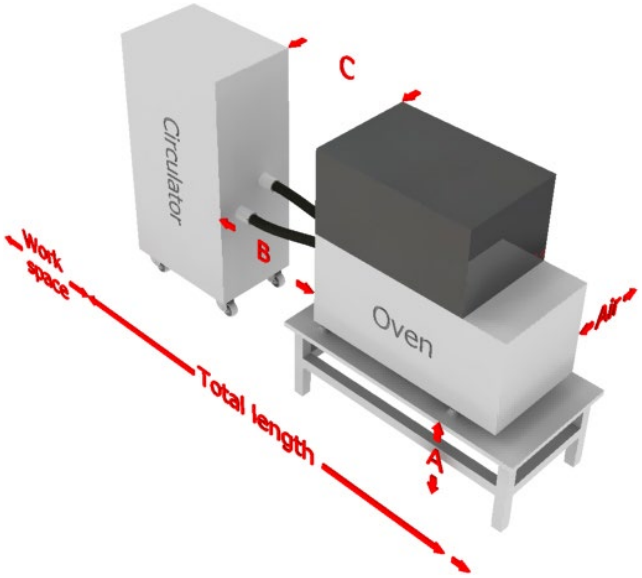
Load capacity [kg]: min 50
Width [mm]: 1000 to 1200
Depth [mm]: 500 to 600
Height [mm]: 400 to 470

## Circulator in line with the EB 17 oven

Place the circulator, so that the back panel of the circulator faces the left side of the EB 17 oven.

Place the circulator and oven as shown in the illustration below. If this setup is standing close to a wall, make sure that both circulator and oven has a clearance of at least 200 mm from the wall.

Also make sure that this clearance reaches all the way from the floor to at least 200 mm above the instruments for good air circulation. Do not have any shelfs or other wall hanging items blocking within this specified clearance.




Specified distances are (corresponding to the illustration):

A [mm]: 400 to 470
B [mm]: 650 to 660
C [mm]: Circulator (left-) & oven (back-) sides should be flush.

Work space at circulator front [mm]: ~ 700 or more

Total length [mm]: 2230 (work space not included) or ~ 2370 with table from Elastocon.

Air [mm]: ≥ 200

To connect the circulator and oven, see part *Connecting the circulator and oven* further on.

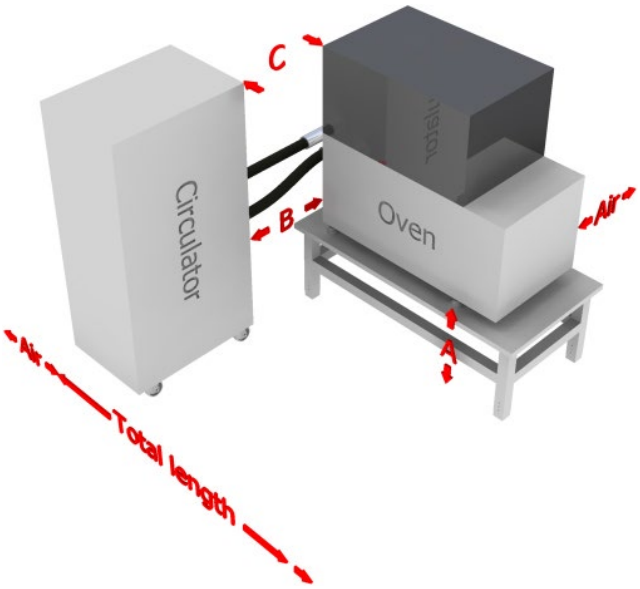
**Note:** When the setup is completed, always lock the circulator front wheels by activating the wheel lock on each wheel. Only the 2 front wheels have wheel locks.

## Circulator perpendicular to the EB 17 oven

Place the circulator, so that the back panel of the circulator faces the left end of the EB 17 oven front.

Place the circulator and oven as shown in the illustration below. If this setup is standing close to a wall, make sure that both circulator and oven has a clearance of at least 200 mm air from the wall (Air).

Also make sure that this clearance reaches all the way from the floor to at least 200 mm above the instruments for good air circulation. Do not have any shelfs or other wall hanging items blocking within this specified clearance.




Specified distances are (corresponding to the illustration):

A [mm]: 400 to 470
B [mm]: ~400
C [mm]: Circulator (left-) & oven (back-) sides should be flush.

Total length [mm]: 1390 or ~1550 with included bench from Elastocon.

Air [mm]: ≥200

To connect the circulator and oven, see *Connecting the circulator and oven*.

**Note:** When the setup is completed, always lock the circulator front wheels by activating the wheel lock on each wheel. Only the 2 front wheels have wheel locks.

## Connecting the circulator with the EB 17-II oven

**Step 1.**

The connections made between the circulator and oven are done with 2 separate cables and the 2 liquid hoses. In addition to that a connection should be done to the “Overflow connection” on the back of the circulator.

- External Pt100 sensor.
- Serial port.
- Liquid hose in
- Liquid hose out
- Overflow connection

See separate manual for the circulator to access the external temperature sensor and serial cable connection on the circulator.

- Connect the external Pt-100 sensor cable to the circulator EXT Pt 100 connection and the other end on the EB 17 oven left side to the connection labelled circulator Pt-100.

**Circulator** **Oven**



- Connect the serial cable to the circulator SERIAL connection and the other end at the back of the EB 17 oven to the connection labelled Circulator RS232C.

**Circulator** **Oven**


### Step 2. Main power connection for circulator

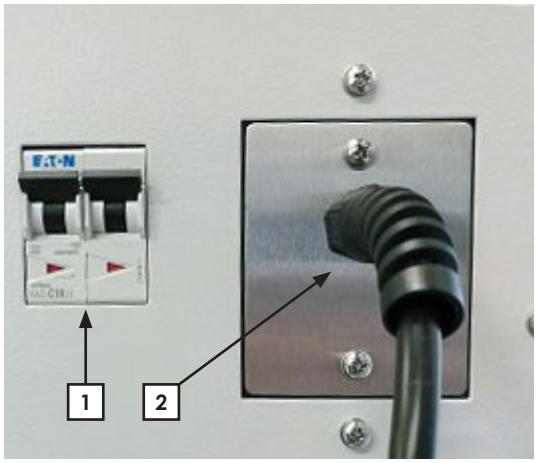
**IMPORTANT!**

Compare the voltage and frequency labelled on the circulator with the specifications of the main outlet before connecting the circulator to the main power socket.

The main power socket must have a ground connection.

Any deviation in voltage and frequency between the circulator type label and main power outlet might damage components in the circulator.

If your instrument type labels deviate from the main power supply specifications, please contact your supplier or the manufacturer. In such case, **do not power up the instruments!**




**Main power supply on the circulator**

1. Circuit breakers
2. Main power cord

**Circulator: A80 – 208 V / 60 Hz / 15 Ampere**

| | |
|---|---|
| Mains connection [nom. volt.]: | 208 |
| Nominal frequency [Hz]: | 60 |
| Tolerance of the nom.voltage [%]: | -10, +15 |
| Main supply fuse [A]: | 15 |

**Circulator: A80 – 230 V / 50 Hz / 16 Ampere**

| | |
|---|---|
| Mains connection [nom. volt.]: | 230 |
| Nominal frequency [Hz]: | 50 |
| Tolerance of the nom.voltage [%]: | ±10 |
| Main supply fuse [A]: | 16 |

**Circulator: A80 – 230 V / 50 Hz / 13 Ampere**

| | |
|---|---|
| Mains connection [nom. volt.]: | 230 |
| Nominal frequency [Hz]: | 50 |
| Tolerance of the nom.voltage [%]: | ±10 |
| Main supply fuse [A]: | 13 |

If the voltage and frequency correspond between the instrument and main power supply, then connect the power cord and switch the circuit breakers to ON.

