Multitron

Operating manual



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INFORS HT

Multitron – Rel. 4.4.x
Incubator shaker
FW: 3.4x

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More information about the product is available online at:
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Supplemental directives

About this Manual



This manual enables the safe and efficient handling of the device. All the information and instructions in this operating manual comply with the current standards, legal regulations and the latest technological developments.

This operating manual is a component part of the device. It must be kept near the device unit and be accessible to staff at all times. All persons working on or with the device must read the operating manual thoroughly and fully understand its contents before beginning any work. Adhering to all the safety notes 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 device as supplied.

Customer Service and Services

The customer service of the manufacturer or the local licensed dealer is at your disposal for technical advice and specialist enquiries (contact details see ➦ https://www.infors-ht.com/en/contact/). Due to their familiarity with the potential applications of the device, the Customer Service team is able to provide information on whether the unit can be used for a specific application or modified to handle the planned process.

Declaration of Conformity

The device (only 230 V version) meets the general requirements of the following standards:

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

The declaration of conformity in the sense of the Machinery Directive, Annex II 1 A is attached to the operating manual.

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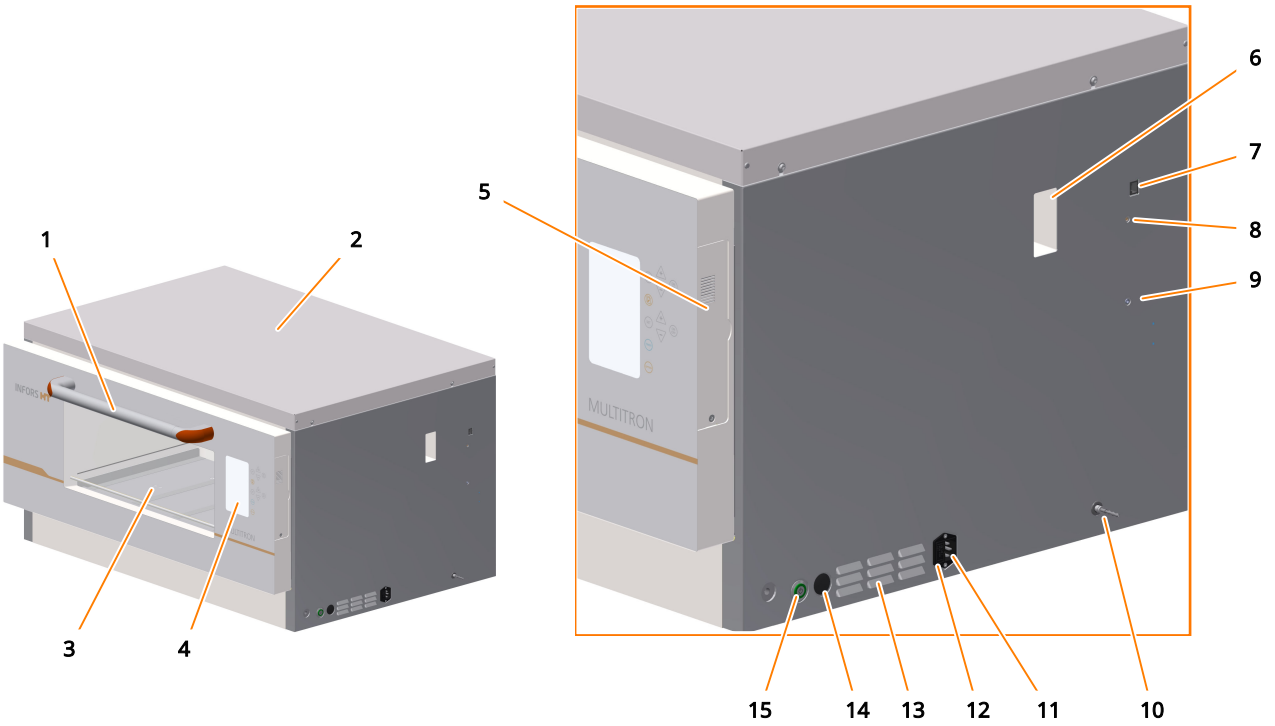
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1 Overview of the Device

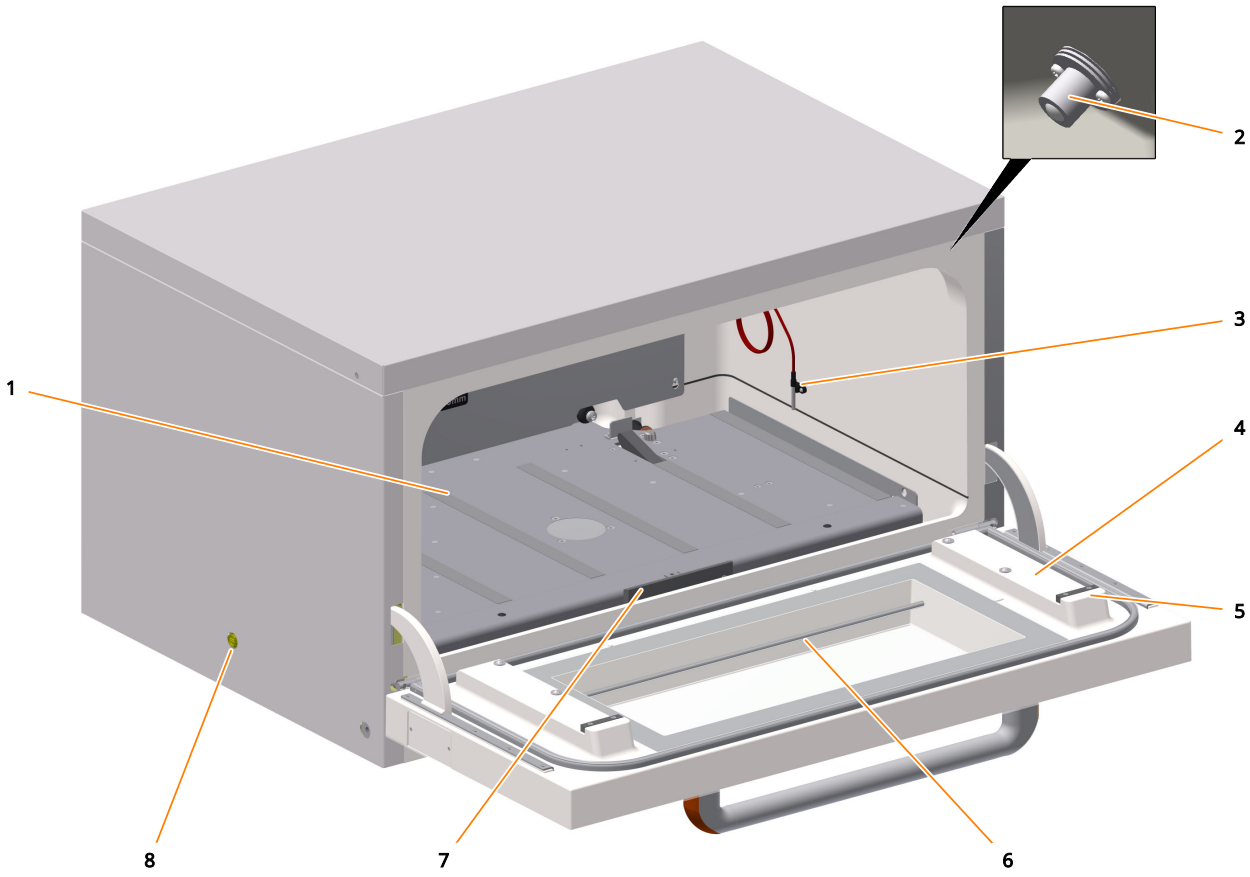
1.1 Basic Unit

Exterior



1 Door handle
2 Cover (optional)
3 Door with window (opens downwards)
4 Display and operating elements
5 USB connection (only for service purposes)
6 Cable pass-through (optional)
7 Ethernet Interface (*LAN*)
8 Status LED (*STATUS*, only for service purpose)
9 Connection of external alarm (*EXTERNAL ALARM*)
10 CO_2 connection (*CO_2 IN*, optional)
11 Mains connection (*MAINS*)
12 Slot for fuses (230 V version) or thermal protection switches (115 V version)
13 Air vents
14 UV decontamination key (*UV*, optional)
15 Power switch (*POWER*)

Interior



1 Shaking Table
2 Working light
3 Pt100 temperature sensor
4 Slide rail
5 Mechanical stop of tray pull-out
6 Door heating
7 Stop bar
8 Discharge outlet

Short Description

The Multitron incubator shaker is used to cultivate microorganisms or cell cultures in a laboratory environment. The basic version of the device is fitted with a shaker drive and a heater. Depending on which version of the device you have bought, it will come with either a 3 mm, 25 mm or 50 mm shaking throw. A version with an adjustable shaking throw (12.5, 19, 25 and 50 mm) is also available.

The device can be operated either locally, using the operating panel on the front of the device, or remotely, using a computer connected to the device via an Ethernet interface.

Overview of the Device

Stacking Devices

If necessary, up to three devices can be stacked to save space. Devices can also be stacked subsequently but stacking must be performed by the manufacturer's qualified personnel or persons authorised by the manufacturer.

If stacked devices are operated, you have to keep in mind that the maximum permissible rotation speed is limited for the top units in the stack. For a detailed description of the technical data and possible maximum rotation speeds of stacked devices, see ➦ Chapter 12.4.1 'Rotation Speed Parameter (Shaker Drive)' on page 130.

