Operating Manual

Minitron

Incubation Shaker

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INFORS HT

Infors AG
Headoffice, Schweiz
Rittergasse 27
CH-4103 Bottmingen
T +41 (0)61 425 77 00
F +41 (0)61 425 77 01
info@infors-ht.com
service@infors-ht.com

Infors GmbH
Dachauer Str. 6
D-85254 Einsbach
T +49 (0)8135 8333
F +49 (0)8135 8320
infors.de@infors-ht.com

Infors UK Ltd
The Courtyard Business Centre
Dovers Farm, Lonesome Lane,
Reigate
Surrey, RH2 7QT, UK
T +44 (0)1737 22 31 00
F +44 (0)1737 24 72 13
infors.uk@infors-ht.com

Infors Sarl
2, rue du Buisson aux Fraises
Bâtiment D13
F-91300 Massy
T +33 (0)1 69 30 95 04
F +33 (0)1 69 30 95 05
infors.fr@infors-ht.com
www.infors-ht.fr

Infors Benelux BV
Markweg 9-A, NL-6883 JL
Velp (GLD)
P.O. Box 125, NL-6880 AC
Velp (GLD)
T +31 (0)26 369 31 00
F +31 (0)26 369 31 09
infors.bnl@infors-ht.com

Infors USA Inc.
9070 Junction Drive, Suite D
Annapolis Junction, MD20701
T +1 301 362 3710 /
T +1 855 520 7277 (toll-free USA)
F +1 301 362 3570
infors.usa@infors-ht.com
www.infors-ht.us

Infors Canada
8350 rue Bombardier
Anjou, Quebec
Canada H1J 1A6
T +1 514 352 5095
F +1 514 352 5610
infors.ca@infors-ht.com

Infors Bio-Technology (Beijing) Co., Ltd.
Room 505C, Building 106
Lize Zhongyuan
Wangjing New Industrial Zone
Chaoyang District, Beijing
100102 P.R. of China
T +86 10 51652068
F +86 10 64390585
info@infors-ht.com.cn

Infors South East Asia
16, 1st Floor, Taman City
MY-51200 Kuala Lumpur
Malaysia
T +603 625 771 81
F +603 625 067 48
info@infors-ht.com.my

Infors LATAM Ltda.
Rua Dr. Alceu de Campos
Conjunto 205
CEP: 04544-000
São Paulo – SP
Brasil
T +55 (11) 95304-0201
F +55 (11) 98585-5334
Infors.br@infors-ht.com

Contact details of our local dealers worldwide can be found on our website.

www.infors-ht.com

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1 General Information

1.1 About this Manual

This manual enables the safe and efficient handling of the equipment.

All the information and instructions in this operating manual comply with the current standards, legal regulations, the latest technological and scientific developments and the knowledge gained from the manufacturer's many years of experience in this field.

This operating manual is a component part of the equipment. It must be kept near to the equipment and must be accessible to the operators at all times.

The users must read the operating manual thoroughly and fully understand its contents before beginning any work.

Adhering to all the safety and operating instructions in this manual is essential to ensure that work is carried out safely.

The scope of delivery may differ from the explanations, descriptions and figures in this operating manual due to special designs, additional options specified on ordering and the latest technical/mechanical modifications.

This manual contains illustrations to aid general understanding. These may differ from the actual equipment as supplied.

1.2 Explanation of Special Notices

1.2.1 Warning Notices

Warning notices in this manual are indicated by a coloured bar and begin with a signal word that signifies the degree of the hazard.

DANGER

The signal word “DANGER” indicates a dangerous situation that will lead to severe or even fatal injuries if not avoided.

WARNING

The signal word “WARNING” indicates a potentially dangerous situation that may result in moderate to severe injuries if not avoided.

CAUTION

The signal word “CAUTION” indicates a potentially dangerous situation that may result in minor injuries if not avoided.

1.2.2 Other Notices

ATTENTION

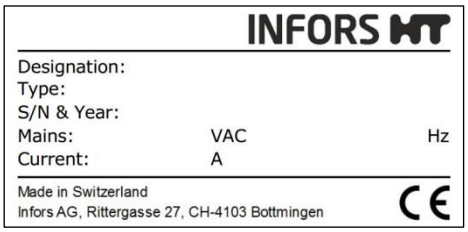
The word “ATTENTION” on a blue bar indicates a situation that may result in significant damage to property if not avoided.

INFORMATION

Texts located below a grey bar bearing the notice “INFORMATION” provide useful tips and recommendations for ensuring efficient, fault-free operation of the equipment.

1.3 Equipment Identification (Standard Identification Plate)

The identification plate is designed to allow clear identification of the equipment. It contains the following information:



- Designation = Category of equipment
- Type = Equipment type (name)
- S/N = Serial number
- Year = Year of manufacture
- Mains = Nominal voltage and frequency
- Current = Current consumption
- Manufacturer address and name
- CE marking

1.4 Declaration of Conformity

The equipment complies with the following provisions in accordance with the EC Machinery Directive 2006/42 EC, Annex II 1 A:

- Machinery Directive 2006/42/EC
- EMC Directive 2014/30/EU

The Declaration of conformity does not constitute part of the operating manual. However, it is nevertheless included in the general documentation supplied with the equipment.

1.5 Customer Service and Services

Our Customer Service is at your disposal for technical advice and specialist enquiries. For contact information, see page 2.

Due to their familiarity with the potential applications of the equipment, the Customer Service team is able to provide information on whether the equipment can be used for a specific application or modified to handle the planned process.

Experience of working with the equipment will be published semi-regularly on the manufacturer's website in the form of "application notes". Furthermore, our colleagues are always interested in new information and experiences resulting from user's applications for the equipment that may be valuable for the continued development of our products.

2 Safety and Responsibility

This section describes general considerations relating to user safety that must be taken into account when working with the equipment.

In the remaining sections, warning notices are used only to highlight particular hazards directly arising from the actions being described in the section in question.

It is essential to read the operating manual carefully – especially this section and the warning notices in the text – and to follow the instructions therein.

This section also refers to areas that are the responsibility of the provider due to certain risks arising from particular applications for which the equipment is used deliberately and with full awareness of the associated risks.

2.1 Intended Use, Incorrect Use and Misuse

Depending on its features, the equipment is designed to be used as an incubator shaker for cultivating microorganisms or cell cultures only under the following conditions:

- **Cultivation of non-pathogenic microorganisms or cell cultures of risk category 1 in a biology lab of biological protection level 1.**
- **Cultivation of pathogenic microorganisms or cell cultures of risk category 2 in a biology lab of biological protection level 2.**

When using the equipment in protection level 2, users are responsible for taking appropriate protective measures to ensure that organisms cannot escape uncontrollably due to flask breakage, unintentional detaching of the sterile seal or similar.

The equipment is designed and constructed exclusively for the intended use described above.

Intended use also includes following all the instructions in this manual, especially those relating to:

- The installation site
- Use of suitable cultivation vessels
- User qualifications
- Permissible parameter setpoints
- Correct operation and maintenance

Any failure to observe the requirements specified in this manual shall be deemed incorrect use, in particular, use of inappropriate cultivation vessels and/or unsuitable holders at speeds that are too high.

Any use of the equipment outside the scope of the intended use as described above shall be deemed misuse. This also applies to applications for which the equipment is not designed, especially the following:

- The equipment is not protected against explosions. Use and manufacture of explosive gases as well as operating the equipment in the Ex area are therefore not permitted.
- The equipment is not designed to sufficiently protect its users if pathogenic organisms escape uncontrollably. Cultivation of pathogenic organisms of risk categories 3 and 4 is therefore not permitted.

To use the equipment for special applications not covered by conventional, intended use, the equipment must be modified and certified accordingly by the manufacturer.

Any use of the equipment outside of a biological laboratory, i.e. in any environment in which the conditions required for the safety of users cannot be met or cannot be met to their full extent, shall also be deemed misuse.

2.2 Cultivation Vessels to Be Used

Significant forces are applied to cultivation vessels, in particular in case of large vessels and high speeds. Hence, the cultivation vessels used are particularly significant in relation to user safety.

! ATTENTION

Use of unsuitable or defective cultivation vessels can lead to glass breakage and therefore damage to property.

Approved cultivation vessels

The equipment has been designed for use with the following vessels using the holders designed specifically for them:

- Erlenmeyer flasks up to 5,000 mL made of borosilicate glass (e.g. Schott Duran®) or high-grade plastic, such as polycarbonate (z. B. Corning®) etc.
- Fernbach flasks up to 3,000 mL made of borosilicate glass (e.g. Schott Duran®) or high-grade plastic, such as polycarbonate (z. B. Corning®) etc.
- Other vessels with the holders designed for them:
  - Test tubes
  - Centrifuge tubes
  - Microtitre plates
  - Deep well plates

To avoid the vessels coming out of the clamps at very high speeds, they might have to be secured using cable ties underneath the springs or some other suitable measure.

Cultivating organisms of risk category 2

When cultivating pathogenic organisms of risk category 2, special measures must be taken to stop the organisms from escaping. The user is responsible for this.

When using the equipment under protection category 2, stainless steel clamps of the correct size must be used to affix the flasks. Due to limited resistance to disinfectants as well as the risk of unintentional detaching of flasks, «Sticky Stuff» adhesive matting is not suitable for this purpose.

We further recommend using disposable plastic flasks with screw tops and filter membranes. We recommend using sticky tape to secure the lid against loosening unintentionally. Using glass flasks with cotton wool or paper plugs is not sufficiently safe.

Trays with «Sticky Stuff» adhesive matting

INFORMATION

For trays with «Sticky Stuff» adhesive matting, special provisions apply in relation to maximum permitted speeds. These must be observed to prevent cultivation vessels from detaching.

For detailed information see chapter 5.1.3 "Tray with «Sticky Stuff» Adhesive Matting", page 55.

2.3 Qualified Personnel

Due to the complexity of the equipment and the potential risks arising from its operation, the equipment may only be used by qualified, specialist personnel.

2.3.1 Provider

The term “provider” applies to all persons who are responsible for making the equipment and the necessary infrastructure available. These persons may also be included in the group of people known as “users”, though this is not always the case.

Irrespective of whether a provider is a member of the company’s board of management or a supervisor, they bear a special level of responsibility with regard to the processes and the qualification and safety of the users.

2.3.2 User

General

The term “user” applies to all persons who come into contact with the equipment in any way and perform work on or with it. This primarily applies to the following activities, which can be performed by the manufacturer’s own specialists or a variety of other persons (it is not always possible to distinguish clearly between the different types of person):

- Assembly, installation and commissioning
- Definition and preparation of the process
- Operation
- Troubleshooting and remedying of faults
- Maintenance and cleaning (autoclaving, if necessary)
- Service work and repairs
- Disassembly, disposal and recycling

Qualified personnel

On account of their specific education, training and – in many cases – experience, the qualified personnel required for this work are able to recognise risks and respond accordingly to potential hazards.

The qualified personnel (either internal or external) who cannot be categorised under the separate “operators” group are made up of the following groups of persons:

- Electricians (electrical engineers)
- Decontamination specialists
- Repair specialists
- Specialists in disassembly and (environmentally friendly) disposal
- Recycling specialists

2.3.3 Operator

The “operators” are a specific sub-group of users distinguished by the fact that they work with the equipment. They are the true target audience for this operating manual.

Qualified technicians

Only technicians who have been trained for working in a biological laboratory can be considered for the role of operator. These include:

- Process technicians in the fields of biotechnology and chemistry
- Biotechnologists (biotechnicians)
- Chemists with a specialisation in biochemistry; chemists in the field of organic chemistry or biochemistry
- Life scientists (biologists) with special education in cytology, bacteriology, molecular biology, genetics, etc.
- Lab assistants (lab technicians) from various fields

In order to be classed as a “sufficiently qualified technician” for the operation of the equipment, the persons in question must have received thorough training and have read and understood the operating manual.

The operator must be informed in a training session provided by the provider of the tasks delegated to the operator and the potential risks of improper conduct. Tasks that go beyond the scope of operation under normal conditions may only be performed by the operator if this is specified in the manual and the provider has explicitly entrusted said tasks to the operator.

Technicians in training

Persons in this group who are undergoing training or apprenticeships are only permitted to use the equipment under supervision and in accordance with the instructions of a trained and qualified technician.

2.4 Unauthorised Persons

The term “unauthorised persons” applies to all persons who can access the work area but are not qualified to use the equipment in accordance with the aforementioned requirements.

Unauthorised persons are not permitted to operate the equipment or use it in any other way.

2.5 Responsibility of the Provider

The equipment is used for industrial and scientific purposes. As such, the provider of the equipment is individually liable with regard to the legal requirements relating to occupational health and safety in a biological laboratory. In particular:

- The provider is responsible for ensuring that the work and environmental regulations applicable in a biological laboratory are observed.
- The provider must ensure that the equipment remains in safe and proper working condition throughout its entire term of use.
- The provider must ensure that all safety equipment is fully functional and is not disabled.
- The provider must ensure that the equipment is only worked on by qualified users, and that said users receive sufficient training.
- The provider must ensure that the protective equipment required for working with the equipment is provided and worn.
- The provider must ensure that this operating manual remains in the immediate vicinity of the equipment throughout its entire term of use.

2.6 General Hazards

This section covers general hazards and residual risks that are always present when using the equipment in accordance with normal, intended use.

The following notices are general in nature. As such, with a few exceptions they are not repeated in the remaining sections.

2.6.1 Electrical Current

The equipment runs on electrical power and has a mains connection. As a result, certain parts will be live during operation. There is an immediate risk of fatal injury if contact is made with live parts.

The following points must be observed in order to avoid the risk of fatal injury:

- In case of damage to insulation, disconnect the equipment from the mains immediately and arrange for it to be repaired.
- Disconnect the equipment from the mains before commencing any work on the electrical system.
- Always use qualified electricians for any work on the electrical system.
- Disconnect the equipment from the mains before beginning any maintenance, cleaning or repair work.
- Do not bypass any fuses or take them out of operation.
- Observe the correct rates (in Amps) when replacing fuses.
- Keep moisture away from live parts. It may lead to a short circuit.
- Never remove the covers from the housing when the power is switched on.

2.6.2 Danger due to Moving Parts

Moving parts are a general dangers posed by the equipment because body parts can be pinched or scratched when one is not careful.

However, there is no danger that clothing or body parts can be pulled into the equipment due orbital movement of the table.
The danger that fingers are pinched has been minimised by means of a sufficient distance between the tray and the casing and a stop mechanism that stops the shaker drive when the door is opened.
Nonetheless, the cultivation flasks must only be moved when the table has come to a complete standstill.

2.6.3 Incorrect Auxiliary Supplies and Consumables

The use of incorrect auxiliary supplies and consumables can lead to both equipment failure and injury/damage to health.

The auxiliary supplies and consumables required for use with the equipment are specified in the relevant sections of this manual.

2.6.4 Incorrect Spare Parts

Incorrect spare parts, imitations or spare parts that have not been authorised by the manufacturer represent a significant safety risk.

As such, we recommend procuring all spare parts from an authorised dealer or directly from the manufacturer.
For the contact details of the manufacturer's representatives, see page 2.

2.7 Particular Hazards

This section covers particular hazards and residual risks that may arise when using the equipment for special applications in accordance with normal, intended use.

Since the use of the equipment for such applications is deliberate, it is the responsibility of the operators and the provider to ensure that all personnel are protected from potential damage to health. The provider is responsible for ensuring that the appropriate protective equipment for such applications is provided, and that the necessary infrastructure is in place.

2.7.1 Danger due to Hot Surfaces

For applications that are performed with temperatures over 55 °C, there is a danger of burns on hot surfaces in the interior or on the cultivation vessels.

Since the equipment is intended for applications at high temperatures, its users are responsible for ensuring that they are protected sufficiently.

2.7.2 Dangerous Gases

The use or production of dangerous – i.e. toxic or asphyxiant – gases such as CO_2, O_2 or N_2 entails a significant health risk, especially in enclosed spaces.

In order to prevent high emissions of dangerous gases, the following measures must be taken:

- The gas connections on the equipment must be checked before any cultivation processes using dangerous gases are initiated.
- The gaskets on the equipment must be checked at regular intervals and replaced if necessary.

2.7.3 Flammable or Explosive Substances

The use or production of flammable or explosive substances, such as hydrogen, methane or biofuels, is not covered under “intended use” of the equipment, as the equipment is not explosion-proof.

If the provider intends to use the equipment for such purposes, they must first contact the manufacturer to discuss its suitability for the planned application.

2.7.4 Corrosive or Toxic Substances

The use or production of corrosive or toxic substances entails a significant health risk. As such, special measures must be taken to protect the users for such applications.

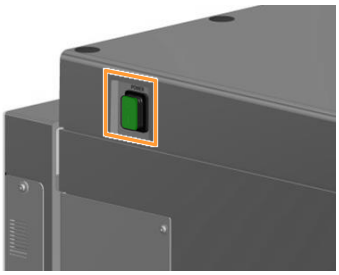
Since the equipment is used deliberately for such applications, the users are responsible to ensure that they have sufficient protection.

2.7.5 Pathogenic Organisms

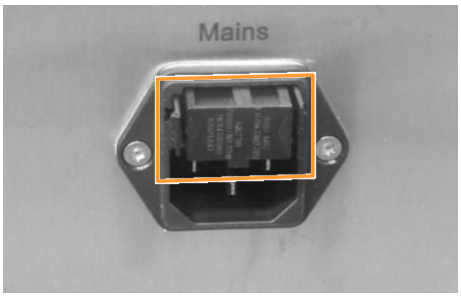
The device is not approved for cultivation of pathogenic organisms of risk categories 3 and 4. In the context of intended use, it is nonetheless possible for pathogenic organisms and viruses to be cultivated. Contact with pathogenic organisms bears a significant health risk. Hence, users are responsible for ensuring adequate protection.

2.8 Safety Features

The equipment comes with the following safety features:



Main switch with emergency switching off
In addition to normal switching on and off of the equipment, the main switch also works as an emergency switch. If the main switch is switched off, all circuits of the equipment are disconnected completely from the grid.



Equipment fuses
The equipment is protected from impermissibly high power input by two equipment fuses. The slot for the equipment fuses is directly above the mains connection on the right side of the casing underneath the “Mains” label. For descriptions of which fuses to use for which equipment type see chapter 8.3.1 "Replace Equipment Fuses", page 149.

Door monitoring
The position of the door is monitored electronically. If the door is opened, all dangerous movements (shaker drive and fan) are stopped immediately. As soon as the door is closed again completely, the shaker drive and fan restart automatically.

Over-temperature switch-off
The equipment is protected against overheating by means of an over-temperature switch-off. The over-temperature switch-off turns off the heating at a surface temperature of 200 °C.

2.9 Warning Symbols on the Equipment

The following warning symbols (stickers) are placed on the equipment:

Position
On the equipment casing in the area of the power plug.

Meaning
The equipment covers may only be opened by qualified electricians. Turn off the equipment and pull out the power plug before commencing any work on the electrical system.

Position
On the compressor on the optional cooling.

Meaning
Whilst operating, the surface temperature of the compressor can be up to 70 °C. Touching the compressor can therefore cause burns.

WARNING

Over time, stickers and signs can get dirty or become illegible for some other reason.

- Always ensure that all safety, warning and operating notes are easy to read.
- Immediately replace damaged signs or stickers.

2.10 Declaration of Decontamination

When returning the equipment for repair, disassembly or disposal, it is required for the safety of all parties involved and because of legal provisions that a lawful declaration of decontamination is present.

The following must be observed if this is the case:

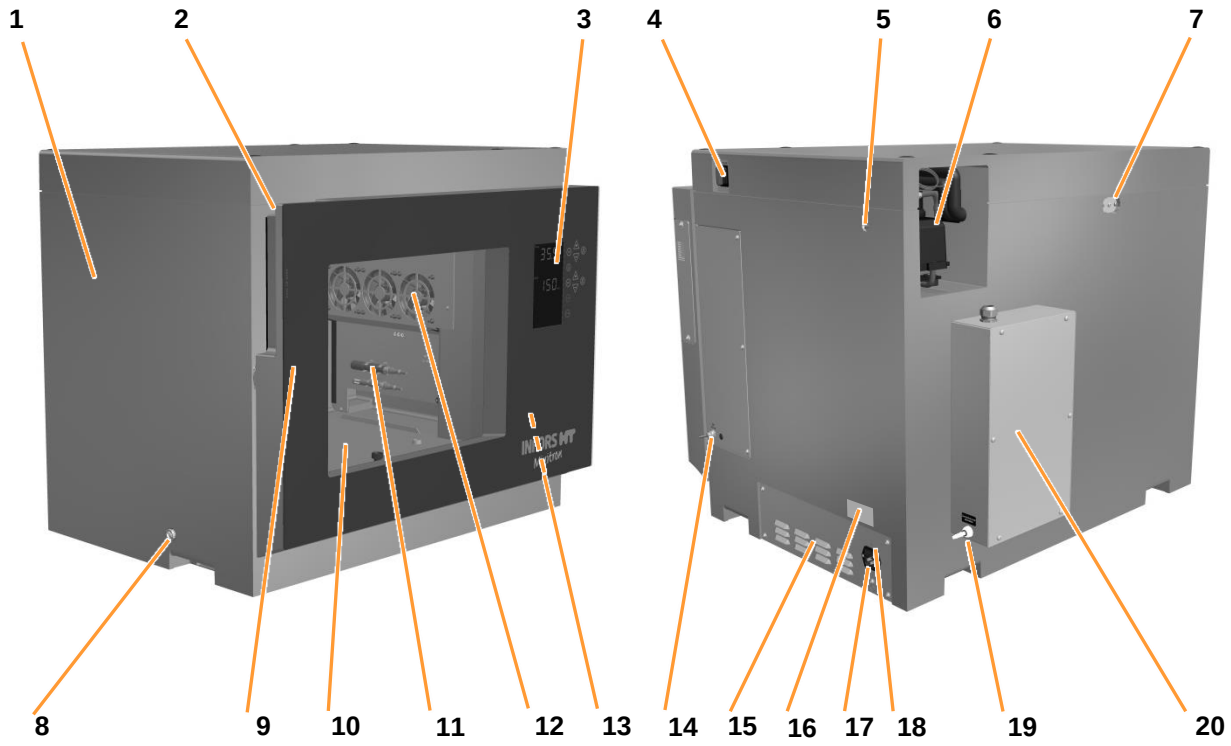
- The equipment, the component part or accessory must be entirely decontaminated before sending to the manufacturer
- The provider is therefore required to completely and truthfully fill out a declaration of decontamination, and have it signed by the person responsible.
- **The declaration of decontamination must be affixed on the outer packaging in which the equipment is sent back.**
- These forms can be obtained from the licensed dealer or the manufacturer. See address on page 2.

Important notice

If the return shipment is not accompanied by a signed and complete declaration of decontamination and it is not affixed to the outer packaging, the shipment will be returned unopened to the sender at their expense (see also T&C).

3 Setup and Function

3.1 Structure of the Basic Unit



1 Casing (PUR-IHS)
2 Grip recess for opening the door
3 Display and operating elements
4 Main switch
5 Antenna connection (antenna optional)
6 Cooling unit (optional)
7 Ventilation (open or closed)
8 Discharge outlet
9 Door with window (opening to the right)
10 Table
11 Temperature sensor Pt100 (+ optional sensors)
12 Fan
13 Connection for the external alarm (behind the door)
14 CO_2 connection (optional)
15 Air vents
16 Identification plate
17 Mains connection
18 Slot for fuses
19 Water connection for humidification (optional)
20 Humidification unit (optional)

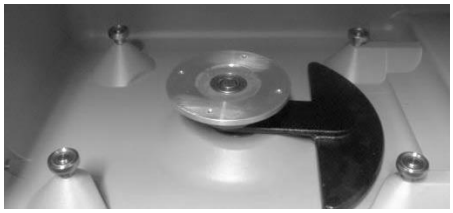
3.2 Functions Installed by Default

The standard features of the equipment include the shaking (“rotations per minute” parameter, *RPM*) and tempering (“temperature” parameter, *Temp*.) functions.

3.2.1 Standard Function Shaking

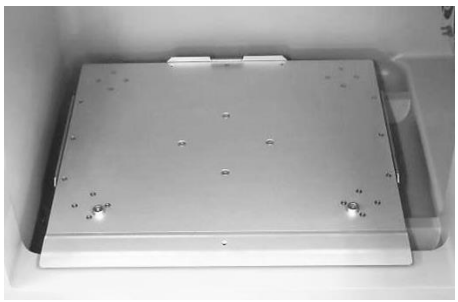
An electronic motor provides the shaking function. Thanks to the strong motor, rotation speeds of up to 400 min^{-1} can be reached even with a full load.

Mechanics



In the centre, there is an eccentrically rotating wave with the flange for receiving the table. The equipment is available with a 25 mm or 50 mm throw.
The image shows the counter-weight for balancing the mass on the table. In the corners of the interior, there are four bearings for stabilising the table.

Table



The table is affixed to the flange by means of 4 screws (Allen screws M6, SW 5). It is used to accept the tray measuring 48 x 42 cm (N tray), various versions of which are available.
Bars on the side, a stop (at the back) and two tapered plugs ensure that the tray is positioned correctly.
To clean the base tray, the table can removed by loosening the four screws in the centre (see chapter 9.2.1 "Cleaning", page 151).

Operation

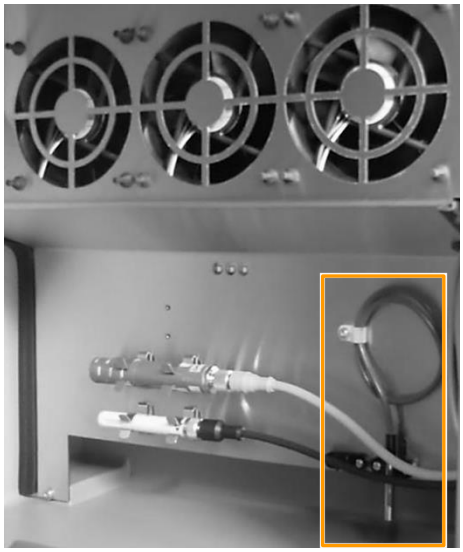
The “RPM” parameter is operated via the operating panel. Beside the actual value the symbol *RPM* and unit *min^{-1}* appear on the display.
For a detailed description of how to set and activate the parameters see chapter 7.4 "Entering Parameter Setpoints and Turning Parameters On/Off", page 82.

Technical data and setpoints

For detailed descriptions of the technical data and possible maximum speeds, see chapter 12.3.1 "Rotation Speed Parameter (Shaker Drive)", page 162.

3.2.2 Standard Function Tempering (Heating and Ventilating)

Using a heater and fans, a specific temperature can be reached and maintained in the entire incubation chamber.



Technical data

The heating element is located on the bottom, right side of the equipment, behind the sheet metal cover. The axial fans ensure constant air circulation at around 100 m^3/h and the most even temperature distribution possible in the incubation chamber.

Sensor

The temperature sensor (Pt100) is located at the front right inside the casing and is positioned vertically.
The sensor is designed for temperatures ranging from 0 to 80 °C, whereby the highest temperature that can be reached in the equipment is around 65 °C, and the minimum temperature is 4 °C. At a temperature of 50 °C, control precision falls into a range of ± 0.2 °C.

Operation

The “Temperature” parameter is operated using the operating panel. Beside the actual value the symbol *Temp* and unit *°C* appear on the display.
For a detailed description of how to set the parameters see chapter 7.4 "Entering Parameter Setpoints and Turning Parameters On/Off", page 82.

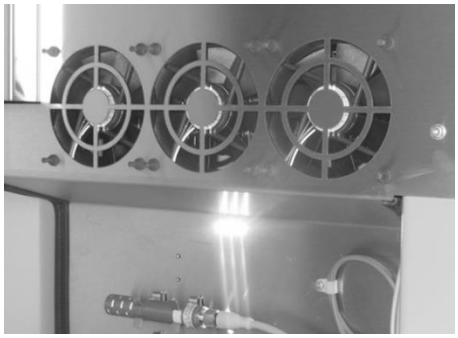
Technical data and setpoints

For detailed descriptions of the technical data and possible minimum or maximum temperatures, see chapter 12.3.2 "Temperature Parameter (Heating and Ventilation)", page 162.

3.2.3 Interior Lighting

The equipment features interior lighting. Interior lighting is switched on automatically as soon as a key is tapped. After 20 seconds without input, the lighting switches off again immediately.

If the door is opened, interior lighting also switches on and stays on for up to 20 seconds after closing the door.



Interior lighting consists of a print with 3 white LEDs, which is installed on the right side of the casing in the recess underneath the fan. In case of a defect, the lighting unit must be replaced by a qualified expert.

The option function (user mode) can be used to completely deactivate the interior lighting if necessary (see chapter 7.6.7 "Setting the Interior Lighting", page 133).

3.3 Connections and Interfaces

3.3.1 Mains Connection

The mains connection is located at the back of the equipment at the bottom right and is labelled “Mains”. The power cable required for connecting the power is included in the equipment’s scope of delivery. Two equipment fuses above the power connection protect the equipment from impermissibly high power input.

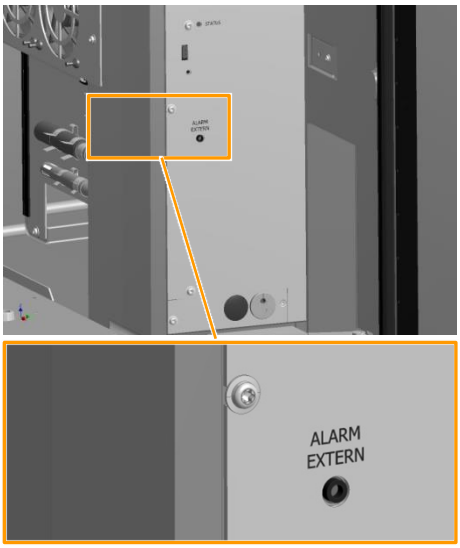
Two different versions of the equipment are available for different mains voltages:

- 230V 50/60 Hz
- 115V 60 Hz

Prior to connecting the equipment, make sure that the voltage values of the equipment match those of the local power supply.

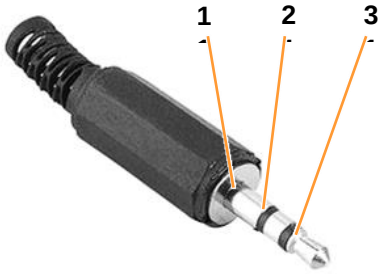
For more information see chapter 12.2 "Specifications of the Basic Unit", page 158.

3.3.2 Alarm Connection



On the cover on the right side of the casing, behind the door, there is a socket (stereo jack, 3.5 mm) for connecting the equipment to an alarm system. It is labelled “ALARM EXTERN”.
The cable of this connection is installed downwards through the door gap on the right side of the seal.

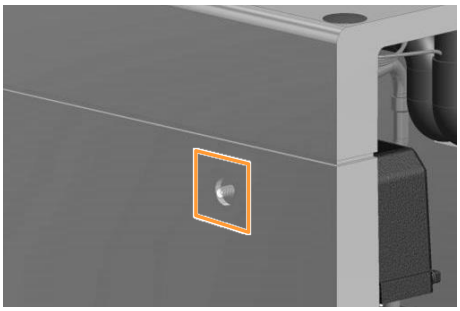
The socket is designed for a maximum of 30 V/DC, 1 A.



Allocation of contacts

1	COM (common)
2	NC (normally closed)
3	NO (normally open)

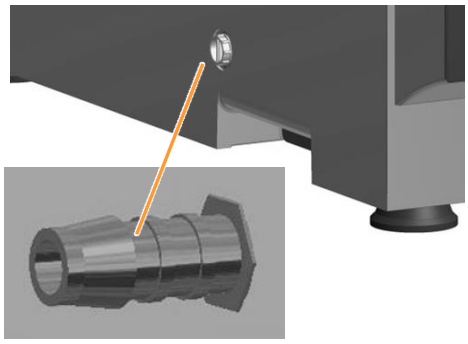
3.3.3 Antenna Connection



The connection (SMA, male) for the antenna (optional) is located on the back, on the top, right-hand side of the casing.
The antenna is used to optimise the wireless connection for “wireless” operation. If should only be necessary if the equipment is located far away from the computer required to control it or even in another room.