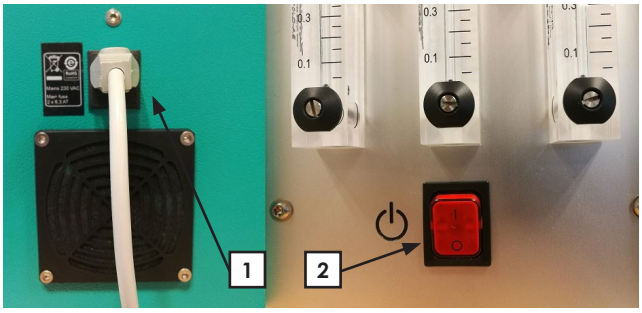
### Step 3. Main power connection for EB 17 Oven

**IMPORTANT!**

Compare the voltage and frequency labelled on the oven with the specifications of the main outlet before connecting the oven to the main power socket.

The main power socket must have a ground connection.

As for the circulator, if any of the main power supply specifications do not match with the main power outlet specification, then contact your supplier or the manufacturer before the power is being switched on.




**Main power supply on the circulator**

1. Main power cord
2. Power switch

**Oven: EB 17 – 115 V / 60 Hz / 10 Ampere**

| | |
|---|---|
| Mains connection [nom. volt.]: | 115 |
| Nominal frequency [Hz]: | 60 |
| Tolerance of the nom.voltage [%]: | -10, +15 |
| Main supply fuse [A]: | 10 |

**Circulator: EB 17 – 230 V / 50 Hz / 10 Ampere**

| | |
|---|---|
| Mains connection [nom. volt.]: | 230 |
| Nominal frequency [Hz]: | 50 |
| Tolerance of the nom.voltage [%]: | ±10 |
| Main supply fuse [A]: | 10 |

Connect the power cord, but **do not power up the EB 17 oven now.**

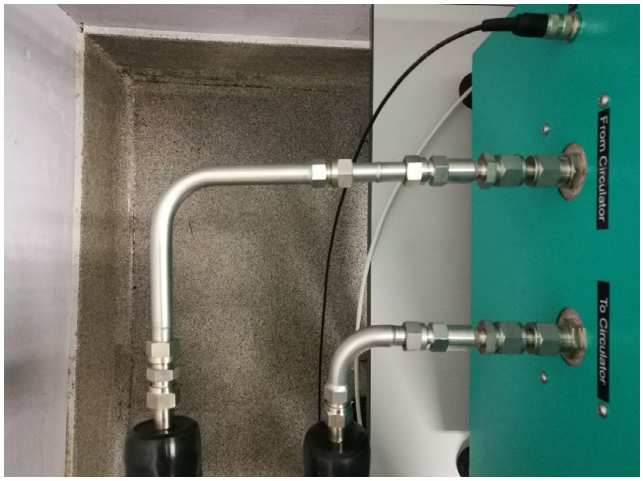
**Step 4.**

Find the two liquid hoses for connection between the circulator and the EB 17 oven.

The two hoses are identical.

**If the circulator is placed perpendicular to the EB 17 oven**, simply attach the two 90° elbows to the EB 17 oven inlet/outlet.

Place the elbows as shown on the photo (taken from above).




Each of the 2 pre-assembled elbow connectors will only fit in one direction. Tighten the elbow connections gently and use two wrenches when tightening. One wrench to support the EB 17 oven pipe connection and one wrench to turn/tighten the hose connector. This to avoid rotating the pipe connection at the EB 17 oven.

**If the circulator is placed in line with the oven**, simply attach the hoses directly on the EB 17 oven pipe connection, as shown on the photo below.

Tighten the hose connections gently and use two wrenches when tightening. One wrench to support the EB 17 oven piping and one wrench to turn/tighten the hose connector. This to avoid rotating the piping at the EB 17 oven.

Connect the other hose ends to the circulator.

– Hose attached to EB 17 oven *From circulator* must be connected to the circulator with this symbol:

– Hose attached to EB 17 oven *To circulator* must be connected to the circulator with this symbol:

**Step 5. Install the fiberglass tube insulation**

Place the fiberglass tube insulation around the bare metal surface on the hose connector ends. Use the pre-installed adhesive tape on the insulation tube to secure it on the metal tubing.

- Attach the short insulation tubes on the circulator hose ends. See previous photo for the “in line” setup.
- Attach the longer (in line setup) or angled tubes (perpendicular setup) where the metal tubes enters the oven. See previous photo for the “in line” setup and photo below for the “perpendicular” setup.

### Step 6.

Connect a heat resistant rubber tube to the *Overflow connection* on the back of the circulator. Lead the open end from this connector into a metal canister. This connection is an escape port if the volume of the expanded liquid gets too high. The connection in the circulator is an M16×1 mm male connection. Refer to manual for the circulator.

Refer to the manual for the circulator and check the following settings on the circulator.

For the cell oven model **EB 17** do the following adjustments:

- Tank = 220 °C tol +2/-0
- Reservoir 90 °C tol +2/-0

For the cell oven model **EB 17 HT** do the following adjustments:

- Tank = 265 °C tol +5/-0
- Reservoir 90 °C tol +2/-0

These adjustments can be made on the front panel of the circulator. If any of these adjustments are turned, the set value will automatically show up in the display.

### Step 7.

The following instruction includes changes to the circulator setup. At this point the circulator must be stopped (OFF in process value display) and the unit must be set to local communication.

Refer to the circulator manual for additional guidance if the instruction in this manual is insufficient.

- Power up the circulator.
  Switch on the unit at the mains switch.
  After the self-test, the unit will start up in the *OFF* mode and an alarm will sound.
  Press the alarm notice windows to mute the alarm signal.

  The unit must now be put in a local communication mode.
- Put the circulator in local communication mode
  a) From the circulator display, tap on the Menu button.
  b) Tap on the Connect unit button.
  c) Tap on the Remote-control button.
  d) Tap on the Off button and then on the *House symbol* button to return to the main screen.
- Set the unit to fill mode with the following instruction.
  a) Tap on the Menu button.
  b) Tap on the Install unit button.
  c) Tap on the Fill unit button.
  d) If or when the window small, medium, large appears – select medium.
  e) Tap on the Pump stage button and select stage 2.
  f) Open the lid on top of the circulator.
  g) Remove fill cap.
  h) Slowly pour heat transfer liquid into the round opening. Use the attached fill tap on the plastic canister to avoid waste of liquid.

  *Lid on top of the circulator with fill cap.*

  Fill with about 7.5 liters of liquid if the circulator model is A80 or W80. Ask the supplier or manufacturer if another circulator model is being used.
  i) Return to standard display by pressing the *OK* button.
  j) Switch off the unit at the mains switch, wait for a few seconds and the switch it back on.

  An initial alarm may sound.
  k) Press the alarm notice windows to mute the alarm signal.

- The circulator must now be programmed with parameters tested by the manufacturer.

  a) Find the USB flash drive that is provided with the EB 17 oven and put it in to the USB port on the circulator.