Overview of the Options

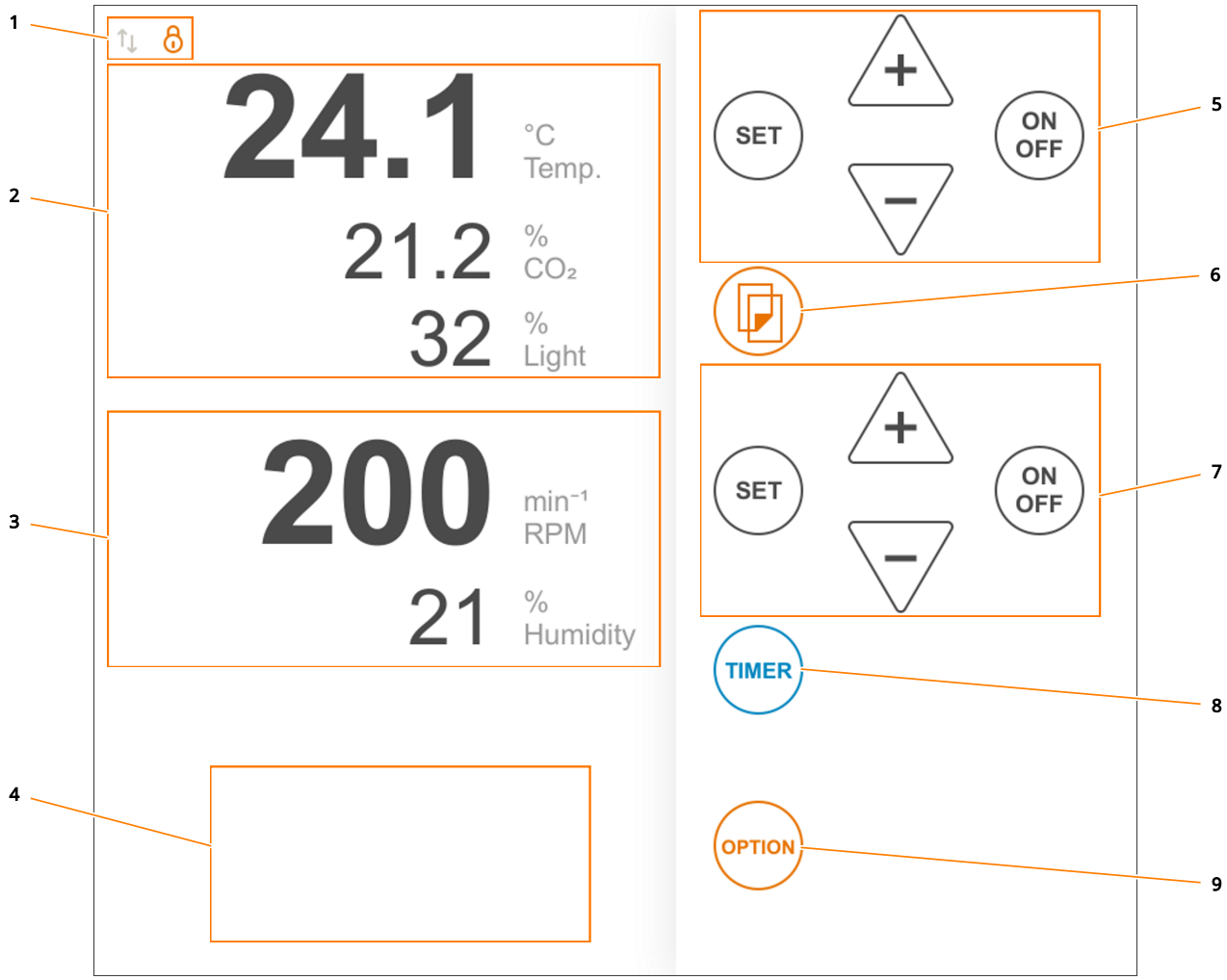
The following options are available for adapting the device to different usage scenarios:

Option	Additional information
Internal or external cooling	➦ Chapter 4.1, page 40
Hygienic Humidity Control (HHC)	➦ Chapter 4.2, page 43
CO_2 control	➦ Chapter 4.3, page 48
LED lighting	➦ Chapter 4.4, page 51
HEPA filter	➦ Chapter 4.5, page 52
UV decontamination	➦ Chapter 4.6, page 54
Removable shelf	➦ Chapter 4.7, page 54
Darkening	➦ Chapter 4.8, page 55
Analog output	➦ Chapter 4.9, page 55
Cable pass-through	➦ Chapter 4.10, page 56
Antimicrobial coating	➦ Chapter 4.11, page 58

1.2 Parameters

Parameter	Display	Unit	Setting range	Option	Additional information
Temperature	*Temp.*	°C	4.0 to 65.0	No	The temperature that can actually be achieved depends on a variety of factors (e.g. the ambient temperature around the device, the ventilation and the temperature of the other devices in the stack) (➥ Chapter 12.4.2, page 131).
Rotation speed	*RPM*	min^{-1}	25/50 mm: 20 to 400 3 mm: 20 to 1000	No	The maximum permissible rotation speed depends on the throw, the position of the device in a stack, and the load on the tray (mass). (➥ Chapter 12.4.1, page 130).
Humidity	*Humidity*	%	20.0 to 85.0	Yes	While the evaporator of the humidification system is heating up and until the "Temperature" parameter has reached the set-point, *HEAT* is displayed (alternating with the current value).
CO_2 concentration	*CO_2*	%	0.1 to 20.0	Yes	
Light intensity	*Light*	%	1 to 100	Yes	

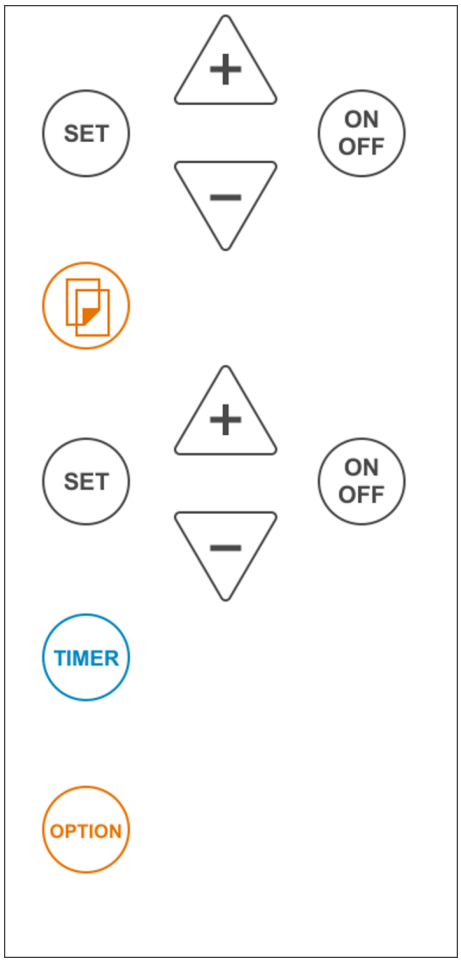
1.3 Operating and Display Elements



1 Status display (PIN function, remote control of the device)
2 Upper view box: Parameters target/actual values (Temperature, CO_2, Light)
3 Lower view box: Parameters target/actual values (Rotation speed, Humidity)
4 View box for timer function and error messages
5 Upper control panel: Setting the parameters (Temperature, CO_2, Light)
6 **Select** key
7 Lower control panel: Setting the parameters (Rotation speed, Humidity)
8 **TIMER** key
9 **OPTION** key

1.3.1 Operating Elements

Overview



The device is controlled via keys in the operating section. The keys are colour-coded based on their function:

- Black: Setting keys
- Blue: Timer selection key
- Orange: Parameters and settings selection key

The black setting keys exist in duplicate form. The upper setting keys control the parameters in the upper view box, the lower setting keys control the parameters in the lower view box.

The sensor-controlled soft-touch keys are located behind the glass cover and only need to be pressed lightly.

The device can also be operated with laboratory gloves.

If the interior lighting is activated, it switches on automatically as soon as any key is pressed. After 2 Minutes, it turns off again automatically.

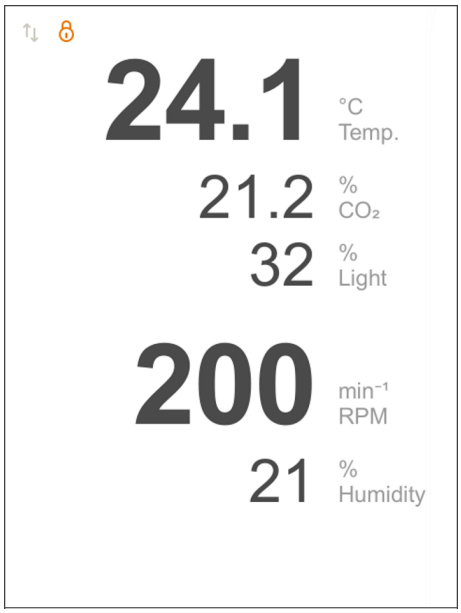
Overview of the Device

Function

Operating element	Designation	Function
	**Select**	The **Select** key is used to select the parameters (also within the Timer function). The key is also used to exit the timer overview and the settings menu.
	**TIMER**	The **TIMER** key is used to open the Timer overview and select the phases within timer programming. For more information, see ➦ Chapter 7.4 'Timer Function' on page 88.
	**OPTION**	The **OPTION** key is used to open the Settings menu. This menu enables you to adjust the main device settings. Pressing the key again closes the Settings menu. For more information, see ➦ Chapter 7.6 'Settings Menu (Option Function)' on page 97.
	**SET**	After pressing the **SET** key, you can enter the values for the selected parameter.
	**Plus**	Use the **Plus** key to increase values. When you hold down the key, the display runs up the specified value range in increasingly large intervals. The key is used for navigation in the Settings menu.
	**Minus**	Use the **Minus** key to decrease values. When you hold down the key, the display runs down the specified value range in increasingly large intervals. The key is used for navigation in the Settings menu.
	**ON/OFF**	You can use the **ON/OFF** key to switch on or off the selected parameter, a setting in the Settings menu or the timer.

1.3.2 Display Elements

Parameter



The following parameters are displayed in the upper view box:

- Temperature (*Temp.*)
- CO_2 concentration (*CO_2*, optional)
- Light intensity (*Light*, optional)

The following parameters are displayed in the lower view box:

- Rotation speed (*RPM*)
- Humidity (*Humidity*, optional)

Depending on their status, the parameters are displayed in different colours:

- Black: The parameter is activated.
- Grey: The parameter is deactivated.
- Orange: The parameter is in programming mode, i.e. the setpoint can be set and the parameter can be activated or deactivated.