3.4 Openings

3.4.1 Discharge Outlet



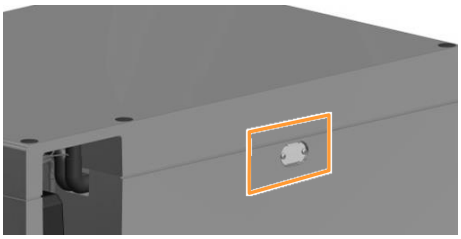
The opening for discharging leaked liquids, detergents or condensation that has been collected is located at the bottom, on the left hand side of the casing, close to the centre.
The opening is sealed with a yellow plug. A hose nozzle (¼ inch) for connecting a hose (Ø 10 mm) is provided.

INFORMATION

In case of large fill volumes, we recommend installing the discharge hose to avoid the bearings coming into contact with liquid if a flask breaks.

If safety requirements must be met, e.g. when working with genetically modified organisms, the discharge hose must lead to a suitable, sealed receptacle. This can be, for example, an empty chemical container that is sealed with foil.

3.4.2 Ventilation Opening



An opening for ventilation of the interior is located in the top centre of the rear of the casing. The purpose of ventilation is to supply bacterial cultures with oxygen from the air.
The opening with a diameter of 22 mm is covered by a metal plate that can be mounted in two different ways:

- If the bevelled parts of the plate point outwards, the plate seals the opening.
- In contrast, if it is mounted with the two screws in such a way that the bevelled parts face the equipment, this results in a ventilation slot.

The opening can also be used to insert reference sensors.

INFORMATION

If the optional parameters CO_2 and/or humidity are available on the equipment, the equipment is delivered with the opening sealed. The subsequent opening of the ventilation can lead to a significantly higher gas consumption in this case.

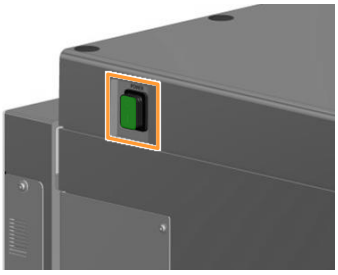
If the optional parameters CO_2 and/or humidity are not available, closing the ventilation can lead to a lack of oxygen or the culture and therefore to low growth.

3.4.3 Air Vents

The air vents are located on the bottom right-hand side of the casing, near the mains connection.
When setting up the equipment, you must ensure that these air vents remain unobstructed.

3.5 Operating and Indicating Elements

3.5.1 Main Switch

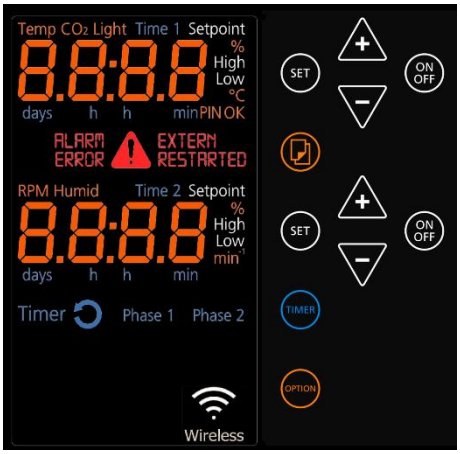


The main switch is located on the right-hand side of the equipment. The main switch is designed as a flip switch. As soon as the equipment is switched on, the main switch lights up green. In addition to normal switching on and off, the main switch also works as an emergency switch.

INFORMATION

In case of an emergency shut down via the main switch, all parameter setpoints are stored and the equipment restarts immediately when it is switched on via the main switch.

3.5.2 Operating Panel



All equipment functions can be controlled directly via the operating panel on the front of the unit. The operating panel is divided into display and operating sections:

- In the display section on the left side, information on actual values and setpoints, runtimes of the timer function and fault notifications are displayed, among other things.
- The keys in the operating section on the right side can be used to set the parameters and the timer function and adjust the basic settings of the equipment.

For detailed information on the display and operating elements see chapter 7.3 "Overview about the Display und Controls", page 76.

3.6 Markings on the Equipment

3.6.1 Identification Plate

The identification plate for identifying the equipment is located on the right side of the casing, directly above the mains connection.

For information on the data provided on the identification plate see chapter 1.3 "Equipment Identification (Standard Identification Plate)", page 9.

3.6.2 Identification of the Throw

At the front left of the table, there is a sticker that identifies the throw of the equipment.

4 Options

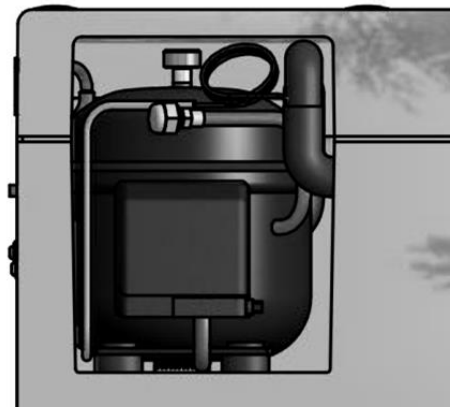
Just like the fixed parameters “Temperature” and “RPM”, the additional optional parameters such as “Humidity” (*Humid*) and “CO_2 gassing” (*CO_2*) are controlled using the operating panel.

The control element is configured in such a way that all parameters can be operated without further steps, even if retrofitted.

4.1 Cooling

As the equipment is self-heating, it can be operated at a temperature of 5° C above ambient temperature. For processes that require temperatures significantly lower than this temperature, an installed cooling unit option is available.

4.1.1 Setup and Function



The cooling unit is installed at the top right (viewed from the front) on the back of the equipment. This cooling unit can be used to achieve temperatures of up to 16 °C lower than the ambient temperature but no lower than 4 °C.

The cooling liquid circulates in a closed circuit which makes the cooling unit mostly maintenance-free.

Temperatures are measured using a Pt100 sensor which is available anyway.

4.1.2 Operating the Cooling Unit

Cooling is operated using the “Temperature” parameter. The top alphanumeric display shows the actual value in *°C* with the symbol *Temp*.

The only way to see that cooling is used is that temperatures below the ambient temperature can be reached in the incubation chamber.

For a detailed description of how to set and activate the parameters see chapter 7.4 "Entering Parameter Setpoints and Turning Parameters On/Off", page 82.

⚠ CAUTION

During operation, the surface of the compressor of the cooling unit reaches temperatures of around 70 °C. Touching the hot surface can result in burns.

However, the compressor is installed in such a way that it normally cannot be touched during operation.

4.1.3 Specifications and Technical Data

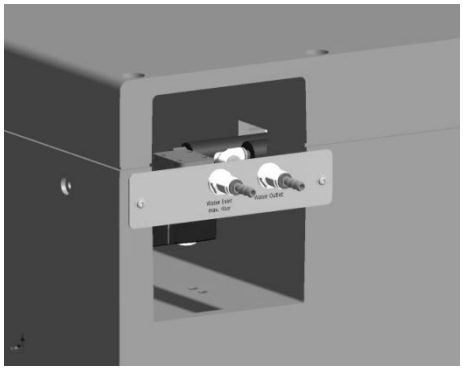
For detailed descriptions of the technical data and possible minimum and maximum temperatures, see chapter 12.4.1 "Cooling", page 163.

4.2 External Cooling

The equipment can optionally be set up for connection to an external cooling system.

4.2.1 Setup and Function

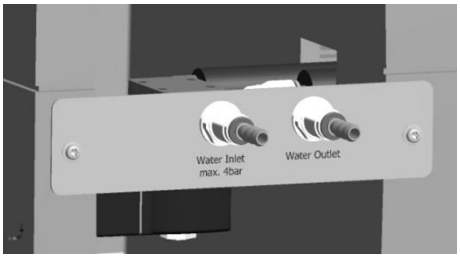
If you are planning to connect the equipment to an external cooling system, a cooling register and a controlled valve are installed.



The (closed-loop) control of the valve takes place using the installed (open-loop) control without any modifications being required.

Temperatures are measured using a Pt100 sensor which is available anyway.

4.2.2 Connecting an External Cooling System



The connections for the external cooling system are located at the back of the equipment, at the top right, near the opening designed for the cooling unit. The connections are labelled “Water Inlet” und “Water Outlet”.
The connection pressure at the inlet of the cooling medium may be up to 4 bar, the outlet should be depressurised.
The external diameter of the hose nozzles is 8 mm.

ATTENTION

The installed valve regulates the temperature by closing and opening the cycle. Hence it can be necessary to install a bypass from the inlet to the outlet to protect the circulation pump against damage.

4.2.3 Operating the External Cooling System

The external cooling system is operated using the “Temperature” parameter. The top alphanumeric display shows the actual value in *°C* with the symbol *Temp*.
The only way to see that cooling is used is that temperatures below the ambient temperature can be reached in the incubation chamber.

For a detailed description of how to set and activate the parameters see chapter 7.4 "Entering Parameter Setpoints and Turning Parameters On/Off", page 82.

4.2.4 Specifications and Technical Data

Sufficient external cooling requires a cooling unit with a cooling power of at least 200 to 300 W for each unit connected.

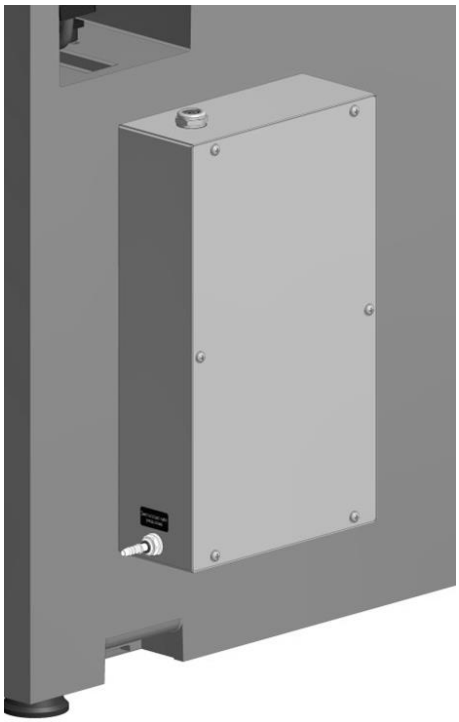
For detailed descriptions of the technical data and possible minimum and maximum temperatures, see chapter 12.4.1 "Cooling", page 163.

4.3 Direct Steam Humidification

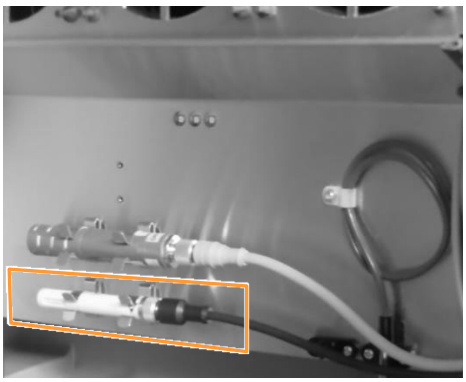
In particular when using microtitre and deep well plates, it can be necessary to reduce the evaporation of the medium. This is preferably done by installing the optional direct steam humidification.

4.3.1 Setup und Function

The direct steam humidification unit is installed outside the casing on the rear of the equipment.

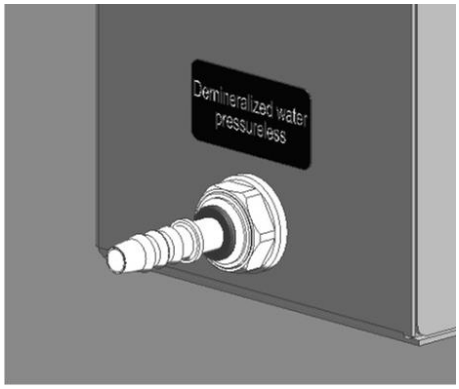


Keep in mind that direct steam humidification only works properly up to an interior temperature of 40 °C.
Together with the humidification unit, a door with a built-in bar heater (24 V/15 W) is installed.
At an ambient temperature of up to 25 °C, the heater prevents the window from fogging up at temperatures up to 37 °C and air humidity of up to 85 % in the incubation chamber.



The white humidity sensor is located on the right-hand side of the incubation chamber.

4.3.2 Connecting the Direct Steam Humidification



The connection for water supply for direct steam humidification is located at the bottom of the additional housing and (viewed from the front) points to the right. The connection for hoses of 6 to 7 mm diameter is labelled “Demineralized water, pressureless”.

ATTENTION

Using tap water can quickly lead to lime scales in the vaporiser of the humidification unit, which would affect correct functioning.

Ultra pure water (WFI, water for injection purposes) must not be used either as this is highly corrosive and thus damages the equipment.

For information on the requirements regarding the quality of the water used, see chapter 12.4.2 "Direct Steam Humidification", page 164.

4.3.3 Operating the Direct Steam Humidification

The humidification unit is operated using the “Humidity” parameter. The bottom of the alphanumeric display shows the value in % (relative humidity) with the symbol *Humid*.
Keep in mind that the humidification unit needs 15 minutes to heat up the steam generator.

INFORMATION

To prevent condensation on walls when using Direct Steam Humidification, the equipment must be heated up for two hours to at least 37 °C prior to starting the process.

When Direct Steam Humidification and the optional cooling unit are operated at the same time, strong condensation might occur on the cooling register – depending on the conditions. This can occur, in particular, when temperatures are low and when the temperature setpoint is lowered.

ATTENTION

If condensate forms on the tray, the adhesiveness of the «Sticky Stuff» adhesive matting is no longer guaranteed. This can result in cultivation vessels separating from the adhesive matting and breaking.

Hence, consider the following when using the «Sticky Stuff» adhesive matting:

- Ensure that condensate does not form on the tray.
- Let cultivation vessels that were stored in the fridge warm up to ambient temperature first before placing them on the adhesive matting.

For a detailed description of how to set and activate the parameters see chapter 7.4 "Entering Parameter Setpoints and Turning Parameters On/Off", page 82.

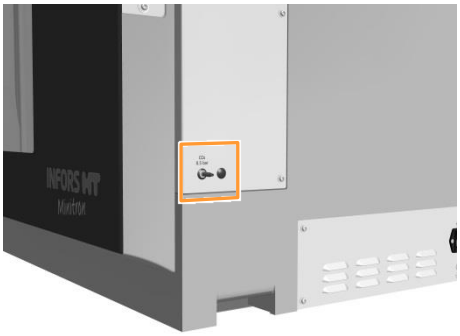
4.3.4 Specifications and Technical Data

For detailed descriptions of the technical data and possible humidity values, see chapter 12.4.2 "Direct Steam Humidification", page 164.

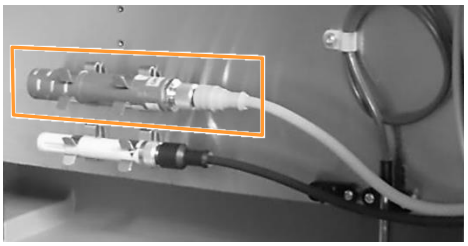
4.4 CO_2 Gassing

Optional CO_2 gassing is offered for using the equipment to cultivate mammalian cells.

4.4.1 Setup and Function

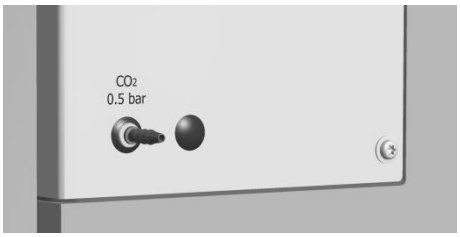


The installation for the CO_2 gassing unit consists of a regulated valve, the connection on the right side of the casing and the CO_2 sensor installed in the interior.
Inflow of CO_2 must be ensured using external supply where the pressure can be regulated.



On the image to the left, the grey Vaisala CO_2 sensor is located above the white humidity sensor.

4.4.2 Connection for CO_2 Supply



The connection for the CO_2 gassing unit is located at the bottom on the front of right side of the casing.
The Legris connection is designed for a hose diameter of 4 to 5 mm. The input pressure must not exceed 0.5 bar (± 0.1).

4.4.3 Operating the CO_2 Gassing Unit

The CO_2 gassing unit is operated using the "CO_2" parameter. The top alphanumeric display shows the actual value in % with the symbol *CO_2*.

For a detailed description of how to set and activate the parameters see chapter 7.4 "Entering Parameter Setpoints and Turning Parameters On/Off", page 82.

⚠ WARNING

Leaking CO_2 can lead to death by suffocation, especially in small rooms.

The gas lines and seals on the equipment therefore have to be checked for leaks at regular intervals.

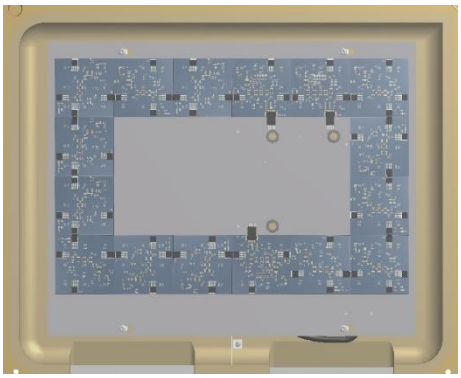
4.4.4 Specifications and Technical Data

For detailed descriptions of the technical data and possible CO_2 values, see chapter 12.4.4 "CO_2 Gassing", page 167.

4.5 LED Lighting Unit

The equipment can optionally be equipped with an LED lighting unit. This illuminates the surface of the table at an adjustable light intensity. For example, the LED lighting unit can be used to cultivate photo-sensitive cells.

4.5.1 Setup and Function



Overview

The LED lighting unit consists of LEDs installed on the circuit boards and is located underneath the top plate.
It generates a light intensity of up to 240 µmol/m²s (at the 100 % setting), which is distributed evenly over the surface of the table.
An end-to-end sealed protective screen made of polycarbonate separates the LED lighting unit from the interior. It protects the electronics from splashes and steam.
Heat generated by the LED lighting unit is dissipated via two fans.

⚠ CAUTION

Depending on the specification of the LEDs used, very high intensity light can be emitted. Furthermore, light can be emitted at a wavelength that is (almost) imperceptible to the human eye. This means that, under certain circumstances, the light intensity can be so high that the eyes can be damaged even though the light intensity is not perceived as dangerous.

Standard LED light colour / warm white:

- Avoid direct eye contact with the LEDs.

Other LED light colours:

- Depending on the spectrum of the LEDs used (according to the manufacturer's separate data sheet), wear suitable protective goggles.

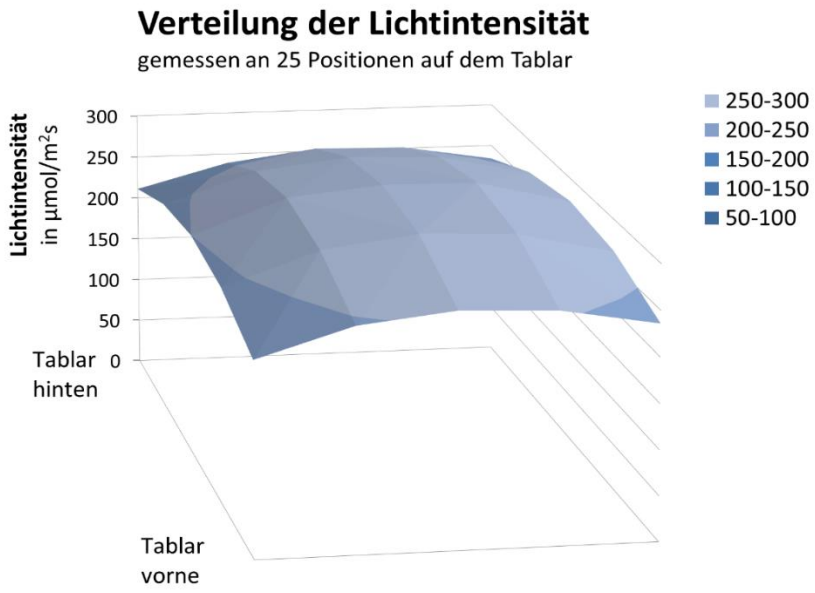
Distribution of the light intensity

The distribution of the light intensity at the level of the tray was measured using a Quantum LI-COR sensor. The measurement was taken at 25 points distributed evenly over a black tray at 100 % light intensity (max. 240 µmol/m²s).

The average of the measurement was 240 µmol/m²s with a relative standard deviation of ± 10 % (in relation to the total amount).

INFORMATION

The deviation is greatest in the corners of the tray.



The diagram shows the distribution of the light intensity on the tray. The basic area of the diagram corresponds to the tray, the z axis shows the light intensity in µmol/m²s.

Fans

The heat generated by the LED lighting unit is dissipated by two fans. The air vents for exhaust air are located on the back of the equipment.

ATTENTION

If the LED lighting unit gets too hot, it switches off automatically.

- The air vents must not be covered.
- Keep a safety distance to walls and other equipment (min. 100 mm).

4.5.2 Operating the LED Lighting Unit

The LED lighting unit is operated using the “Light” parameter. The bottom of the alphanumeric display shows the value in % with the symbol *Light*.
The light intensity can be regulated from 1 – 100 %. It responds linearly to a value of 5 to 240 µmol/m²s

INFORMATION

At a light intensity of above 80 %, do not set temperatures of above 45 °C.

At a light intensity of less than 80%, temperatures of up to 65 °C can be selected.

If the LED lighting unit gets too hot, it switches off automatically.

For a detailed description of how to set and activate the parameters see chapter 7.4 "Entering Parameter Setpoints and Turning Parameters On/Off", page 82.

4.5.3 Specifications and Technical Data

For detailed descriptions of the technical data and possible settings, see chapter 12.4.5 "LED Lighting Unit", page 167.

4.6 Analogue Output

4.6.1 Setup and Function

The equipment can optionally be equipped with an analogue output module. This provides 8 channels via which measured values can be transferred to external equipment or target values from external equipment can be sent to the shaker.

The output module is located on the right-hand side and is in its own casing. The signal range corresponds to 4 – 20 mA with a precision of ± 0.05 mA.

The operator must pre-assemble and connect the cable. To connect the cable, the lid of the casing can be removed by loosening the four hexalobular screws (M4x6). The cable is guided out of the casing using a cable gland. This protects the cable as well as the output module from mechanical influences and humidity.

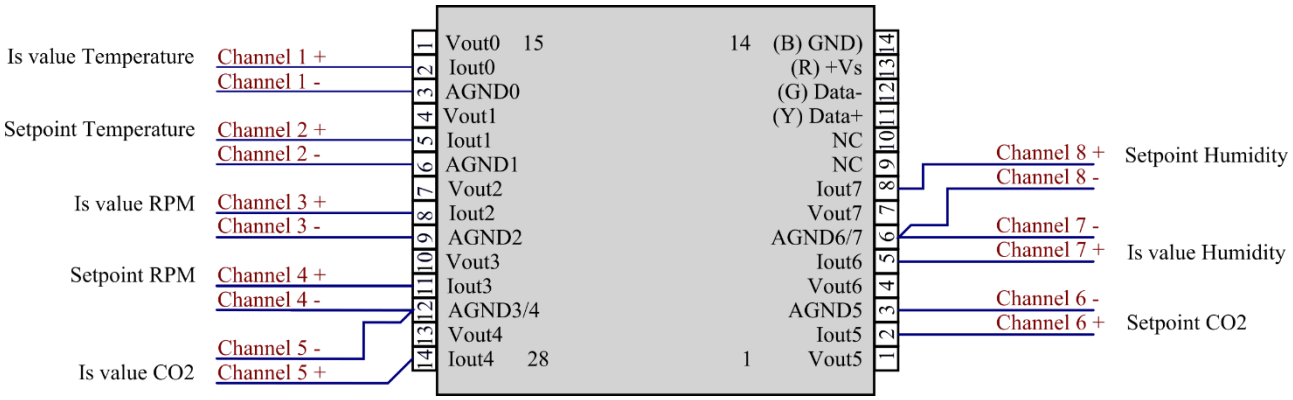
INFORMATION

If necessary, the analogue output can be retrofitted to existing equipment.

4.6.2 Connection Assignment

The connections of the output module are assigned as follows:

Channel	Connection	Function	Signal range
1	Iout0 / AGND0	Actual temperature °C	0 % to 100 % = 4 mA to 20 mA
2	Iout1 / AGND1	Temperature setpoint	0 % to 100 % = 4 mA to 20 mA
3	Iout2 / AGND2	Actual speed	0 min^{1} to 500 min^{1} = 4 mA to 20 mA
4	Iout3 / AGND3/4	Speed setpoint	0 min^{1} to 500 min^{1} = 4 mA to 20 mA
5	Iout4 / AGND3/4	Actual CO_2 value	0 % to 20 % = 4 mA to 20 mA
6	Iout5 / AGND5	CO_2 setpoint	0 % to 20 % = 4 mA to 20 mA
7	Iout6 / AGND6/7	Actual humidity	0 % to 100 % = 4 mA to 20 mA
8	Iout7 / AGND6/7	Humidity setpoint	0 % to 100 % = 4 mA to 20 mA



4.7 Cable Pass-Through

On the left side of the casing, a pass-through for cables or hoses can be installed, for example, if you wish to use additional sensors or gassing.

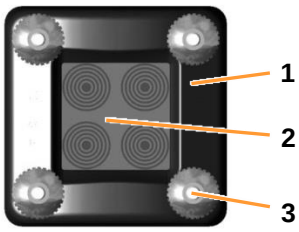
The pass-through reduces loss of heat and/or humidity and, if applicable, gas consumption if cables or hoses have to be passed into the incubation chamber.

DANGER

If external equipment that is supplied with mains power is operated on the table whilst it is operating, there is a risk that the cable might break or get jammed. This poses a risk of death by electrocution.

- Electrical equipment may only be used when the shaking function is switched off (e.g. in conjunction with the “Temperature” parameter.)
- Electrical equipment may only be used in conjunction with the “Humidity” parameter if the equipment is adequately protected against humidity. Observe the permissible environmental conditions for operating the equipment.

4.7.1 Setup



The pass-through consist of a stable, black frame (1) into which blue sealing elements (2) are inserted. By removing layers, these elements can be adapted to the diameter of the cable or hose. The entire part is affixed to the casing by means of four knurled screws (3).

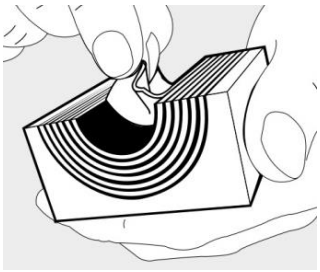
4.7.2 Adjusting and Mounting the Cable Pass-Through

Procedure

1. Loosen the knurled screws on the cable pass-through frame.

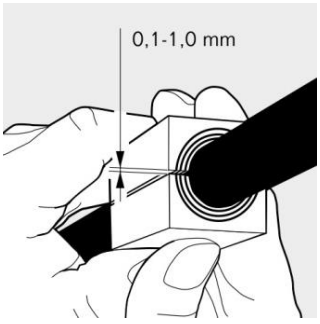
2. Remove the cable pass-through.
3. Push the blue interior part out of the frame.

4. Split the blue modules in the middle and take out as many layers of segments as needed to make the opening slightly smaller than the diameter of the cable or hose.



INFORMATION

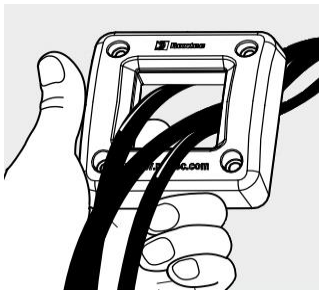
Keep the removed parts of the segments in the bag provided. They are needed to reseal the hose pass-throughs once they are no longer needed.



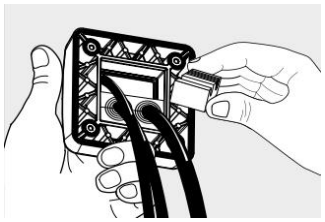
5. Place the module halves around the cables and/or hoses.

   The module halves must fit together in such a way that a 0.1 to 1.0 mm gap remains between the modules once they are put together.

   This ensures that the pass-through provides seals sufficiently once installed.



6. Pass the hoses and/or cables through the opening of the frame.
7. Generously lubricate the inner edge of the frame with the provided gel lubricant (Roxtec).



8. Push the complete modules placed around the cables and the complete modules back into the frame.

   Ensure that all module parts are on the same level.

9. Pass the cables and/or hoses through the opening of the casing.
10. Affix the frame to the cases using the knurled screws.

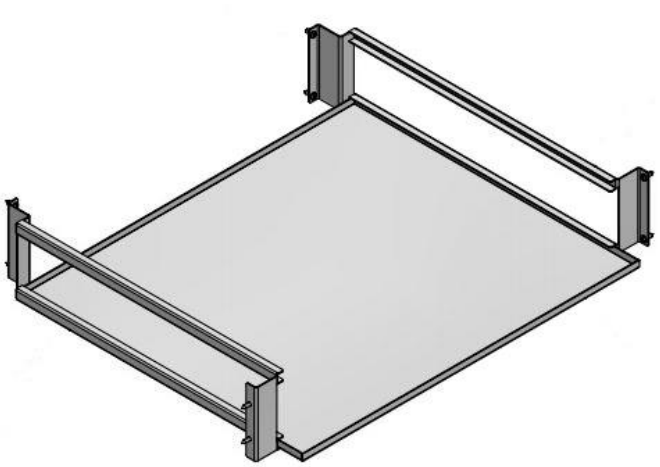
To seal an opening that is temporarily not required, a red plug is provided for a standard diameter (8 mm).

! ATTENTION

When installing the cables and/or hoses in the interior, make sure that they do not rub and do not get jammed to prevent damage.

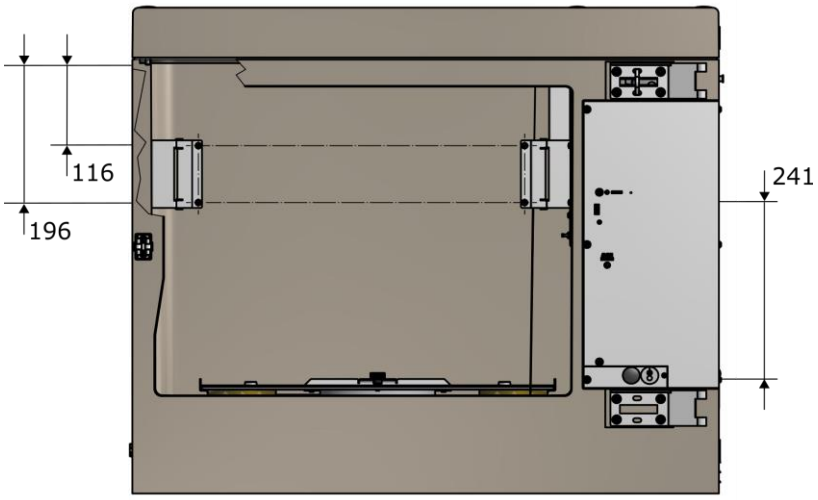
4.8 Removable Intermediate Base

The removable intermediate base (approx. 503 mm x 426 mm) facilitates static incubation in climatic conditions almost identical to the cultivation flasks.



The 4 mm strong intermediate base can be inserted at two different heights and is very easy to remove.

Options



Depending on the position of the intermediate base, the following shake flasks can be placed on the tray underneath it

- If the intermediate base is in the lower position, shake flasks with a volume of up to 1 litre (maximum height: 220 mm) can be placed on the tray.
- If the intermediate base is in the upper position, shake flasks with a volume of up to 3 litres (maximum height: 320 mm) can be placed on the tray.

ATTENTION

The inserted intermediate base can change the climate conditions in the incubation chamber as it hinders air circulation. To prevent damage to cultures, the climate above and beneath the intermediate base should be checked frequently and, if necessary, monitored using mobile sensors.