  From the circulator display,

  b) Tap on the Menu button.

  c) Tap the button Install unit

  d) Tap the button Save/load parameters.

  e) Use the browser to locate the folder Julabo circulator setup and find the correct file. The file name will correspond to circulator model and serial number. There should be only one file for this purpose on the USB memory stick. Compare the file name with the circulator model and serial number before continuing.

  f) Tap on the file name and select Open.

  g) Tap on the OK button.

  All unique parameters will now be uploaded to the circulator.

If there is too much bath fluid or if the bath fluid extends due to heating during operation, a high-level warning is activated. If the fluid level raised above the warning limit, the circulator will drain the excessive fluid through the "Over flow connection" on the back of the circulator.

If there is to little bath fluid or if the bath fluid contracts due to cooling during operation, a low-level warning is activated. If the fluid level drops below the warning limit, the circulator will shut down.

If the high-level warning appears, please run the fill unit sequence again. The error may have been caused by air pockets trapped in the system. The Fill unit sequence will eliminate air in the system.

If the high-level warning persists, please refer to the circulator manual to withdraw some amount of the heat transfer liquid in order to find a correct liquid level.

- Set the unit to Remote with the following instruction.

  a) From the circulator display, tap on the *Menu* button.

  b) Tap on the *Connect unit* button.

  c) Tap on the *Remote-control* button.

  d) Tap on the RS232 button and then on the *House symbol* button to return to the main screen.

  e) Tap on the "House symbol" button to return to the main screen.

  f) The capital letter "R" should now be visible in the upper left corner of the display.

- Power up the EB 17 oven

  Switch on the EB 17 oven, set the temperature to 20 °C and tap on the red button *START Circulator*. The circulator unit should now start after a few seconds. And the start-up phase can be monitored on the EB 17 oven display.

If there are no communication between the EB 17 oven and circulator check the following:

On the circulator

a) Tap the Menu button

b) Tap the button Connect unit

c) Tap on the button Digital Interface

d) Tap on the button RS232

Make sure that the settings are:
Parity = Even
Baudrate = 4800
Handshake = None

If any of these settings deviates, tap on the corresponding buttons and correct the setting.

The circulator unit must run for at least 60 minutes to ensure a proper function with the new heat transfer medium. Different liquid alarm may go off. Just ignore these alarms and continue. It might be necessary to switch the unit off at the mains switch and back to recover from an alarm.

To ensure a proper function over the entire temperature range, both highest and lowest temperatures should run for at least 30 minutes after the set points are reached.

Set the temperature at max according to the EB 17 oven specifications and leave it until the temperature is reached, then let it sit for another 30 minutes.

Repeat the same procedure for the lowest set point possible.

# 2. Running the Cell Ageing Oven

When the circulator is powered up, make sure that the main display shows:

**1.** The capital letter ”R” in the circulator display.

**2.** External.

If not, go through chapter 1, step 7 *Set the unit to Remote,* with the following instruction.

If the display shows Internal instead of External – correct this with the circulator manual.

Note that to perform any changes to the system, the remote “R” must be switched off first.

Remember then after correcting the system settings to resume the remote “R”.

## 2.1 Starting

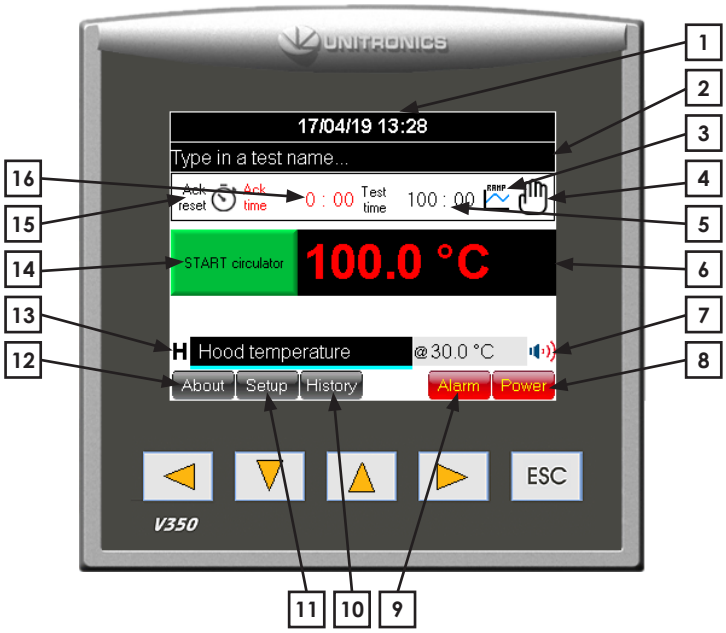
Switch on the power (red switch).
Reset the power failure and alarm, see chapter 2.2.4 and 2.2.6.

On the PLC:

- Set the temperature, see chapter 2.2.1.
- Tap on the button *START Circulator*.

**Note:** Adjust the Set Value temperature so the temperature in the rigs, which is shown in the Relaxation software on the computer, are close to the test temperature.

If there is a difference between the set temperature and the the temperature in the rig, it can be caused by poor contact between the bottom of the cell and the rig. Another reason can be that the aluminium lid is not properly positioned in the cell.




## 2.2 Settings

### Explanation

1. Date & time.
2. Test name.
3. When this symbol is blinking the temperature ramp is running. Tap to enter ramp screen.
4. Hand symbol. Tap to enter the manual temperature mode.
5. Countdown time left of the ramp program.
6. PV = Process value – the actual temperature in the cells. Also acts as a status info screen. Tap to enter the SV = Set value.
7. Alarm Buzzer on or off.
8. Power Failure indicator.
9. Current alarm list – tap to access the alarm list and acknowledge the alarm.
10. Alarm history – tap to see alarm history on the PLC screen.
11. Set up for
    - date & time
    - communication with software
    - calibration offset
    - user settings
12. About.
13. Hood temperature – tap on the right symbol/number to change the set temperature for the hood.

    The left number shows the actual temperature in the hood at each moment.
14. Start/Stop circulator.
15. Tap clock to reset time counting up.
16. Continues time counting up when the temperature ramp is running. Can be reset at any time when the ramp is running.

The oven has a touch controlled screen. A stylus pen for the touch screen is included.

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

## 2.2.1 Temperature setting

A fix temperature can be set at any time when a temperature ramp is not running. Even if the circulator is switched off by the button *START circulator*. That means a fix temperature can be set before the button *Start circulator* is switched on and when the *START circulator* button is activated.

Tap on the red temperature figures to enter the set temperature control, *see figure 2.2.1a*.

A new window will appear with a set value control, *see figure 2.2.1b*.

Tap on the set value control to access a numeric keyboard, *see figure 2.2.1c*. Type in the set temperature with the numeric keyboard and finish with a tap on the *Return* button

Then tap the *Return* button to go back to the main screen.

The most common way of using the EB 17 oven is for temperature cycling. This is described in chapter 3.

Refer to this chapter to run temperature cycling and setup/ start/stop/pause a temperature ramp. Also, how to store and use pre-defined ramp files.

The EB 17 oven can also be used for ageing as a regular cell oven with one fix temperature in 6 cells, *see figure 2.2.1d*.

Tap on the *Hand* symbol (*top right in figure 2.2.1a*) to access this screen.