Parameter-specific Displays

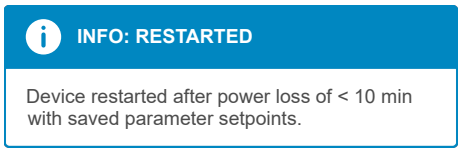
Display	Meaning
SETPOINT	The parameter is in programming mode (the setpoint can be set and the parameter can be activated or deactivated).
OFF	The parameter is deactivated.
REMOTE	The parameter is controlled by a software (e.g. eve®) connected to the device.
REMOTE OFF	The parameter was deactivated by a software (e.g. eve®) connected to the device by sending setpoint 0. *REMOTE OFF* is displayed until a new setpoint is set on the device.
HIGH LOW	The actual value of the parameter deviates significantly from the setpoint.
MAX SETPOINT °C Temp.	The possible setpoints for the "Rotation speed" and "Temperature" parameters can be restricted in the Settings menu. If you try to enter a higher or lower value, *MAX* or *MIN* is displayed.

Overview of the Device

Status Displays

Symbol	Meaning
	The control panel is locked with a PIN. If you try to make a setting, a PIN prompt appears. Once you enter the correct PIN, the symbol disappears.
	The device is connected to external software (e.g. eve®). ■ Both arrows are greyed out. The connection to the software has been established (IP is known), but there is no communication. ■ The up arrow is orange, the down arrow is greyed out. The software is reading values but unable to send setpoints. The device is in “Read only” mode ■ Both arrows are orange: The software is reading values and able to send setpoints. The device is in “Read & write” mode. For more information, see ➦ ‘Ethernet Connection’ on page 99.
	HEPA filtration is active (HEPA filter installed, fans running).

Alarms, Error and Warning Displays



Alarms, error messages and important information are displayed below the parameter displays (➦ Chapter 8 ‘Rectifying Faults’ on page 104).

Timer Display



If the timer function is active, the two phases and the running time of the phases are shown on the lower side of the display (➦ Chapter 7.4 ‘Timer Function’ on page 88).

2 Safety and Responsibility

This chapter contains general information on safety when using the device. In the remaining chapters, warning messages are used only to highlight particular hazards directly arising from the actions being described.



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

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

2.1 Explanation of Special Displays

2.1.1 Warning Messages

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

WARNING

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

CAUTION

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

NOTICE

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

2.1.2 Other Messages

Texts that are marked in this way provide useful tips and recommendations for ensuring efficient, fault-free operation of the device.

2.2 Intended Use, Incorrect Use and Misuse

Intended Use

The device is designed to be used as an incubator shaker for cultivating microorganisms or cell cultures under the following conditions:

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

When using the device in protection level 2, personnel 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.

⚠ WARNING

The device is designed and built exclusively for the intended use described above.

Each instance of non-conventional use of the device is considered incorrect use and may lead to dangerous situations.

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

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

Incorrect Use/Misuse

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 rotation speeds that are too high.

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

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

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

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

2.3 Cultivation Vessels to be Used

NOTICE

Significant forces are applied to cultivation vessels, in particular in case of large vessels and high rotation speeds. Use of unsuitable or defective cultivation vessels can lead to glass breakage and therefore damage to property.

Approved Cultivation Vessels

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

- Erlenmeyer flasks up to 5000 mL made of borosilicate glass (e.g. Schott Duran®) or high-grade plastic, such as polycarbonate (e.g. Corning®) etc.
- Fernbach flasks up to 3000 mL made of borosilicate glass (e.g. Schott Duran®) or high-grade plastic, such as polycarbonate (e.g. Corning®) etc.
- Thomson Optimum Growth® flasks up to 7000 mL
- 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 rotation 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 device 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 adhesive tape to secure the top plate against coming off unintentionally. Using glass flasks with cotton wool or paper plugs is not sufficiently safe.

Trays with Sticky Stuff



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

For more information, see ➦ Chapter 5.1.6 'Tray with Sticky Stuff' on page 66.

2.4 Qualified Personnel

2.4.1 Operator

The operator operates the device in the context of the intended use. Only persons who have been trained for working in a biotechnology laboratory can be considered for the role of operator. These include, for example:

- Process technicians in the fields of biotechnology and chemistry
- Biotechnologists (biotechnicians)
- Chemists with a specialization 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

To be allowed to operate the device, the operator 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.

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

2.4.2 Technician

The technician is an individual who, by virtue of their relevant professional education, training and/or experience, is competent to identify risks and prevent hazards arising from the use of the device. The technician is familiar with the environment in which they are operating and knows the relevant standards and regulations.

Technicians include, for example, the following groups of people:

- Qualified electricians
- Decontamination specialists
- Disassembly, disposal and recycling specialists

2.4.3 INFORS HT Service Technician or Licensed Dealer

Certain work may only be performed by the manufacturer's skilled personnel or by skilled personnel authorized by a licensed dealer. Other persons are not authorized to perform this work.

2.5 Unauthorized Persons

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

Unauthorized persons are not permitted to operate the device or use it in any other way.

2.6 Responsibility of the Provider

Provider

The term “provider” applies to all persons who are responsible for making the device and the necessary infrastructure available. The provider bears a special level of responsibility with regard to the processes and the qualification and safety of the operators.

Provider Obligations

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

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

2.7 Residual Risks

This chapter covers residual risks that are always present when using the device in accordance with normal, intended use.

Electric Current



The device is operated electronically. 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 device from the power supply immediately and arrange for it to be repaired.
- Disconnect the device from the power supply before commencing any work on the electrical components.
- Always use qualified electricians for any work on the electrical components.
- Disconnect the device from the power supply before commencing any maintenance, cleaning or repair work.
- Do not bypass any fuses or take them out of operation.
- When replacing fuses, ensure they have the correct number of Amperes.
- If the power cable is defective, replace it with a power cable of the same type.
- Keep moisture away from live parts. It could cause a short circuit.
- Never remove covers from live parts.

Moving Parts



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

However there is no risk of clothing or body parts being pulled into the device. The risk 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.

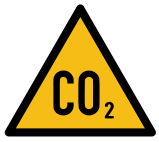
Hot Surfaces



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

For applications with temperatures of above 55 °C, wear heat-resistant protective gloves.

Dangerous Gases



The use or production of dangerous – i.e. toxic or asphyxiant – gases entails a significant health risk, especially in small rooms. To prevent high emissions of dangerous gases, the following measures must be taken:

- The gas connections on the device must be checked before any cultivation using dangerous gases are initiated.
- Check the seals on the device at regular intervals and replace them if necessary.
- Check gas-carrying hoses for leaks at regular intervals.

Flammable or Explosive Substances



The use or production of flammable or explosive substances does not fall under the intended use, as the device is not explosion-proof. If the provider intends to use the device for such applications, it is essential to check the suitability of the device with the relevant local authorities.

There is a risk of explosions when using impure process gases: you must therefore only use process gases without impurities.

Flammable or Explosive Substances (Refrigerant R290)



Applies only to devices with optional cooling: The cooling system operates with refrigerant R290 (propane). R290 is a highly flammable refrigerant classified under safety class A3. Improper handling may result in fire or explosion hazards.

- The device must only be operated in well-ventilated areas. Avoid installation in recesses or confined niches where propane could accumulate.
- Open flames, spark generation, and smoking in the vicinity of the devices are strictly prohibited.
- The theoretically required room volume, based on the lower explosion limit of approximately 0.038 kg/m^3, is 2.4 m^3 for the 230 V version and 2.1 m^3 for the 115 V version. However, the assessment of the local installation conditions is the responsibility of the provider. The provider is therefore required to conduct a site-specific risk assessment. Based on this assessment, the requirements for room size, installation, ventilation, and necessary protective measures must be determined.
- Any work on the refrigerant circuit – particularly draining or repairs – must be carried out exclusively by certified and qualified personnel.

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 personnel for such applications.

Since the device is used deliberately for such applications, it is the responsibility of the personnel to ensure that they have sufficient protection.

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. Therefore, personnel are responsible for providing adequate protection.

Accessories and Spare Parts

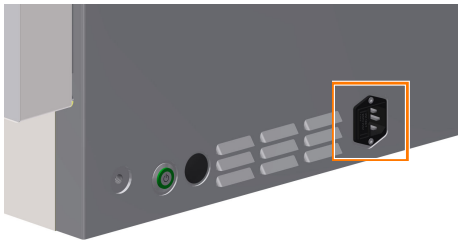


Incorrect spare parts, imitations or spare parts that have not been authorized by the manufacturer and unauthorized accessories represent a significant safety risk. As such, we recommend procuring all spare parts and accessories from a licensed dealer or directly from the manufacturer.

2.8 Safety Features

The device comes with the following safety features:

Device Fuses/Thermal Protection Switches



Two fuses (230 V version) or two thermal protection switches (115 V version) protect the device from impermissibly high power input. The fuses are located right next to the mains connection on the right-hand side of the housing. For information on which fuses to use for which device type, see ➥ Chapter 12.3.3 ' Electrical Connection and Power Values' on page 127.

Overheating Shut-down

The heating of the device is protected against overheating by a temperature limiter. This triggers as soon as the maximum permissible temperature is exceeded and immediately turns off the heating.

Door Monitoring

The position of the door is monitored electronically. If the door is opened, the shaker drive is stopped immediately. As soon as the door is fully closed again, the shaker drive restarts automatically.

2.9 Warning Symbols on the Device

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

Warning symbol	Position	Meaning
	On the housing of the optional humidity control on the rear of the device.	Observe the instructions in the operating manual when connecting the humidity control to ensure compliance with the required water quality. For information regarding the required water quality, see ➦ Chapter 12.5.3 'Hygienic Humidity Control (HHC)' on page 134.
	On the packaging of the supplied spare screws for mounting the shaking table.	The shaking table can be detached and folded up for cleaning the base tray. To subsequently reconnect the shaking table to the rotary axis, you must use new, TufLok-coated screws. That is why suitable spare screws are supplied with the device. For detailed information on removing and mounting the shaking table, see ➦ Chapter 9.2.3 'Cleaning and Disinfecting the Base Tray' on page 117.