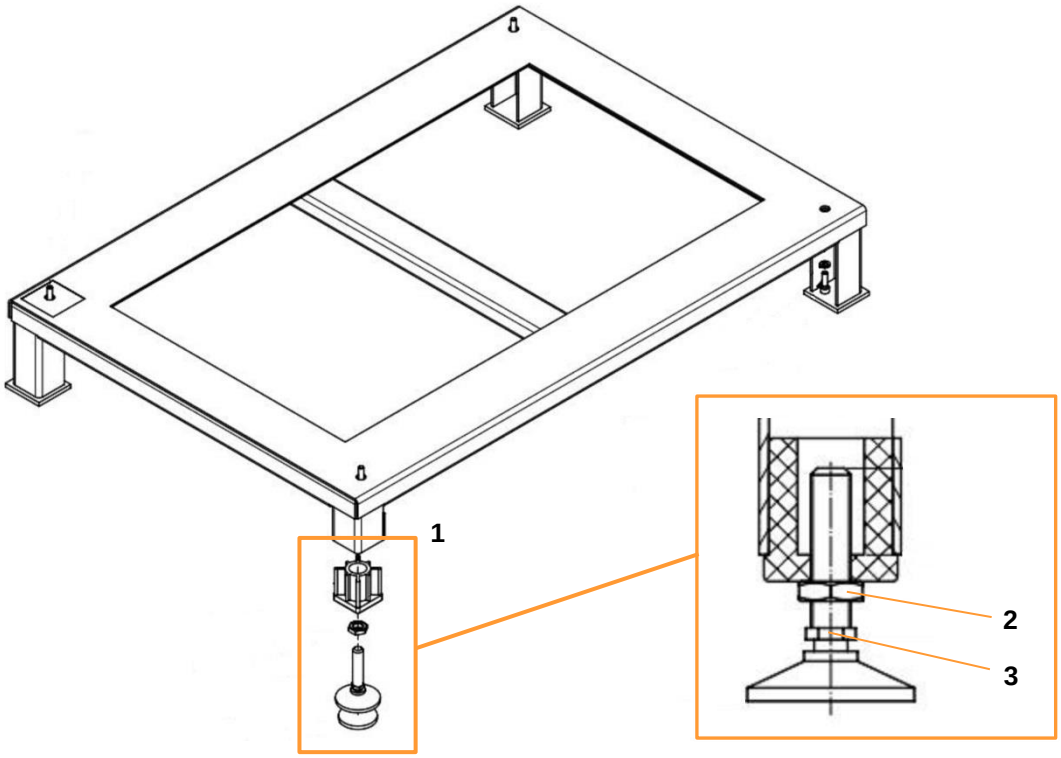
4.9 Base - 120 mm

By default, individual units are equipped with rubber feet (height: 17 mm). On request, the equipment can be equipped with a 120 mm base, which has the advantage that it can be levelled.

Stacked equipment is only supplied with this base.

4.9.1 Setup and Function

On the front right side of the base, there is an adjustable foot (1) for levelling the equipment.



1 Adjustable foot

2 Locknut (SW 19)

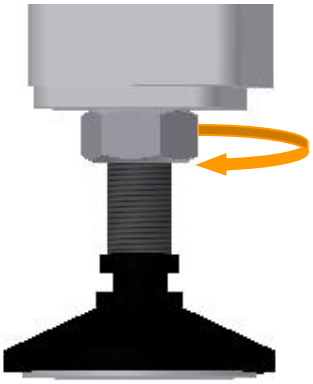
3 Hexagon for adjusting the foot (SW 12)

4.9.2 Levelling the Base

To be able to operate the equipment at very high speeds, it must be absolutely level. Hence, the optionally available base is equipped with a foot that can be levelled.

To level the base, proceed as follows:

Procedure



1. Loosen the locknut (SW 19) on the adjustable foot.
2. Set the desired height on the hexagon (SW 12) of the foot.
3. Use a spirit level to check the correct position of the equipment on all three axes.
4. Tighten the locknut again.
5. With loaded equipment, use increments of 50 min^{-1} to test whether vibrations occur at certain min^{-1} ranges.

INFORMATION

If you have a stack of 2, simultaneously load both units, start them and operate them at increasing min^{-1} to test both of them together.

If vibrations occur during this final test, the steps described above have to be repeated until a stable run is achieved throughout the whole range of rotation speed.

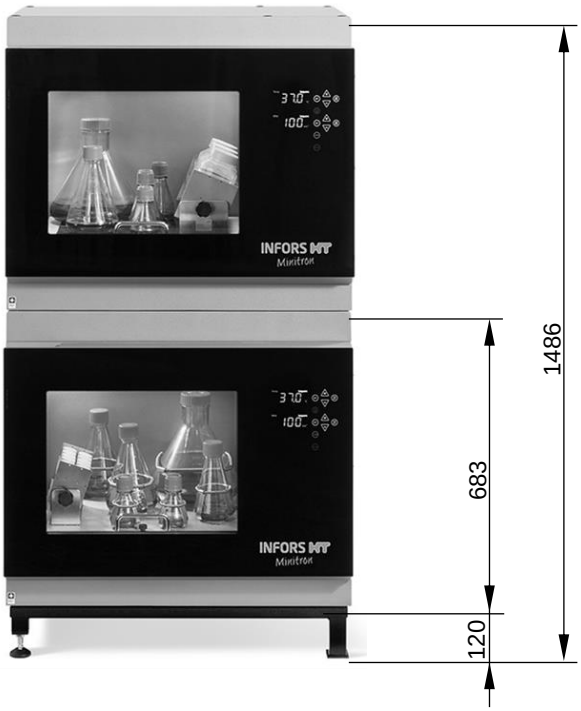
If the equipment is positioned on particularly slippery ground, anti-slip underlay must be placed under all feet. The equipment can thus be stopped from moving on the floor.

4.10 Stacked Equipment

Minitron offers the option to stack two units to save space.

Equipment can also be stacked subsequently but stacking must be performed by INFORS HT experts.

4.10.1 Dimensions (Values in mm)



In a stack of two, the rubber feet must be replaced by the stable base (height: 120 mm).

4.10.2 Restrictions Regarding Permissible Rotation Speeds

For a detailed description of the maximum rotation speeds for the top unit in a stack of two see chapter 12.5.2 "Maximum Permissible Setpoints for the Rotation Speed", page 171.

The maximum permissible min^{-1} are specified to avoid damage. Hence, they must be observed whereby further restrictions (e.g. tray with «Sticky Stuff») must be taken into account.

5 Accessories

Various accessories are available for the equipment, for example, trays and holders, which can meet a range of different requirements.

For special applications, please contact our customer service for advice (for contact information, see page 2).

5.1 Trays

Different trays are available for the equipment; these can be purchased individually or ordered with the equipment. In addition to the universal table tray, which can be equipped as desired, various trays with fixed features are available for different purposes.

5.1.1 Universal Table Tray

The N tray referred to “universal table tray” with the dimensions 48 x 42 cm features drill holes on a grid so that is can be fitted as desired. For fitting, various clamps and test tubes are available; these can be combined as desired.

The universal table tray is made of anodised aluminium and can be sterilised in autoclaves if required.

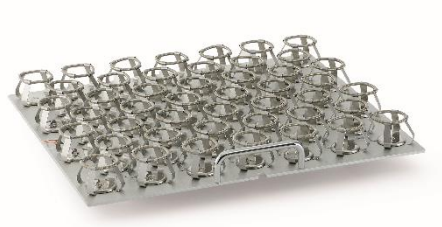
The separately available «Sticky Stuff» adhesive matting (4 units of 20 x 20 cm) can also be stuck onto the universal table tray.

Technical data of the universal table tray	
Description	**Value**
Material	Aluminium
Size	480 x 420 mm
Threaded holes	M4
Threaded holes	224
Threaded hole grid	28.28 x 28.28
Sterilisation	YES

5.1.2 Pre-Fitted Trays

Pre-fitted trays are equipped with one clamp type each. They are used if only a single size of flask is to be used for certain experiments. In contrast to the universal table tray, their holders cannot be changed.

Trays with fixed fixtures feature a capacity that is up to 30 % higher than an individually equipped universal table tray. Since no drill holes have to be taken into account in the grid, the clamps can be installed closer together.



Tray with clamps

Fitting identical clamps on the entire N tray results in the following capacities:

Steel clamps	
Flask size	**Number of flasks per N tray**
25 mL	105
50 mL	69
100 mL	46
250 mL	25
500 mL	15
1000 mL	10
2000 mL	6
3000 mL	5

Technical data of the steel clamps	
Description	**Value**
Material	Stainless steel
Fastening screws	25 – 50 mL: M4 x 6 100 – 5000 mL: M4 x 8
Temperature range	95 °C
Cleaning	Mild neutral cleaning agent
Disinfection	Commercially available disinfectant
Sterilisation	YES

Accessories

Plastic clamps	
Flask size	**Number of flasks per N tray**
100 mL	35
250 mL	23
500 mL	14

Technical data of the plastic clamps	
Description	**Value**
Material	POM Co polymer
Fastening screws	M4 x 6
Temperature range	65 °C
Cleaning	Mild neutral cleaning agent
Disinfection	Commercially available disinfectant
Sterilisation	NO

Tray with pin holders

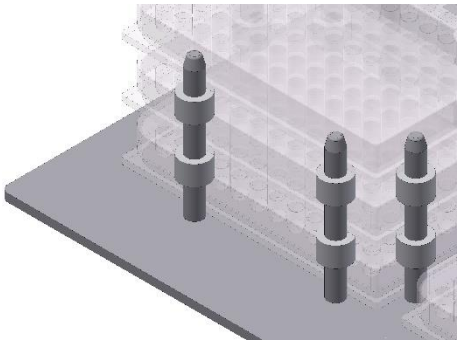
For applications in which large numbers of microtitre or deep well plates are to be incubated, various trays with pin holders are available. These enable loading with several layers of microtitre and deep well plates.

The plates can be stacked. This makes it possible to simultaneously incubate up to 24 deep well plates and up to 36 microtitre plates on one N tray.

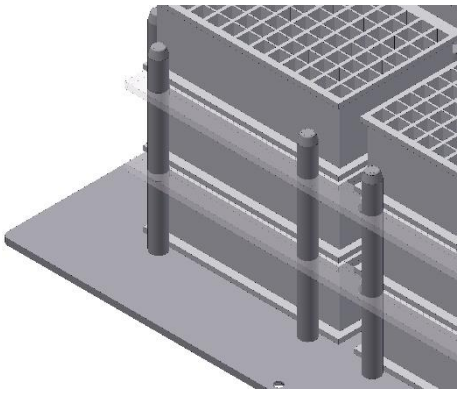
The trays are designed for plates with the dimensions 85.1 x 127 mm.

To ensure the cultures receive optimum oxygen supply, spacers can be placed between stacked plates. These are available in two variants:

Accessories



- **Ring spacers** (10 mm high) are placed on the pins individually. Depending on the type of tray loading, this makes it possible to remove individual plates or stacks of plates.



- **Quickload spacers** are long plastic strips (4 mm high) that span across several plates, thus making it possible to save time while loading.

ATTENTION

Since all spacers are made of plastic, they cannot be autoclaved as this would destroy them.

Technical data and specifications	
Description	**Value**
Material	Aluminium
Fastening screws	M5 x 12
Cleaning	Mild neutral cleaning agent
Disinfection	Commercially available disinfectant
Sterilisation	YES

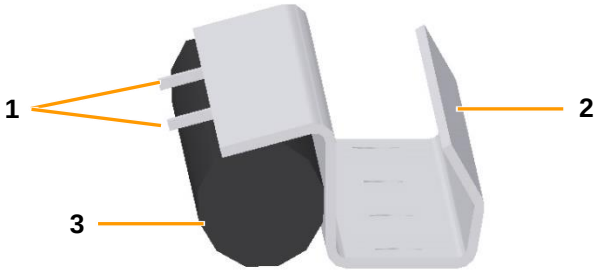
Accessories

Tray with clamping assembly

To affix microtitre and deep well plates, there is a quick clamping assembly. Two versions of this clamping assembly are available:

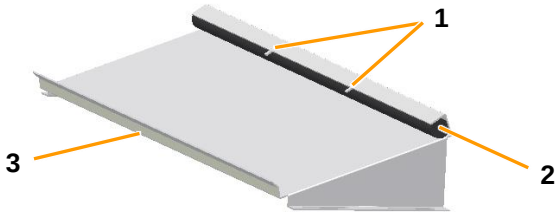
Tray with flat clamping assembly (on the image to the right, horizontal incubation).

The straight clamping assembly is a profile made of sheet metal that is equipped with an angled strip (2). On the other side, there is an edge featuring a foam rubber strip (3). To position the microtitre plates or deep well plates, there are two spacers on the edge (1).



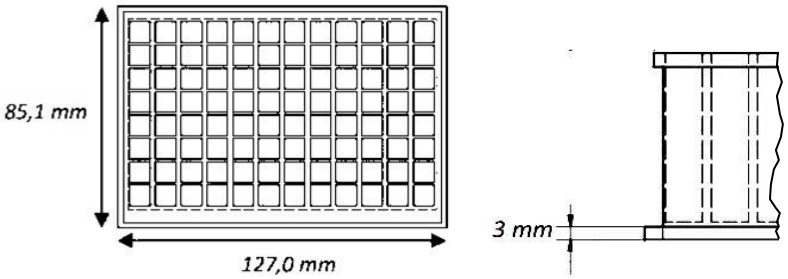
Tray with folded clamping assemblies at an angle of 20° (on the image to the left, angled incubation):

The folded clamping assembly is wedge-shaped metal sheet with two profiles. The lower profile is an angled bar (3). The upper profile is a U profile into which the cellular rubber string (2) is inserted. To position the microtitre plates or deep well plates, there are two spacers on the upper edge (1).



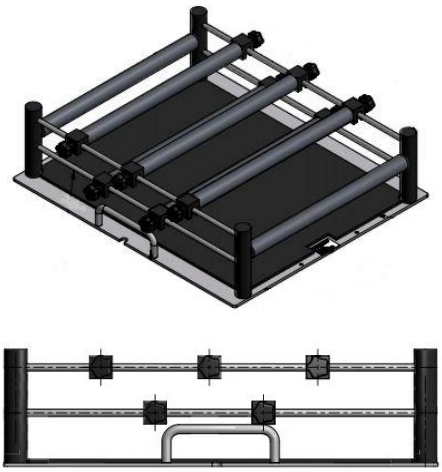
The trays with clamping assemblies are designed for microtitre and deep well plates with dimensions 85.1 mm x 127 mm. To ensure sufficient clamping force can be achieved, plates with a web height of at least 3 mm must be used.

Accessories



Technical data and specifications	
Description	**Value**
Rail material	Aluminium
Foam rubber material	CR rubber
Temperature range	≤ 80 °C
Cleaning	Mild neutral cleaning agent
Disinfection	Commercially available disinfectant
Sterilisation	NO
Size microtitre -plates deep-well-plates	85.1 x 127 mm

Tray with fixing bars



Trays with fixing bars enable incubation of vessels of various sizes. The fixing bars can be affixed onto any desired point on the support bars. This makes it possible to also affix bottles with vertical walls and a curved bottom.

The bars enveloped in soft material are arranged on two different levels to securely hold bottles of different sizes.

The scope of delivery of the tray includes the fixed frame and 5 movable fixing bars.

Technical data of the fixing bars	
Description	**Value**
Material	Aluminium, plastic
Cellular rubber mat	EPDM cellular rubber
Cellular rubber cover	Armaflex
Cleaning	Mild neutral cleaning agent
Disinfection	Commercially available disinfectant
Sterilisation	NO

5.1.3 Tray with «Sticky Stuff» Adhesive Matting

ATTENTION

If condensate forms on the tray, the adhesiveness of the «Sticky Stuff» adhesive matting is no longer guaranteed. This can result in cultivation vessels separating from the adhesive matting and breaking.

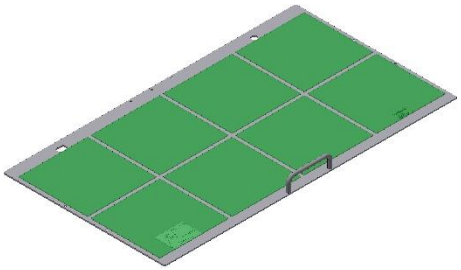
Hence, consider the following when using the «Sticky Stuff» adhesive matting:

- Ensure that condensate does not form on the tray.
- Let cultivation vessels that were stored in the fridge warm up to ambient temperature first before placing them on the adhesive matting.

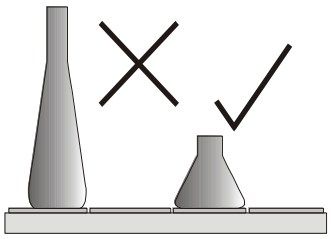
ATTENTION

If cultivation is started at low temperatures and the temperature is then increased, condensation can form on the flasks because these are heated up slower than the ambient air. This can lead to the flasks coming off the adhesive matting.

Whether or not condensation occurs depends on the selected temperatures, flask size and room climate, in particular the air humidity.



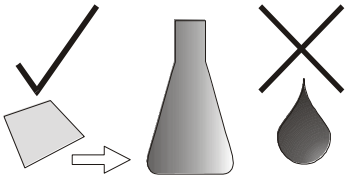
- If you are looking for a very flexible option for equipping the tray, «Sticky Stuff» adhesive matting offers an ideal alternative.
- However, you have to keep in mind that speeds are limited when using «Sticky Stuff» adhesive matting (for more information on this, refer to the table at the end of the chapter).



About using «Sticky Stuff» adhesive matting

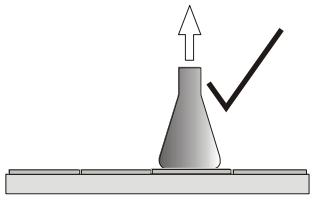
- Use only vessels with a broad flat base. Large Erlenmeyer flasks (e.g. 3000 mL) adhere more strongly than smaller ones (e.g. 500 mL).
- Ensure that the entire bases of the flasks are on the adhesive matting. They must not extend beyond the edge of the tray.

Accessories

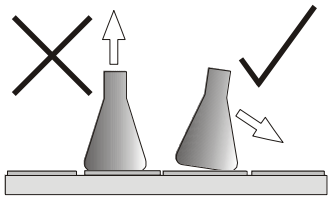


- Check vessels for damage prior to use and replace, if necessary.

  Never use damaged vessels!
- Prior to putting down any vessel, ensure that its base is dry, clean and grease-free.

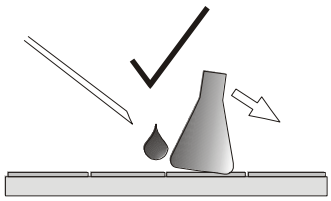


- Prior to the shaking process, gently pull on every vessel to ensure they are all stuck on firmly.
- If the humidity is too high or the temperatures are too low or if there are extreme jumps in temperature (e.g. when using the timer function), keep an eye on condensate. Condensate can result in vessels detaching from the adhesive matting.

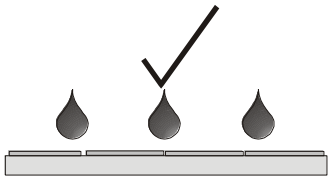


- To remove vessels, gently and evenly pull or push on the neck and wait a few seconds.

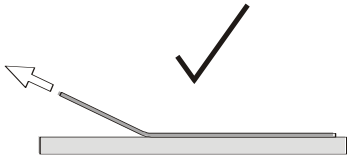
  Never use force!
- In case of large vessels, it can take 20 to 30 seconds until they detach from the adhesive matting.



- Vessels that are stuck can be removed from the adhesive matting by using a syringe to inject water under the flask.
- Due to their shape (wide base, short neck), Fernbach flasks in particular can be difficult to remove. If necessary, cover part of the adhesive matting with the protective foil provided.



- The adhesive power deteriorates over time due to dust and dirt. To clean and restore full adhesive power, thoroughly wipe down the surfaces with a brush or a dish sponge and clear water with mild detergent (dishwashing liquid). Then let dry over night.
- **Quaternary ammonium compounds are suitable for disinfection.**
- Consider application times and thoroughly rinse with water. If the adhesive matting is disinfected at regular intervals, it might need to be replaced sooner.



To replace the adhesive matting proceed as follows:

1. Thoroughly spray the tray with water
2. On one side, peel the adhesive matting off the tray and pull up diagonally.

3. Use acetone to degrease the tray and apply new **wet** adhesive matting (according to separate installation instructions). Only peel off protective foil prior to use.

The removed adhesive matting can be reused and can be reapplied after regeneration in water.

Adhesive matting that is severely worn due to age must definitely be replaced if you notice that adhesion has deteriorated after cleaning.

INFORMATION

Due to limited resistance to disinfectants as well as the risk of unintentional detaching of flasks, «Sticky Stuff» adhesive matting is not suitable for cultivating pathogenic microorganisms.

Maximum rotation speeds with «Sticky Stuff»

To ensure that the flasks do not detach from the adhesive matting, the rotation speed is limited when using adhesive matting.

INFORMATION

The following guidelines only apply to undamaged, completely dry adhesive matting free of grease. If old or dirty adhesive matting is used, there is a risk that flasks detach even at lower speeds.

Schott Duran® glass Erlenmeyer flask	Filling	Maximum permissible speed	
		25 mm hub	50 mm hub
25 to 750 mL	20 %	250 min^{-1}	200 min^{-1}
1000 mL	20 %	300 min^{-1}	250 min^{-1}
2000 mL	20 %	300 min^{-1}	250 min^{-1}
3000 mL	20 %	350 min^{-1}	300 min^{-1}
5000 mL	20 %	300 min^{-1}	250 min^{-1}

Corning plastic Erlenmeyer flask	Filling	Maximum permissible speed	
		25 mm hub	50 mm hub
125 to 3000 mL	20 %	300 min^{-1}	200 min^{-1}

Corning plastic Fernbach flask	Filling	Maximum permissible speed	
		25 mm hub	50 mm hub
3000 mL	20 %	300 min^{-1}	250 min^{-1}

5.2 Clamps and Other Holders

For individual fitting of the universal table tray, various clamps and holders are available.

ATTENTION

The clamps and holders are fixed to the tray using screws. If screws that are too long are used, these will stick out of the bottom of the tray. This has the effect that the tray can no longer be inserted and affixed correctly.

- If you have to replace lost fastening screws, you must use screws that have the same length as the original screws.

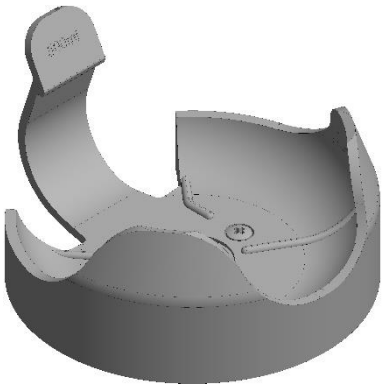
5.2.1 Clamps

The clamps of various sizes required for individual fitting can be ordered separately to be assembled by users.

Stainless steel clamps

The following stainless steel clamps are available:

For flask type	Volume		
Erlenmeyer	25 mL	500 mL	4000 mL
	50 mL	1000 mL	5000 mL
	100 mL	2000 mL	
	250 mL	3000 mL	
Fernbach	1800 mL	2800 mL	



Plastic clamps

The following plastic clamps are available:

For flask type	Volume		
Erlenmeyer	100 mL	250 mL	500 mL

5.2.2 Test Tube Holders

Test tube holders are used to securely affix different sized test tubes. Test tube holders can be screwed onto a universal table tray or placed on «Sticky Stuff» adhesive matting».

The following test tube holders are available:

For long test tubes	Number of test tubes per holder
Ø 8 mm	144
Ø 10 mm:	100
Ø 12 mm	72 (large holder) 44 (small holder)
Ø 14 mm	64
Ø 16 mm	36
Ø 18 mm	39 (large holder) 24 (small holder)
Ø 20 mm	36 (large holder) 21 (small holder)
Ø 22 mm	33
Ø 25 mm	20
Ø 30 mm	16

For short test tubes	Number of test tubes per holder
Ø 12 mm	72
Ø 14 mm	64
Ø 18 mm	39

Accessories

For plastic tubes with ventilation lid	Number of test tubes per holder
Ø 16 mm	36
Ø 30 mm	16

For other vessels	Number of vessels per holder
Eppendorf 1.5 mL	36
Cultivation vessel 600 mL	3

If necessary, the inserts with the tubes can be tilted by loosening the black nuts. The tilt can be set freely. Then tighten the nuts again.

The entire inner part with the holders for the tubes can be removed by loosening the black nuts, whereby the u-shaped holder remains on the tray.

When inserting the inner parts, ensure that the feet of the holder (part on the tray) on both sides rest between the rubber ring and the Teflon washer.

Test tube holders can also be used on a tray with «Sticky Stuff» adhesive matting. To do this, the pre-installed screw must be removed from the base plate.

ATTENTION

The test tube holders adhere extremely strongly to the «Sticky Stuff» adhesive matting, so that water has to be sprayed underneath the edge of the holder with a syringe in order to remove them. This is done to prevent damage to the holder or the tray.

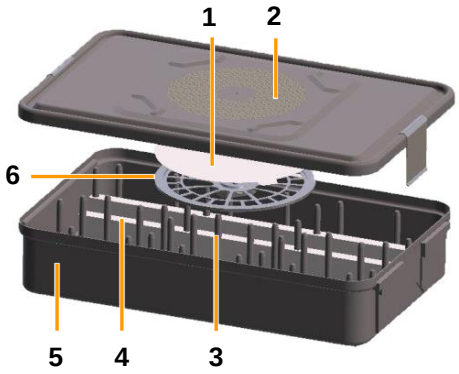
5.3 Box for Microtitre Plates

Overview

The box for microtitre plates is used for low-vapour cultivation of microtitre plates and deep well plates. It protects cultures from drafts in the incubation chamber and also offers a stable container in which cultures can be transported.

The box for microtitre plates consists of an aluminium container with a removable lid into which a replaceable paper filter is integrated. A microtitre insert with screw-mounted pins is used for mounting microtitre plates and deep well plates.

For shaking, the box for microtitre plates can be screwed onto a universal table tray or placed on the «Sticky Stuff» adhesive matting.



Structure

1 Filter
2 Top plate
3 Microtitre insert
4 Quickload Spacers
5 Container
6 Filter washer

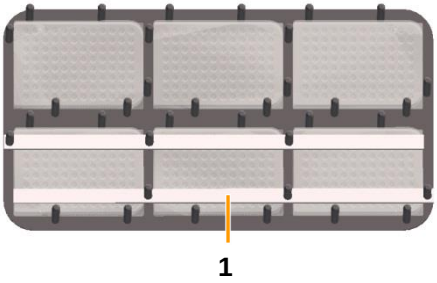
Mounting the box for microtitre plates

The box for microtitre plates is mounted on the table by means of four Phillips-head screws. When delivered, the fastening screws are covered with plastic cap nuts. These must be removed prior to installation.

Alternatively, the box for microtitre plates can be placed on «Sticky Stuff» adhesive matting. In this case, all fastening screws must be removed to avoid damaging the adhesive matting.

During installation, ensure that the tray is always loaded evenly.

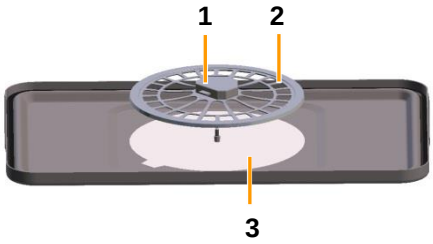
Accessories



Loading the box for microtitre plates

To improve transfer of oxygen to the cultures and facilitate the removal of the plates, spacers (Quickload Spacers) (1) can be placed between the individual layers. Prior to loading, the Quickload Spacers must be removed. Following that, microtitre or deep well plates can be inserted.

For cultivations with a low oxygen requirements, Quickload Spacers do not have to be used.



Inserting/replacing a filter

To insert or replace a sterile filter (3), the filter washer (2) must be removed first. To do so, press the locking button (1) on the filter washer and lift up the filter washer. Following that, the filter can be inserted and the filter washer can be put back in its place.

Sterilising the box for microtitre plates

The box for microtitre plates can be autoclaved (recommendation: 20 min at 120 °C). To do so, remove the Quickload Spacers first and disinfect them using commercial disinfectant.

Agitation speed limits

When there are high agitation speeds or insufficient grip due to humidity or dirt, the box for microtitre plates can separate from the «Sticky Stuff» adhesive matting during agitation and cause damage to the incubation chamber. The maximum permissible agitation speed is therefore limited as follows:

Description	25 mm throw	50 mm throw
On universal table tray	350 min^{-1}	250 min^{-1}
On «Sticky Stuff» adhesive matting	150 min^{-1}	150 min^{-1}

Accessories

Technical data

Container with top plate and tray	
Description	**Value**
Size	465 x 280 mm
Weight	4.23 kg
Filter, paper, round, Ø	185 mm
Screws for microtitre tray	M4 x 8 hexalobular
Screws for microtitre box	M4 x 12 Phillips head
Material	Aluminium, autoclavable
Detergent	Mild dishwashing liquid or neutral cleaning agent

Quickload Spacer	
Description	**Value**
Dimensions	412 x 14 x 5 mm
Quantity	12 units
Material	Polyamide 6.6 can be sterilised
Detergent	Mild dishwashing liquid or neutral cleaning agent

Loading capacity	
Standard plate size 85.1 x 127 mm x 42 mm	**Value**
Microtitre plates	18 units
Deep well plates	12 units

5.4 Software

5.4.1 eve®

eve® is a platform software for planning, execution and analysis of bioprocesses which has been developed by INFORS HT. The structure of the software is modular; the core software can be enhanced as required with additional packages. This makes it possible to adapt it to the individual needs and requirements of its users.

Among other things, eve® makes it possible to store data and control process flows automatically. Aside from INFORS HT products, biotech machines and analysis equipment from other manufacturers can also be integrated. This makes it possible to holistically control, monitor and analyse bioprocesses using a software.

eve® is installed on a centralised server. Access takes place via a browser, no client side installation is required.

5.4.2 Wireless Communicator

The Wireless Communicator is a wireless communication system for connecting a Minitron to an OPC XML-DA client.
The scope of delivery contains the software and the Infors wireless dongle. The equipment already includes a wireless module.

Every Infors wireless dongle creates its own wireless network. The wireless network meets the IEEE 802.15.4 standard and uses the 2.4 GHz frequency band.

The reach of the network is up to 20 m, even through a plaster board wall.

To ensure that communication to a shaker can be established, the Infors wireless dongle must be connected to a USB port of the computer.

The application supports the operating systems Windows 7, Windows 8, Windows 8.1.

5.5 Antenna (for Wireless Connection)

If the quality of the wireless connection via the optionally available “Wireless Communicator” program is insufficient, an antenna is available as an accessory.

We recommend purchasing the antenna, for example, if the equipment is located in a clean room and is to be operated from outside of the room.

6 Installation

Only the manufacturer's qualified expert personnel or persons authorised by the manufacturer may install and initially commission the equipment.

⚠ WARNING

Installation and initial commissioning require trained expert personnel with sufficient experience. Errors during installation may lead to dangerous situations or significant damage to property.

- Only the manufacturer's expert personnel or person's authorised by the manufacturer may install and initially commission the equipment.
- The manufacturer must also be consulted if the equipment is subsequently moved.

Hence, the following section only lists the requirements for the installation location to be observed by the provider.

6.1 Operating Conditions at the Installation Location

To achieve optimal and reproducible results, the equipment should be set up in stable ambient conditions without strong temperature and humidity fluctuations.

All climatic changes in the environment can transfer to the climate in the interior, after which the (open-loop) control requires some time to reach the setpoints again.

Operating conditions	
Temperature range	10 – 32 °C
Humidity	10 – 85 %
Restrictions	■ Do not expose to direct sunlight ■ Do not expose to dust ■ Do not expose to vibrations
The equipment may only be set up indoors.	

To achieve a stable climate in the incubation chamber, the following requirements must be observed:

- Do NOT set up directly underneath, next to or in the air stream of the air conditioners or other devices that generate strong air flows (e.g. circulation fans in clean rooms).
- Do NOT set up next to devices with strong heat radiation, such as heaters or autoclaves, and do not place in their exhaust heat stream.
- Do NOT set up next to devices with strong heat radiation, such as heaters or autoclaves, and do not place in their exhaust heat air stream.

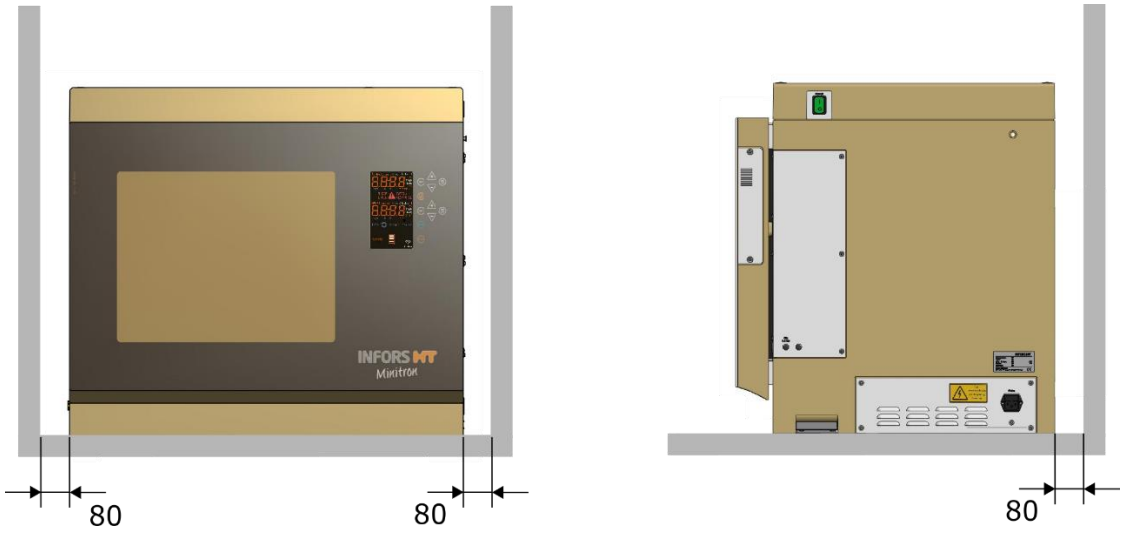
INFORMATION

To be able to control the climate in the incubation chamber as precisely as possible, the equipment must not be set up in poorly ventilated recesses or in the exhaust heat air stream of air conditioners or other sources of heat.