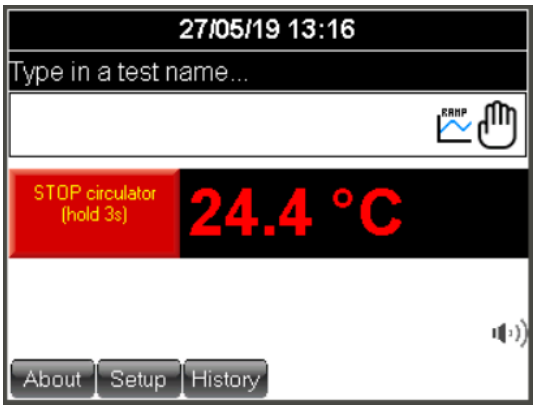



Figure 2.2.1a

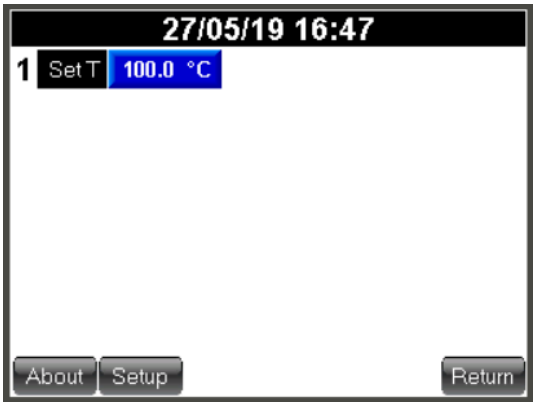



Figure 2.2.1b

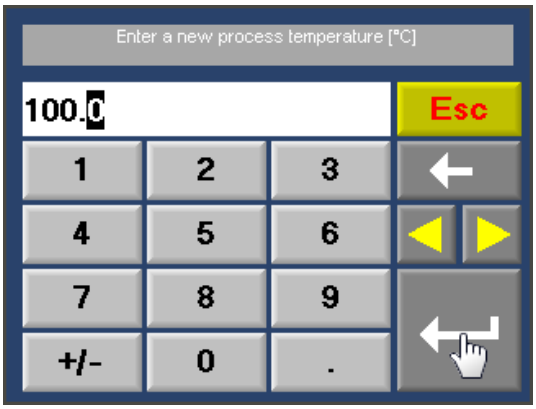



Figure 2.2.1c

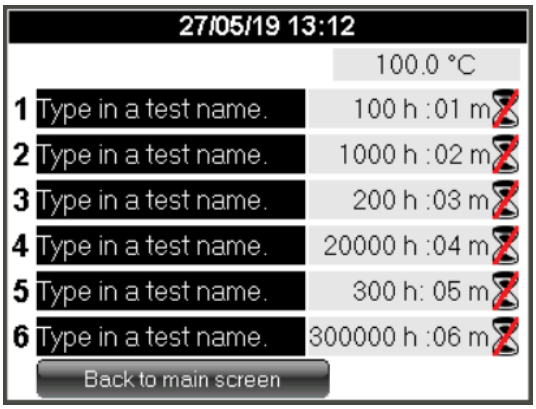



Figure 2.2.1d

## 2.2.2 Test name (Figure 2.2.2)

One test name can be typed in on the main screen and this field is used when the temperature ramp is used.

When entering the *Hand* symbol a test name can be given for each and one of the 6 cells. The number of caracters are then reduced to 20 for each cell.

Tap on the text box (Type a test name), on the main screen. Type the test name from the touch screen keyboard. One test name row on the screen can hold up to 29 characters.

1. Use the white arrow keys on the upper left corner to swap between different keyboard character layouts.
2. Tap on the *Enter* key 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* key and return to the previous screen.


Figure 2.2.2

## 2.2.3 Test time

Test time is automatically defined when using the temperature ramp function.

1. One common test time for all cells when the temperature ramp in used. One time counting down the total test time and one time counting up an accumulating time, *see figure 2.2.3a*.
   The accumulating time can be reset at any time when the temperature ramp is running. Press the “Ack reset”-clock symbol to reset.
2. 6 individual test times counting down the total test time for each cell.

**To set a test time:**

**When using the temperature ramp.**
The test time shown on the main screen is the total ramp time left of the ramp test time. The set value is taken from the ramp it self and can not be edited.

**When using the EB17II oven in the “Hand” mode.**
Next to each test name, the test times can be preset.

In the “Hand” mode the test time will start to count down as soon as the “hour glass” next to the test time is pressed for each cell, *see figure 2.2.3b*.

These timers can only be changed when the corresponding “hour glass” symbol is deactivated (red stretch).

To stop an individual time of counting down, simply press and hold on the corresponding “hour glass” for about 3 seconds.

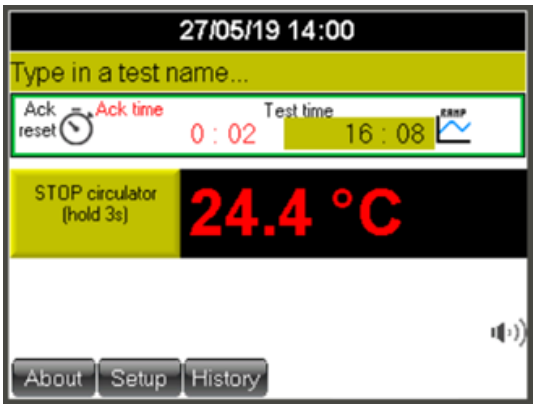



Figure 2.2.3a

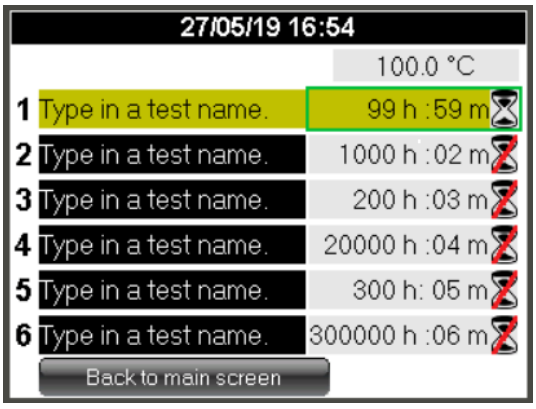



Figure 2.2.3b

## 2.2.4 Power failure

### Power failure during a test

The EB 17 oven will automatically handle a power failure for the oven, for the circulator or both. The 2 units do not have to start up simultaneously.

The power failure will be handled differently depending on how the oven is used.

**With a temperature ramp running** (Figure 2.2.4a)

The ramp will be set to *Pause* every time a power failure occurs, *see figure 2.2.4b*. If the operator did tick the parameter box *Automatically resume an ongoing ramp after power failure*, then the oven will resume the temperature ramp as soon as the circulator is running normally and the last know temperature set point is reached.

See chapter 2.2.5 *Set up screen*, on how to set the tick box *Automatically resume an ongoing ramp after power failure*.

If the operator did not tick the box *Automatically resume an ongoing ramp after power failure*, then the ramp will remain in the *Pause* state until the operator taps on the *Pause* button to resume the ramp. The ramp will however still wait for the start up to be completed and wait for the temperature to reach the last temperature set value before the power failure occured.

The temperature will remain on the last set point before the power failure occurred and the operator cannot resume the ramp until the circulator is running normally, *see figure 2.2.4c*.

With or without having this box ticked in, the temperature ramp will only be resumed when the process temperature is within ± 2 °C from the setpoint before the power failure occurred, *see figure 2.2.4d*.