⚠ WARNING

Illegible or missing warning symbols on the device will lead to the personnel being exposed to risks that the warning symbols in question were designed to make them aware of.

It is the provider's responsibility to ensure that all the stickers with warning symbols on the device are always intact.

2.10 Declaration of Decontamination

When returning the device for repair, disassembly or disposal, a legally compliant declaration of decontamination is required for the safety of all involved and due to legal requirements. The following must be observed if this is the case:

- The device, component or accessory which is to be repaired must be entirely decontaminated before being sent 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 device is sent back.
- These forms can be obtained from the licensed dealer or the manufacturer.



If the return shipment is not accompanied by a signed and complete declaration of decontamination or 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 Standard Functions

3.1.1 Shaking Function

Mechanics

The shaking table moves in a circular movement. It is driven by an electric motor, which is connected to the device's flywheel by a drive belt. To prevent injuries and facilitate loading and unloading, the drive is switched off automatically as soon as the door is opened.

The counterweight used to balance the mass is fitted under the shaking table. Depending on the design, the deflection of the circular movement is either 3, 25 or 50 mm for devices with an adjustable throw. The shaking table moves in clockwise circles.

Variable Throw

If the device features a variable shaking throw, there are four possible positions for the eccentric throw:

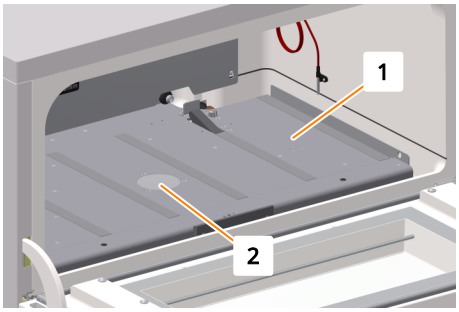
- 12.5 mm, 19 mm, 25 mm, 50 mm

The counterweights are also adjustable to reduce vibrations during operation.



The shaking throw may only be adjusted by qualified personnel that has received appropriate training and authorisations. If in doubt, contact INFORS HT.

Shaking Table

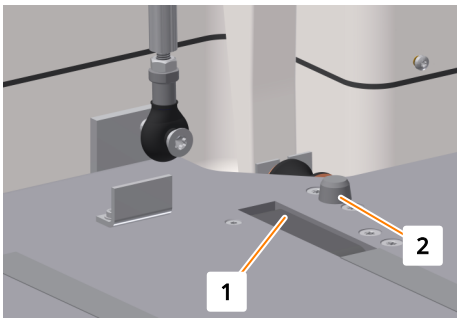
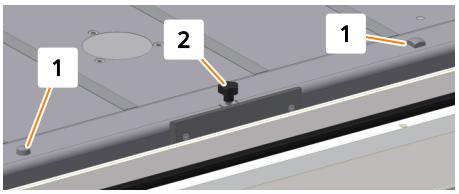


The shaking table (1) is used to hold the 85 x 47 cm (type M) tray, various versions of which are available. Bars on the sides, two stops and two tapered plugs ensure that the tray is positioned correctly.

The shaking table is connected to the drive hub (2) by means of three hexalobular socket screws. To clean the base tray, the three hexalobular socket screws can be removed and the shaking table can be lifted 30°.

Tray Lock

The way the tray is fixed on the shaking table differs depending on the shaking throw.

25 and 50 mm throw	3 mm throw
	
The device is fitted with a tray lock to hold the tray in place on the shaking table. To insert and affix the tray, manually move it into the incubation chamber all the way to the mechanical stop. When you close the door, the tray is lowered into the locking cones (2) and thus affixed to the shaking table. When you open the door completely, the ejection levers (1) under the shaking table lift the tray out of the table's locking cones. The tray is now free and can be manually pulled out of the incubation chamber.	To insert the tray, manually move it into the incubation chamber all the way to the mechanical stop and lower it into the locking cones (1) in the front section of the shaking table. The tray then has to be affixed to the shaking table using a knurled screw (2). To remove the tray from the incubation chamber, the knurled screw has to be removed again. Following that, the tray can be lifted out of the locking cones and be manually pulled out of the incubation chamber.

Operation

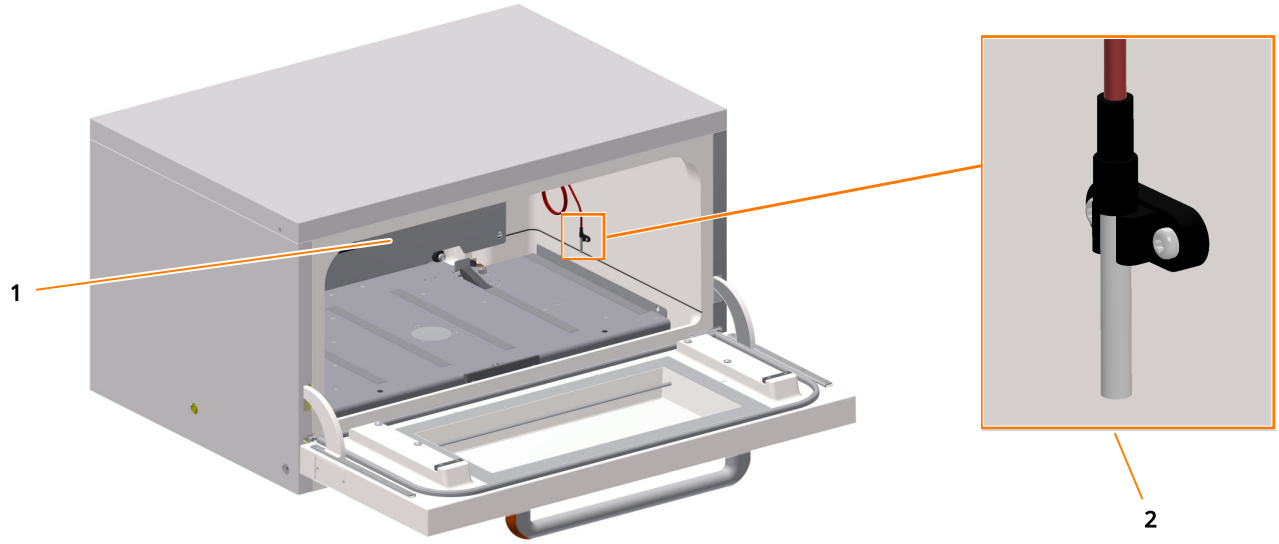


The "Rotation speed" parameter (*RPM*) is operated via the operating panel. For information on how to set and activate the parameter, see ➥ Chapter 7.3 'Setting, Activating and Deactivating Parameters' on page 87.

The permissible load weights depend on the position of the device in the stack, the shaking throw and the shaking speed (➥ Chapter 12.4.1 'Rotation Speed Parameter (Shaker Drive)' on page 130).

3.1.2 Temperature Control (Heating)

Function



1 Finned heater and axial fan (in back wall, not visible)
2 Pt100 temperature sensor

The temperature in the incubation chamber is regulated using a Pt100 temperature sensor with a PID controller. Four axial fans ensure constant air circulation, and keep the temperature distribution in the incubation chamber as constant and gradient-free as possible. Downstream of the axial fans is a finned heater, which heats the air in the incubation chamber. To reach temperatures below the ambient temperature, the device can be fitted with an optional cooling system.

The only purpose of the temperature sensor is to measure the temperature of the air in the incubation chamber. Do not remove the temperature sensor from the holder and immerse it in the liquid in the flask.

Operation



The “Temperature” parameter (*Temp.*) is operated via the operating panel. For information on how to set and activate the parameter, see ➦ Chapter 7.3 ‘Setting, Activating and Deactivating Parameters’ on page 87.

3.2 Connections and Interfaces

3.2.1 Mains Connection



The mains connection is located on the right-hand side of the device. Three different versions of the device are available for different mains voltages:

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

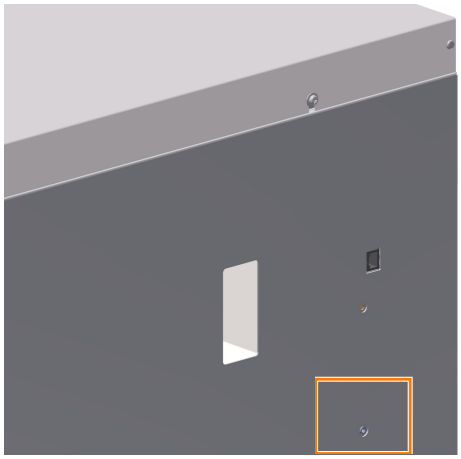
Two device fuses (230 V version) or two thermal protection switches (115 V version) immediately adjacent to the mains connection protect the device from impermissibly high power input.

The country-specific power cable required for connecting the power supply is included in the device's scope of delivery. If the power cable is defective, replace it with a power cable of the same type.

Prior to connecting the device, make sure that the voltage values of the device match those of the local mains voltage. The mains connection must be easily accessible at all times so that the device can be disconnected from the power supply quickly in case of an emergency.

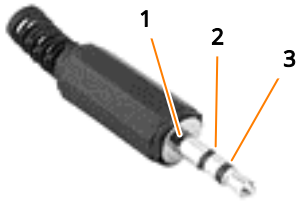
For information on the electrical connection values, see ➦ Chapter 12.3.3 ' Electrical Connection and Power Values' on page 127.

3.2.2 Alarm Connection



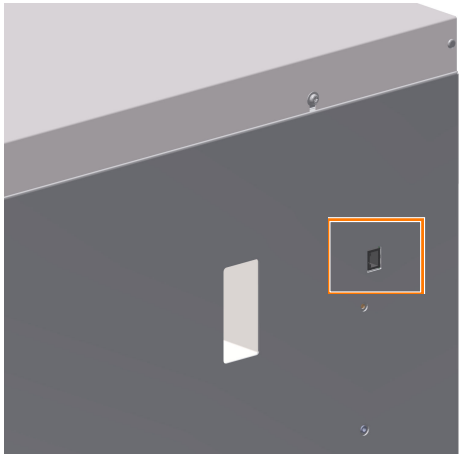
On the right side of the housing, there is a socket (stereo jack, 3.5 mm) for connecting the device to an alarm system. It is labelled *EXTERNAL ALARM*. The socket is designed for a maximum of 34 V AC/DC, 1 A. The alarm relay is activated permanently as long as the alarm is active.