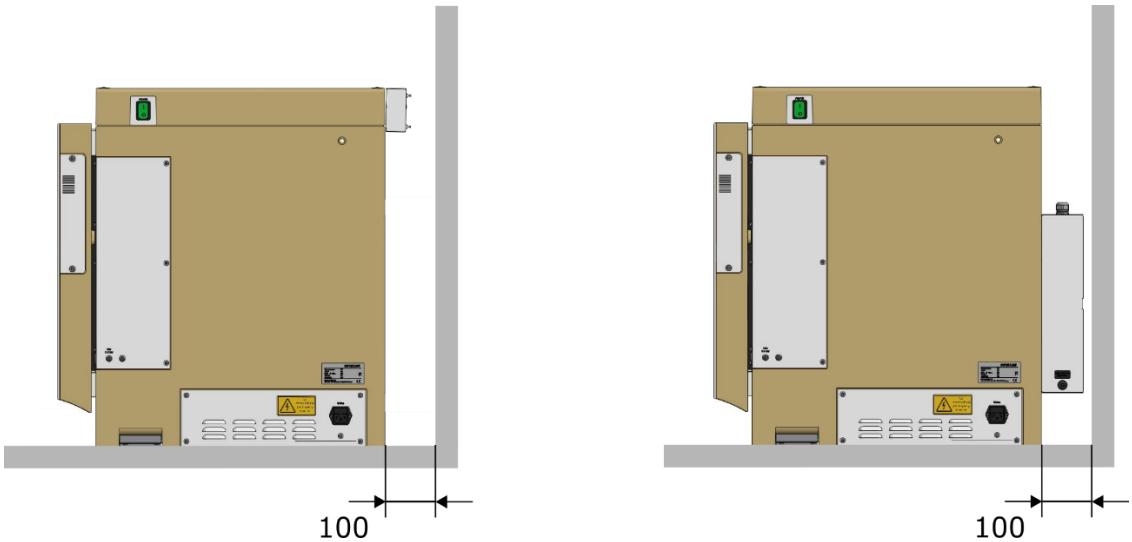
6.2 Minimum Distances to the Equipment

When setting up the equipment, the following minimum distances must be observed to ensure adequate ventilation and access to the most important connections:

Minimum distances to the basic unit

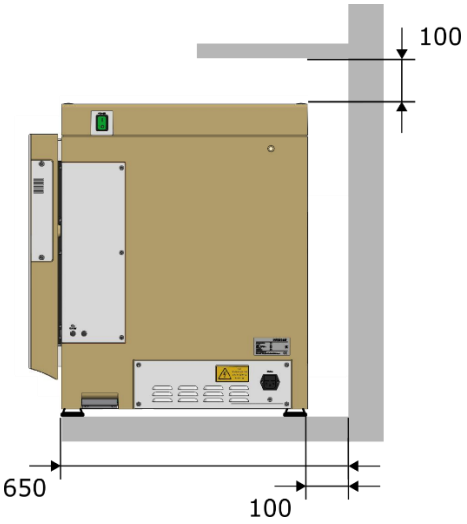


Minimum distances with options (LED lighting, direct steam humidification and cooling)



Installation

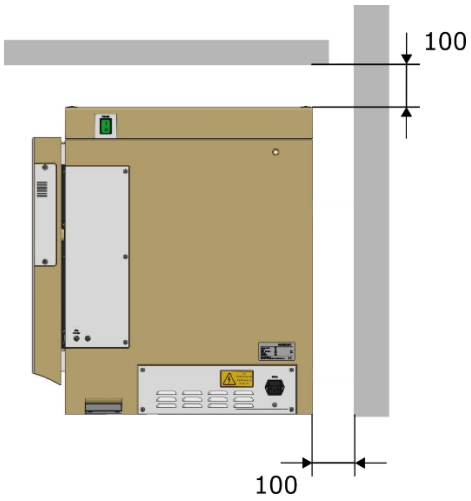
Placing the equipment on a table



When placing the equipment on a table, observe the following:

- To prevent the table from vibrating, use a heavy table with diagonal braces as the minimum (ideally use a stable laboratory bench). Alternatively, the table can be affixed to the wall.
- The minimum required depth of the table is 650 mm.
- You must leave a ventilation gap of at least 100 mm between the equipment and rear wall.
- If shelves or cupboards are installed above the table, you must leave a minimum distance of 100 mm.
- No gas outlets, shelves or cupboards must be in the way.

Placing the equipment under a table



When placing the equipment under a table, observe the following:

- You must leave a ventilation gap of at least 100 mm between the equipment and rear wall of the table to ensure heat produced by the equipment can escape.
- The minimum distance between the equipment and the underside of the table top is 100 mm.
- When operating the equipment with installed cooling, heat can accumulate under a closed laboratory bench. This can reduce the temperature range of the equipment and result in increased power consumption. Hence, we recommend only installing the equipment under a laboratory bench with air vents.

! ATTENTION

Failure to comply with the required minimum distances can result in components of the equipment overheating and the equipment being damaged. Therefore, please note:

- Never cover the air vents on the right side or those on the rear of the equipment.
- Never position the equipment directly on a wall.

7 Operation

7.1 Switching on the Equipment

After completing preparations such as connecting to the power supply and ensuring the required connections for the installed parameters are set, the equipment can be switched on using the main switch.

ATTENTION

The equipment can start up automatically, if it was not switched off correctly beforehand. Any objects sent flying through the interior if the equipment starts up automatically can damage the equipment as well as the cultivation vessels.

- Prior to switching on the equipment, ensure that there are no foreign objects in the incubation chamber.

1. Activate the main switch at the top right on the front of the casing.

   If the equipment was correctly connected to the mains, the flip switch lights up in green after switching on.

   The equipment undergoes an initialisation process where various messages appear on the alphanumeric display. However, these messages are only of significance to service technicians.

7.2 Loading the Equipment

⚠ CAUTION

If a vessel breaks at high rotation speed, glass splinters are slung around the incubation chamber. When the door is open, the equipment does not stop immediately. Therefore pieces of glass can be slung out.

To avoid injuries:

- Do not open the door in a panic if you notice that a vessel has broken.
- Switch off the equipment at the main switch and only open the door when the table stands still.

⚠ CAUTION

If the loading mass of the table is too high or too low or the load is distributed unevenly, high rotation speeds can cause vibrations. This can result in the equipment moving uncontrollably and potentially falling off the table. This can lead to property damage and injuries.

- Place the cultivation flasks symmetrically in the middle of the tray.
- In case of strong vibrations, reduce the rotation speed and check the loading weights or the distribution of the load (see chapter 7.2.5 "Notices on Loading the Tray", page 75).

⚠ CAUTION

If you put a load of more than 20 kg on the door, there is a risk that the equipment might fall down. This can lead to property damage and injuries.

- Do not lean on the door.
- Do not put a load of more than 20 kg on the door.

7.2.1 Removing the Tray

The equipment is supplied with a mounted tray. Depending on the type of loading it might be necessary to remove the tray for loading. However, the tray usually stays in the equipment and only has to be removed if a different configuration is required (e.g. with larger or smaller clamps).

To remove the tray, proceed as follows:

Procedure

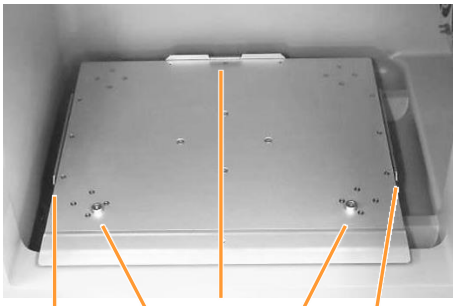
1. Open the equipment door all the way.
2. Remove the screw in the front centre of the tray.
3. Use the grip to lift the tray and take it out of the incubation chamber by pulling it forward along the side guides.

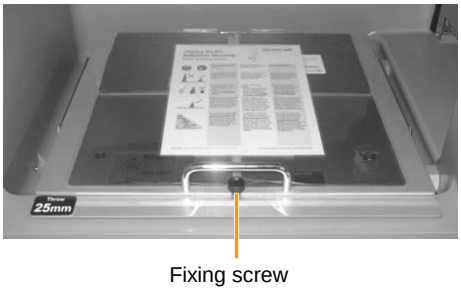
7.2.2 Inserting the Tray

The insertion of the tray works independently of the position of the table. Proceed as follows:

Procedure

1. Open the equipment door all the way.
2. Insert the tray between the two side guides on the table.
3. Use the grip to slide the tray on the table all the way back until you reach the stop.
4. Ensure that the tray is correctly snapped into the two slightly conical plugs on the table.
5. Affix the tray in the centre using the screw at the front; tighten the screw so that it cannot come lose.





INFORMATION

When loading, observe the description regarding ideal masses (see chapter 7.2.5 "Notices on Loading the Tray", page 75).

7.2.3 Handling Cultivation Flasks Without Removing the Tray

Due to the high door opening, it is often possible to handle cultivation flasks without removing the tray. To do so, proceed as follows:

Procedure

1. Temporarily stop the equipment by slightly opening the door.
2. Wait until the table stands still.

⚠ CAUTION

The moving table can cause injuries due to the considerable vibration moment.

3. Open the equipment door all the way.
4. Handle the cultivation flasks.
5. Close the door again.

   The equipment restarts automatically.

7.2.4 Fitting the Holders

! ATTENTION

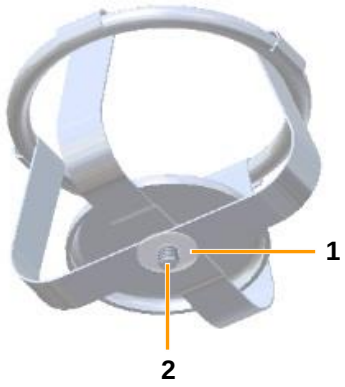
The threaded holes of the tray can be damaged if the fastening screws are not screwed straight into the thread.

- Place the screws vertically on the drill holes.
- Ensure they can be tightened easily.

! ATTENTION

All holders are supplied with pre-fitted screws. If a test tube holder or a box for microtitre plates is placed on the «Sticky Stuff» adhesive matting, there is a risk that the adhesive matting is damaged by protruding screws.

- Remove the screws before you place test tube holders or boxes for microtitre plates on the «Sticky Stuff» adhesive matting.



Fitting a holder

Clamps, test tubes and a boxes for microtitre plates are fixed to the table using screws. The equipment is delivered with pre-fitted screws (2). The screws are each secured with one flat gasket at the bottom (1) so that they cannot fall out. Only use the screws provided or screws of the same size for assembly.

To fit a holder, proceed as follows:

Procedure

1. Loosen flat gaskets.
2. Position the holder on the tray.
3. Centre a screw on the threaded hole in the tray and screw it in loosely. It must still be possible to turn the holder.
4. Align the holder so that all screws are vertical above the respective threaded hole in the tray.
5. Insert screws loosely. Ensure that the screws are screwed in straight and do not tilt.
6. Evenly tighten all screws cross-wise.

Operation

Screw sizes

ATTENTION

If screws that are too long are used to affix the holders, these will stick out at the bottom of the tray. This has the effect that the tray can no longer be inserted and affixed correctly.

- If you have to replace lost fastening screws, you must use screws that comply with the specification below.

Steel clamps		
Flask size	**Screw**	**Flat gasket**
25 – 50 mL	Flat head screw with Phillips head M4 x 6 A4	D = 3.2 x 12 x 0.5
100 – 5000 mL	Flat head screw with Phillips head M4 x 8 A4	D = 3.2 x 12 x 0.5

Plastic clamps		
Flask size	**Screw**	**Flat gasket**
100 – 500 mL	Flat head screw with Phillips head M4 x 6 A4	D = 3.2 x 12 x 0.5

Test tube holder		
Size	**Screw**	**Flat gasket**
Ø 8 – 30 mm	Oval head screw with Phillips head M4 x 6 A2	D = 3.2 x 12 x 0.5

Boxes for microtitre plates	
Screw	**Flat gasket**
Oval head screw with Phillips head M4 x 12 A2	D = 3.2 x 12 x 0.5

7.2.5 Notices on Loading the Tray

Observe the following notices when loading the tray:

- Symmetrically place the cultivation flasks in the middle of the tray.
- If vessels protrude over the edge of the tray, a collision with the inner wall could result in the equipment being damaged or vessels breaking. Therefore, always position cultivation vessels on the tray so that they do not protrude.
- If the tray is only loaded lightly, place additional cultivation vessels filled with water on the tray. This ensures a smoother run.

Ideal loading weights

The ideal load for a tray falls into the following ranges (mass incl. tray, clamps, flasks and filling):

Hub	Ideal load
25 mm	**6 – 11 kg**
50 mm	**7 – 10 kg**

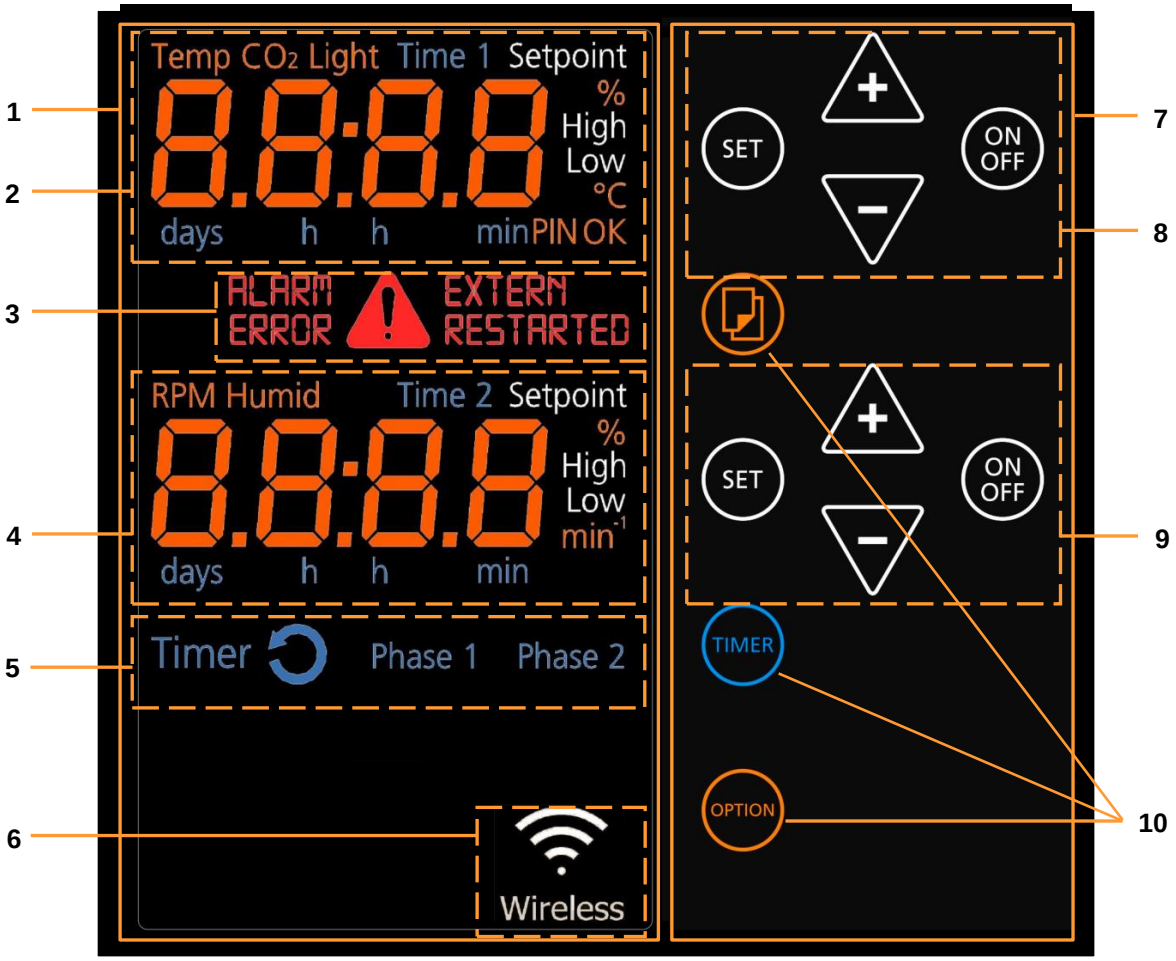
With the above-mentioned load, the equipment is ideally balanced. Higher but also lighter loading causes an imbalance, which causes strong vibrations at higher speeds and can lead to flasks breaking.

When the load on the tray is too light, the tray must be weighed down using flasks filled with water or weights until the ideal mass is reached. If the load is too high, reduce the speed, remove vessels or reduce the fill volume.

INFORMATION

If loading weights, that are too high or too low, are constantly selected, this can lead to increased wear of the equipment. However, short-term deviations of loading weights, be they higher or lower, do not lead to increased wear.

7.3 Overview about the Display und Controls



1 **Complete display area**

2 Upper display: Parameter setpoints and actual values (temperature, CO_2, illumination); time (timer 1)

3 Error and warning messages, alarm

4 Lower display: Parameter setpoints and actual values (RPM, humidity); time (timer 2)

5 Display area for the timer function

6 Display for the wireless function when the equipment is operated via radio signal

7 **Complete operating panel**

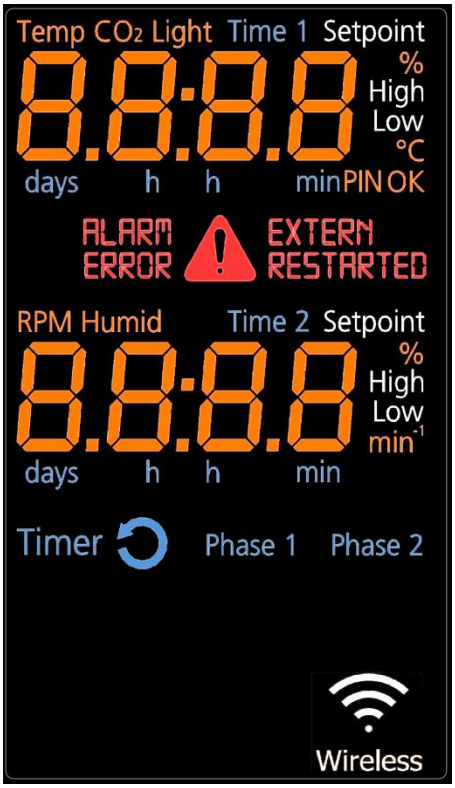
8 Upper operating panel: For setting the parameters (temperature, CO_2, illumination), time (timer 1)

9 Lower operating panel: For setting the parameters (RPM, humidity), time (timer 2)

10 Further operating keys (selection, timer and option)

Parameters in gray are only available when the according option is installed.

7.3.1 Display Area



The Complete Display Area

The display area consists of five parts. It is dominated by the two alphanumeric displays by which the setpoint and actual values of the parameters as well as different messages are communicated.

Between the alphanumeric displays there is an area for various signs in combination with error, warning and alarm messages.

Below the lower alphanumeric display there is the area for blue signs in connection with the timer function. Also the blue signs above and underneath the two alphanumeric displays are related to the timer function.

At the bottom of the display area there is the area for signs in connection with the wireless function, for the case that the equipment is controlled by a computer via radio signals.

The Alphanumeric Displays with Signs and Unit Symbols

The two display areas consist of a centrally located 7-digit alphanumeric display and various signs and symbols which are arranged around them and which are explained in the following.

The upper display area is allocated to the parameters “temperature” (*Temp*) and – if the options are installed – “carbon dioxide concentration” (CO_2) and “illumination” (*Light*).

The lower display area is allocated to the parameters “rotation speed” (*RPM*) and – if the option is installed – “relative humidity” (*Humid*).

7.3.2 Signs and Messages Regarding the Timer Function

In the Upper and the Lower Display Area

All signs and symbols in connection with the timer information – except the duration which needs to be entered – light up in blue.

In the upper display area the sign *Time 1* lights up, when within the timer function (see below) the setpoint value for the duration of the first phase (*Phase 1*) can be entered.
First, the message *OFF* appears, if the timer is not activated.

In a similar way but not at the same time, the according information for the second phase (*Phase 2*, *Time 2*) is shown in the lower display area.

On both alphanumeric displays the time for the timer function is shown.

When entering a time between one minute (00:01) and 23 hours and 59 minutes (23:59) the units *h* and *min* light up.
When entering a time between 24 hours or one day (01:00) and the maximum of 9 days and 23 hours (09:23) the units *days* and *h* light up.

In the Separate Timer Display Area

In the separate timer display area there are the four signs *Timer*, a symbol for *cycle*, *Phase 1,* und *Phase 2*.

The sign *Timer* indicates that either within the timer function the setpoints for the duration (*Time 1* and/or *Time 2*) can be entered or that at least one timer has been activated.

The symbol for the *cycle* mode lights up in addition to the sign *Timer* as soon as two durations (*Time 1* and *Time 2*) have been entered and both timers are activated. Then the equipment alters between the parameter setpoints of the first and the second phase in an endlessly repeated cycle.

The signs *Phase 1* and *Phase 2* indicate in which phase the equipment is operating if both timers are active with different parameter settings.
They also indicate for which phase (*Time 1* or *Time 2*) the parameter setpoints can be entered or the actual values of the parameters are shown on the alphanumeric display.

7.3.3 Signs Regarding the Wireless Function

In the Separate Wireless Display Area

In connection with the wireless function there appears the white sign *Wireless* and the field strength indicator the in the lower right-hand corner of the entire display area.

The sign *Wireless* appears as soon as in the operator mode (option function) the wireless function has been activated. Depending on the state, the sign *Wireless* blinks or remains lighted:

- The sign is blinking when the radio link is available but not yet established.
- The sign remains lighted, when the radio link has been established.

As soon as a communication takes place, the lines of the field strength indicator appear. The number of lines indicates the quality of the signal:

- 3 lines = very good connection
- 2 lines = good connection
- 1 line = bad connection

Even with one line the signal is sufficiently strong for the communication in the same room. To get a better quality of the link there is an optional aerial available which can be mounted on the right-hand side of the casing.

If via radio link changes on the parameter setpoints took place or are taking place, then also the sign *EXTERN* appears in the area of the signs for error, warning, and alarm messages.

INFORMATION

The sign *Wireless* begins to blink again, if the radio link is not stable.

7.3.4 Error, Warning, and Alarm Signs

Between the upper and the lower alphanumeric display area there is a separate field with various signs associated with error, warning, and alarm messages.

The big red general symbol for warnings lights up in connection with error messages and alarms to emphasise the importance of the message.
It always flashes up when the setpoints are changed to avoid mistakes. The warning symbol also lights up, if somebody tries to enter a setpoint value or tapping the **ON/OFF** key without tapping the **SET** key first. In addition, it also appears if someone tries to enter an invalid setpoint value.

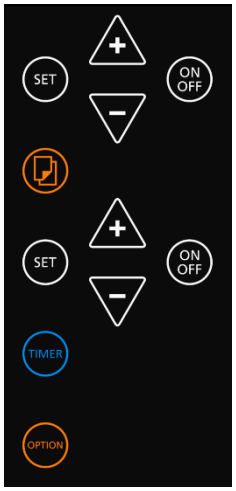
The sign *ALARM* appears in connection with other signs like *ERROR*, *High* or *Low* and it indicates that there is a problem with the equipment. In addition, there will be an acoustic alarm.

The sign *ERROR* indicates that an error occurred in the operation of the equipment which provoked an error message.
In connection with the sign *ERROR* there are often messages on the alphanumeric display which give some more detailed information on what happened. For the according abbreviations (see chapter 8.2 "Faults and Error Messages", page 141).

The sign *EXTERN* lights up when within the operator mode (option function) setup functions in connection with the wireless control are selected.

The sign *RESTARTED* indicates that the equipment had been disconnected from the power supply and did restart automatically on the basis of the saved parameter setpoints.

7.3.5 Operating Panel



The various keys on the operating panel serve to select and set the parameters, timers and other functions and modes. On the panel there are selection keys in orange (parameters, operator mode) and in blue (timer function) as well as white keys for the setting.
The white keys for the setting exist twice because they are arranged in an upper and a lower group within the operating key area which corresponds with the according display area.

INFORMATION

The sensor controlled soft-touch keys are behind a glass cover and they only need to be touched very gently.

Keys for the Selection

With the **Select** key the parameters and functions are selected within the timer function or the operator mode.
The symbol of the selected parameter or timer (*Time 1* or *Time 2*) is displayed in the upper or lower display area.

With the **TIMER** key the timer function is selected. Afterwards, the two timers can be programmed using the keys in the upper or lower operating area.
On both display areas the symbols *Time 1* (upper area) und *Time 2* (lower area) are displayed
For detailed information see chapter 7.5 "Timer Function", page 89.

By holding the **OPTION** key for at least 2 seconds the operator mode is selected. It allows to change the setup of the equipment.
The **OPTION** key is also used to select the functions within the operator mode.
For detailed information see chapter 7.6 "User Mode (Option Function)", page 131.

INFORMATION

Tapping an arbitrary key on the operating panel turns on the light inside the incubation chamber. 60 seconds after tapping the last key it is automatically turned off.

Keys for the Setting

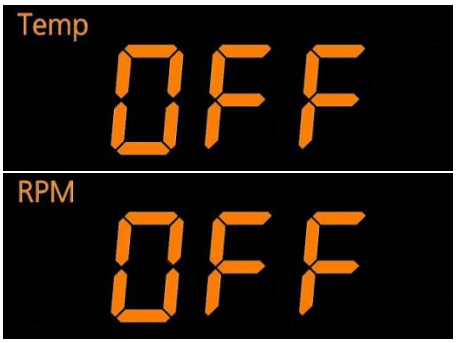
After tapping the **SET** key the parameter setpoints or the duration for the timer can be entered.
In the according display area the sign *Setpoint* lights up.

With the **Plus** key the values for the parameters or the time are increased.
By tapping the key once, the value is increased with the smallest increment for the particular parameter. By holding the key, the increment increases in ever bigger steps.

With the **Minus** key the values for the parameters or the time are reduced.
By tapping the key once, the value is reduced with the smallest increment for the particular parameter. By holding the key, the increment increases in ever bigger steps.

The **ON/OFF** key serves to turn the parameters and timers on or off.

7.4 Entering Parameter Setpoints and Turning Parameters On/Off



Has the equipment been turned on via the main switch and is the initialisation process terminated, the shaker is ready for getting programmed.
In the display area the first, integral pair of parameters, temperature (*Temp*) and rotation speed (*RPM*) appears with the message *OFF*.

7.4.1 Overview about the Parameters

Temperature (*Temp*)

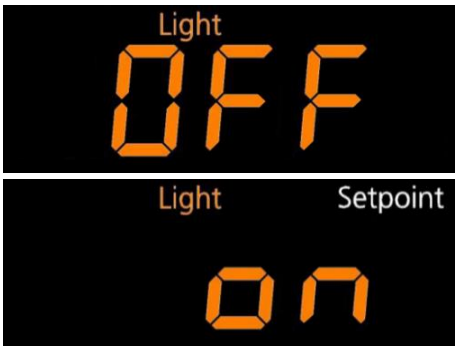
The parameter “temperature” (*Temp*) belongs to the standard scope of delivery.
When entering the setpoint value for the temperature it is shown in degrees Celsius with an accuracy of one decimal place. The setpoint range is between 4.0 and 65.0 °C.
Without cooling unit the reachable temperatures are within the range of 5 °C above ambient temperature and up to 65 °C.
With the cooling unit (option) it is – under perfect conditions – possible to reach temperatures of up to 16 °C below the ambient temperature (but not lower than 4 °C).

INFORMATION

Which temperatures can effectively be reached depends on various factors, like the ambient temperature, the ventilation or the temperature of the other equipment in a stack.

Carbon dioxide concentration (*CO_2*)

The parameter “carbon dioxide concentration” (*CO_2*) does not belong to the standard scope of delivery and therefore it is only available if the according option is installed.
When entering the setpoint value for the carbon dioxide concentration it is shown in percent with an accuracy of one decimal place. The setpoint range is between 0.1 and 20.0 %.
If the parameter is not installed, the display remains empty.



Light (*Light*)

The parameter “light” (*Light*) does not belong to the standard scope of delivery and therefore it is only available if the according option is installed.
When entering the setpoint value for the light intensity it is shown in percent. The light intensity can be set from 1 – 100 %. The light intensity is linearly proportional to a value of 5 to 240 µmol/m²s.
If the parameter is not installed, the display remains empty.

Operation

Rotation speed (*RPM*)

The parameter “rotation speed” (*RPM*) belongs to the standard scope of delivery.
When entering the setpoint value for the rotation speed it is shown in rpm (min^{-1}) with an accuracy of one whole number. The setpoint range is between 20 and 400 min^{-1}.

INFORMATION

The highest rotation speed allowed depends on the throw, the position of the equipment in a stack and the load on the tray (mass).

Relative humidity (*Humid*)

The parameter “relative humidity” (*Humid*) does not belong to the standard scope of delivery and therefore it is only available if the according option is installed.
When entering the setpoint value for the relative humidity it is shown in percent with an accuracy of one decimal place. The setpoint range is between 20.0 and 85.0 %.
If the parameter is not installed, the display remains empty.

Parameter-specific display elements

The sign *Setpoint* lights up, when by tapping the **SET** key on the upper or lower operating panel the setpoint values for the parameters can be entered.

The sign *High* or *Low* lights up, if the current value of a parameter is above respectively below its setpoint value.
After a certain time span or when a critical value is reached an alarm will be set off, because most probably an error or defect hinders the equipment to reach or maintain the setpoint value in question.

7.4.2 Setting the Parameter Setpoint

The following steps must be performed in accordance with the parameters for the two display fields in the upper or lower operator panel.

To set the parameter setpoints, proceed as follows:

Procedure

1. Select the desired pair of parameters with the **Select** key.

   The alphanumeric display field shows the current values of the selected parameter pair.

2. To activate programming, tap the **SET** key in the upper or the lower setting key area.

   The white *Setpoint* sign appears on the top right of the corresponding display field. Together with the last set setpoint, the unit belonging to the parameter appears.

INFORMATION

The *Setpoint* sign lights up for 10 seconds. If you do not make an entry in that time, you have to tap the **SET** key again.

3. Use the **Plus** or **Minus** key to set the desired setpoint of the selected parameter.

   The new setpoint of the selected parameter is displayed in the alphanumeric field.

   After approx. 10 seconds the *Setpoint* sign disappears and the new setpoint is saved. You can speed up this process by tapping the **Select** key.

INFORMATION

The entered value is saved automatically. A separate confirmation is not necessary. If the parameter is already activated, the changes take effect immediately.

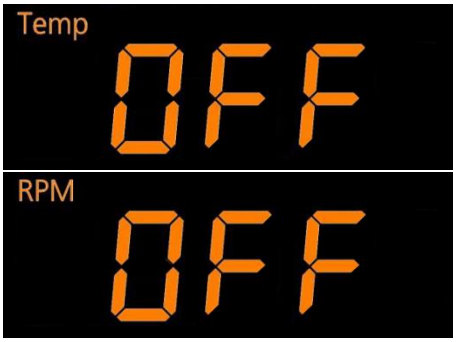
7.4.3 Turning a Parameter On

When the setpoint value of a parameter is entered and the sign *Setpoint* has disappeared, the message *OFF* appears on the alphanumeric display. The selected parameter now needs to be activated.

The following steps must be carried out in either the upper or the lower operating key area (white keys) associated with the according display areas.

To turn a parameter on proceed as shown in the following example based on the parameter rotation speed (*RPM*):

Procedure



1. Select the desired pair of parameters with the **Select** key.

At the selected pair of parameters the message *OFF* appears in the alphanumeric display.

INFORMATION

This step can be omitted, if the parameter is turned on after entering the setpoint value but the sign Setpoint has already disappeared.

2. Tap the **SET** key in the upper or the lower setting key area.

In the according display area (upper or lower) the sign *Setpoint* appears in the upper right-hand corner. On the alpha-numeric display the setpoint value of the parameter is shown.