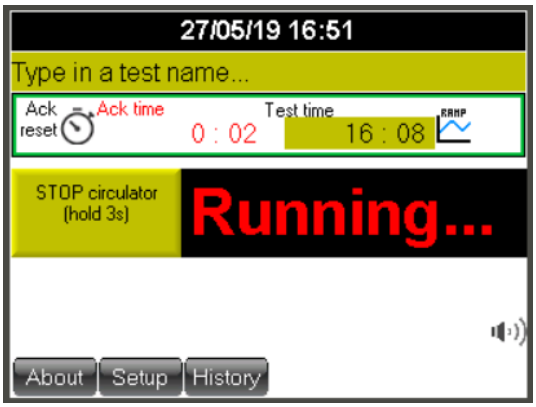



Figure 2.2.4a

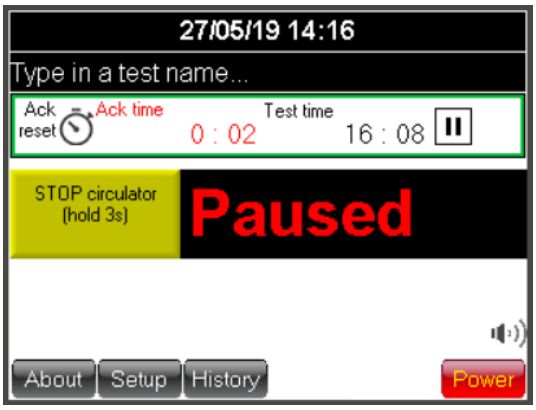



Figure 2.2.4b


Figure 2.2.4c

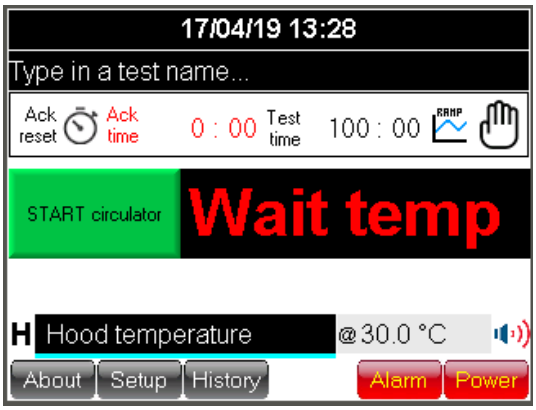



Figure 2.2.4d

**With the "Hand" timers running** (Figure 2.2.4e)
When running a test in "Hand" mode, the test will be resumed as soon as the EB 17 oven is powered up.

The test time will not compensate for the time duration of the power failure, but will just continue on the time before the power failure occurred.

The oven will try and establish communication with the circulator and continue to control the temperature on the fix temperature that was set before the power failure occurred.

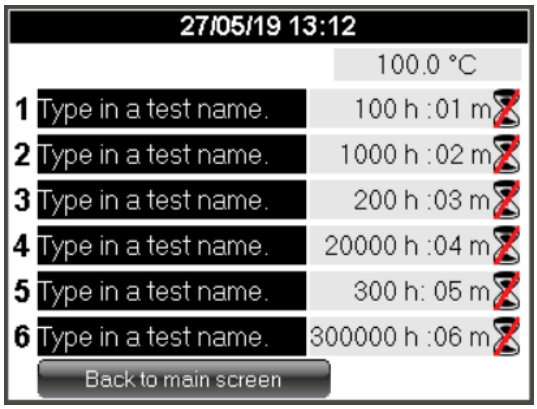


Figure 2.2.4e

**Power failure indicator**
When the power is resumed, a test is running at set point and any test timer or temperature ramp running, the screen will light up a power failure button.

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

A new screen will show, *see figure 2.2.4f*.
This feature will give the operator information about duration of the power failure and temperature drop caused by the power failure. The power failure button will remain until the button *Clear & Exit* is tapped.

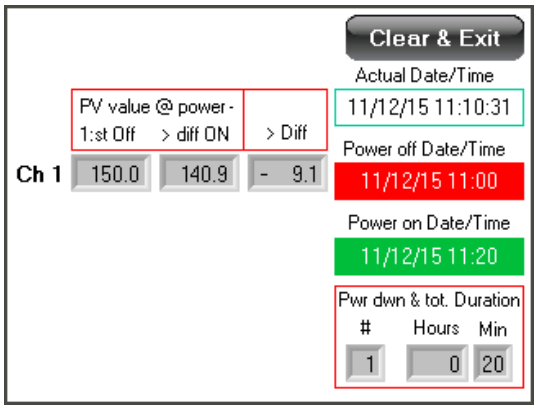


Figure 2.2.4f

## 2.2.5 Set up screen (user)

**Password** (Figure 2.2.5a)
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.

Default password is: 1111

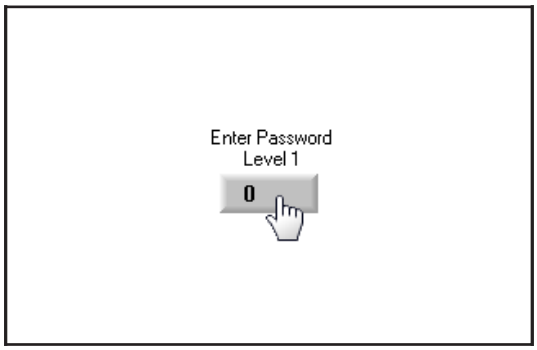


Figure 2.2.5a

**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 offset value can be added to the temperature controller. This value will be an offset for the whole temperature range of the instrument.

**Standby temperature**
The operator can in this *Set up* also preset a standby temperature. That means when the test timer has reached the end, 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 2.2.5b*.

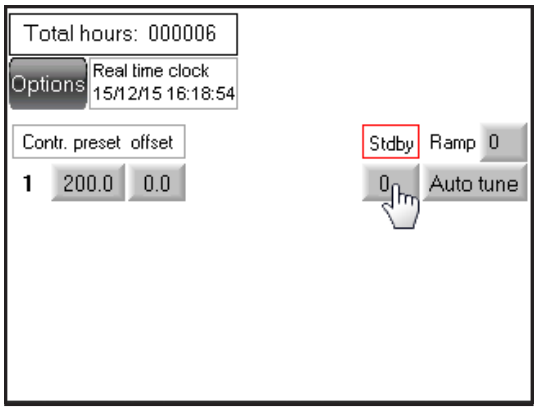


Figure 2.2.5b

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 or lower value than zero represents the temperature set value or the final temperature when running a ramp. Eg. if the operator sets the standby control to 30 *(as in figure 2.2.5c)*, the oven will go to 30 °C after the test time has reached the end. Minimum set value (SV) for the oven can be found in chapter 9, *Technical specification*.

Figure 2.2.5c

### Real time clock (Figure 2.2.5d)

Tap on the real time clock control to set time and date.

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.

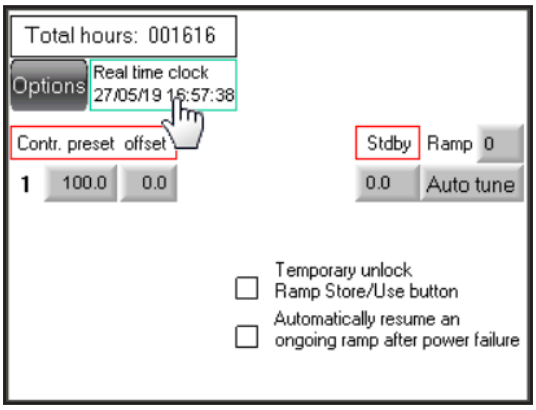


Figure 2.2.5d

### Automatically resume an ongoing ramp after power failure (tick box) (Figure 2.2.5e)

Tap on this box to let the instrument continue an ongoing ramp after a power failure.