Allocation of contacts:



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

3.2.3 Ethernet Interface



The device has an Ethernet interface (RJ45 socket). This is located on the right side of the device. The Ethernet interface can be used for the following purposes:

- Integration of the device into a network to control the device via eve® the bioprocess platform software.
- Connection of the device to a PLC to control the device via a SCADA system. Depending on the protocol used, this requires either the Profibus DP or Modbus TCP gateway (➥ Chapter 5.4 'Profibus DP and Modbus TCP Gateways' on page 74).
- Control of the device via a laboratory management or monitoring system from a third-party manufacturer. For this purpose, a driver must be developed which translates the protocol used for the external software. The necessary documentation for the communication protocol can be ordered from INFORS HT.

The following data and states are transmitted via the Ethernet interface:

- From the device to the SCADA/bioprocess software: setpoints and actual values of the parameters as well as the status of the door and PIN function
- From the SCADA/bioprocess software to the device: sending new setpoints

Alarms and error messages are not transmitted via the Ethernet interface. Alarm limits can be defined either in eve® or in the SCADA system, depending on the application.

For more information on using the Ethernet interface, see ➥ Chapter 7.5 'Using eve® to Operate the Device' on page 95.

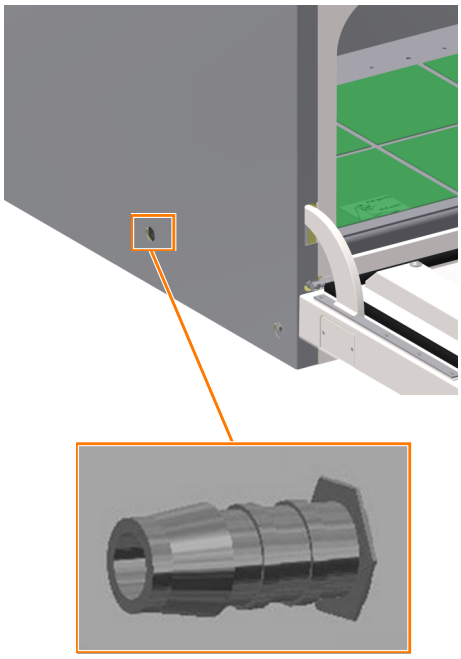
3.2.4 USB Connection



The USB connection on the right side of the operating panel is reserved for service purposes and has no function in normal operation.

3.3 Openings

3.3.1 Discharge Outlet



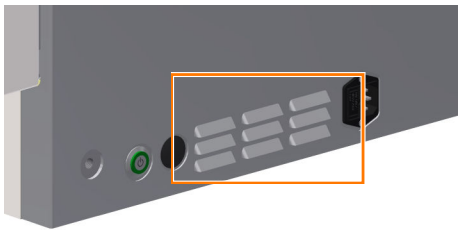
For draining spilled liquids, cleaning agents or accumulated condensation water, there is a discharge outlet at the bottom, almost in the middle of the left side of the casing.

The opening is sealed with a yellow plug on delivery. A hose nozzle (¼ inch) for connecting a hose (Ø 10 mm) is provided.

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.

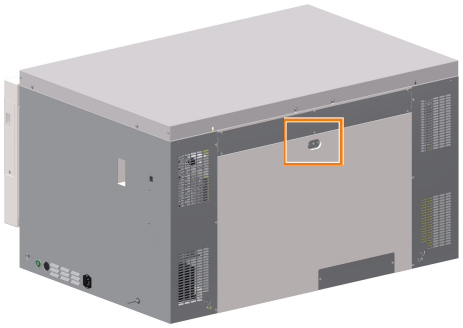
If safety requirements must be met, e.g. when working with genetically modified organisms, the discharge hose must lead to a suitable, sealed receptacle. One example of such a receptacle would be an empty chemical container sealed with foil.

3.3.2 Air Vents

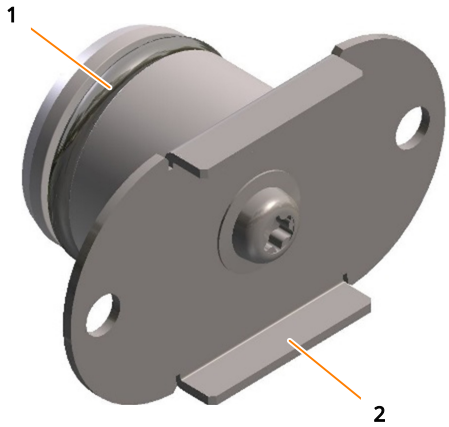


The device has several air vents. When setting up the device, you must ensure that these air vents remain unobstructed (keeping a minimum distance of 80 mm to walls or objects on either side) in order to ensure that the exit gas can be extracted without obstruction and none of the components overheat.

3.3.3 Ventilation Opening



An opening for ventilation of the interior is located in the top centre of the rear of the housing. The purpose of ventilation is to supply bacterial cultures with oxygen from the air.

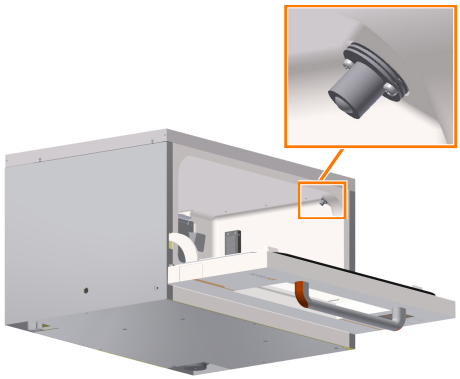


The opening with a diameter of 22 mm is covered by a metal plate with a plug and O-ring (1). The plate can be mounted in two different ways:

- If the plug (1) is facing inwards and the folded parts of the plate (2) are facing outwards, the plate will seal tightly.
- If the plug (1) is facing outwards and the folded parts of the plate (2) are facing towards the device, this results in a ventilation slot.

The device is always delivered with an open ventilation opening. If increased gas consumption is detected when using the optional CO_2 control, the ventilation opening can be closed. Note that closing the ventilation opening can lead to a lack of oxygen to the culture and thus to low growth.

3.4 Working Light



The device features two LED spots to illuminate the incubation chamber. These are located in the door area on the inside of the housing.

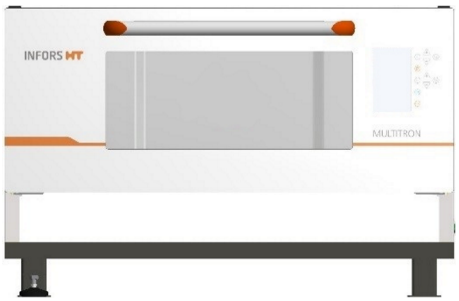
The working light is switched on automatically as soon as a key is pressed or the door is opened. After 2 minutes without input or 2 minutes after closing the door, the working light switches off again automatically.

The Settings menu (**OPTION** key) can be used to completely deactivate the working light if necessary.

3.5 Substructure

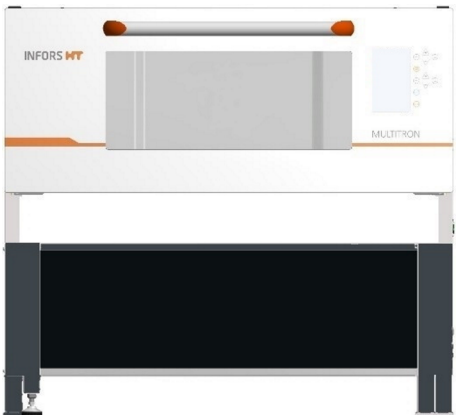
Different versions of the incubator shaker are available with different substructures:

Low Base



Single units and three units stacked can be fitted with a low base. The base has an adjustable foot that can be used to level the device.

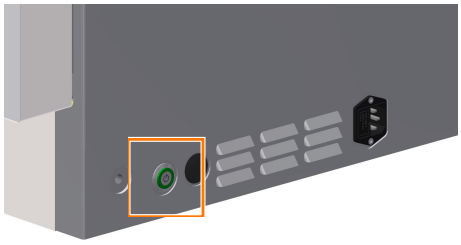
High Base



Single units and two units stacked can be fitted with a high base. This has an adjustable foot that can be used to level the device. The interior of the high base can be used as a storage space, e.g. for trays that are currently not in use. Alternatively, a suitable cooling unit is optionally available for the high base.

3.6 Operating and Display Elements

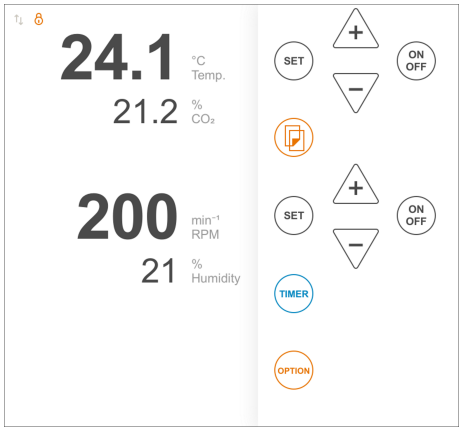
3.6.1 Power Switch



The power switch is located on the right-hand side of the device. In addition to normal switching on and off, the power switch also works as an emergency switch.

If the device is switched off, all parameter setpoints remain stored and the device restarts immediately when it is switched on again.

3.6.2 Operating Panel



All device functions can be controlled directly via the operating panel on the front of the device. The operating panel is divided into a display section and an operating section.

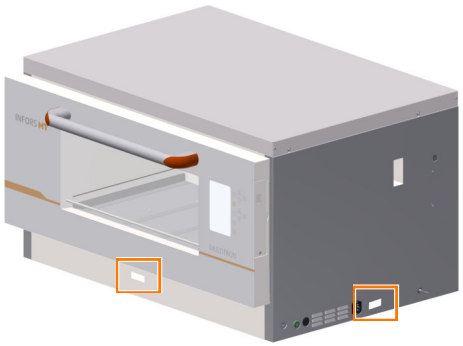
- In the display section on the left side, information on actual values and setpoints, run times of the timer function and fault notifications are displayed, among other things.
- The keys in the operating section on the right side can be used to set the parameters and the timer function and adjust the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

For more information on the display and operating elements on the operating panel, see ➦ Chapter 3.6 'Operating and Display Elements' on page 37.