INFORMATION

This step can be omitted, if the parameter is turned on immediately after entering the setpoint value and the sign *Setpoint* has not yet disappeared.

3. Immediately tap the **ON/OFF** key in the according operating key area. (Here only shown with the example of the parameter rotation speed.)

The parameter is instantly turned on.
The sign *Setpoint* disappears. On the alphanumeric display the message on appears for a very short time, then the current value of the parameter is shown.

INFORMATION

When the parameter rotation speed (RPM) is activated, the shaker table starts to move instantly. It is therefore suggested to turn it on last.

Information when Cultivating Process is Running

Example

When the cultivating process is running each pair of parameters is displayed for 20 seconds:

- Current value of the activated parameters

or

- the message *OFF* for all installed but not activated parameters

  For parameters of a pair which are not installed the upper or the lower display area remains black.

Additional information is provided by tapping the following keys:

- Parameter setpoint values **(Select** then **SET)**

After selecting the desired parameter and then tapping the **SET** key the setpoint value of this parameter is shown.
That a setpoint value is shown can be distinguished by the sign *Setpoint* above the alphanumeric display.

7.4.4 Turning a Parameter Off

To turn a parameter off, as shown with the example of the integral pair of parameters “temperature” (*Temp*) and “rotation speed” (*RPM*), proceed as follows:

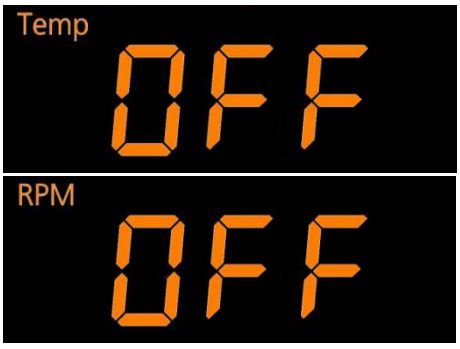
Procedure

1. Select the desired pair of parameters with the **Select** key.

In the alphanumeric display area the current values of the selected parameters appear.

2. Tap the **SET** key in the upper or the lower setting key area.

In the according display area (upper or lower) the sign *Set-point* appears and on the alphanumeric display the setpoint value of the parameters is shown.



3. Immediately tap the corresponding **ON/OFF** key.

The parameter is instantly turned off. On the alphanumeric display the message *OFF* is shown.

7.5 Timer Function

ATTENTION

If cultivation is started at low temperatures and the temperature is then increased (e.g. when using the timer), condensation can form on the flasks because these are heated up slower than the ambient air. In conjunction with the «Sticky Stuff» adhesive matting, this can lead to the flasks coming off the adhesive matting.

INFORMATION

If the timer function is not activated, the equipment runs until it is stopped by manually deactivating the parameters.

You can use the timer function to program three different procedures (modes):

1 Cyclical change with different setpoints
2 One-time change with different setpoints
3 One-time change to stop the process

The different versions of the timer programming are described in detail below:

7.5.1 About the Description of the Programming Procedures

The following examples show the complete control panel with the display area (left) and the operating area (right) as it might look when the timer function is activated.

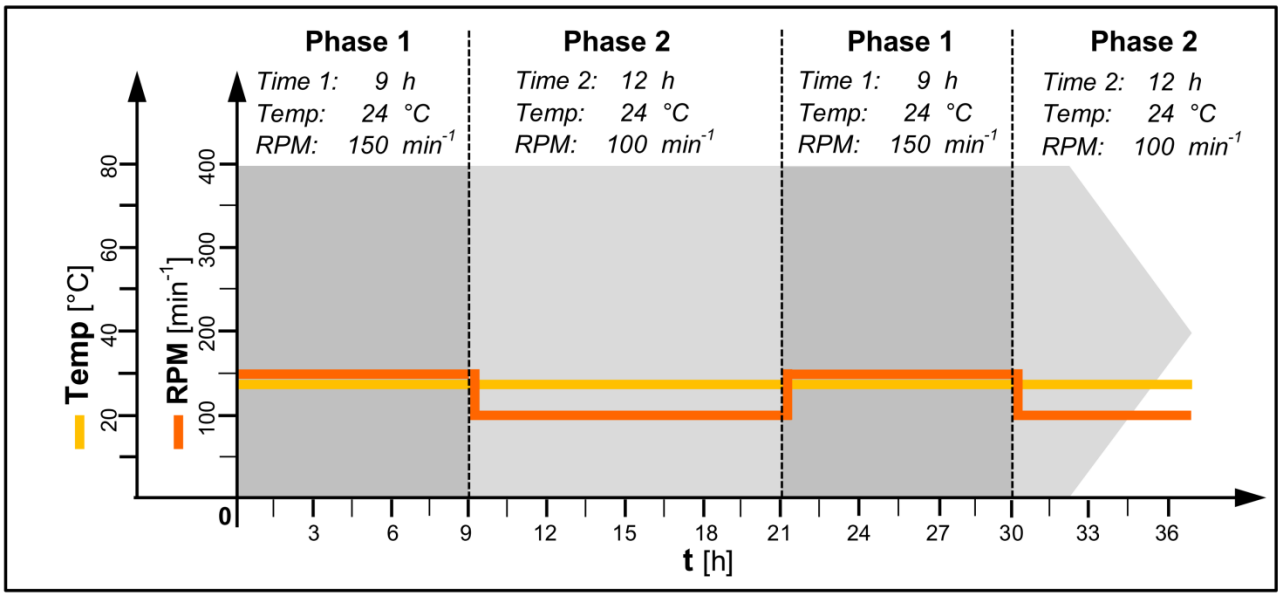
In the following only the relevant signs and messages on the left-hand part are shown, without illustrating the keys which are mentioned in the description of the procedure.
The blinking of the currently active phase of the timer is illustrated by three gray dots (not shown on the display) below the according signs *Phase 1* and *Phase 2*.

Example 1

A Cyclic Change between Different Parameter Settings

Application

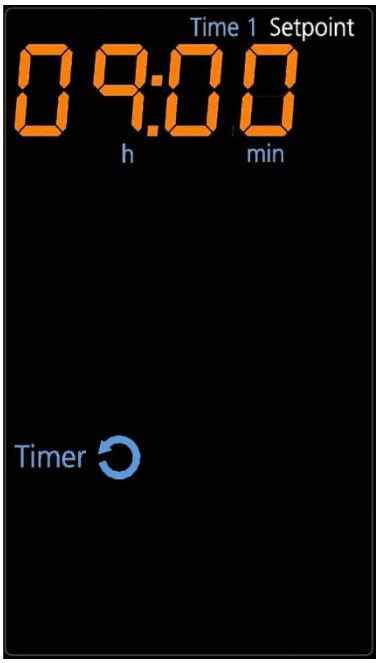
If the equipment is programmed in this way, two different parameter settings are repeated in an endless, precisely timed cycle. The two time intervals (*Phase* 1 and *Phase 2*) alternate until the cultivating process is stopped manually by turning the parameters off.

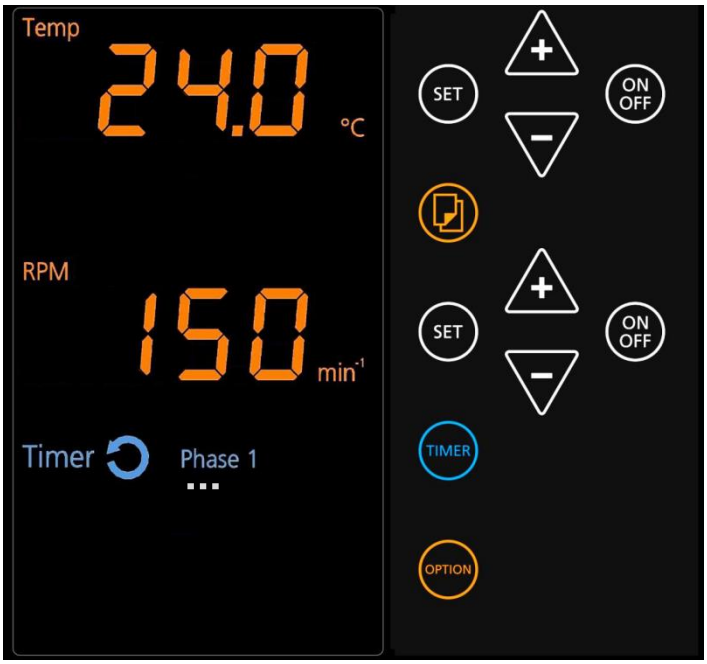


Schematic diagram of the programming mode 1, cyclic change

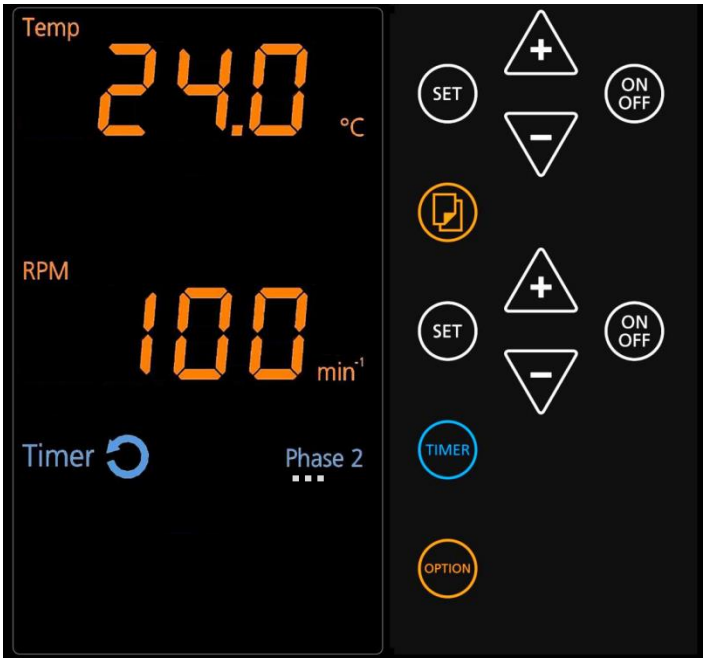
Both timers are programmed for the cyclic change with different parameter settings (mode 1). In this case the timer for the first phase (*Time 1*) and the one for the second phase (*Time 2*) must both be activated (see illustration on the left).

Shown is a cyclic change with the parameter rotation speed (*RPM*) which alternates constantly between 150 min^{-1} and 100 min^{-1} while the parameter temperature (*Temp*) always remains at 24.0 °C.


Time 1 Setpoint
09:00
h
min
Timer


Temp
24.0
°C
RPM
150
min-1
Timer
Phase 1
SET
ON OFF
TIMER
OPTION


Time 2 Setpoint
12:00
h
min
Timer


Temp
24.0
°C
RPM
100
min-1
Timer
Phase 2
SET
ON OFF
TIMER
OPTION

Example 2

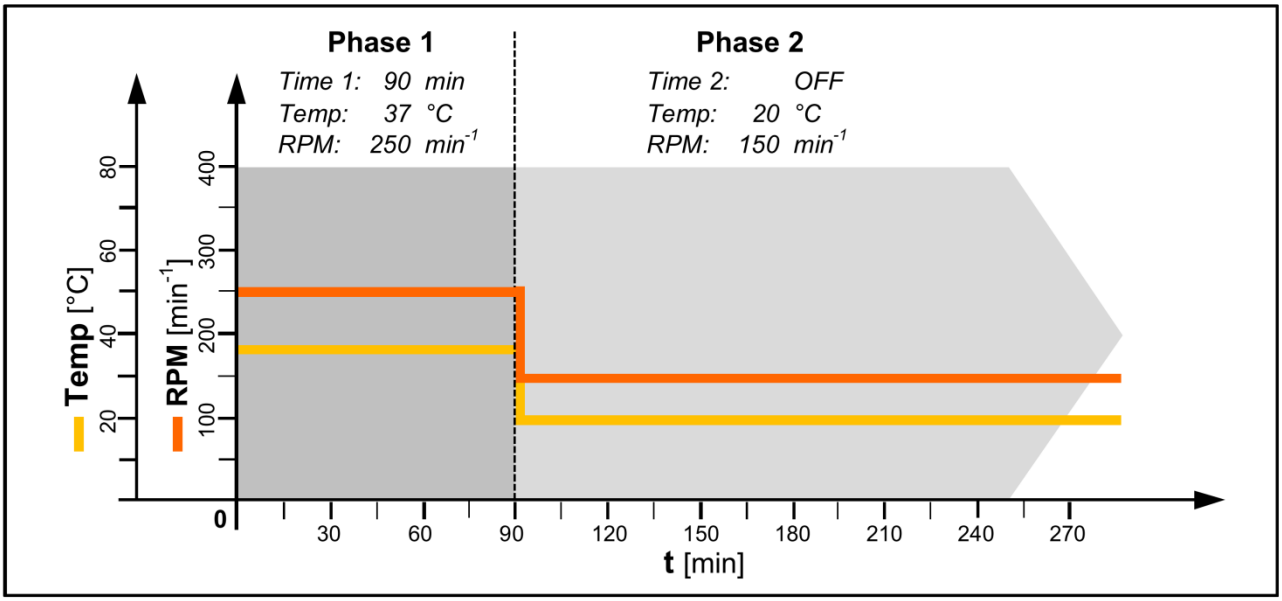
A Single Change of Different Parameter Settings

Application

If the equipment is programmed in this way, the two different parameter settings for the cultivating process change after the given period of time. The equipment then runs using the settings for the second phase (*Time 2*) until it is stopped manually by turning the parameters off.

This program is suited to delay the growth, to slow it down or to stop it, but also for the induction of a protein expression.

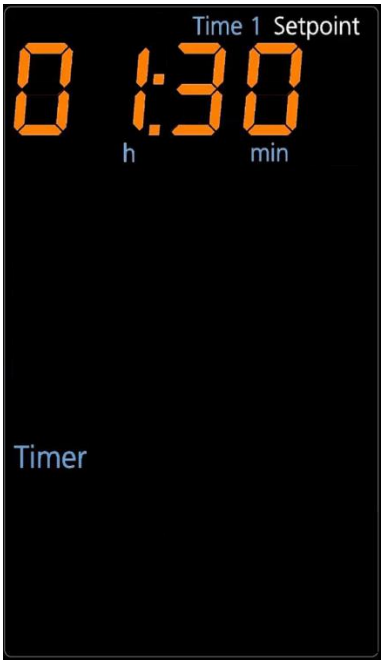
It is also possible to establish ideal conditions inside the incubation chamber (temperature, humidity, CO_2 concentration, etc.) before the process is initiated by turning on the parameter rotation speed.

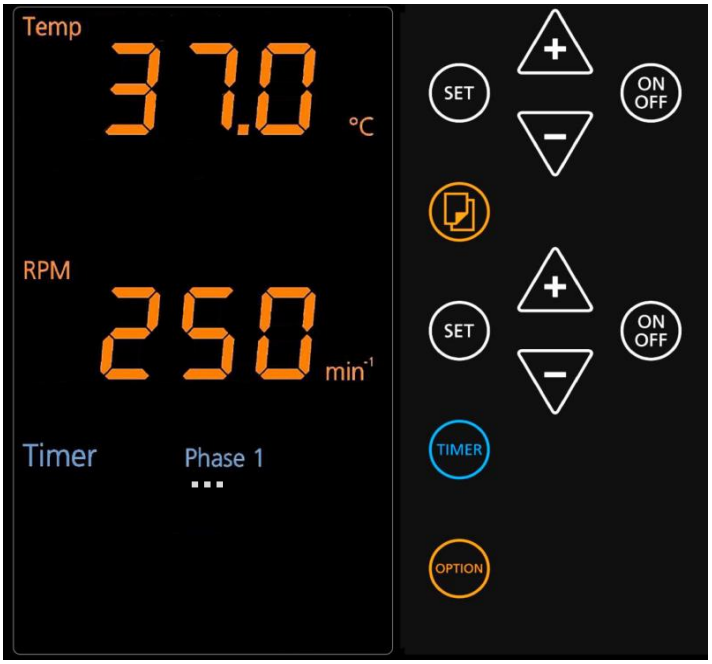


Schematic diagram of the programming mode 2, single change

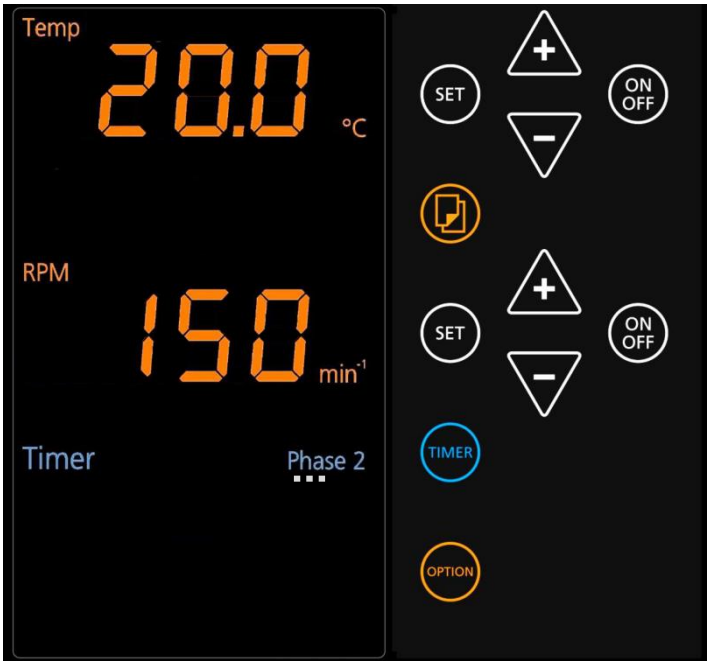
Both timers are programmed for the single change of two different parameter settings (mode 2). In this case only the timer for the first phase (*Time 1*) is activated (see illustration on the left).

The equipment runs first for 90 minutes (01:30 h) with a rotation speed of 250 min^{-1} at a temperature of 37,0 °C and then changes after the end of the first phase to a rotation speed of 150 min^{-1} and a temperature of 20,0 °C.


Time 1 Setpoint
0 1:30
h
min
Timer


Temp
37.0
°C
RPM
250
min-1
Timer
Phase 1
SET
ON OFF
SET
ON OFF
TIMER
OPTION


Time 2 Setpoint
OFF
h
min
Timer

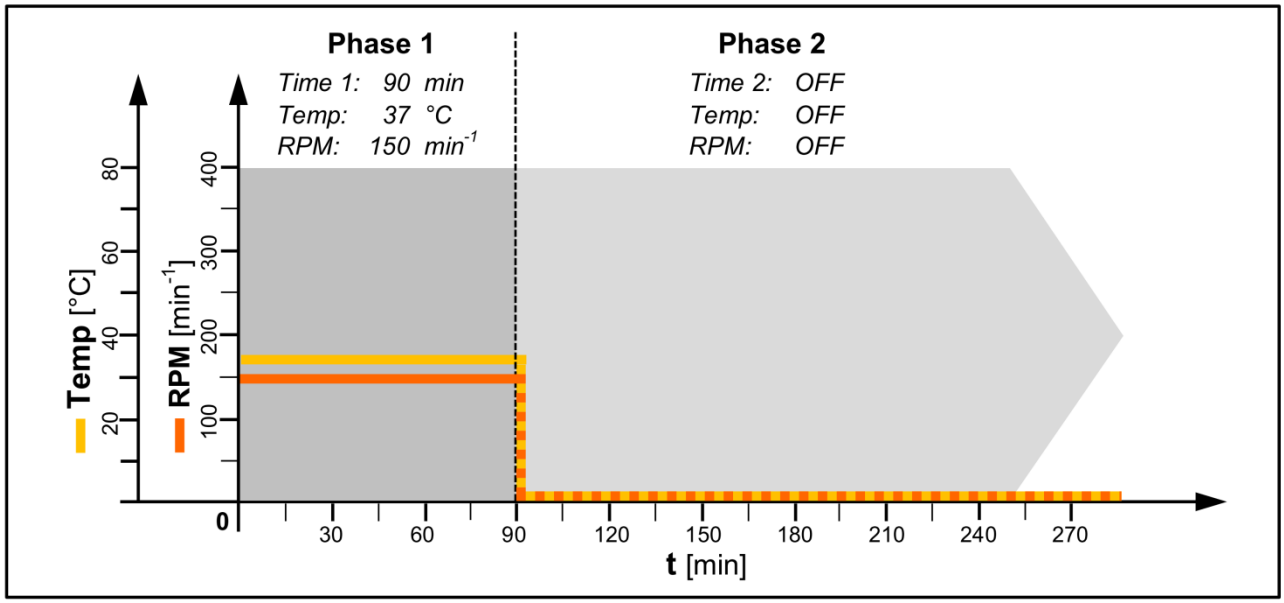

Temp
20.0
°C
RPM
150
min-1
Timer
Phase 2
SET
ON OFF
SET
ON OFF
TIMER
OPTION

Example 3

A Single Change to Stop the Process

Application

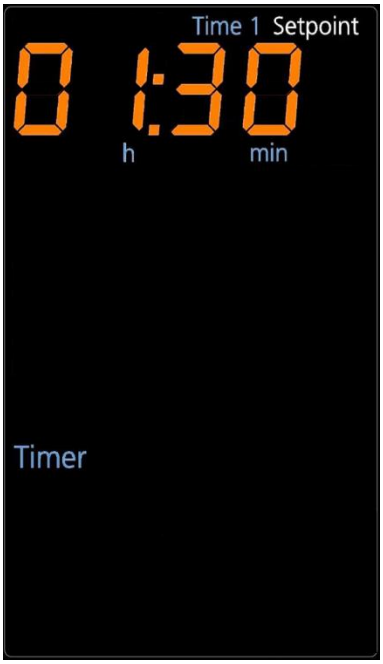
With this programming of the timer it is possible to stop the cultivating process after a precisely defined period of time.



Schematic diagram of the programming mode 3, for stopping the cultivating process on time

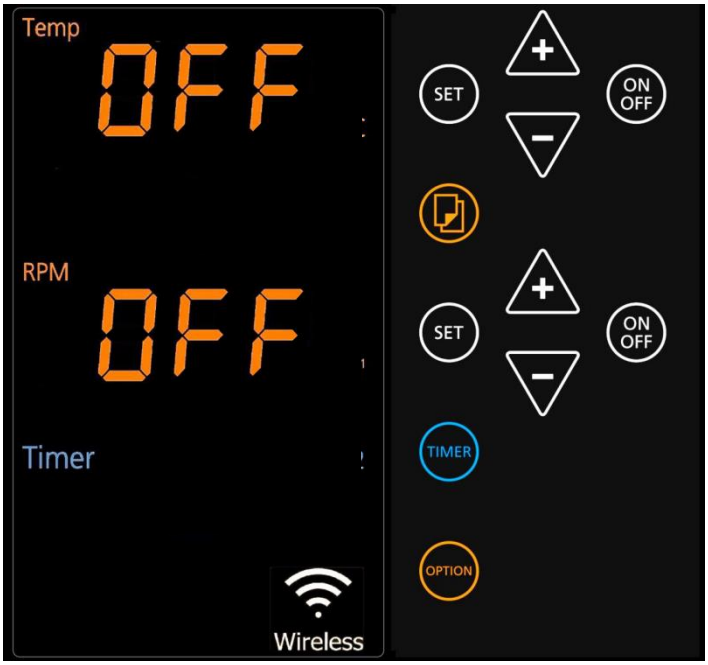
Both timers are programmed for the single change to stop the cultivating process (mode 3). In this case only the timer for the first phase (*Time 1*) is activated (see illustration on the left).

The equipment runs for 90 minutes (01:30 h) with a rotation speed of 150 min^{-1} at a temperature of 37,0 °C. The timer and the parameters for the second phase are turned off.
In this example also the wireless function is activated what is indicated by the sign *Wireless*.


Time 1 Setpoint
0 1:30
h
min
Timer


Temp
37.0
°C
RPM
150
min-1
Timer
Phase 1
Wireless
SET
ON OFF
SET
ON OFF
TIMER
OPTION


Time 2 Setpoint
OFF
h
min
Timer


Temp
OFF
RPM
OFF
Timer
Wireless
SET
ON OFF
SET
ON OFF
TIMER
OPTION

7.5.2 Mode 1: Cyclic Change between Different Parameter Settings

Programming

Procedure

1. Tap the **TIMER** key to start the timer function.

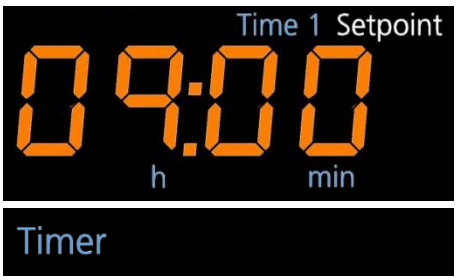
If the first timer (*Time 1*) is deactivated, the message *OFF* appears on the upper alphanumeric display.
Otherwise the information shown in the next step (step 2) appears on the display.
In the separate timer display area the sign *Timer* is lit up.

INFORMATION

Possibly the message *OFF* for the second timer (*Time 2*) appears on the lower alphanumeric display. Then the **TIMER** key needs to be tapped again to get to the first timer (*Time 1*).

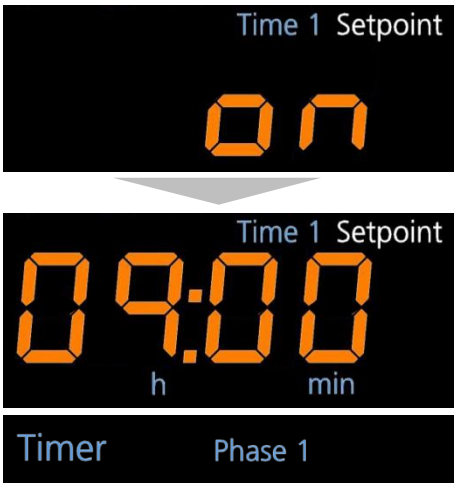
2. Tap the **SET** key in the upper setting key area.

In the upper display area the blue sign *Time 1* and the white sign *Setpoint* are lit up.
On the alphanumeric display appears the time entered last or 00:00 if no time had been entered.
In the separate timer display area the sign *Timer* is lit up.



3. Use the **Plus** or the **Minus** key in the upper setting key area to set the time for the first phase (*Time 1*).

On the upper alphanumeric display the time set is shown either in hours (*h*) and minutes (*min*) or in days (*days*) and hours (*h*).
According to the example shown in the schematic diagram 09 hours and 00 minutes are entered.
In the separate timer display area the sign *Timer* is lit up.

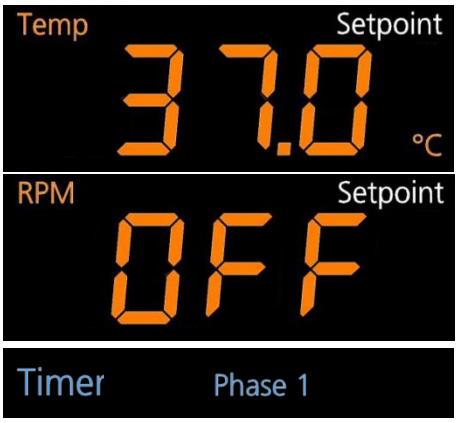


4. Tap the **ON/OFF** key in the upper setting key area to activate the timer (*Time 1*).

On the upper alphanumeric display the message *on* appears for a very short time and then the time entered is shown
In the separate timer display area the sign *Timer* is lit up and the sign *Phase 1* lights up for the first time.

INFORMATION

It is not possible to set the parameters for the first phase as long as the timer for the first phase has not been activated.



5. Tap the **Select** key to quit the timer setting.

In both display areas the first integral pair of parameters (*Temp* and *RPM*) appears with the last setpoint values entered or the message *OFF*.
In both display areas the white sign *Setpoint* is lit up.
In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

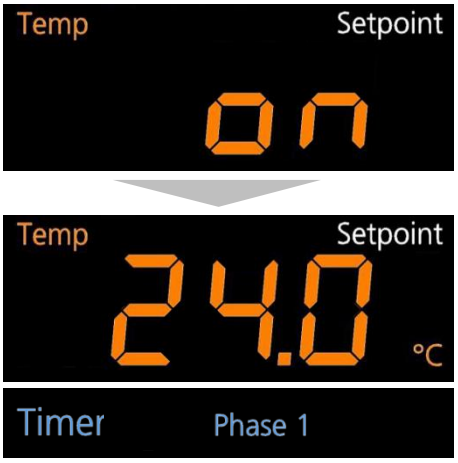
INFORMATION

In this phase of the programming process the sign *Setpoint* remains lit up and does not disappear after 10 seconds.

6. Tap the **Plus** or **Minus** key in the upper setting key area to set the desired setpoint value for the parameter temperature (*Temp*).

The new setpoint value for the temperature appears on the upper alphanumeric display.
In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

Operation



7. Tap the **ON/OFF** key in the upper setting key area to turn the parameter temperature on, if initially not a setpoint value was shown but the message *OFF*.

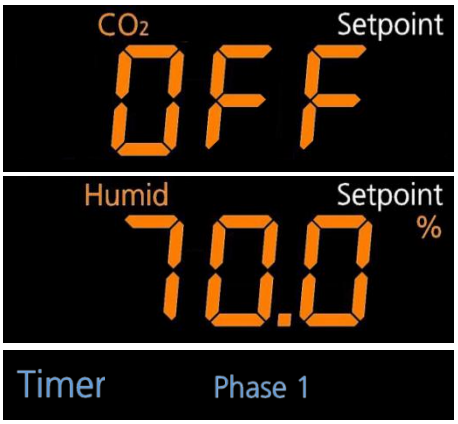
   On the upper alphanumeric display the message *on* appears for a very short time, then the setpoint value of the parameter temperature is shown.
   In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

8. Tap the **Plus** or **Minus** key in the lower setting key area to set the desired setpoint value for the parameter rotation speed (*RPM*).

   The new setpoint value for the rotation speed appears on the lower alphanumeric display.
   In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

9. Tap the **ON/OFF** key in the lower setting key area to turn the parameter rotation speed on, if initially not a setpoint value was shown but the message *OFF*.

   On the lower alphanumeric display the message *on* appears for a very short time, then the setpoint value of the parameter rotation speed is shown.
   In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

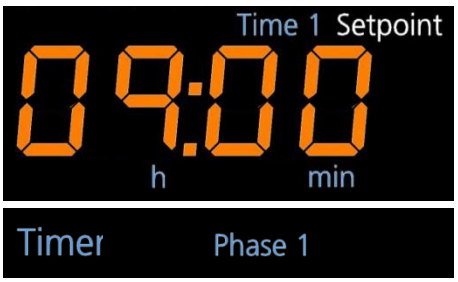


10. Tap the **Select** key to continue.

In both display areas the next pair of parameters (*CO_2* and *Humid*) – if installed as options – appears with the last set-point values entered or the message *OFF*.
In both display areas the white sign *Setpoint* is lit up.
In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

11. If applicable, repeat the steps 6. to 10. for the parameters CO_2-concentration and humidification (*CO_2* and *Humid*) and Illumination (*Light*).

12. Tap the **Select** key to continue.

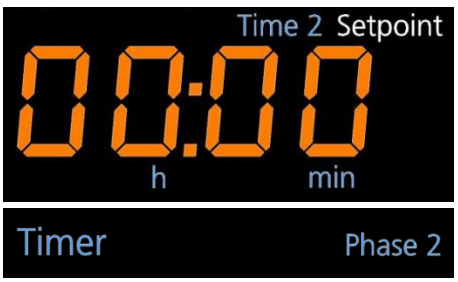


In the upper display area again the time entered for the first phase (*Time 1*) appears with the white sign *Setpoint*.
In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

INFORMATION

With the **Select** key the parameters and the time entered for the first phase can be selected and changed over and over again.

13. Tap the **TIMER** key to get to the time settings for the second phase (*Time2*).



In the lower display area the blue sign *Time 2* and the white sign *Setpoint* are lit up.
On the alphanumeric display appears the time entered last or 00:00 if no time had been entered.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

Operation

14. Use the **Plus** or the **Minus** key in the lower setting key area to set the time for the second phase (*Time 2*).

On the lower alphanumeric display the time set is shown either in hours (*h*) and minutes (*min*) or in days (*days*) and hours (*h*).
According to the example shown in the schematic diagram 12 hours and 00 minutes are entered.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

15. Tap the **ON/OFF** key in the lower setting key area to activate the timer (*Time 2*).

On the upper alphanumeric display the message *on* appears for a very short time and then the time entered is shown
In the separate timer display area the signs *Timer* and *Phase 2* are lit up and the symbol *cycle* lights up for the first time.

INFORMATION

It is not possible to activate the timer for the second phase as long as the timer for the first phase has not been activated.