Ramp will be resumed when the circulator is in normal state and the temperature has reached the set point when the power failure occurred.

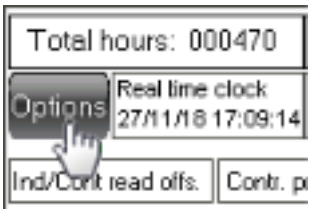


Figure 2.2.5e

### Option (Figure 2.2.5e)

Tap on the button *Options* from the setup screen to enter this menu.

This is a settings menu for the user. The user can do the following settings:

Air pump ON or off and from what temperature swet point the air pump should shut down.

The temperature-controlled air pump shut down is normally engaged to avoid warm air to be pumped in to the much colder cells in the oven. The critical point is normally from around 10 °C for room tempered and condensated, none dried air.

### Auto dim display (Figure 2.2.5f)

The auto dim display function will dim the background light with 50 % if the screen touch has been inactive for 1 minute.

Click on the *Auto dim display* symbol to activate the function.

Inactive

Active

The other settings are for temperature control.

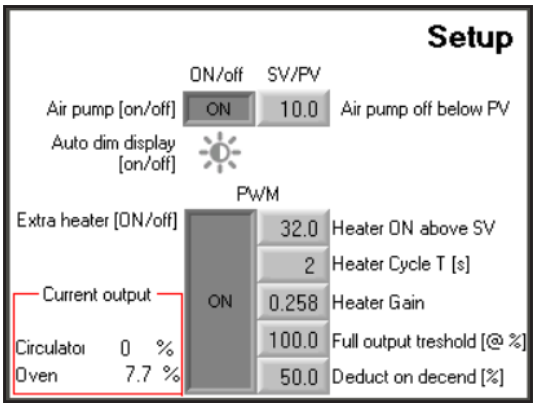


Figure 2.2.5f

## 2.2.6 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 [1)]

[1)] This alarm will be reset automatically when the temperature is within tolerance from set value again.

| Error code | Problem cause | Remedy |
|---|---|---|
| **001–006** Cell 1–6 | Melt fuse broken. | The alarm will be reset when the alarm has been acknowledged and the fuse replaced. |
| **007–012** Cell 1–6 | Temperature difference between set value and process value ±1 °C. | Wait until the temperature is within range to acknowledge the alarm. |
| **013** | Low pressure from airpump. | Check the airpump filter and function. |
| **014** | Shinko Communication Timeout. | Contact support. |
| **015** | Low battery. | Replace backup battery in OPLC (contact support). |
| **016–021** Cell 1–6 | Loop break controller #. | Broken temperatur sensor, call for service. |
| **022–027** 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. |
| **028** | PR-59 Communication Timeout. | No communication with the hood cooling system. |
| **029** | Circulator Communication Timeout. | No communication with the circulator. |

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 ±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 *2.2.6 Alarm* to identify the alarm and address the problem for proper action.

 **Buzzer off**

 **Buzzer on**

## Acknowledge any alarm

To acknowledge any alarm, tap on the button Alarm.

**Figure 2.2.6a**. 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.

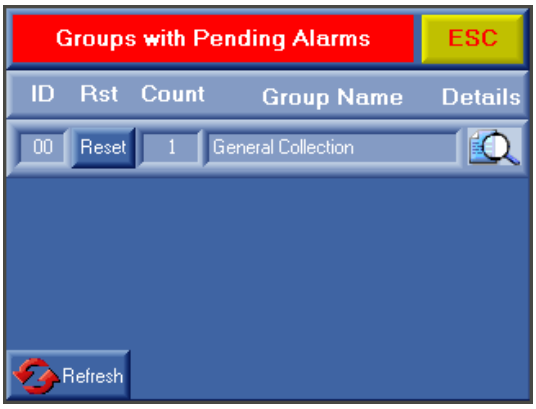



Figure 2.2.6a

**Figure 2.2.6b**. To acknowledge an alarm, press the magnifying glass to the right of the chosen alarm.

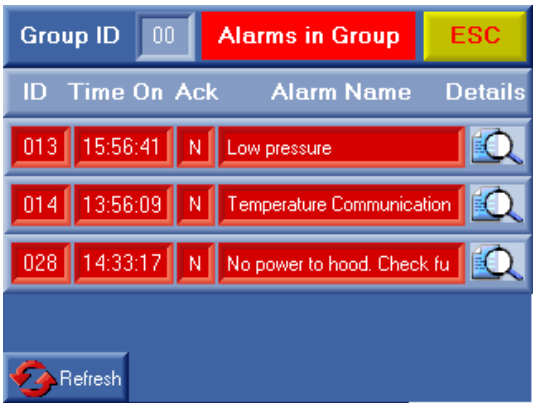



Figure 2.2.6b

**Figure 2.2.6c**. 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.


Figure 2.2.6c


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 |

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.

# 3. Programming of ramp with cycling temperatures

**Programming of cycling temperatures/ramp is an additional option except for:**

1. **EB 17**
2. **ES 07-II**

**These exceptions will have the ramp option as default.**

*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.

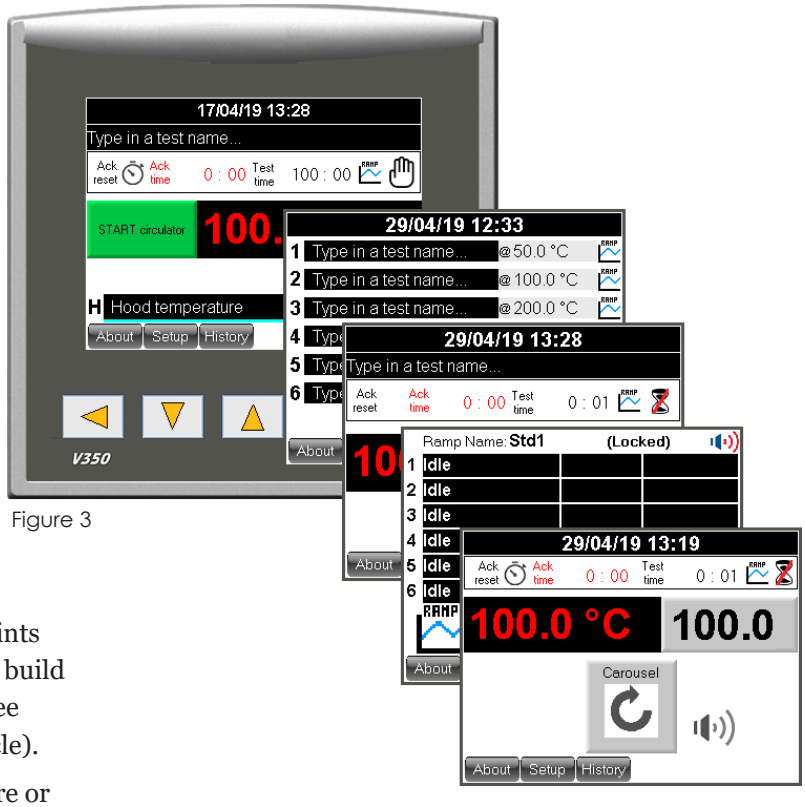



Figure 3

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.