3.7 Markings on the Device

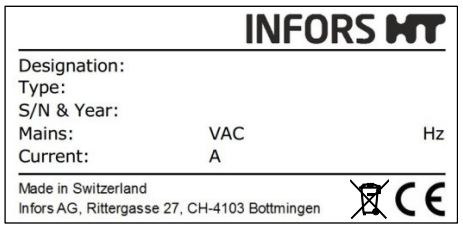
3.7.1 Identification Plate

Position



There is an identification plate identifying the device located on the right side of the housing, directly next to the mains connection and another one on the door at the front.

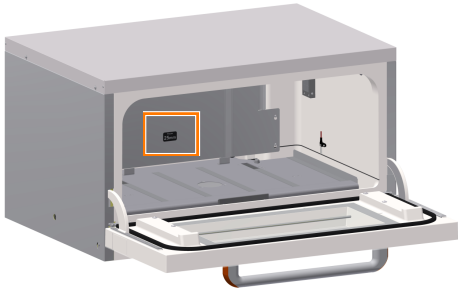
Content



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

- Manufacturer's name
- Designation = category of device
- Type = device type (name)
- S/N = serial number
- Year = year of manufacture
- Mains = nominal voltage and frequency
- Current = power consumption
- Manufacturer's address
- WEEE marking
- CE marking

3.7.2 Identification of the Throw



On the back wall inside the incubation chamber, there is a sticker that identifies the throw (*Throw*).

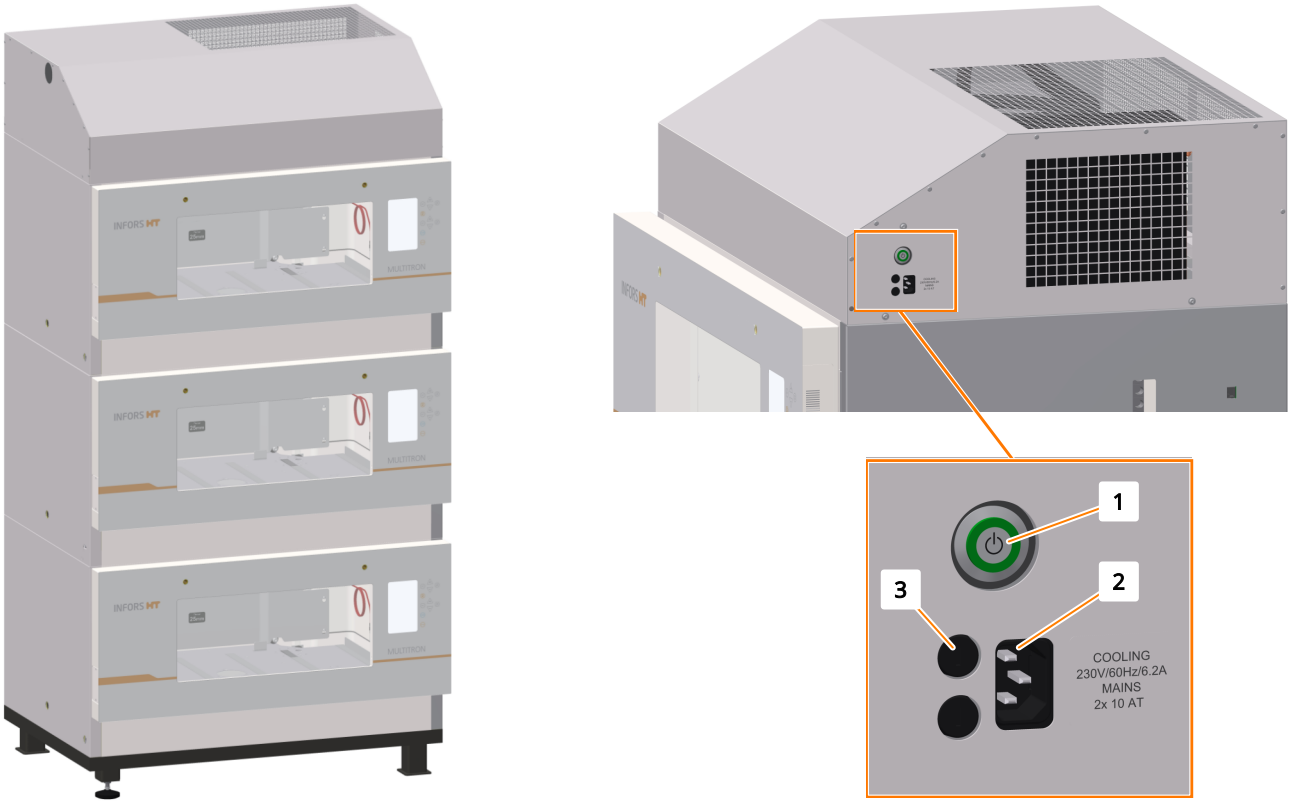
4 Options

To adapt the device to the specific usage scenarios, the device can be enhanced with various options. The options can be ordered at the same time as the device or can be fitted at a later stage. For detailed information on the options as well as advice, please contact our customer service.

4.1 Cooling

For processes that require low temperatures, the device can be fitted with internal cooling or connected to an external cooling system.

4.1.1 Internal Cooling



1 Power switch
2 Mains connection
3 Fuses (230 V version) or thermal protection switch (115 V version)

The device can be fitted with an internal cooling unit. Two different models of the cooling unit are available:

- Single-compressor version
- Dual-compressor version (available only for the 230 V variant)

The cooling unit can either be placed in a bracket on the incubator shaker or in the high base (single-compressor version only).

The dual-compressor version is used when very low temperatures are to be reached. Since two independent compressors are installed in this variant, this also ensures that cooling can continue if one compressor fails (redundancy).

The cooling unit is an autonomous system and has its own power supply and power switch. This is located on the right-hand side of the bracket or base. The cooling unit is a 2-circuit system with a cooling liquid tank. Prior to commissioning, it must be filled with cooling liquid by the manufacturer's qualified personnel or persons authorised by the manufacturer.

The heat exchanger is located behind the rear wall in the incubation chamber.

Alarm Output

The dual-compressor version has an alarm output (alarm relay). The alarm relay is activated as soon as the temperature of the cooling liquid is constantly higher than -3.5 °C for more than 6 hours.

The alarm output can be used, for example, to signal a fault in the cooling system to an external alarm system or to output the fault via a warning light. The alarm relay provides a Normally Closed (NC) and a Normally Open (NO) contact for this purpose. One or both contacts can be used as required.



The cable for the connection must be assembled by the provider. Only the manufacturer's qualified personnel or persons authorised by the manufacturer may connect it. For information on the technical data for the relay contacts, ➥ Chapter 12.5.1 'Internal Cooling' on page 132.

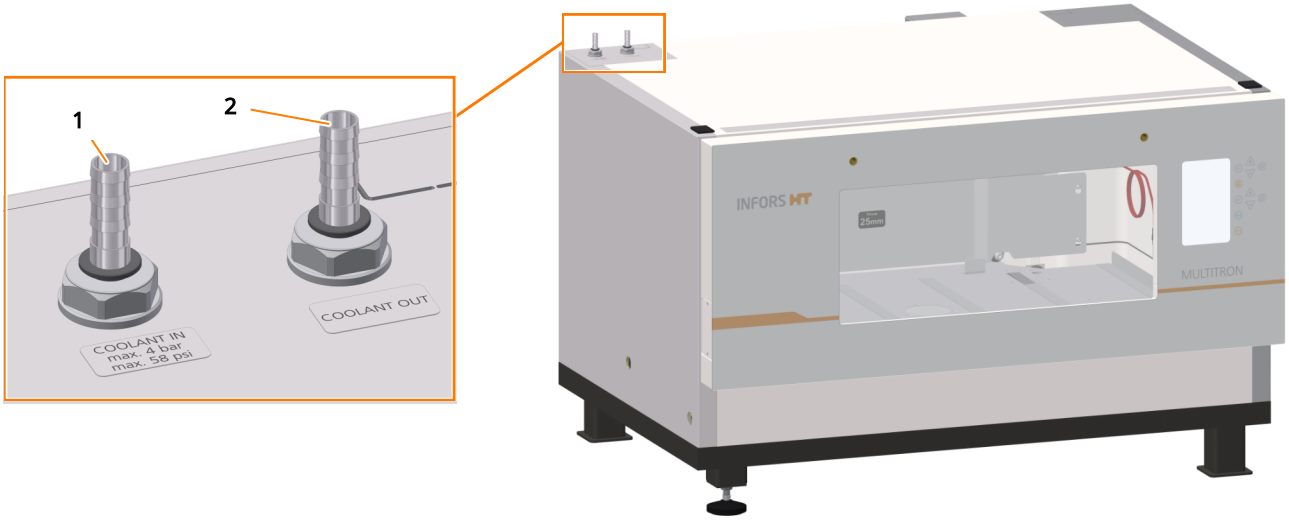
4.1.2 External Cooling System

Setup and Function

If you are planning to connect the device to an external cooling system, a cooling register and a control valve are installed. The control valve opens when necessary to allow cooling liquid to flow through the cooling register. The temperature is measured using a Pt100 sensor which is installed by default.

Options

Connection Conditions



1 Cooling medium inlet
2 Cooling medium outlet

The connections for an external cooling system are on the top of the device. The connections are labelled *COOLANT IN* (inlet) and *COOLANT OUT* (outlet). If several devices with external cooling are stacked, the lines are connected internally and only the top unit has connections on the top.

The connection pressure at the inlet of the cooling medium may be up to 4 bar(g), the outlet must be pressureless. The external diameter of the hose nozzles is 10 mm.