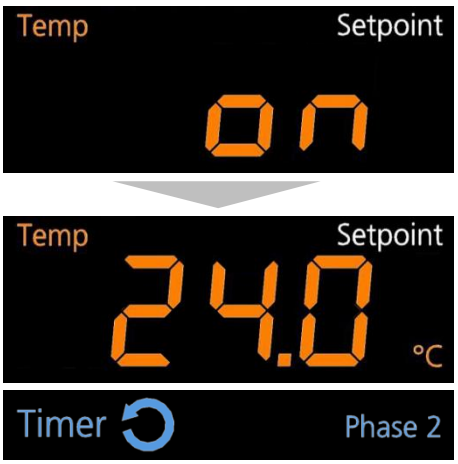
16. Tap the **Select** key to quit the timer setting.

In both display areas again the first integral pair of parameters (*Temp* and *RPM*) appears with the last setpoint values entered or the message *OFF*.
In both display areas the white sign *Setpoint* is lit up.
In the separate timer display area the signs *Timer* and *Phase 2* as well as the symbol *cycle* are lit up.

17. Tap the **Plus** or **Minus** key in the upper setting key area to set the desired setpoint value for the parameter temperature (*Temp*).

The new setpoint value for the temperature appears on the upper alphanumeric display.
In the separate timer display area the signs *Timer* and *Phase 2* as well as the symbol *cycle* are lit up.

18. Tap the **ON/OFF** key in the upper setting key area to turn the parameter temperature on, if initially not a setpoint value was shown but the message *OFF*.



On the upper alphanumeric display the message *on* appears for a very short time, then the setpoint value of the parameter temperature is shown.
In the separate timer display area the signs *Timer* and *Phase 2* as well as the symbol *cycle* are lit up.

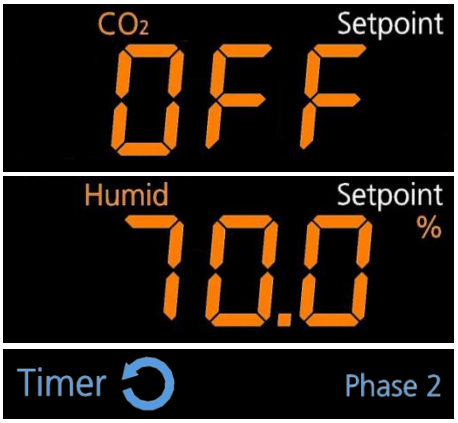
19. Tap the **Plus** or **Minus** key in the lower setting key area to set the desired setpoint value for the parameter rotation speed (*RPM*).

The new setpoint value for the rotation speed appears on the lower alphanumeric display.
In the separate timer display area the signs *Timer* and *Phase 2* as well as the symbol *cycle* are lit up.

Operation

20. Tap the **ON/OFF** key in the lower setting key area to turn the parameter rotation speed on, if initially not a setpoint value was shown but the message *OFF*.

On the lower alphanumeric display the message *on* appears for a very short time, then the setpoint value of the parameter rotation speed is shown.
In the separate timer display area the signs *Timer* and *Phase 2* as well as the symbol *cycle* are lit up.

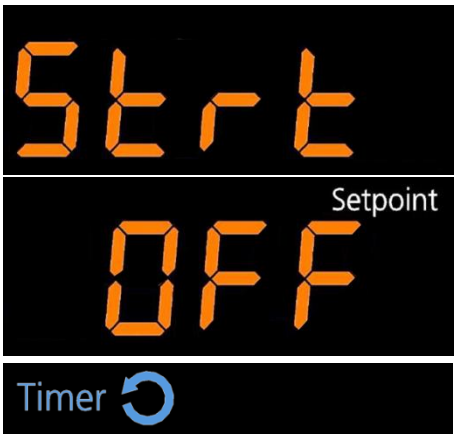


21. Tap the **Select** key to continue.

In both display areas the next pair of parameters (CO_2 and *Humid*) – if installed as options – appears with the last set-point values entered or the message *OFF*.
In both display areas the white sign *Setpoint* is lit up.
In the separate timer display area the signs *Timer* and *Phase 2* as well as the symbol *cycle* are lit up.

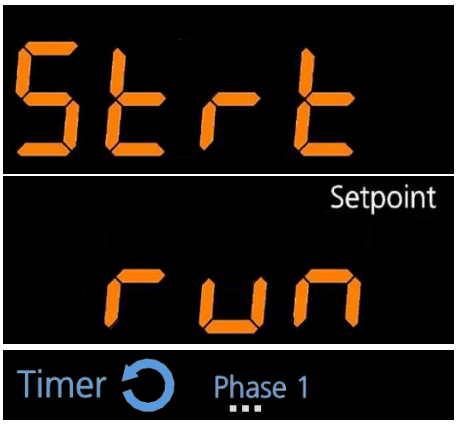
22. If applicable, repeat the steps 17. to 21. for the parameters CO_2 concentration and humidification (CO_2 and *Humid*) and Illumination (*Light*).

With the **Select** key the parameters and the time entered for the second phase can be selected and changed over and over again.



23. Tap the **TIMER** key when all settings for the second phase are correct.

On the alphanumeric displays the messages *Strt* (upper) and *OFF* (lower) appear. In the lower display area the white sign *Setpoint* is lit up. This means that the timer function can now be started.
In the separate timer display area the sign *Timer* and the symbol *cycle* are lit up.



24. Tap the **ON/OFF** key in the lower setting key area to start the timer function.

On the alphanumeric displays the messages *Strt* (upper) and *run* (lower) appear. In the lower display area the white sign *Setpoint* is lit up.
In the separate timer display area the sign *Timer* and the symbol *cycle* are lit up. The blue sign *Phase 1* is blinking, indicating that the timer function has started.

The display then changes to showing the remaining time of the first phase on the upper and the message *run* on the lower alphanumeric display.
In the separate timer display area the sign *Timer* and the symbol *cycle* are lit up. The sign *Phase 1* is blinking.

Operation

25. Tap the **Select** key to quit the timer programming mode.

If the **Select** key is not used, the display changes to the normal operating mode automatically after 60 seconds.

The displays now show the current values of the integral parameters temperature and rotation speed.

INFORMATION

As shown in the example on the left with the parameter temperature, some parameters need some time to reach the setpoint values. Until the setpoint is reached, the signs *High* or *Low* appear if the current value is higher or lower than the setpoint.

If other parameters are installed, the display shows the current values of each pair of parameters for 20 seconds.
In the separate timer display area the sign *Timer* and the symbol *cycle* are lit up. The sign *Phase 1* is blinking, indicating that the cultivating process is running.
After the first phase, the sign *Phase 2* is blinking

The cultivating process now runs with the alternating setpoint values of the first and the second phase until the equipment is stopped manually by turning the parameters off.

By turning the parameters off, also the timer function is deactivated, the sign *Timer* and the symbol *cycle* disappear.

INFORMATION

The timer function can at any time be deactivated separately or by turning off the first timer. When the first timer is turned off, also the second timer is deactivated and the cultivating process continues with the last active parameter setpoint values.

With the **TIMER** key it is at any time possible to get access to both timers and the parameters of each phase (see the separate chapters on this issue).

7.5.3 Mode 2: Single Change with Different Parameter Settings

Programming

Procedure

1. Tap the **TIMER** key to start the timer function.

If the first timer (*Time 1*) is deactivated, the message *OFF* appears on the upper alphanumeric display.
Otherwise the information shown in the next step (step 2.) appears on the display.
In the separate timer display area the sign *Timer* is lit up.

INFORMATION

Possibly the message *OFF* for the second timer (*Time 2*) appears on the lower alphanumeric display. Then the **TIMER** key needs to be tapped again to get to the first timer (*Time 1*).

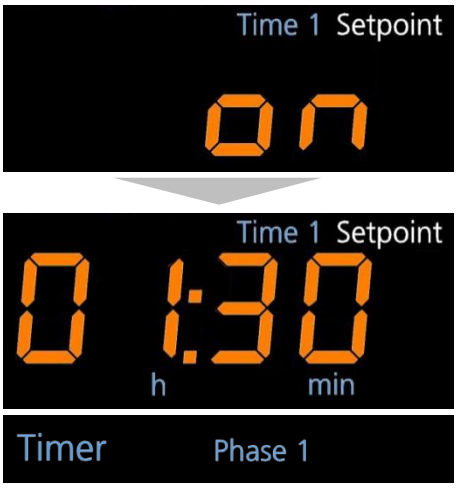
2. Tap the **SET** key in the upper setting key area.

In the upper display area the blue sign *Time 1* and the white sign *Setpoint* are lit up.
On the alphanumeric display appears the time entered last or 00:00 if no time had been entered.
In the separate timer display area the sign *Timer* is lit up.

3. Use the **Plus** or the **Minus** key in the upper setting key area to set the time for the first phase (*Time 1*).

On the upper alphanumeric display the time set is shown either in hours (*h*) and minutes (*min*) or in days (*days*) and hours (*h*).
According to the example shown in the schematic diagram 01 hour and 30 minutes are entered.
In the separate timer display area the sign *Timer* is lit up.

Operation

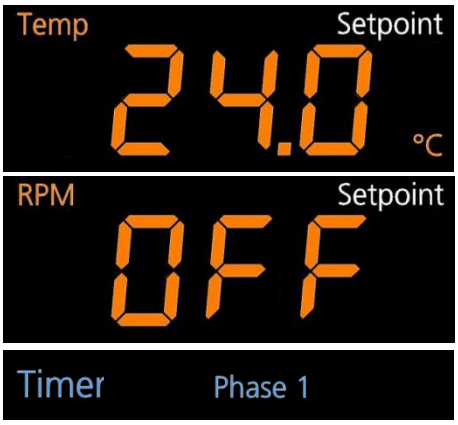


4. Tap the **ON/OFF** key in the upper setting key area to activate the timer (*Time 1*).

   On the upper alphanumeric display the message *on* appears for a very short time and then the time entered is shown
   In the separate timer display area the sign *Timer* is lit up and the sign *Phase 1* lights up for the first time.

INFORMATION

It is not possible to set the parameters for the first phase as long as the timer for the first phase has not been activated.



5. Tap the **Select** key to quit the timer setting.

   In both display areas the first integral pair of parameters (*Temp* and *RPM*) appears with the last setpoint values entered or the message *OFF*.
   In both display areas the white sign *Setpoint* is lit up.
   In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

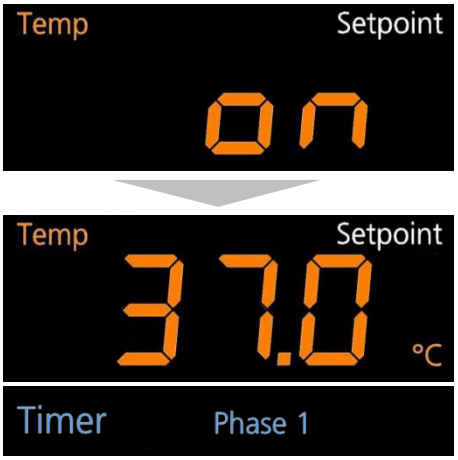
INFORMATION

In this phase of the programming process the sign *Setpoint* remains lit up and does not disappear after 10 seconds.

6. Tap the **Plus** or **Minus** key in the upper setting key area to set the desired setpoint value for the parameter temperature (*Temp*).

   The new setpoint value for the temperature appears on the upper alphanumeric display.
   In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

7. Tap the **ON/OFF** key in the upper setting key area to turn the parameter temperature on, if initially not a setpoint value was shown but the message *OFF*.



On the upper alphanumeric display the message *on* appears for a very short time, then the setpoint value of the parameter temperature is shown.
In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

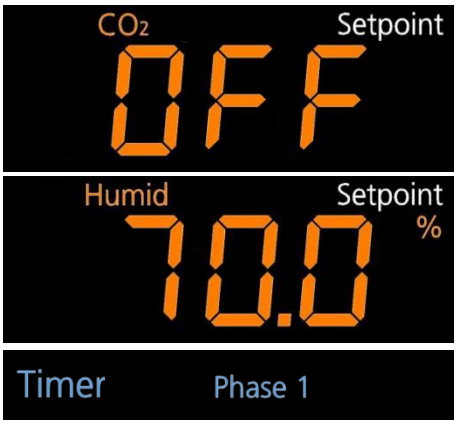
8. Tap the **Plus** or **Minus** key in the lower setting key area to set the desired setpoint value for the parameter rotation speed (*RPM*).

The new setpoint value for the rotation speed appears on the lower alphanumeric display.
In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

9. Tap the **ON/OFF** key in the lower setting key area to turn the parameter rotation speed on, if initially not a setpoint value was shown but the message *OFF*.

On the lower alphanumeric display the message *on* appears for a very short time, then the setpoint value of the parameter rotation speed is shown.
In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

Operation

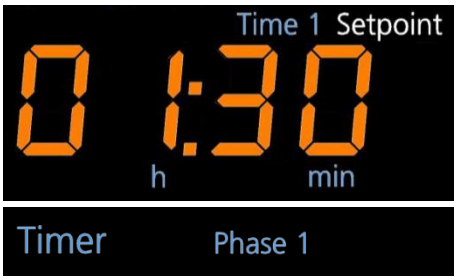


10. Tap the **Select** key to continue.

In both display areas the next pair of parameters (CO_2 and *Humid*) – if installed as options – appears with the last set-point values entered or the message *OFF*.
In both display areas the white sign *Setpoint* is lit up.
In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

11. If applicable, repeat the steps 6. to 10. for the parameters CO_2 concentration and humidification (CO_2 and *Humid*) and Illumination (*Light*).

12. Tap the **Select** key to continue.

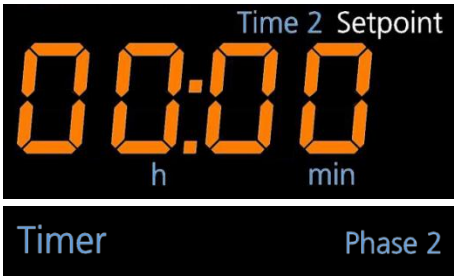


In the upper display area again the time entered for the first phase (*Time 1*) appears with the white sign *Setpoint*.
In the separate timer display area the signs *Timer* and *Phase 1* are lit up.

INFORMATION

With the **Select** key the parameters and the time entered for the first phase can be selected and changed over and over again.

13. Tap the **TIMER** key to get to the time settings for the second phase (*Time 2*).



In the lower display area the blue sign *Time 2* and the white sign *Setpoint* are lit up.
On the alphanumeric display appears the time entered last or 00:00 if no time had been entered.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

14. Make sure the second timer is turned off. If not, use the **ON/OFF** key in the lower setting key area to turn the timer (*Time 2*) off.

On the lower alphanumeric display the message **OFF** appears.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

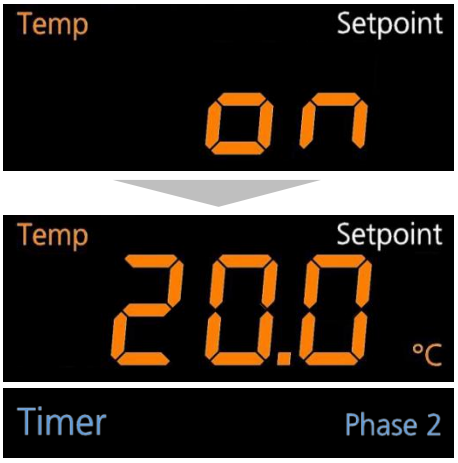
15. Tap the **Select** key to quit the timer setting.

In both display areas again the first integral pair of parameters (*Temp* and *RPM*) appears with the last setpoint values entered or the message *OFF*.
In both display areas the white sign *Setpoint* is lit up.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

16. Tap the **Plus** or **Minus** key in the upper setting key area to set the desired setpoint value for the parameter temperature (*Temp*).

The new setpoint value for the temperature appears on the upper alphanumeric display.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

Operation



17. Tap the **ON/OFF** key in the upper setting key area to turn the parameter temperature on, if initially not a setpoint value was shown but the message *OFF*.

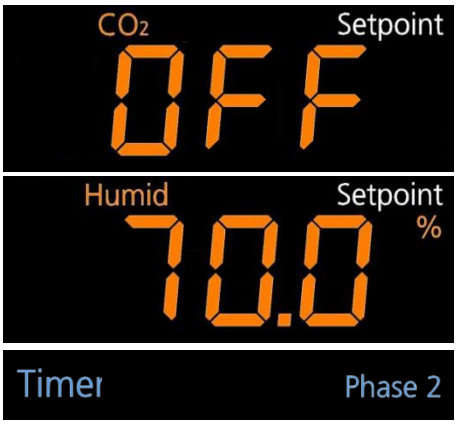
On the upper alphanumeric display the message *on* appears for a very short time, then the setpoint value of the parameter temperature is shown.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

18. Tap the **Plus** or **Minus** key in the lower setting key area to set the desired setpoint value for the parameter rotation speed (*RPM*).

The new setpoint value for the rotation speed appears on the lower alphanumeric display.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

19. Tap the **ON/OFF** key in the lower setting key area to turn the parameter rotation speed on, if initially not a setpoint value was shown but the message *OFF*.

On the lower alphanumeric display the message *on* appears for a very short time, then the setpoint value of the parameter rotation speed is shown.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.



20. Tap the **Select** key to continue.

In both display areas the next pair of parameters (*CO_2* and *Humid*) – if installed as options – appears with the last set-point values entered or the message *OFF*.
In both display areas the white sign *Setpoint* is lit up.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

21. If applicable, repeat the steps 16. to 20. for the parameters CO_2 concentration and humidification (*CO_2* and *Humid*) and Illumination (*Light*).

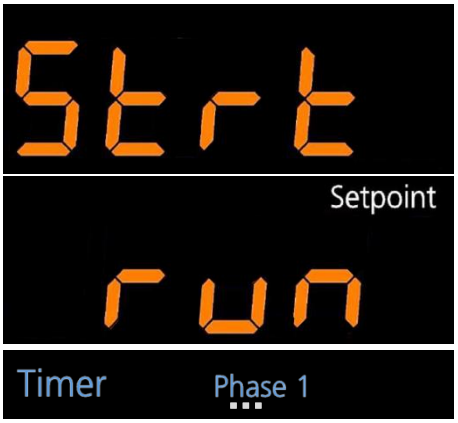
With the **Select** key the parameters and the time entered for the second phase can be selected and changed over and over again.

22. Tap the **TIMER** key when all settings for the second phase are correct.

On the alphanumeric displays the messages *Strt* (upper) and *OFF* (lower) appear. In the lower display area the white sign *Setpoint* is lit up. This means that the timer function can now be started.
In the separate timer display area the sign *Timer* is lit up.

Operation

23. Tap the **ON/OFF** key in the lower setting key area to start the timer function in mode 2 (single change with different parameter settings).



On the alphanumeric displays the messages *Strt* (upper) and *run* (lower) appear. In the lower display area the white sign *Setpoint* is lit up.
In the separate timer display area the sign *Timer* is lit up. The blue sign *Phase 1* is blinking, indicating that the timer function has started.

The display then changes to showing the remaining time of the first phase on the upper and the message *run* on the lower alphanumeric display.
In the separate timer display area the sign *Timer* is lit up. The sign *Phase 1* is blinking.

24. Tap the **Select** key to quit the timer programming mode.

If the **Select** key is not used, the display changes to the normal operating mode automatically after 60 seconds.

The displays now show the current values of the integral parameters temperature and rotation speed.
In the separate timer display area the sign *Timer* is lit up. The sign *Phase 1* is blinking, indicating that the cultivating process is running.

If other parameters are installed, the display shows the current values of each pair of parameters for 20 seconds.

The cultivating process now runs with the parameter setpoint values for the first phase, until the time entered for the first timer (*Time 1*) has lapsed.

After the time for the first phase has lapsed, the message *End* appears on the lower alphanumeric display. This message alternates every 20 seconds with the current values of the parameters for the second phase.
In the separate timer display area the sign *Timer* is still lit up, but there is no sign *Phase 2* blinking.
In addition, there is an acoustic alarm every 60 seconds.

The cultivating process now runs with the setpoint values of the second phase until the equipment is stopped manually by turning the parameters off.

If the alarm is confirmed by tapping the **TIMER** key, the acoustic alarm stops, the message *End* does not appear anymore and the sign *Timer* disappears.
Therefore, it will not be visible that initially the equipment ran in a programmed timer mode.

INFORMATION

The timer function can at any time be deactivated separately or by turning off the first timer. When the first timer is turned off, also the second timer is deactivated and the cultivating process continues with the last active parameter setpoint values.

With the **TIMER** key it is at any time possible to get access to both timers and the parameters of each phase (see the separate chapters on this issue).

7.5.4 Mode 3: Single Change to Stop the Process

Programming

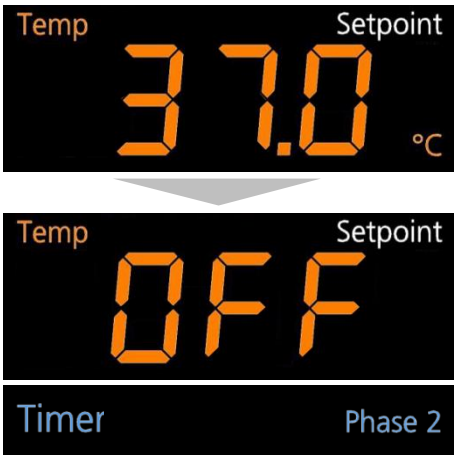
Procedure

1. to 14. Proceed according to the procedure specified for **mode 2**.

15. Tap the **Select** key to quit the timer setting.

In both display areas again the first integral pair of parameters (*Temp* and *RPM*) appears with the last setpoint values entered or the message *OFF*.
In both display areas the white sign *Setpoint* is lit up.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

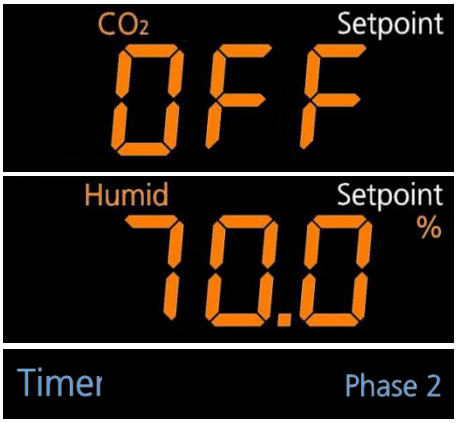
16. Tap the **ON/OFF** key in the upper setting key area to turn the parameter temperature off, if initially a setpoint value was shown but not the message *OFF*.



On the upper alphanumeric display the message *OFF* appears.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

17. Tap the **ON/OFF** key in the lower setting key area to turn the parameter rotation speed off, if initially a setpoint value was shown but not the message *OFF*.

On the lower alphanumeric display the message *OFF* appears.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.



18. Tap the **Select** key to continue.

In both display areas the next pair of parameters (*CO_2* and *Humid*) – if installed as options – appears with the last setpoint values entered or the message *OFF*.
In both display areas the white sign *Setpoint* is lit up.
In the separate timer display area the signs *Timer* and *Phase 2* are lit up.

19. If applicable, repeat the steps 16. to 18. for the parameters CO_2 concentration and humidification (*CO_2* and *Humid*) and Illumination (*Light*).

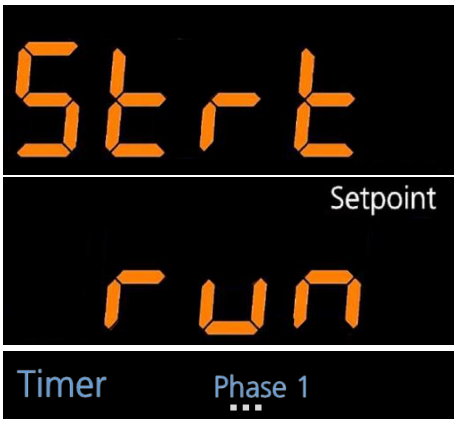
With the **Select** key the parameters and the time entered for the second phase can be selected and changed over and over again.

Operation

20. Tap the **TIMER** key to continue.

On the alphanumeric displays the messages *Strt* (upper) and *OFF* (lower) appear. In the lower display area the white sign *Setpoint* is lit up. This means that the timer function can now be started.
In the separate timer display area the sign *Timer* is lit up.

21. Tap the **ON/OFF** key in the lower setting display area to start the timer function.



On the alphanumeric displays the messages *Strt* (upper) and *run* (lower) appear. In the lower display area the white sign *Setpoint* is lit up.
In the separate timer display area the sign *Timer* is lit up. The blue sign *Phase 1* is blinking, indicating that the timer function has started.

The display then changes to showing the remaining time of the first phase on the upper and the message *run* on the lower alphanumeric display.
In the separate timer display area the sign *Timer* is lit up. The sign *Phase 1* is blinking.

22. Tap the **Select** key to quit the timer programming mode.

If the **Select** key is not used, the display changes to the normal operating mode automatically after 60 seconds.

The displays now show the current values of the integral parameters temperature and rotation speed.
In the separate timer display area the sign *Timer* is lit up. The sign *Phase 1* is blinking, indicating that the cultivating process is running.

If other parameters are installed, the display shows the current values of each pair of parameters for 20 seconds.

The cultivating process now runs with the parameter setpoint values for the first phase, until the time entered for the first timer (*Time 1*) has lapsed.

After the time for the first phase has lapsed, the message *End* appears on the lower alphanumeric display. This message alternates every 20 seconds with the current values of the pa-rameters for the second phase.
In the separate timer display area the sign *Timer* is still lit up, but there is no sign *Phase 2* blinking.
In addition, there is an acoustic alarm every 60 seconds.

If the alarm is confirmed by tapping the **TIMER** key, the acoustic alarm stops, the message *End* does not appear anymore and the sign *Timer* disappears. The cultivating process is stopped and the timer function has been deactivated.

INFORMATION

The timer function can at any time be deactivated separately or by turning off the first timer. When the first timer is turned off, also the second timer is deactivated and the cultivating process continues with the last active parameter setpoint values.

With the **TIMER** key it is at any time possible to get access to both timers and the parameters of each phase (see the separate chapters on this issue).

7.5.5 Calling Up Parameter Setpoint Values during Activated Timer Function

Especially during a long cultivating process in the cycle mode, there might be the need for calling up the parameter setpoint values from time to time.

Variant A: Current Values of the Active Phase

Procedure

1. Tab the **Select** key to select the specific parameter.

In the two display areas the parameters appear with their current values.
In this example the parameter temperature with 37 °C is shown.

2. Tap the **SET** key in the upper or rather lower setting key area.

On the according alphanumeric display the setpoint value of this parameter appears.
In this example the parameter temperature with a setpoint value of 37 °C is shown.

3. Tap the **SET** key to return to the normal operating mode of the display or wait 10 seconds until the sign *Setpoint* disappears.

The display then shows the current values of the parameters again.

Variant B: Setpoint Values for Both Phases

Procedure

1. Tap the **TIMER** key to select the timer function.

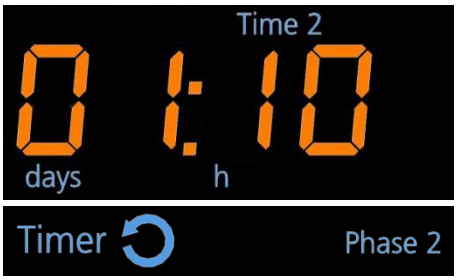
On the upper alphanumeric display the remaining time of the active phase appears on the lower the message *run*. In the lower display area also the sign *Setpoint* is lit up.
In the separate timer display area the sign *Timer* and maybe the symbol *cycle* as well as the sign of the active phase (*Phase 1* or *Phase 2*) are lit up.

2. Tap the **TIMER** key again to get into the programming mode of the timer.

On the upper alphanumeric display the time entered for the first phase (*Time 1*) is shown.
In the separate timer display area the sign *Timer* and maybe the symbol *cycle* as well as the sign of the phase shown (*Phase 1*) are lit up. Maybe the sign for the other phase is blinking if this phase is active.

3. Tap the **Select** key to select the desired pair of parameters for the first phase (*Phase 1*).

On both alphanumeric displays the selected pair of parameters appears with the setpoint values, as indicated by the sign *Setpoint*.
In the separate timer display area the sign *Timer* and maybe the symbol *cycle* as well as the sign of the phase shown (*Phase 1*) are lit up. Maybe the sign for the other phase is blinking if this phase is active.



4. Tap the **TIMER** key to get to the parameters of the second phase.

On the lower alphanumeric display the time entered for the second phase (*Time 2*) is shown.
In the separate timer display area the sign *Timer* and maybe the symbol *cycle* as well as the sign of the phase shown (*Phase 2*) are lit up. Maybe the sign for the other phase is blinking if this phase is active.

5. Tap the **Select** key to select the desired pair of parameters for the second phase (*Phase 2*).

On both alphanumeric displays the selected pair of parameters appears with the setpoint values, as indicated by the sign *Setpoint*.
In the separate timer display area the sign *Timer* and maybe the symbol *cycle* as well as the sign of the phase shown (*Phase 2*) are lit up. Maybe the sign for the other phase is blinking if this phase is active.

6. Tap the **TIMER** key to end this procedure.

On the upper alphanumeric display the remaining time of the active phase appears on the lower the message *run*, which indicates that the cultivating process is running. In the lower display area also the sign *Setpoint* is lit up.
In the separate timer display area the sign *Timer* and maybe the symbol *cycle* are lit up. The sign of the active phase (*Phase 1* or *Phase 2*) is blinking.

After 60 seconds the display returns to the normal operating mode and shows the current values of the parameters. This step can be shortened by tapping the **Select** key.

Information when Timer Function is Activated

Example temperature and rotation speed

During a cultivating process which runs with programmed time intervals the following information appears on the two alphanumeric displays:

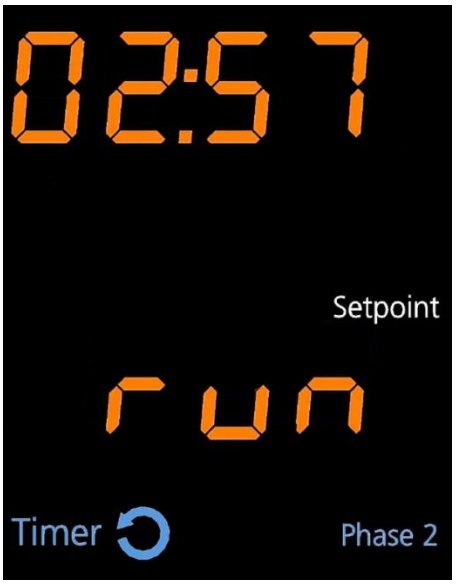
- Current value of the activated parameters (each pair of parameters for 20 seconds)

or

- the message *OFF* for all installed but not activated parameters

  For parameters of a pair which are not installed the upper or the lower display area remains black.

Additional information is provided by tapping the following keys:



- Remaining time of the active phase (1x **TIMER**)

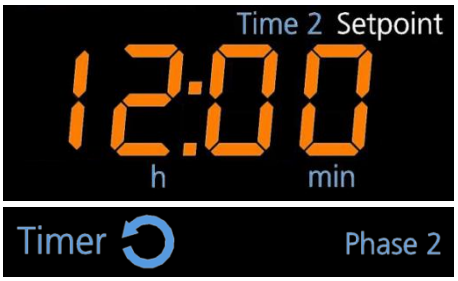
If the **TIMER** key is tapped once, the remaining time of the active phase (in this case *Phase 2*) is shown on the upper alphanumeric display.

Operation

- Programmed time interval of the <u>first</u> phase (2x **TIMER**)

That a setpoint value is shown is indicated by the sign *Setpoint*.

The phase (in this case *Phase 1*) for which the setpoint values are given is shown in the separate timer display area.



- Programmed time interval of the <u>second</u> phase (3x **TIMER**)

That a setpoint value is shown is indicated by the sign *Setpoint.*

The phase (in this case *Phase 2*) for which the setpoint values are given is shown in the separate timer display area.

- Parameter setpoints for <u>1st</u> phase
  (2x **TIMER** then **Select**)

That a setpoint value is shown is indicated by the sign *Setpoint*.

The phase (in this case *Phase 1*) for which the setpoint values are given is shown in the separate timer display area.

- Parameter setpoints for <u>2nd</u> phase
  (3x **TIMER** then **Select**)

That a setpoint value is shown is indicated by the sign *Setpoint*.

The phase (in this case *Phase 2*) for which the setpoint values are given is shown in the separate timer display area.