## 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

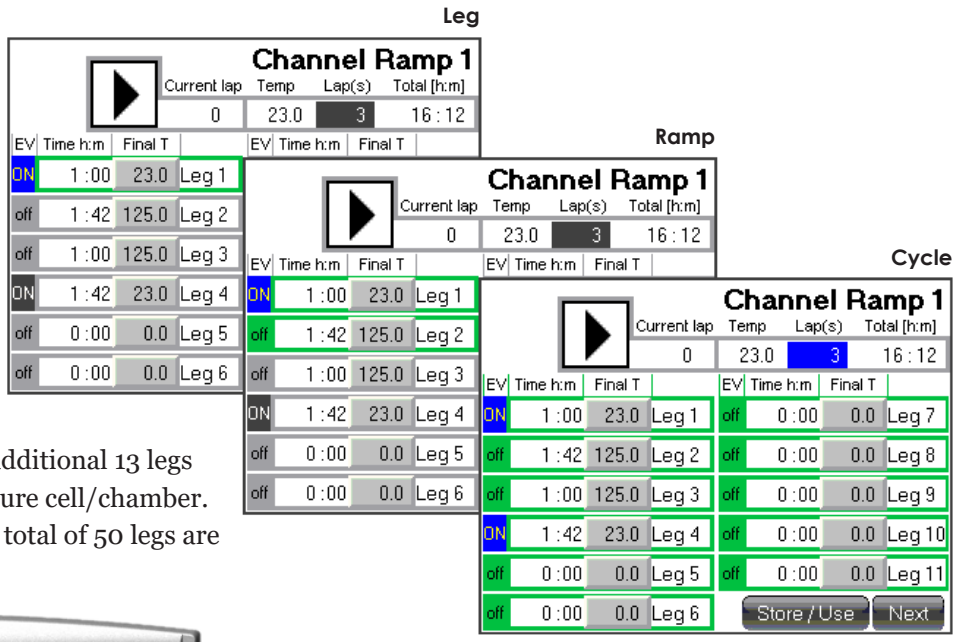
When the ramp is started, each leg filled with information will be processed. Legs with time settings 0:00 will not be processed and will be skipped.

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**.

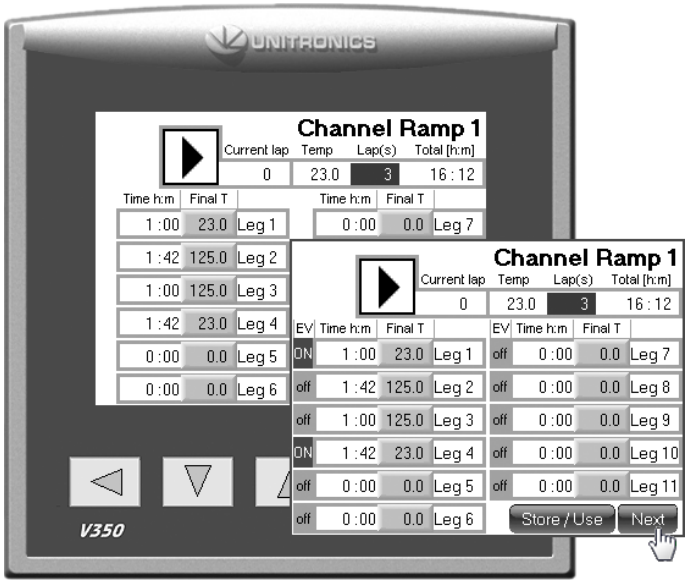
Ramp speed tolerances can be found in the specifications for the instrument.

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.



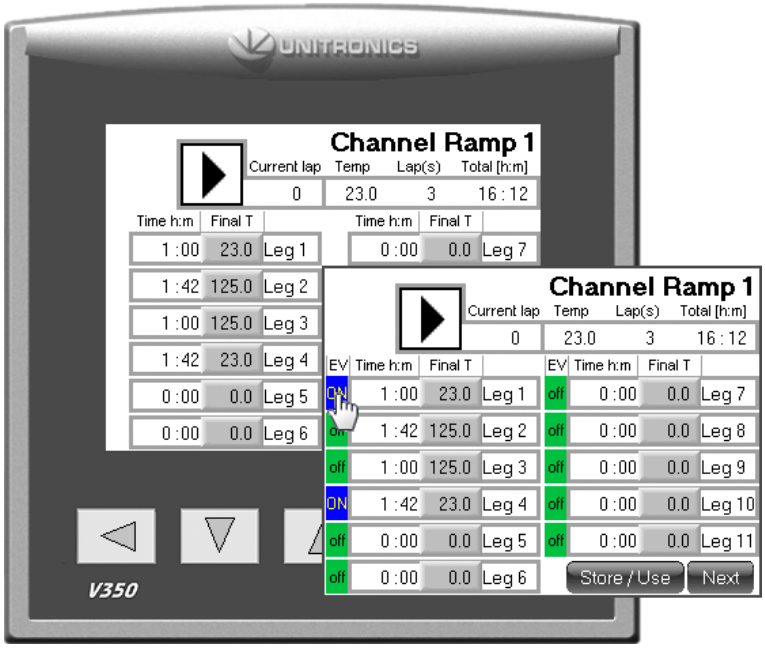
## **Button [ON/off]** (optional)

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.

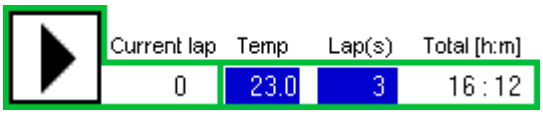
ON = will activate the output (valve or control will be switched on when this leg is running).

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 it appearance to a stop button.

Play

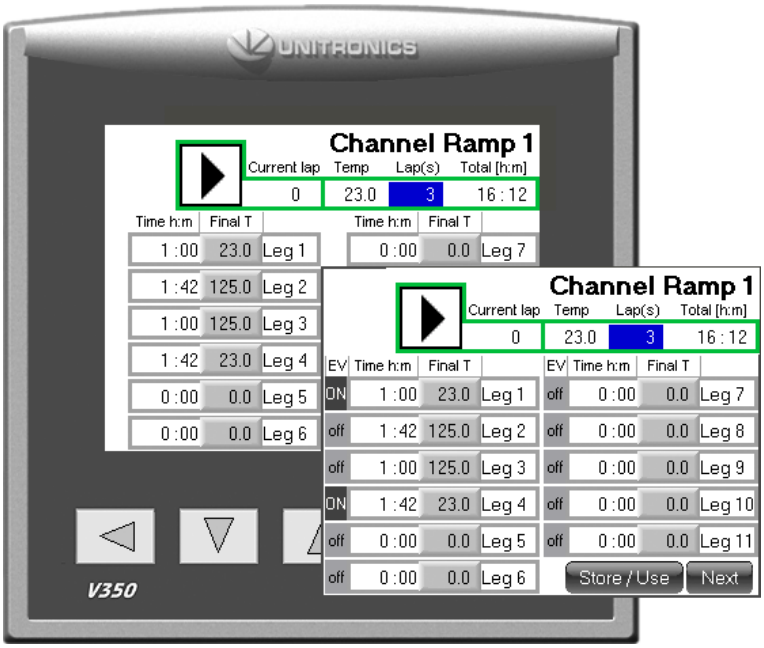
An additional button will now also appear. This button is the *PAUSE* button. Press the *Pause* button to pause the ramp. In this state the temperature will stop at the current processed set value. Press the *Pause* button again and the temperature ramp will continue.

Pause Stop

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 beeing 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

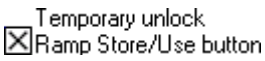
Notice that the file name for the stored ramp is fixed and the file names are always “RampDat1 for Bank 1”, “RampDat2 for bank 2” and so on.

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.

   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.

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.