NOTICE

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

4.1.3 Operating the Cooling System

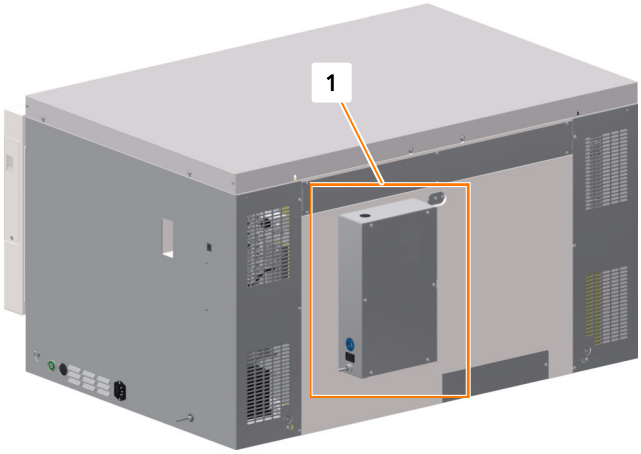


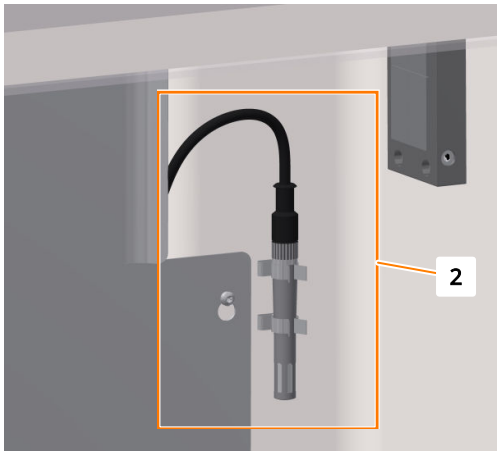
The cooling system is operated using the “Temperature” parameter (*Temp*). Cooling is activated automatically, if this is necessary to reach the entered setpoint for the temperature.

For information on how to set and activate the parameter, see ➦ Chapter 7.3 ‘Setting, Activating and Deactivating Parameters’ on page 87.

4.2 Hygienic Humidity Control (HHC)

4.2.1 Setup and Function





1 Hygienic Humidity Control
2 Humidity sensor

Part of the medium can evaporate, in particular in case of small volumes of work (e.g. when using microtitre and deep well plates) and long cultivation processes. To reduce evaporation of the medium, the device can also be fitted with Hygienic Humidity Control. This regulates the humidity in the incubation chamber to a defined setpoint and thus ensures a consistent culture volume.

Humidity control allows both humidification and dehumidification of the air in the incubation chamber.

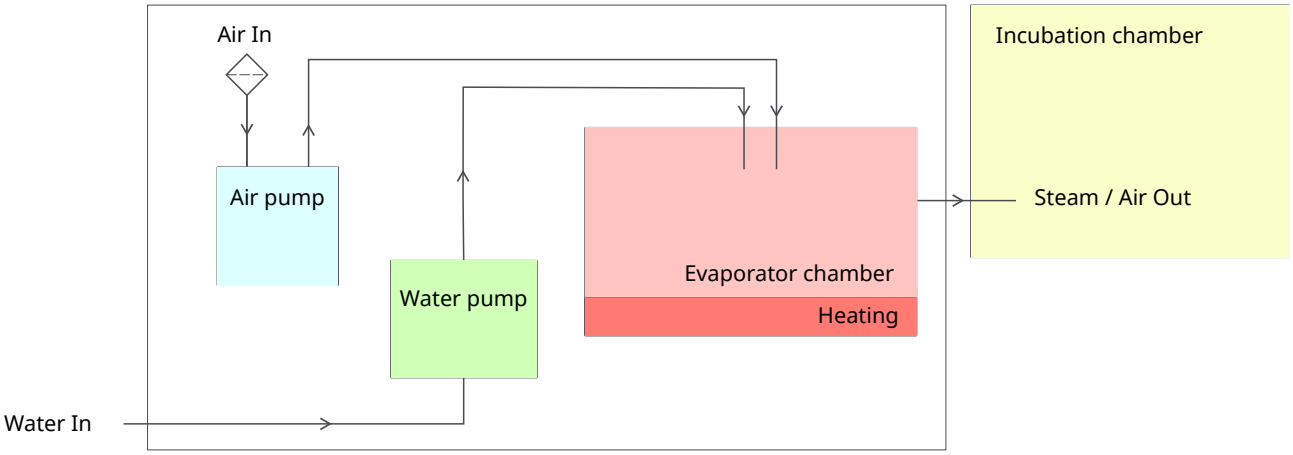
- **Humidification:**

  A controlled water pump feeds water into an evaporator chamber via a feed hose. The water is heated, evaporates and is then fed directly into the incubation chamber. At the same time, a diaphragm pump enriches the steam in the evaporation chamber with ambient air. This has the effect that the air remains above the dew point when entering the incubation chamber. This prevents water from condensing in the incubation chamber.

- **Dehumidification:**

  To dehumidify the air in the incubation chamber, ambient air is introduced into the incubation chamber. This reduces the relative humidity in the incubation chamber, that is, the air is dried.

Options



For pumping water and air, as well as for generating steam, the device is equipped with a water pump, air pump and an evaporation chamber. These, as well as the electronics of the humidity control, are located in their own housing at the rear of the device (1) To measure the humidity in the incubation chamber, a humidity sensor is located in the rear wall of the incubation chamber (2).

Notes on Use

Observe the following points when using humidity control:

- Humidity control is optimised for operation at temperatures up to 40 °C.
- If humidity control is used in combination with LED lighting, the heat radiating from the LEDs can result in the desired humidity not being reached. In addition, there can be significant condensation in the incubation chamber.
- The “Temperature” parameter must be activated.
- The air in the incubation chamber is dehumidified by supplying ambient air to the incubation chamber. The lowest possible humidity in the incubation chamber therefore corresponds to the humidity of the ambient air.

Additional Heating Elements and Cover

As an additional means of preventing condensation in the incubation chamber, the device is equipped with several heating elements (door heating, door seal heating and floor heating). These are activated automatically, as soon as humidity control is switched on.

To reduce condensation on the ceiling, devices without cooling on top of the device (top cooling) are additionally equipped with a cover (height = 40 mm).

Note on Drying the Device

For applications with high humidity levels, it is recommended to dry the incubation chamber before switching off the device. Proceed as follows:

1. Switch off the parameter *Humidity*.
2. Open the door slightly.
3. To keep the door open, place a thin object between the door and the housing.
4. Heat the device to 37 °C and let it run until the residual moisture has completely evaporated (typically 1 to 2 hours).

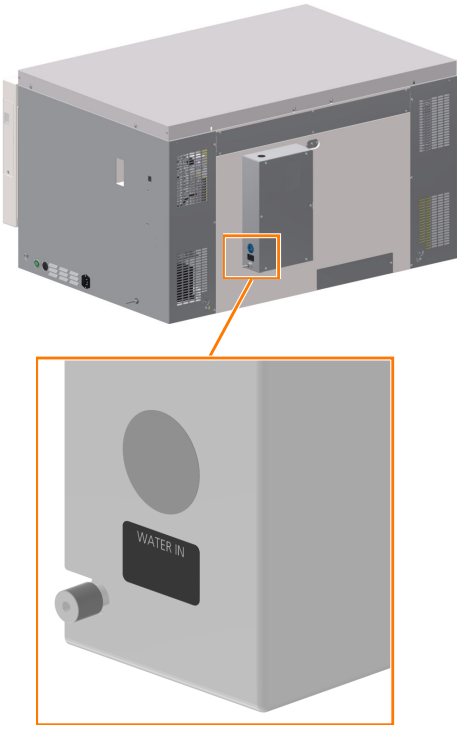
Note on Cleaning

NOTICE

The use of the recommended disinfectants Fermacidal D2 or Biocidal ZF may have negative effects on the humidity and CO_2 sensors and lead to deviations in the measurement values (sensor drift).

- Before carrying out any cleaning work, remove the sensors from the device.
- If removing the sensors is not possible, cover the sensors completely and securely to prevent any contact with the disinfectant.

4.2.2 Connection Conditions



Before commissioning the humidity control, the unit must be connected to the water supply. There are two types of water supply:

- Unpressurised from a water tank
- With inlet pressure of max. 2 bar(g) from a pressurised water pipeline

The connection for water supply for humidity control is located at the bottom of the housing and is designed for PTFE hoses with a diameter of 3.2 mm.

NOTICE

Using tap water – even as a minor additive to ultra-pure water – can quickly lead to limescale in the vaporiser of the humidification unit, which would affect correct functioning.

Adding detergents, disinfectants or similar chemicals to the water for the hygienic humidity control can damage the device. Only use water without additions, in accordance to the specification.

For an optimal operation ultra-pure water or WFI (water for injection purposes) is recommended.

If a water tank is used for the water supply, it can be placed either on the device or on the floor during operation. However, during initial commissioning and whenever the supply hose is empty, it is necessary to place the water tank higher than the humidity control housing (e.g. on the device) until the supply hose is completely filled with water. This is necessary because the maximum suction height of the pump is limited when dry.

4.2.3 Operating the Humidity Control



Humidity control is operated using the “Humidity” parameter (*Humidity*).



To prevent condensation on the walls of the interior, the humidity control evaporator is not turned on until the temperature setpoint (± 1 °C) is reached. After switching on the parameter and reaching the temperature setpoint, it takes approx. 5 minutes for the evaporator to heat up. During this time, the actual value of the humidity and the message *HEAT* are displayed.

If the parameter is constantly in the *HEAT* state, check if the “Temperature” parameter is activated. This must be switched on in order to use humidity control.

For information on how to set and activate the parameter, see ➦ Chapter 7.3 ‘Setting, Activating and Deactivating Parameters’ on page 87.