7.5.6 Changing Timer Settings during Activated Timer Function

If it is required to change the duration of the time intervals, both timers can be reprogrammed. To change the setting of the timers proceed as follows:

Procedure

oder

1. Tap the **TIMER** key to enter the timer programming mode.

On the upper alphanumeric display the remaining time of the active phase appears on the lower the message *run*, which indicates that the cultivating process is running. In the lower display area also the sign *Setpoint* is lit up.

In the separate timer display area the sign *Timer* and maybe the symbol *cycle* are lit up The sign of the active phase (*Phase 1* or *Phase 2*) is blinking.

oder

2. Tap the **TIMER** key again.

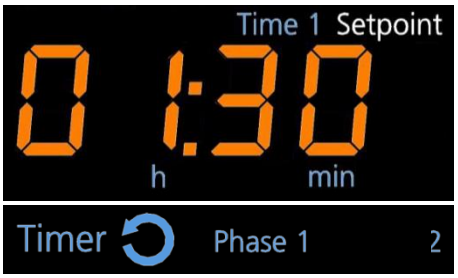
The display then shows the time that has been entered for the first phase (*Time 1*).

In the upper display area the blue sign *Time 1* and the white sign *Setpoint* are lit up.

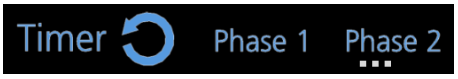
On the alphanumeric display the setpoint value last entered for the time interval of the first phase is shown.

In the separate timer display area the sign *Timer* and maybe the symbol *cycle* are lit up. The sign of the phase for which the time interval can be changed is not blinking anymore. But happens this phase not to be the active phase, then also the sign of the active phase is shown but blinking. In the example shown at the bottom on the left, the second phase is active, while the time for the first phase is being changed.

Operation



oder



3. Use the **Plus** or the **Minus** key in the upper setting key area to set the time for the first phase (*Time 1*).

On the upper alphanumeric display the newly set time is shown either in hours (*h*) and minutes (*min*) or in days (*days*) and hours (*h*).

4. Tap the **TIMER** key to get to the time settings for the second phase (*Time2*).

INFORMATION

Do not tap the **ON/OFF** key after changing the timer setting, as this would turn off the timer immediately.
If this happens in the cycle mode with the timer for the first phase, also the timer for the second phase is deactivated. And if accidentally the second timer is turned off, it cannot be activated again.

oder

On the lower alphanumeric display the time set for the second phase (*Time 2*) is shown either in hours (*h*) and minutes (*min*) or in days (*days*) and hours (*h*).
In the separate timer display area the sign *Timer* and maybe the symbol *cycle* are lit up.
The sign of the phase for which the time interval can be changed is not blinking anymore. But happens this phase not to be the active phase, then also the sign of the active phase is shown but blinking.

5. If required, tap the **Plus** or the **Minus** key to change the time setting for the second phase.

On the lower alphanumeric display the newly set time is shown either in hours (*h*) and minutes (*min*) or in days (*days*) and hours (*h*).

6. Tap the **TIMER** key again to quit the programming mode of the timer.

On the upper alphanumeric display the remaining time of the active phase appears on the lower the message *run*. In the lower display area also the sign *Setpoint* is lit up.

7. Tap the **Select** key return to the normal operating mode of the display.

Extending a Time Interval to a Certain Duration

If it is required to extend a time interval to a new total time, so the difference to the previous time must be entered while considering the remaining time of the interval.

Example:

For a time interval (*Phase 1* or *Phase 2*) a time of 10 hours had been entered. It should now be extended by 4 hours to a total time of 14 hours after a time of 8 hours has lapsed (remaining time 2 hours). In this case a time of 6 hours must be entered.

14 h - 10 h = 4 h + 2 h (remaining time) = 6 h

7.5.7 Changing Parameter Setpoint Values during Activated Timer Function

Especially during long cultivating processes in the cycle mode it might be required to change the parameter settings after a certain time.

Parameters of the Active Phase

or (in the cycle mode)

Which phase is active is indicated by the blinking of the symbol *Phase 1* or *Phase 2* in the separate timer display area.

To change the setpoint values of the parameters of the active phase proceed as follows:

Procedure

1. Select the desired pair of parameters by tapping the **Select** key – if necessary several times.

In the two alphanumeric display areas the selected pair of parameters appears. In this example only the parameter temperature (*Temp*) in the upper display area is shown.
In the separate timer display area the sign *Timer* is lit up and the one of the active phase is blinking. And maybe the symbol *cycle* is lit up – as shown in this example.

2. Tap the **SET** key in the upper or lower operation key area.

In the according display area the white sign *Setpoint* is lit up, which indicates that a new setpoint value can be entered.
In the separate timer display area the sign *Timer* is lit up and the one of the active phase is blinking. Maybe the symbol *cycle* is lit up.

3. Tap the **Plus** or **Minus** key in the according setting key area to set the new setpoint value.

The new setpoint value for the parameter appears on the according alphanumeric display.
In the separate timer display area the sign *Timer* is lit up and the one of the active phase is blinking. Maybe the symbol *cycle* is lit up.

4. Tap the **Select** key to quit the parameter setting mode.

The display returns to the normal operating mode and shows the current values of the parameters.

Parameters of any Phase

Procedure

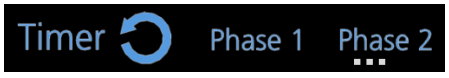
1. Use the **TIMER** key to select the desired phase.

After taping the **TIMER** key once, the remaining time of the active phase appears with the message *run*.

After tapping the **TIMER** key twice, the time entered for the first phase (*Time 1*) appears.

After tapping the **TIMER** key three times, the time entered for the second phase (Time 2) appears.

or



The chosen phase is indicated by the sign *Phase 1* or *Phase 2* which is not blinking anymore.
The sign of the phase for which the parameters can be set is not blinking anymore. But if this phase is not the active phase, then in addition the sign of the active phase is blinking. In the example on the left (bottom) the second phase is active while the parameters for the first phase can be changed.

2. Use the **Select** key to select the desired parameters within the phase chosen.

In the upper or lower display area (here the example rotation speed in the lower one) the previously entered setpoint value is shown. In the upper right-hand corner the sign *Setpoint* is lit up.
In the separate timer display area the sign *Timer* and maybe the symbol *cycle* are lit up. The sign of the phase for which the parameters can be changed is lit up. In this case this is the second phase (*Phase 2*) which is also the active one.

3. Tap the **Plus** or **Minus** key in the according setting key area to set the new setpoint value.

Operation

The new setpoint value for the parameter appears on the according alphanumeric display.
In the separate timer display area the sign *Timer* and maybe the symbol *cycle* are lit up. The sign of the phase for which the parameters can be changed is lit up. In this case this is the second phase (*Phase 2*) which is also the active one.

INFORMATION

As the parameters already had been used for the cultivating process, it is usually not required to activate them after the new setpoint values have been entered.

4. Use the **Select** key to get to the next pair of parameters or quit the parameter setting mode with the **TIMER** key.

   If the parameter setting mode is left in the first phase, the **TIMER** key must be tapped twice to get to the display of the remaining time of the active phase and the message *run*.

5. Tap the **Select** key to return to the normal operation mode of the display.

7.5.8 Stoping the Timer Function

If required, the timer function can be stopped at any time. There are three different ways to do this.

- To turn off the timer function.
- To turn off the first timer (*Time 1*).
- To turn off all parameters.

Turning Off the Timer Function

Procedure

1. Tap the **TIMER** key to select the timer function.

   On the upper alphanumeric display the remaining time of the active phase (here *Phase 2*) appears on the lower the message *run*. In the lower display area also the sign *Setpoint* is lit up.
   In the separate timer display area the sign *Timer* and maybe the symbol *cycle* as well as the sign of the active phase (*Phase 1* or *Phase 2*) are lit up.

2. Tap the **ON/OFF** key in the lower operating key are to turn the timer function off.

   On the alphanumeric displays the messages *Strt* (upper) and *OFF* (lower) appear. In the lower display area the white sign *Setpoint* is lit up.
   In the separate timer display area the sign *Timer* and maybe the symbol *cycle* are lit up.

3. Tap the **Select** key to quit the timer programming mode.

   The display returns to the normal operating mode and in the separate timer display area all signs and symbols have disappeared.

Turning Off the First Timer

If both timers are activated, it is sufficient to turn off the first timer (*Time 1*) to stop the timer function, because the second timer (*Time 2*) is then turned off automatically.

If there is only one timer (*Time 1*) is activated, only this one can be turned off, because the second timer (*Time 2*) cannot be activated, if the first timer is turned off.

The procedure to turn off the first timer is almost identical to the procedure to change the time setting for first timer when the timer function is activated. Therefore, only the individual steps are mentioned here.

Procedure

1. Tap the **TIMER**-key twice.

   The display then shows the time that has been entered for the first phase (*Time 1*). In the upper display area the blue sign *Time 1* and the white sign *Setpoint* are lit up.

2. Tap the **ON/OFF** key to turn the timer for the first phase off.

   On the upper alphanumeric display the message *OFF* appears.

3. Tap the **Select** key to quit the timer programming mode.

   The display returns to the normal operating mode and in the separate timer display area all signs and symbols have disappeared.

Turning Off the Second Timer

In the cycle mode, for which both timers must be activated, it is possible to turn off the second timer (*Time 2*).

The procedure is identical with the one for the first timer, except that the **TIMER** key needs to be tapped three times.

The cultivating process is then continued with the parameter setpoint values of the active phase. If the process should be continued with the setpoint values of the first phase (*Time 1*), one must wait until *Phase 1* is active.

INFORMATION

In the cycle mode it is possible to turn off the second timer (*Time 2*) but it cannot be turned on again.

The function is not deactivated by opening the door or by an interruption in the power supply.

7.6 User Mode (Option Function)

The user mode controlled using the *Option* function makes it possible to change the equipment settings. To open the equipment's user mode, proceed as follows:

Procedure

1. Tap the **OPTION** key for at least 2 seconds.

On the top display, the *OPt* message appears with the signs *Setpoint* and *High.* User mode is thus activated and the desired settings can be made.

Tapping the **OPTION** key again lets you switch to the next function. If no key is tapped for 60 seconds, the display returns to normal operating mode. If all functions are clicked through, the equipment also returns to normal operating mode.

INFORMATION

The upper and lower limits for the setpoints of the parameters can only be set within the factory-set values.

The following chapters explain the individual functions.

7.6.1 Setting the Upper Limit for the Rotation Speed

Top display: *OPt*, *Setpoint* and *High*
Bottom display: *RPM*

The maximum rotation speed that can be entered as a setpoint can be restricted. To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **Plus** or **Minus** key to set the desired value.

Default value: 400 min^{1}

INFORMATION

If the setpoint for the rotation speed is limited in the user mode of the equipment and an attempt is made to enter higher value, the message *bloc* appears.

7.6.2 Setting the Upper Limit for the Temperature

Top display: *OPt*, *Temp*, *Setpoint* and *High*

The maximum temperature that can be entered as a setpoint can be restricted. To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **Plus** or **Minus** key to set the desired maximum temperature.

Default value: 65 °C

7.6.3 Setting the Lower Limit for the Temperature

Top display: *OPt*, *Temp*, *Setpoint* and *Low*

The minimum temperature that can be entered as a setpoint can be restricted. To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **Plus** or **Minus** key to set the desired minimum temperature.

Default value: 4.0 °C

7.6.4 Setting the Brake Force for Halting the Table

Top display: *OPt*
Bottom display: *br. 0-3*

The brake force with which shaking operation is stopped when the door is opened can be set in four levels. To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **Plus** or **Minus** key to set the desired brake force.

The levels *br. 0* to *br. 3* have the following meaning:

- At brake force level **0** the table is stopped by reducing the speed very slowly to preserve the cultures.
- At brake force level **1** the table is also controlled but stopped a little less slowly.
- At brake force level **2** a passive brake is activated by switching off the motor. This setting is selected as the default when the equipment is delivered.
- At brake force level **3** the motor is short-circuited to stop the table as quickly as possible.

7.6.5 Activating or Deactivating the Key Pad Lock (with a PIN)

Top display: *OPt* and *PIN*

To prevent unauthorised persons making entries on the operating panel, the key pad can be locked using a PIN. To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **ON/OFF** key to activate or deactivate the key pad lock.

If the key pad lock has been activated, you can then tap the **OPTION** key followed by the **SET** key to enter a PIN (number between 0 and 9999). Once the PIN has been entered, this must be confirmed using the **ON/OFF** key (the message *PIN OK* appears on the top display).

INFORMATION

By entering the number “1756” (Super PIN), the PIN is deactivated and set to zero.

7.6.6 Activating or Deactivating the Key Tone

Top display: *bEEP*

The key tone (clicking sound when tapping a key) can be activated or deactivated. To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **ON/OFF** key to activate or deactivate the key tone.

7.6.7 Setting the Interior Lighting

Top display: *OPT* and *Light*

The behaviour of the interior lighting can be set.
To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **ON/OFF** key to select the desired behaviour.

The following settings are possible:

- *Auto*: The light is activated by tapping any key. After 20 seconds, the light turns off again automatically.
- *OFF*: Interior lighting is deactivated permanently.

7.6.8 Activating or Deactivating the Timer Function

Top display: *OPt* and *Time 1*

The timer function can be activated or deactivated. To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **ON/OFF** key to activate or deactivate the timer function. If the timer functions is set to *OFF*, it can no longer be selected by using the **TIMER** key.

7.6.9 Selecting the Communication Type for the Wireless Function

Top display: *OPt*, *EXTERN* and *Wireless*

The properties of the wireless function can be set. To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **ON/OFF** key to select the desired setting.

The following settings are possible:

- *Auto:* Send and receive data, i.e. information from the equipment can be recorded but commands can also be sent to the equipment (e.g. changes to the parameters).
- *on:* Only receive data, i.e. only data from the equipment can be recorded.
- *OFF:* The wireless function is deactivated; no communication can take place.

7.6.10 Entering the PAIN ID (Wireless Function)

Top display: *PAn*, *EXTERN* and *Wireless*

The PAN coordinator uses the PAN ID (identification of the Personal Area Network) to define the network. The pre-set PAN ID is 4193, which can be changed if necessary. To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **Plus** or **Minus** key to set the desired PAN ID (0000 to 9999). To save the entry, it must be confirmed using the **ON/OFF** key.

INFORMATION

We recommend changing the PAN ID. Make sure the same PAN ID is set for all equipment in the network.

7.6.11 Choosing the Channel for the Wireless Function

Top display: *CHAn*, *EXTERN* and *Wireless*

If necessary, the channel for the wireless function can be changed. To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **Plus** or **Minus** key to set the desired channel (11-36).

Default value: 20

7.6.12 Setting the Height Above Sea Level (Altimeter)

Top display: *ALti* and *CO_2*

The digital CO_2 sensor GMP251 is pressure-dependent. To achieve precise measuring results, the altitude of the equipment's location can be entered. To do so, tap the **SET** key (the sign *Setpoint* appears) and then use the **Plus** or **Minus** key to set the altitude in meters.

Default value: 0

7.6.13 Activating or Deactivating the Door Alarm

Top display: *doAL*

The equipment has a door alarm. This is triggered if the door is left open for too long. To activate or deactivate the door alarm, tap the **SET** key (the sign *Setpoint* appears) and then use the **ON/OFF** key.

The time after which the alarm is triggered can be set. To do so, tap the **SET** key again (the sign *Setpoint* appears) and then use the **Plus** or **Minus** key to set the desired time period (1-10 minutes).

7.7 Stopping the Cultivation Process and Switching Off the Equipment

7.7.1 Stopping the Cultivation Process

To stop the cultivation process, all existing parameters must be deactivated by tapping the **SET** key immediately followed by the **ON/OFF** key.

You must make sure that, in addition to the rotation speed, parameters that are not visible such as temperature, humidification or CO_2 gassing are also switched off.

ATTENTION

If a cultivation process is stopped by merely flicking the main switch, all activated parameters are stored and are automatically activated when the equipment is switched on.
If the parameter “Rotation speed” (*RPM*) is still activated, the equipment starts immediately.

7.7.2 Switching Off the Equipment

The equipment may only be switched off via the main switch when it is ensured that all parameters are deactivated.

ATTENTION

To avoid damage, all parameters must be deactivated as described above prior to switching off the equipment. Otherwise, lose items in the incubation chamber can cause damage when the shaker starts up immediately.

7.8 Wireless Function

By standard the equipment offers the possibility to be remotely operated via a radio link with a computer. For this purpose an extra software (optional) is required for which a separate manual is provided.

The software also serves to record the current values of parameters to be able to analyse and maybe reproduce a process.

For establishing the radio link the software “Wireless Communicator” (optional) is required for which also a separate manual is provided.

A few aspects must be considered, it the equipment should be operated via the radio link:

To establish the radio link the equipment must be prepared accordingly. In this regard the following points are important:

- The wireless function must be activated by the according settings in the operator mode (option function, see chapter 7.6 "User Mode (Option Function)", page 131).

  In addition, the modes “read“ or “read and write“ (from the perspective of the software) must be chosen.
- In the operator mode (option function) the equipment must get a PAN-ID. It is important that all units in the network have the same PAN-ID.

For all the parameters installed, it is possible to change the setpoint values but it is not possible to turn the parameters on or off via the radio link.

If the equipment should be controlled via the radio link, all installed or needed parameters must be turned on via the control panel on the equipment.

The cultivating process can be stopped via the radio link by setting all parameter setpoint values to 0, but this way the parameters are not turned off.

It is not possible to activate the timer function via the radio link. The timer function can only be programmed on the equipment.

7.9 Behaviour in Case of Interrupted Power Supply

If the power supply to the equipment is interrupted during a running cultivation process (e.g. by flicking the main switch or in case of a power failure), all parameters and timer setpoints as well as the residual time of the last active timer phase are stored.

If power supply is restored, the equipment restarts automatically with the last stored setpoints. If a timer was active prior to the interruption to power supply, the equipment restarts with the residual time of the last active phase and the setpoints stored for this phase.

As a warning, the word *RESTARTED* and the warning icon flash on the display field with the warning and alarm messages.
The *RESTARTED* message can be confirmed by tapping any key and then disappears.

8 Rectifying Faults

The following section describes possible reasons for faults and how to rectify them.

In case of displays relating to faults that can occur in the equipment, a distinction is made between alarms (*ALARM*) and error messages (*ERROR*):

- **Alarms** refer to errors in the process, for example, when the actual parameter values deviate from the setpoints. Alarms are indicated with the warning symbol and an acoustic signal.
- **Error messages** relate to technical faults in the equipment.

Contact the manufacturer in case of faults that cannot be resolved by following the instructions below. For service contact details, see page 2.

8.1 Alarm Messages

Faults in relation to the procedures in the process are displayed by means of alarm messages.

The *ALARM* symbol appears in conjunction with the warning icon and indicates that there is a problem. In addition, an acoustic alarm sounds.

The alarm message can be confirmed by tapping any key.

8.1.1 Parameter-Specific Alarm Messages

These messages always relate to a deviation of the actual value from the set setpoint of an installed parameter.

To trigger an alarm message, certain conditions must be met.

INFORMATION

An alarm is only triggered if the value of the parameter does not change for a certain period. If there is a fluctuation, the counter for triggering the alarm is reset.

Rectifying Faults

In conjunction with the "Temperature" parameter *(Temp)*

The alarm is triggered after 20 minutes, if the deviation in the range from 18 °C to 40 °C exceeds plus/minus 1 °C of the setpoint.
In case of temperatures outside of the above range, the alarm in case of the same deviation is only triggered after 75 minutes.
On the example on the left, the display shows that a setpoint is exceeded (top display field).

In conjunction with the "Rotation speed" parameter *(RPM)*

The alarm is triggered after 2 minutes, if the deviation exceeds plus/minus 10 min^{-1} of the setpoint.
On the example on the left, an shortfall of the setpoint is displayed (bottom display field).

In conjunction with the "CO_2 concentration" parameter *(CO_2)*

The alarm is triggered after 15 minutes, if the deviation exceeds the setpoint by more than plus/minus 5 %.
On the example on the left, an shortfall of the setpoint is displayed (top display field).

In conjunction with the "Humidity" parameter *(Humid)*

The alarm is triggered after 15 minutes, if the deviation exceeds the setpoint by more than plus/minus 5 %.
On the example on the left, an shortfall of the setpoint is displayed (bottom display field).

INFORMATION

If the setpoint for a parameter is limited in the user mode of the equipment and an attempt is made to enter higher value, the *bloc* message appears.

8.1.2 Alarm Message *RESTARTED*

The alarm message *RESTARTED* appears if the equipment has switched itself back on based on the stored parameters after a power failure.
After power is restored, the equipment automatically restarts with the same parameters to avoid damage to the cultures due to an unintentional termination of the process. The alarm message indicates that the process has been interrupted. However, it is not possible to determine how long the interruption lasted.

The alarm message can be confirmed by tapping any key.

8.2 Faults and Error Messages

Faults during operation are indicated using error messages that refer to specific functions. The affected functions are stopped automatically.

In case of error messages, the warning symbol appears as well as the *ERROR* sign; there is also an audio alarm.

To stop the alarm, the message must be confirmed using the **Select** key.

8.2.1 Error Messages Explained

The faults listed here, the causes of which are described using error messages, can generally not be resolved by users. One of the manufacturer's service technicians needs to be consulted if these messages appear.

In addition to the warning indicator and the *ERROR* sign, messages that are abbreviated appear at the top and bottom alphanumeric displays. These messages have the following meanings:

Top	Bottom	General faults
		*Open* The equipment door is open. When the door is opened, the equipment is automatically stopped using the greatest possible breaking effect, whereby the shaking movement phases out over a few more seconds, depending on the speed.

Rectifying Faults

Top	Bottom	In conjunction with the “Temperature” parameter (*Temp* symbol lights up)
		*Error 1, Temperature High* A temperature above 100 °C is measured.
		*Error 1, Temperature Low:* A temperature below 0 °C is measured.
		*Error 1, Sensor* The Pt100 sensor is not returning any readings.
		*Error 2, Sensor* The mobile Pt100 sensor (optional) is not returning any readings.
		*Error 1, Fan 1* The front fan (near the door) is blocked.
		*Error 2, Fan 2* The centre fan is blocked.
		*Error 1, Fan 3* The back fan is blocked.

Top	Bottom	In conjunction with the “number of rotations” parameter (*RPM* symbol lights up)
		*Heat Error* The control of the motor has overheated because of excessively high rotation speed or excess loading. Once the equipment has cooled down it can be restarted.
		*blocked, Error* The motor or tray is blocked. Remove any foreign objects from the incubation chamber, if necessary, dismount the table to do so (see chapter 9.2.1 "Cleaning", page 151).
		*Belt Error* The transmission belt is torn.

Rectifying Faults

Top	Bottom	In conjunction with the “Humidity” parameter (*Humid* symbol lights up)
		*Sensor Error* The humidity sensor is not returning any readings (humidity sensor not connected or defective).
		*H_2O Error* The water supply for humidification is interrupted (empty water tank or defective hose).
		*Heat Error* The heating or temperature recording of the steam humidifier is defective.

Top	Bottom	In combination with the “CO_2” parameter (CO_2 symbol lights up)
		*Sensor Error* The CO_2 sensor is not returning any readings (CO_2 sensor not connected or defective).
		*cntr Error* The actual CO_2 value does not rise (CO_2 supply interrupted, pressure too low or door not closed correctly).

Top	Bottom	In conjunction with the “Light” parameter (*Light* symbol lights up)
		*Light Error* The LED lighting unit got too hot and switched itself off automatically.

Top	Bottom	In conjunction with the control
		*Light Error* Due to a new program versions, problems with EEProm or problems with one of the internal data buses, EEProm was initialised. After this fault, it might be necessary to recalibrate temperature measuring again.
		*Lock Error* The key pad cannot be initialised. If the problem is caused by one of the internal data buses, the mainboard or HMI unit must be replaced.

8.2.2 Fault Tables

The following tables describe possible faults for which usually no error message appears on the display and for which no alarm is sounded, a few exceptions aside. In many cases operators can resolve these themselves.

General faults

Fault		
After activating the main switch, the display and the main switch do not light up.		
Possible cause	**Measures**	**Personnel**
Power supply of the equipment is interrupted.	■ Check if the plugs are plugged in correctly. ■ Check the mains connection.	Operator
The fuse of the equipment is defective.	Change the fuse (see chapter 8.3.1 "Replace Equipment Fuses", page 149).	Operator

Fault		
The tray cannot be locked.		
Possible cause	**Measures**	**Personnel**
The tray is blocked by foreign objects.	Remove foreign objects from the table.	Operator
The tray is bent.	Replace the tray.	Operator

Fault		
The interior lighting does not work		
Possible cause	**Measures**	**Personnel**
Interior lighting is deactivated.	Activate interior lighting (see chapter 7.6.7 "Setting the Interior Lighting", page 133).	Operator
The LED unit of the interior lighting is defective.	Contact your local INFORS HT branch.	INFORS HT service technician or specialist dealer

In conjunction with the “Rotation speed” parameter

Fault		
The table does not move.		
Possible cause	**Measures**	**Personnel**
The table is blocked by foreign objects.	Remove foreign objects (see chapter 9.2.1 "Cleaning", page 151).	Operator
The load is too heavy, making the drive too week or causing it to overheat.	Reduce the load. If the drive has overheated, the process can be continued after it has cooled down.	Operator
The drive has heated up too much so that it was turned off automatically.	Let the equipment cool down. Ensure that the air vents on the side are unobstructed.	Operator
The drive belt has torn.	Contact your local INFORS HT branch.	INFORS HT service technician or specialist dealer
The motor is defective.	Contact your local INFORS HT branch.	INFORS HT service technician or specialist dealer
The (open-loop) control of the drive is defective.	Contact your local INFORS HT branch.	INFORS HT service technician or specialist dealer

Fault		
Strong vibrations occur.		
Possible cause	**Measures**	**Personnel**
The load is too heavy so that the equipment is no longer balanced.	Reduce the load to the prescribed value.	Operator
The load is too light so that the equipment is no longer balanced.	Increase the load to the prescribed value.	Operator
The load is distributed unevenly.	Load the tray in the centre. If possible, do not place any heavy weights in the corners of the tray.	Operator
The rotation speed is too high.	Reduce the rotation speed.	Operator
The equipment is not standing straight.	Level the table or the equipment (adjustable foot on the base).	Operator
The substructure (table) is too weak.	Place the equipment on a stable table or the floor.	Operator

Rectifying Faults

Fault		
The shaker drive accelerates too quickly or runs too fast.		
Possible cause	**Measures**	**Personnel**
The motor control is defective.	Contact your local INFORS HT branch.	INFORS HT service technician or specialist dealer
Fault in measuring the rotation speed.	Switch the equipment off and then on again.	Operator

Faults in conjunction with the “Temperature” parameter

Fault		
Temperature too high compared to setpoint.		
Possible cause	**Measures**	**Personnel**
Fault in temperature measuring.	Check if the Pt100 sensor works. In case of a defect, contact INFORS HT.	Operator
External cooling is not switched on.	Switch on cooling.	Operator

Fault		
The temperature does not reach the desired setpoint.		
Possible cause	**Measures**	**Personnel**
The heating is not switched on.	Activate the “Temperature” parameter.	Operator
The setpoint is set too low.	Raise setpoint.	Operator
The ambient temperature does not meet the requirements.	see chapter 6.1 "Operating Conditions at the Installation Location", page 66	Operator
Door not closed completely.	Close door completely.	Operator
Cooling fins dusty.	Clean cooling fins.	Operator
The heating fan does not work.	Contact your local INFORS HT branch.	INFORS HT service technician or specialist dealer

Rectifying Faults

INFORMATION

The re-measuring of the temperature only provides reliable information when calibrated measuring tools are used and only if they are used at points specified by INFORS HT. A measurement at undefined positions in the casing will not produce any usable data.

For information about temperature measuring, contact your local INFORS HT branch or request a quote for calibrating the parameters.

Faults in conjunction with the "CO_2" parameter

Fault		
CO_2 concentration too low (deviation > 1%).		
Possible cause	**Measures**	**Personnel**
CO_2 bottle empty.	Install new CO_2 bottle.	Operator
Inlet pressure or flow too low.	Increase inlet pressure or flow.	Operator
CO_2 valve closed or blocked.	Contact your local INFORS HT branch.	INFORS HT service technician or specialist dealer

Fault		
CO_2 concentration too high (deviation < 1%).		
Possible cause	**Measures**	**Personnel**
CO_2 input pressure too high.	Reduce input pressure.	Operator

Fault		
CO_2 value fluctuates, actual value is not constant.		
Possible cause	**Measures**	**Personnel**
Inlet pressure or flow too high.	Decrease inlet pressure or flow.	Operator

Rectifying Faults

Faults in conjunction with the “Humidity” parameter

Fault		
The water supply for humidification is interrupted.		
Possible cause	**Measures**	**Personnel**
The water container is empty.	Top up the water container.	Operator
Air trapped between wet filter and reservoir.	Replace the wet filter with a dry one.	Operator
Valve defective.	Contact your local INFORS HT branch.	INFORS HT service technician or specialist dealer

Fault		
The “Humidity” parameter was deactivated automatically.		
Possible cause	**Measures**	**Personnel**
Transfer error of the humidity sensor or temperature sensor.	Restart software (switch the equipment off and then on again).	Operator
Inlet pressure is too high.	Reduce inlet pressure (max. 0.3 bar).	Operator
Steam generator is defective.	Contact your local INFORS HT branch.	INFORS HT service technician or specialist dealer

Faults in conjunction with the “Light” parameter

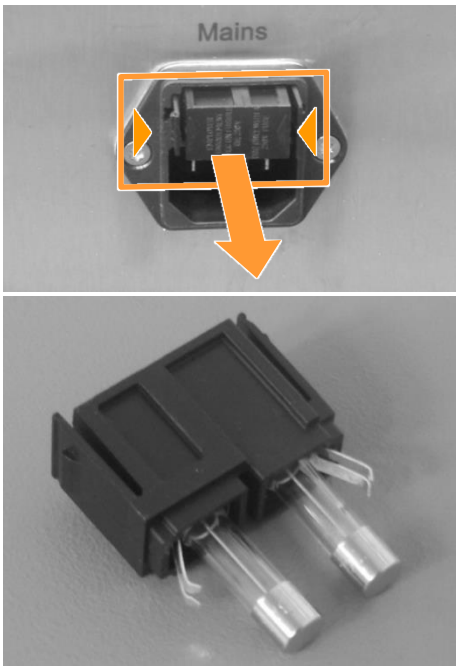
Fault		
The LED lighting unit was switched off automatically.		
Possible cause	**Measures**	**Personnel**
The LED lighting unit got too hot.	Wait a minute. Then turn LED lighting back on again. Prior to turning it back on, check the following: ■ The fans are unobstructed and the required distance to the wall (min. 100 mm) is observed. ■ The temperature falls within the range specified in the incubator shaker. ■ The temperature at the installation location is the same as the room temperature (max. 25 °C).	Operator
LED lighting unit is defective.	Contact your local INFORS HT branch.	INFORS HT service technician or specialist dealer

8.3 Rectifying Faults

8.3.1 Replace Equipment Fuses

Defective equipment fuses can be replaced by the operator. To do so, proceed as follows:

Procedure



1. Turn off the equipment and pull out the plug.
2. Unlock the plug for fuses by pressing together the two flaps and pull out at the same time.
3. Remove the defective fuse.
4. Insert a new fuse with the correct number of Amperes.
5. Push the plug-in as far back in the opening as possible until it snaps in.
6. Re-establish the power supply to the equipment.

Required fuses		
Grid type	**230 V / 50/60 Hz**	**115 V / 60 Hz**
Equipment fuses 2 time 5 x 20 mm, time lag	6.3 A	10 A

8.4 Returning for Repair

The provider must return the equipment or the faulty component part(s) to the manufacturer if, after consulting the service department of the local dealer or the manufacturer, on-site diagnosis and/or repair is not possible.

INFORMATION

When returning the equipment, the component part or accessory for repair, it is required for the safety of all parties involved and because of legal provisions that a lawful declaration of decontamination is present. Refer to chapter “Safety”, “Declaration of Contamination” for details.

9 Maintenance and Cleaning

DANGER

To prevent life-threatening electric shocks, always switch off the equipment and disconnect it from the power supply before carrying out any maintenance or cleaning.

9.1 Maintenance

The equipment requires hardly any maintenance. This reduces the running costs to certain regular checks and cleaning.

Keep in mind that various media or gases have more or less corrosive effects on the metal parts. When using particularly aggressive substances, more frequent checks are required to maintain smooth equipment operation.

9.1.1 Maintenance Schedule

The following section describe the maintenance work that is required for optimal and fault-free operation.