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

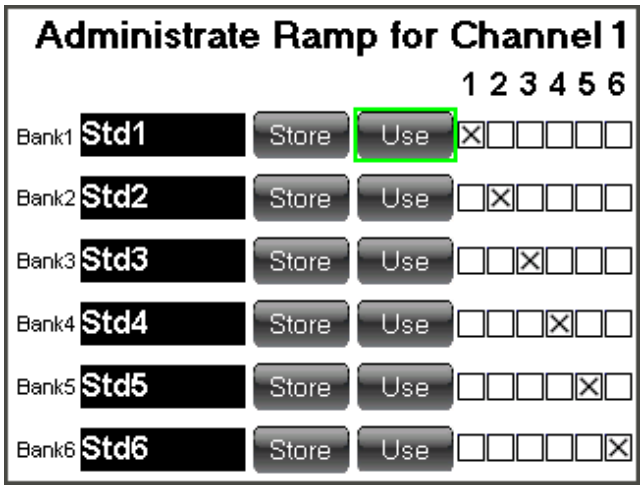
## Use

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.

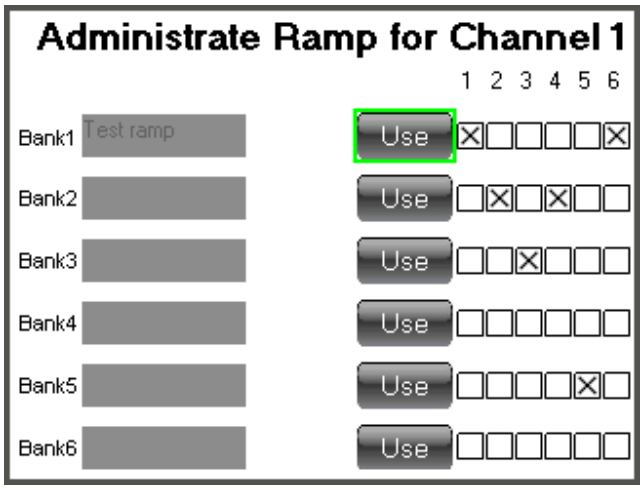


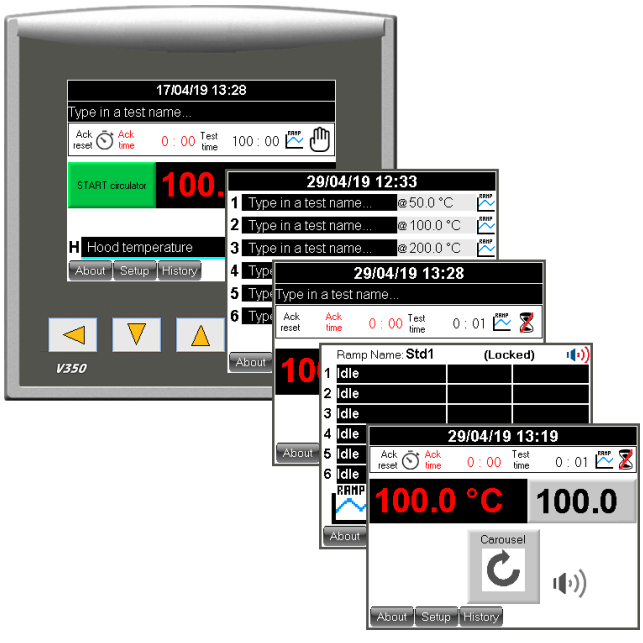

This matrix will show each channel and if it is connected to a ramp.

The maximum number of cells/chambers is six.

The example below shows that oven cell 1 was edited (Administrate Ramp for Channe1) 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”.

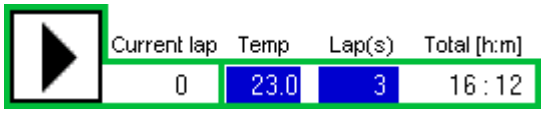


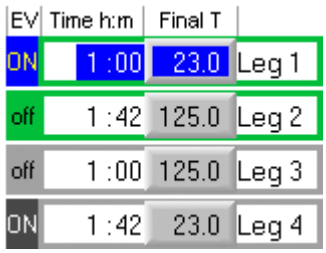
## Quick guide to initiate a ramp (temperature cycle) and run it.

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.



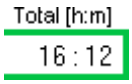

3. Fill in the *Time* and *Final temp* for a number of legs to build all individual ramps in a full temperature cycle. Nine legs are available in the first ramp screen. Another 13 legs can be initiated in the next ramp screen. Press the button *Next* to enter the next ramp window. Four screens are available. 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.

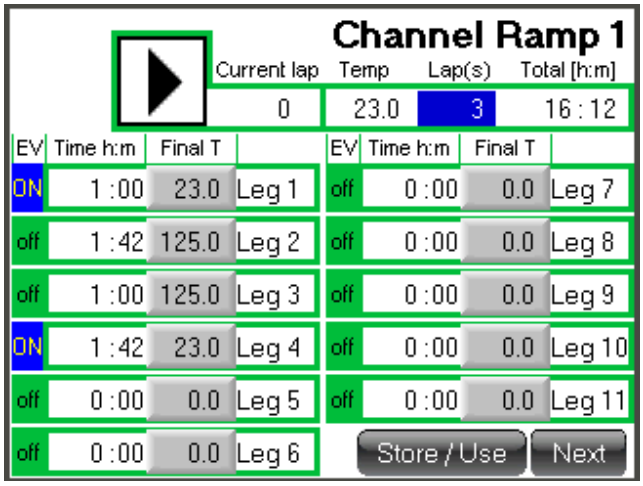
## Example of a temperature cycle:

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 -> 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 -> 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).**

# 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 to 30 °C.
- Let the temperature stabilize in both the rigs and the hood.

# 5. 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, 10 AT, is placed in the connector for the mains lead on the back of the oven. |
| | Broken main power | Check power supply socket. |
| Alarm button flashing | Any alarm | See chapt 2.2.4 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 ± 2° or 27 °C ± 2°.
- Humidity not more than 90 % RH – non condensing.
- Other environmental aspects: Pollution degree 2 – Laboratory environment.

# 9. Technical specification

| | |
|---|---|
| Temperature range, °C: | |
| -40 to +200 °C: | EB 17 and EB 17.01 |
| -40 to +245 °C: | EB 17HT and EB 17.01 |
| -60 to +170 °C: | EB 17 and EB 17.03 |
| Temp. control, -60 to +20 °C, °C: | ± 2,0 |
| +21 to +100 °C, °C: | ± 1,0 |
| +101 to +245 °C, °C: | ± 2,0 |
| Temp. variation in time, °C: | ± 0,25 |
| Ramp speed, temp. rise, °C/min: | 0,1 to 1 |
| Temperature sensors: | Pt 100, 1/3 DIN |
| No. of temperatures: | 1 |
| Air speed, m/s: | <0,001 |
| Air changes, changes/hour: | 3 to 20 |
| Useful volume, l: | 6 × 1,3 |
| No. of cells: | 6 |
| Dimensions, inner, dia × h, mm: | 100 × 160 |
| Dimensions, external, w × h × d, mm: | 960 × 715 × 520 |
| Weight, kg: | approx. 74 |
| Voltage, V/phase/freq: | 220–240/1/50 or 60 |
| Power, W: | 1500 |
| Standards: | ISO 188 method A |
| | ISO 3384-1 method A + B |
| | ISO 3384-2 |
| | ISO 6914 |

## 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.

## Support

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