If increased wear is detected during regular checks, the required maintenance intervals must be shorted in accordance with the actual signs of wear.

Contact the manufacturer if you have questions about maintenance work and intervals, see service contact details on page 2.

Interval	Maintenance work	To be carried out by
Prior to each use	Check hoses and cables for damage; replace if necessary.	Operator
	Check that hoses (water , CO_2) are connected tightly.	Operator
	Check all seals on the equipment, especially on the door, and replace if necessary.	Qualified technicians
	Check whether the interior lighting works, have lamps replaced if necessary.	Qualified technicians
After each use	Clean device, if necessary, disinfect thoroughly.	Operator
Annually	If you are using humidity and CO_2 sensors, have these calibrated at least once again to ensure measuring results remain accurate.	Qualified technicians

9.2 Cleaning and Disinfection

Regular cleaning of the equipment ensures proper operation.

Thorough disinfection reduces the risk of a contamination of cultures.

ATTENTION

Insufficient cleaning and disinfection can lead to damage to cultures due to contamination.

9.2.1 Cleaning

Detergent

Mild detergents, e.g. dishwashing liquid or neutral cleaning agents, are suitable for all surfaces:

- Exterior surfaces of the casing
- Front window
- Interior surfaces of the casing (incl. base tray)
- Steel plate covers
- Table
- Trays (incl. clamps and other holders)

To clean the surfaces, use a soft cloth, ideally lint-free. This applies in particular to the front window.

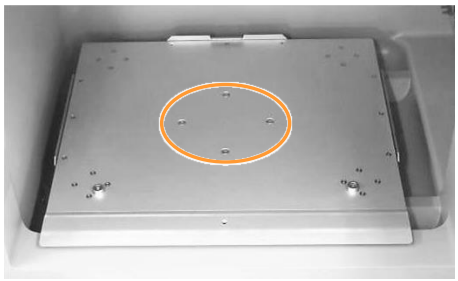
Aggressive, cleaning agents containing solvents as well as abrasive utensils can destroy the lacquer and scratch other surfaces.

Maintenance and Cleaning

Removing the table

To thoroughly clean the base tray, e.g. after a flask breaks, the table must be removed. Proceed as follows:

Procedure



1. Remove tray.
2. Remove the four screws (Allen (hexagon socket) M6, SW 5) in the centre of the table.

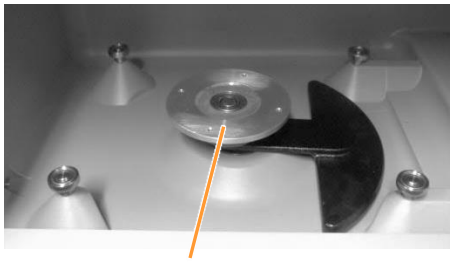
   Make sure that the screws are not lost. Otherwise they may only be replaced with equivalent counter-sunk Allen screws with M6 thread and 5 mm long.
3. Carefully lift up the table vertically.

   To completely clean the base tray, the black counter-weight that is underneath the table can be moved slightly by hand.

Fitting the table

To refit the table after thoroughly cleaning the base tray, proceed as follows:

Procedure



Flange for mounting the shaker plate

1. Align the flange in the centre of the unit in such a way that the four threaded holes are exactly on the vertical and horizontal axis – not as shown in the image.

   Positioning the flange right at the front in the centre makes it easier to fasten the screws.
2. Put down the tray as straight as possible, parallel to the front edge of the equipment and lower it down vertically from above.

   In doing so, ensure that the four ball bearings are in the trays underneath the table.
3. Slightly move the table to cover the thread holes in the flange with the drilling in the table.
4. Insert the four screws cross-wise (order: back, front, right, left) and tighten.

Spray

When cleaning the base tray, only use a wet cloth, never pour water into the tray. Avoid spray getting into the bearing or the electronics behind the cover plate.

After cleaning the equipment, especially the interior and the base tray, dry it with a cloth.

ATTENTION

Spray in the bearings and electronics behind the sheet cover can damage the equipment.

Cleaning must therefore be performed carefully and with as little liquid as possible.

Dust

Over time, dust can collect on the vents and other exposed parts (e.g. heat exchangers). It can be removed carefully with a vacuum cleaner.

9.2.2 Disinfection

Only use quaternary ammonium compounds for wipe-down disinfection. As a tried as tested disinfectant, we recommend Fermacidal D2.

ATTENTION

Heat (temperatures above 80 °C), aggressive disinfectants such as chlorine bleach and UVC radiation can damage the equipment and significantly limit the function and useful life of the machine.

We recommend against using UV lamps for disinfection of the equipment because the UV rays can massively damage the plastic casing in case of multiple applications.

For information about the procedure for disinfection underneath the table, in particular removing and mounting the table, see chapter 9.2.1 "Cleaning", page 151.

10 Transport and Storage

The inbound delivery and transport to the assembly location are performed only by INFORS HT employees or by persons authorised by INFORS HT.

Nonetheless it is possible that the provider's personnel is entrusted with transport tasks in the context of on-site transport. In this case, observe the following notes.

10.1 Transport

⚠ WARNING

Improper transport, the use of incorrect auxiliary equipment and careless handling of the equipment may lead to injuries and severe property damage.

When transporting the equipment, observe the following:

- Prior to moving the equipment, transport fasteners (rubber wedges) must be inserted to prevent uncontrolled movements of the table.
- Always work in pairs and use suitable auxiliary equipment when transporting the unit.
- Especially when using auxiliary tools, it is important to keep in mind that the equipment's centre of gravity is not in the middle.

10.2 Storage

- Decontaminate, thoroughly clean and dry the equipment every time before placing it in storage. Maintain and store sensors produced by other manufacturers in accordance with their instructions.
- Store the equipment and its components clean, dry and protected against dust, dirt and liquids.
- Store the equipment and its components in a cool place with low humidity but protected against frost.
  - Storage temperature: 10 °C to 35 °C.
  - Relative humidity, non-condensing: 10% - 85%.
- Protect the equipment from aggressive media, direct sunlight and vibrations.

11 Disassembly and Disposal

The equipment must be disassembled and disposed of in an environmentally friendly manner if it is no longer in use.

INFORMATION

When returning the equipment for disassembly or disposal, it is required for the safety of all parties involved and because of legal provisions that a lawful declaration of decontamination is present. Refer to chapter “Safety”, “Declaration of Contamination” for details.

11.1 Disassembly

Prior to disassembly:

- Switch off the equipment and lock any isolation switch in the ‘off’ position.
- Physically disconnect the main energy supply from the equipment and wait for components to fully discharge.
- Remove and dispose of all additional consumable items, auxiliary components and/or spent processing material in an environmentally acceptable manner.

Clean and disassemble component parts professionally with regard to any local regulations concerning employment and environmental protection. If possible, separate materials.

11.2 Disposal

Recycle disassembled components if no agreement is made concerning reclaim or disposal.

- Send metals for scrap.
- Send plastic components for recycling.
- Sort and dispose of the remaining components according their material composition.

Disassembly and Disposal

⚠ WARNING

Electronic waste, electronic components, lubricants or other auxiliary materials/supplies are subject to hazardous waste regulations and may only be disposed of by registered specialist disposal firms.

For disposal, the system units are to be disassembled and dismantled into individual material groups. These materials are to be disposed of according to the applicable national and local legislation.

Local authorities or specialist disposal firms can provide information regarding environmentally acceptable disposal.

If no special arrangements have been made for return, INFORS HT units with the required declaration of decontamination can be sent back to the manufacturer for disposal.

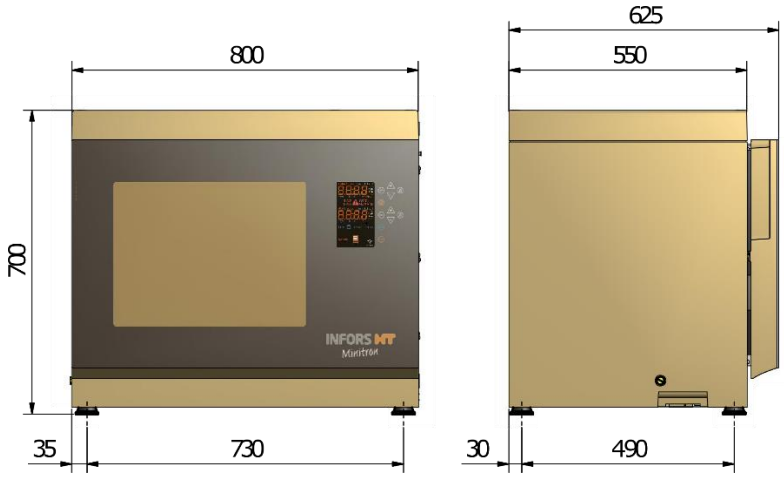
12 Technical Data and Specifications

12.1 Dimension Drawings (without base)

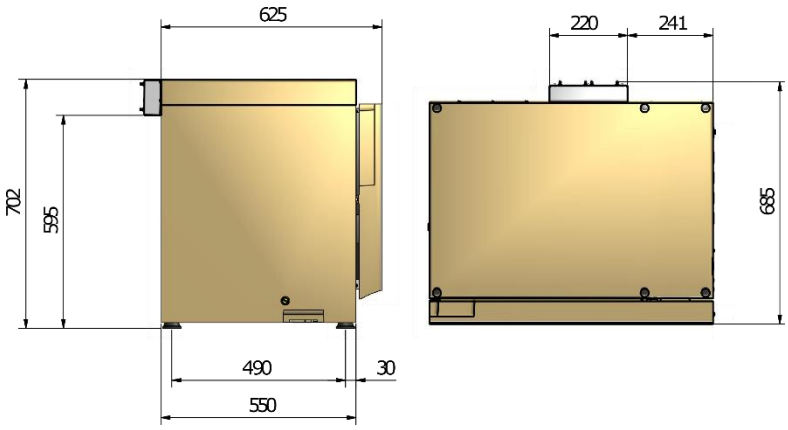
INFORMATION

The “direct steam humidification” and “LED lighting unit” are individual options that are affixed outside the casing. The dimensions of the equipment change if these options are installed.

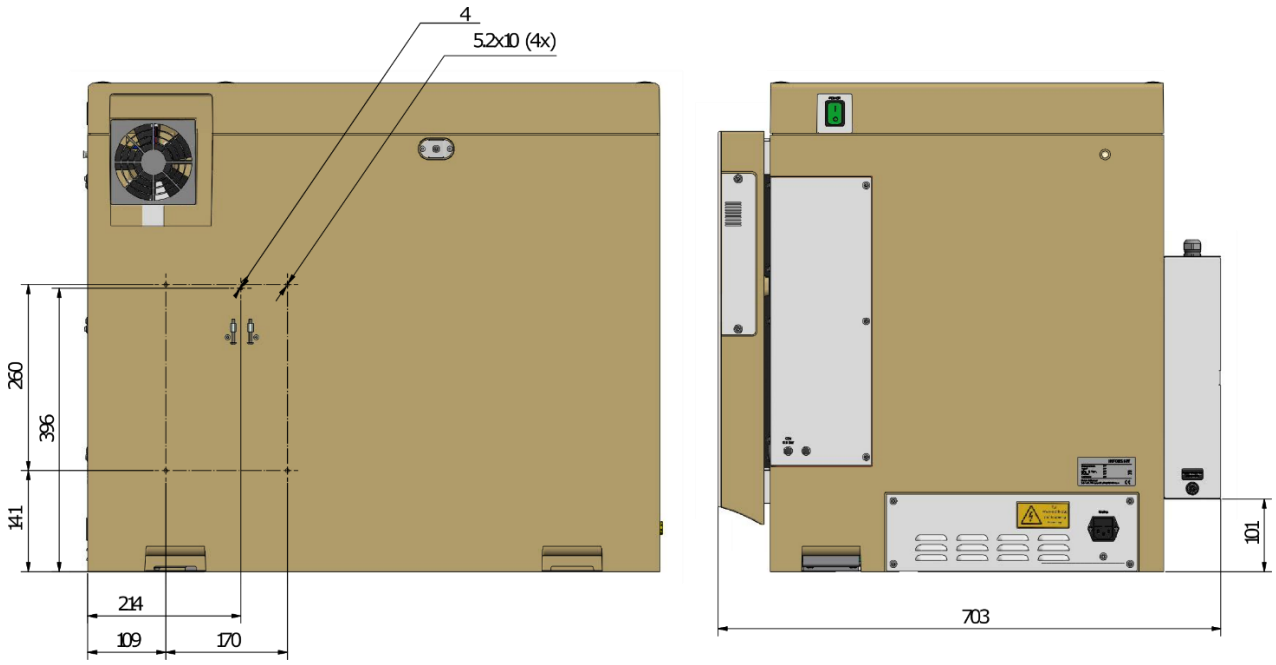
Side and rear view without options



Side and rear view with LED lighting unit



Side and rear view with direct steam humidification



All dimensions in mm

12.2 Specifications of the Basic Unit

12.2.1 Weight and Dimensions

Dimensions		
Description	**Value**	**Unit**
Equipment with 25 mm hub	75.0	kg
Equipment with 50 mm hub	77.0	kg

Exterior dimensions		
Description	**Value**	**Unit**
Width	800	mm
Depth (door closed)	623	mm
Depth (door closed)	1375	mm
Height (without base)	683	mm
Height (with rubber feet)	700	mm
Height (with 120 mm base)	803	mm
Height (2 stack with base)	1486	mm

Interior dimensions (incubation chamber)		
Description	**Value**	**Unit**
Width	570	mm
Depth	528	mm
Height without LED lighting	508	mm
Height with LED lighting	460	mm

Floor space and required space		
Description	**Value**	**Unit**
Floor space [1]	ca. 1.0 x 0.7	m
Space required [2]	ca. 1.0 x 1.5	m

[1]) Incl. min. distance of 80 mm on the side of and behind the equipment
[2]) Incl. operating space when door is open

12.2.2 Connections and Interfaces

Electrical connection values			
Description	**Type 230 V**	**Type 115 V**	**Unit**
	Value		
Voltage	230	115	VAC
Frequency range	50 / 60	60	Hz

Electrical performance values			
Description	**Type 230 V**	**Type 115 V**	**Unit**
	Value		
Max. power input	500	500	W
Max. power consumption	2.8	5.6	A
Fuses (5 x 20 mm, time lag)	6.3	10.0	A

Other connections		
Description	**Value**	**Unit**
Alarm connection (socket)		
Type	Stereo jack, 3.5 mm	
Voltage	max. 30	V
Power consumption	max. 1	A
Antenna connection (socket)		
Type	SMA (male)	

Discharge outlet		
Hose nozzle	¼	inch
Hose diameter	10	mm

12.2.3 Material

Component	Material
Casing	Polyurethane integral hard foam (PUR-IHS)
Door	PUR-IHS, safety glass
Interior	Stainless steel
Table	Aluminium, anodised

12.2.4 Emissions

Description	Value	Unit
Sound pressure	35	dB(C)

12.2.5 Operating Conditions

Description	Value	Unit
Temperature range	10 – 32	°C
Relative humidity, non-condensing	10 – 85	%
Min. distance from walls, ceilings and other equipment	100	mm

INFORMATION

The specified temperature range refers to the temperature directly on the device. In case of heat build-up due to insufficient ventilation, the temperatures on the equipment can be significantly higher than the room temperature.

12.2.6 Fire Protection Class and Protection Type

Description	Value
Fire protection class	B1 (as per DIN 4102)
Protection type	IP20 (as per DIN 60529)

12.2.7 Auxiliary Materials

ATTENTION

Using the wrong auxiliary materials can result in significant damage to property.

- Only use the auxiliary materials in accordance with the table below.

Description	Allowed products
Cooling liquid Secondary cycle Top cooling External cooling	Approved for the food and pharmaceutical sectors Freezing point < -40 °C Corrosion copper: < -0.6 g/m^2 Temperature range: -40 °C to +150 °C
Water qualities Direct Steam Humidification	Distilled water Deionised water Demineralised water Reverse osmosis water (See appendix for details)
General detergent	Mild neutral cleaning agent
General disinfectant	Quaternary ammonium compounds
Disinfectant for door polycarbonate disc	Quaternary ammonium compounds
Detergent for adhesive matting	Mild neutral cleaning agent Dishwashing detergent
Disinfectant for adhesive matting	Quaternary ammonium compounds

12.3 Specifications of Standard Parameters

The shaking function (rotation speed) and tempering that are installed during basic configuration are deemed to be the standard parameters.

12.3.1 Rotation Speed Parameter (Shaker Drive)

Description	Value	Unit
Drive	External rotor motor	
Hub (orbital movement)	25 or 50	mm
RPM range [1]	20 – 400	min^{-1}
Increment	1	min^{-1}
Control precision	± 4	min^{-1}

[1]) The actual rotation speed that can be achieved depends on different factors, such as loading, vessel type (e.g. flasks with baffles) or holder (e.g. clamps or «Sticky Stuff»)

12.3.2 Temperature Parameter (Heating and Ventilation)

Description	Value	Unit
Power	350	W
Setting range	4.0 – 65.0	°C
Increment	0.1	°C
Lowest temperature (via ambient temperature, without optional cooling)	5.0	°C
Highest temperature	65.0	°C
Control precision 4 – 50 °C	± 0.3	°C
Control precision > 50 °C	± 0.5	°C
Sensor type	Pt100	
Measurement range of the sensor	0 – 80.0	°C
Overheating protection	at 200	°C
Ventilation	3 axial fans, 12 V	
Air circulation	100	m^3/h

12.4 Specifications of the Options

The following section summarises all important technical data and specification relating to the options.

12.4.1 Cooling

Electrical data				
Description	**Value**			**Unit**
Grid type	**230 V/50 Hz**	**230 V/50 Hz**	**115 V/50 Hz**	
Power [1]	173	196	146	W
Power consumption	0.93	1.12	0.78	A

[1]) Power consumption of the compressor

Various		
Description	**Value**	**Unit**
Cooling power [2]	200 – 230	W
Additional mass	9.0	kg
Coolant cycle	closed	
Amount of coolant	70	g
Coolant	R134a (1,1,1,2-Tetrafluoreth-ane)	
Sensor type	Pt100	

[2]) Cooling power at a room temperature of 20 °C

Target and actual values of the temperature with cooling		
Description	**Value**	**Unit**
Setting range	4.0 – 65.0	°C
Increment	0.1	°C
Temperature measurement range	0.0 – 80.0	°C
Lowest temperature	16.0 °C under room tempera-ture, minimum 4.0 °C	
Control precision 4 – 50 °C	± 0.3	°C
Control precision < 50 °C	± 0.5	°C
Temperatures that can be reached	4.0 – 65.0	°C

12.4.2 Direct Steam Humidification

Casing dimensions		
Description	**Value**	**Unit**
Height	340	mm
Depth	80	mm
Width	200	mm
Equipment (W x D x H, door closed) [1]	800 x 703 x 700	mm

[1]) Height with rubber feet (17 mm high)

Various		
Description	**Value**	**Unit**
Additional mass	3.5	kg
Water consumption [2]	5.0	g/h
Temperature range for use [3]	28 – 40	°C
Heating time of the unit	15	min

[2]) At an ambient temperature of up to 20 °C, at a temperature of 37 °C in the incubation chamber and relative humidity of 75 %.

[3]) Temperature in the interior at which functioning can be guaranteed

Target and actual humidity values		
Description	**Value**	**Unit**
Setting range	20.0 to 85.0	%rH
Increment	0.1	%rH
Control precision	± 3.0	%rH
Values that can be reached (at 37 °C in the interior and the specified room temperature)	RT 20 °C: – 75.0	%rH
	RT 22 °C: – 80.0	%rH
	RT 25 °C: – 85.0	%rH

Electrical data		
Description	**Value**	**Unit**
Power consumption (max.)	130	W
Voltage	230 / 115	V
Power consumption	0.4 to 0.9	°C
Bar heater (in door)	24	V
	15	W

Specifications for the connection / water quality		
Description	**Value**	**Unit**
Connection (hose Ø)	6 – 7	mm
Input pressure	0 – 0.3	bar
Water hardness	< 0.01, $CaCO_3$ equivalent	mmol/L
Water conductivity	min. 5 / max. 20	µS/cm
Dissolved solids	< 10	mg/L

ATTENTION

Using tap water can quickly lead to calcium deposits in the vaporiser of the humidification unit, which would affect correct functioning.

Ultra pure water (WFI, water for injection purposes) must not be used either as this is highly corrosive and thus damages the equipment.

Specifications for the humidity sensor		
Description	**Value**	**Unit**
Sensor type	HCT01-00D	
Measurement range	20 – 90	%
Response time	< 300	ms
Temperature range for use	- 40 – 80	°C

12.4.3 External Cooling

Connection data		
Description	**Value**	**Unit**
Connection pressure (input)	max. 4.0	bar
Required cooling power	200 – 300 [1]	W
Outer Ø hose nozzles	8	mm

[1]) Depends on the desired lowest incubation temperature and the climate conditions

Technical Data and Specifications

Various		
Description	**Value**	**Unit**
Additional mass	approx. 3.0	kg
Cooling water quality	Soft water [2]	
Antifreeze [3]	1,2-Propanediol	
Preliminary temperature (VT)	> 0	°C

[2]) No distilled or demineralised water (too aggressive)

[3]) Must be suitable for copper

Target and actual values[4] of the temperature with external cooling		
Description	**Value**	**Unit**
Setting range	4.0 – 65.0	°C
Increment	0.1	°C
Temperature measurement range	0.0 – 80.0	°C
Control precision 4 – 50 °C	± 0.3	°C
Control precision > 50 °C	± 0.5	°C
Temperatures that can be reached	approx. 6.0 above VT – 65.0	°C
Sensor type	Pt100	

[4]) If the external cooling unit has sufficient power, this data is determined by the (open-loop) control.

Recommended design for external cooling unit		
Description	**Value**	**Unit**
Preliminary temperature	8.0	°C
Pressure	1.0	bar
Flow rate at 0 bar	23.0	L/min
Cooling power	200 – 300	W

ATTENTION

The installed valve regulates the temperature by closing and opening the cycle. Hence it can be necessary to install a bypass from the inlet to the outlet to protect the circulation pump against damage.

12.4.4 CO_2 Gassing

Connection data		
Description	**Value**	**Unit**
Connection (hose Ø)	4 – 5	mm
Type of connection	Legris	
Input pressure	0.5 (± 0.1)	bar

Various		
Description	**Value**	**Unit**
Additional mass	0.5	kg

Vaisala CO_2 sensor		
Description	**Value**	**Unit**
Sensor type	GMP251	
Measurement range	0 – 20	%
Accuracy (at 1013 hPa, 25)	± 0.1	% CO_2

Target and actual CO_2 values		
Description	**Value**	**Unit**
Setting range	0 – 20	%
Control range	0.1 – 19.5	%
Control precision (at 1013 hPa, 20 °C to 40 °C)	at 0 – 5 % ± 0.5 %	
	at 5 – 10 % ± 0.6 %	
	at 10 – 15% ± 0.7 %	
	at 15 – 20% ± 0.8 %	
Gas consumption (at a gas flow of 3 NL/h)	at 5 % 2.0 NL/h (± 0.5 %)	

12.4.5 LED Lighting Unit

Electrical power values		
Description	**Value**	**Unit**
Power consumption (max.) 1	210	W

[1]) Only LED irradiation unit

Technical Data and Specifications

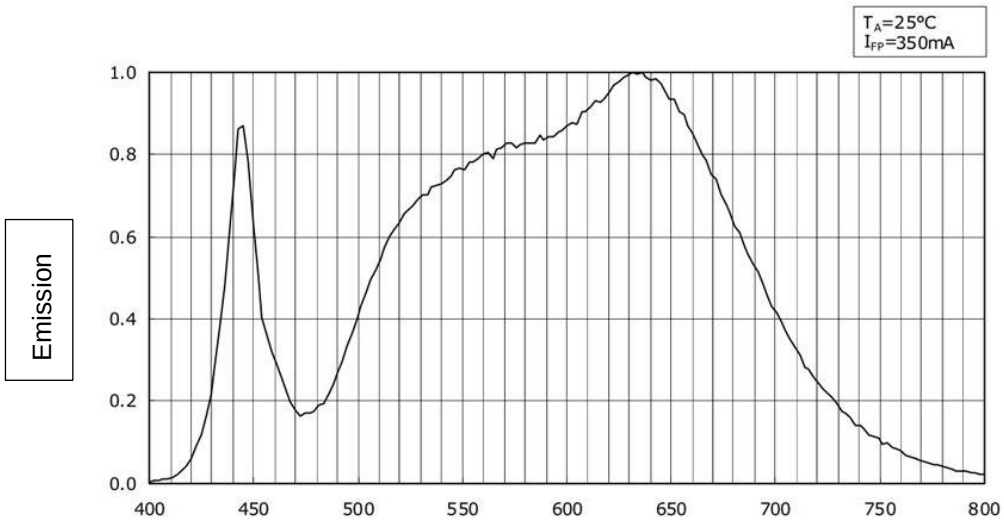
Temperature range	
Description	**Value**
At 80 to 100 % light intensity	16 °C under RT up to 45 °C
At 0 to 80 % light intensity	16 °C under RT up to 65 °C

Light		
Description	**Value**	**Unit**
Light source	High power LEDs	
Light colour of the LEDs	Warm white	
Colour temperature of the light	3500	K
Light intensity (linear) 100 %	240	µmol/m²s
Light intensity (linear) 1 %	5	µmol/m²s
Light distribution[1] on the tray	+/- 10	%
Max. irradiation power	60	W/m²
Compatibility with humidity [2]	up to 85	%rH
Lighting control system	Pulse width modulation	

[1]) Relative standard deviation of the total number of 25 measuring points distributed evenly across the tray.

[2]) With the light switched off and a set max. temperature of 28 °C (without condensate).

Specification of the light



Emission spectrum of warm white LEDs

12.4.6 Overview of the Masses with Options

Mass		
Description	**Value**	**Unit**
Basic unit with 25 mm hub [1]	75.0	kg
Basic unit with 50 mm hub [1]	77.0	kg
Base 120 mm	7.5	kg
Cooling unit	9.0	kg
External cooling	3.0	kg
Humidification	3.5	kg
CO_2 gassing	0.5	kg

[1]) Incl. rubber feet, 17 mm high

Examples		
Hub	**25 mm**	**50 mm**
Basic unit, all options [1]	88.0 kg	90.0 kg
with 120 mm base	95.5 kg	97.5 kg
Stack of 2 without options	159.0 kg	163.0 kg
Stack of 2 with cooling	177.0 kg	181.0 kg
Stack of 2, all options [2]	185.0 kg	189.0 kg

[1]) Incl. rubber feet, 17 mm high

[2]) With optional cooling unit (not external cooling)

Stack of 2 always with 120 mm base, incl. connecting rods (approx. 1.5 kg)

12.5 Achievable Setpoints of Parameters and Rotation Speed

Depending on the options installed, physical laws result in certain restrictions regarding the setpoints of the parameters that can actually be achieved.

12.5.1 Overview of Setting Ranges, Setpoints and Actually Achievable Values

All descriptions are non-binding and merely provided as an overview as the values that can be achieved in practice depend on many factors which cannot all be taken into account here.

Summary of all parameters

Parameter	Symb.	Setting range	Increment	Actual range:	Control precision	Notes
Temperature °C **without cooling**	*Temp*	4.0 to 65.0	0.1	UT + 5 °C to 65.0 °C	± 0.3 °C ± 0.5 °C	from 4 to 50 °C above 50 °C
Temperature °C **with cooling**	*Temp*	4.0 to 65.0	0.1	UT - 16 °C to 65.0 °C	± 0.3 °C ± 0.5 °C	from 4 to 50 °C above 50 °C
Rotation speed min^{-1}	*RPM*	20 to 400	1.0	variable	± 4 min^{-1}	See separate tables
CO_2 content %	*CO_2*	0.0 to 20.0	0.1	up to 20.0 %	± 0.5% ± 0.6% ± 0.7% ± 0.8%	At 0 to 5 % At > 5 to 10 % At > 10 to 15 % At > 15 to 20 % (20 – 40 °C, 1013 hPa)
Humidity[1] %	*Humid*	20.0 to 85.0	0.1	AV up to 85.0 % AV up to 80.0 % AV up to 70.0 %	± 3.0% ± 3.0% ± 3.0%	at 27 °C at 33 °C at 37 °C

AV = ambient value

AT = ambient temperature directly on the equipment

[1]) Values that can normally be reached without condensation

The values listed here were reached using a free-standing individual unit placed on the ground in a temperature-controlled room at 20 °C.

You must ensure that equipment is not set up in a recess of a room or near sources of heat. It should not be exposed directly to the sun either if the values stated above are to be reached.

12.5.2 Maximum Permissible Setpoints for the Rotation Speed

The following description is based on an ideal load for the tray. The ideal load for a tray falls into the following ranges (mass incl. tray, clamps, flasks and filling):

Hub	Ideal load
25 mm	**6 – 11 kg**
50 mm	**7 – 10 kg**

Individual unit

The following guidelines for the maximum rotation speeds are specified to avoid damage. Hence, they must be observed whereby further restrictions (e.g. tray with «Sticky Stuff» adhesive matting) must be taken into account.

Load	Filling	25 mm hub	50 mm hub
Empty N-tray[1]	--	280 min^{-1}	270 min^{-1}
12 x 500 mL Erlenmeyer w/o baffles	⅓	400 min^{-1}	340 min^{-1}
8 x 1000 mL Erlenmeyer w/o baffles	⅓	380 min^{-1}	310 min^{-1}
5 x 2000 mL Erlenmeyer w/o baffles	⅓	290 min^{-1}	240 min^{-1}
3 x 5000 mL Erlenmeyer w/o baffles	⅓	260 min^{-1}	240 min^{-1}
4 x 2500 mL Ultra-Yield (plastic)	1000 mL	350 min^{-1}	280 min^{-1}
3 x 5000 mL Optimum Growth (plastic)[2]	2500 mL	[3] 240 min^{-1}	[4] 230 min^{-1}

[1]) Represents the most unfavourable loading with the greatest imbalance.

[2]) Has been tested with «Sticky Stuff» adhesive matting

[3]) At 250 min^{-1} a flask separated from the adhesive matting (these flasks were the only ones tested on the «Sticky Stuff» adhesive matting, all other flasks were affixed using clamps)

[4]) At this rotation speed, the water splashed onto the lid

Test conditions:

Individual unit standing on the floor with rubber feet. Maximum load on a universal table tray , which is slightly lower than for a fitted tray.

The Erlenmeyer flasks were not additionally secured in the clamps; the Ultra Yield flasks were secured using a cable tie that was attached underneath the spring. The Optimum Growth vessels were tested on the «Sticky Stuff» adhesive matting.

The “critical” rotation speed was deemed to have been reached when the vibrations got too strong or the flasks were about to detach from the clamp or the adhesive matting.

All descriptions provided are guidelines (not guaranteed). Depending on the load, higher rotation speeds are possible; in this case, the speed should be increased slowly. The user is then responsible for determining the maximum rotation speed possible based on the vibrations and the vessel holders (the clamps might have to be secured) and communicating them.

For stacked units (stacks of 2)

Unit at the bottom

For the unit at the bottom of a stack, the values for the maximum rotation speed stated for individual units apply.

Unit at the top

Due to the leverage effect, reduced maximum permissible rotation speeds apply to the unit at the top. During testing, two units with the same hub were used but the values for the top unit apply irrespective of the hub of the unit at the bottom.

Load	Filling	25 mm hub	50 mm hub
Blank N tray with adhesive matting	--	230 min^{-1}	200 min^{-1}
12 x 500 mL Erlenmeyer w/o baffles	⅓	400 min^{-1}	310 min^{-1}
8 x 1000 mL Erlenmeyer w/o baffles	⅓	360 min^{-1}	300 min^{-1}
5 x 2000 mL Erlenmeyer w/o baffles	⅓	270 min^{-1}	220 min^{-1}
3 x 5000 mL Erlenmeyer w/o baffles	⅓	230 min^{-1}	220 min^{-1}
4 x 2500 mL Ultra-Yield	1000 mL	300 min^{-1}	240 min^{-1}
3 x 5000 mL Optimum Growth (adhesive matting)	2500 mL	210 min^{-1}	200 min^{-1}

[1]) Represents the most unfavourable loading with the greatest imbalance.

[2]) Has been tested with «Sticky Stuff» adhesive matting

Maximum rotation speeds with «Sticky Stuff»

For a detailed description of the maximum permissible rotation speeds when using the «Sticky Stuff» adhesive matting see chapter 5.1.3 "Tray with «Sticky Stuff» Adhesive Matting", page 55.

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