4.3 CO_2 Control

4.3.1 Safety Notes

CAUTION

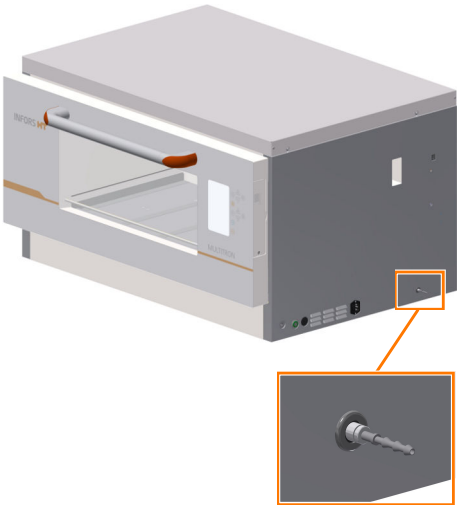
During normal operation, small amounts of CO_2 are constantly dissipated into the environment. Leaking CO_2 can lead to discomfort, loss of consciousness or even death by suffocation, especially in small rooms.

- The provider must install a monitoring system that permanently monitors and evaluates the CO_2 concentration in the room.
- If you are using CO_2 control, only operate the device in well-ventilated areas.
- Comply with local health protection laws and regulations in relation to the use of CO_2 and its limits.
- Regularly check the gas pipelines for leaks.

Opening the ventilation opening on the rear of the device can lead to significantly higher gas consumption. We therefore recommend leaving the ventilation opening closed when using CO_2 control.

4.3.2 Setup and Function

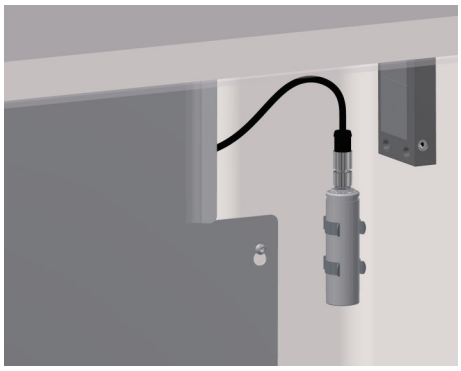
Functional Description



The optional CO_2 control makes it possible to enrich the atmosphere in the interior by 0 % to 20 % CO_2. CO_2 control is particularly suited to cultivation of mammalian cells and algae because the CO_2 ensures that the pH value in the culture medium is stable.

The CO_2 supply is regulated with a control valve. Inflow of CO_2 must be ensured using external supply where the pressure can be regulated. On the right side of the housing, there is a hose nozzle for a hose with a diameter of 3 mm to 4 mm to connect the supply.

CO_2 Sensor



The CO_2 sensor for measuring and controlling the CO_2 content is mounted on the right side of the back wall of the incubation chamber.

Notes on Cleaning

NOTICE

The use of the recommended disinfectants Fermacidal D2 or Biocidal ZF may have negative effects on the humidity and CO_2 sensors and lead to deviations in the measurement values (sensor drift).

- Before carrying out any cleaning work, remove the sensors from the device.
- If removing the sensors is not possible, cover the sensors completely and securely to prevent any contact with the disinfectant.

4.3.3 Connection Conditions

Gas Supply

The in-house CO_2 supply to the device must meet the following requirements:

- Constant inlet pressure not exceeding 0.5 bar(g) (± 0.1 bar)
- Only use clean, dry, oil and dust free gas.

Hoses

The connection hose must satisfy the following conditions:

- Use only pressure-resistant and intact hoses.
- The hose must have an appropriate diameter; an adapter may be used, if necessary.
- Secure hoses using appropriate hose clamps.

4.3.4 Operating the CO_2 Control

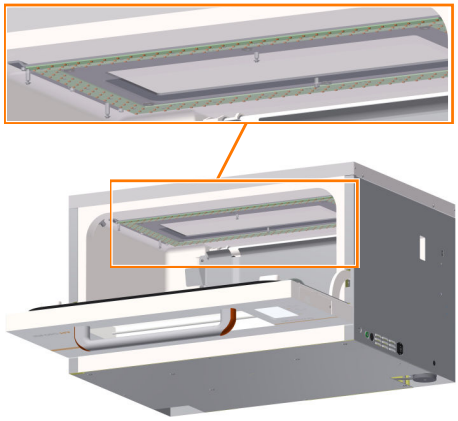


The CO_2 control is operated using "CO_2" parameter (*CO_2*). To prevent large amounts of CO_2 from escaping, CO_2 control is deactivated automatically while the door is open.

For information on how to set and activate the parameter, see ➦ Chapter 7.3 ‘Setting, Activating and Deactivating Parameters’ on page 87.

4.4 LED Lighting

4.4.1 Setup and Function



The optional LED lighting evenly illuminates the surface of the shaking table with an adjustable light intensity. The LEDs emit a spectrum similar to sunlight in the visible range, with a very high proportion of photosynthetically active light. The LED lighting can thus be used, for example, to cultivate phototrophic cells or to simulate day-night cycles.

The LEDs are mounted on the ceiling of the incubation chamber and protected from contact by a protective cover. The cover has a large opening in the centre to promote air circulation. The protective cover reduces the height of the incubation chamber by around 30 mm. This means that Erlenmeyer flasks with a volume of 5000 mL cannot be used.

For better light distribution in the incubation chamber, the glass pane of the door is covered with a darkening film.

LED Lighting and Cooling

The LEDs generate heat during operation and release it to the air in the incubation chamber. Therefore, the LED lighting can only be operated with a cooling system. If the device is operated with internal cooling, the temperature is regulated fully automatically. If the device is connected to an external cooling system, you must ensure that the cooling system is fully functional when operating the LED lighting.

Recommended Maintenance

The light intensity of the LEDs remains largely constant for about 3 years (continuous operation at maximum setpoint). After that, however, the efficiency of the LEDs begins to decrease due to material fatigue and thermal loads. This leads to a gradual and increasingly strong reduction in light intensity. It is therefore recommended to have the LED modules replaced after 3 years of continuous operation.

4.4.2 Operating the LED Lighting



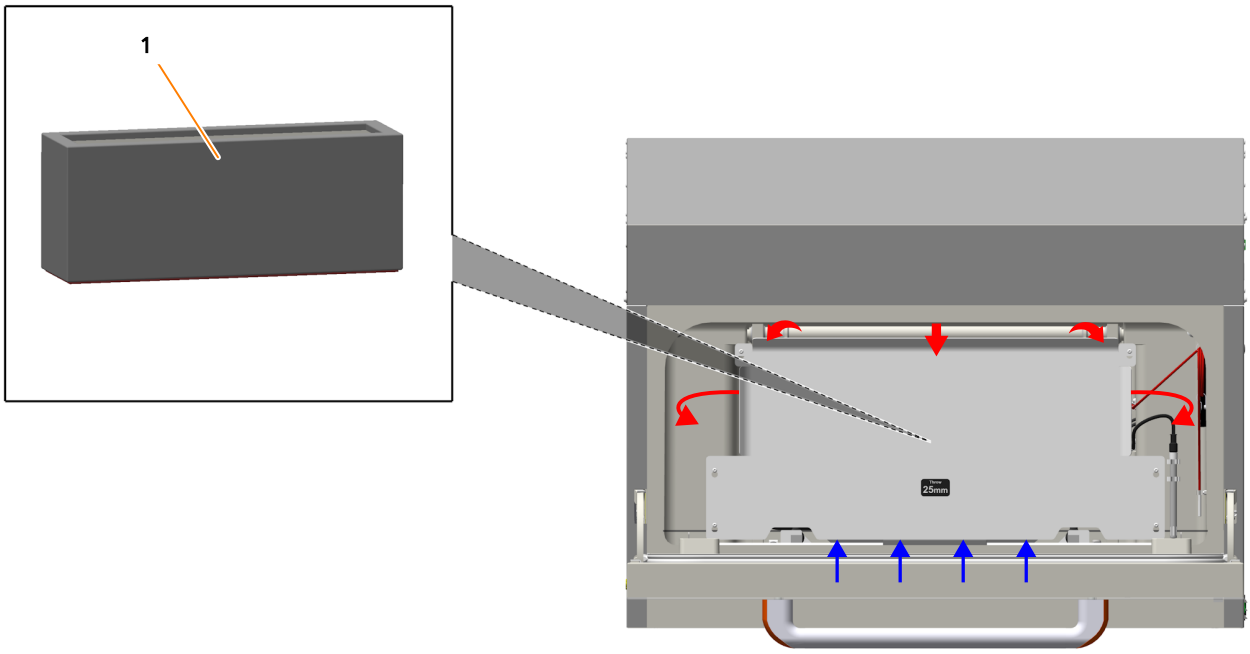
The LED lighting is operated using the “Light intensity” parameter (*Light*). The light intensity can be regulated from 1 % to 100 %.

For information on how to set and activate the parameter, see ➦ Chapter 7.3 ‘Setting, Activating and Deactivating Parameters’ on page 87.

4.5 HEPA Filter

The device can optionally be equipped with a HEPA filter, 1. This filters germs, bacteria, viruses and other microparticles from the air in the incubation chamber and thus protects the cultures from microbiological contamination.

The HEPA filter is located behind the rear panel between the fans and the heating element. The air drawn in by the fans is fed through the HEPA filter, then heated and fed back to the incubation chamber. This continuous air circulation ensures consistently high air quality and optimal and uniform temperature distribution in the incubation chamber.



Recommended Maintenance

The microorganisms and particles separated from the air accumulate over time between the fins of the filter. This can cause the filter to become clogged, which reduces the filter's performance and the air circulation in the incubation chamber. The filter must therefore be replaced at regular intervals.

The service life of the filter depends greatly on the particle load of the air in the incubation chamber and the frequency of use of the incubation shaker. Due to the high number of air changes in the incubation chamber and to ensure maximum operational safety, the filter must be replaced **annually**. As soon as a filter change is required, this is shown on the display of the operating panel.

NOTICE

The HEPA filter is resistant to light splashes of water and cleaning agents. However, intensive wetting, especially saturation of the filter medium, can cause damage. Therefore, never pour water over the filter or soak it completely. The filter cannot be cleaned.

Poor air circulation in the incubation chamber and, as a result, poor temperature distribution is an indication that the filter is clogged and needs to be replaced.

WARNING

HEPA filters trap a wide range of particles, including dangerous germs, viruses and bacteria. These pathogens may be released when the filter is replaced. Contact with or inhalation of these particles presents a significant health risk.

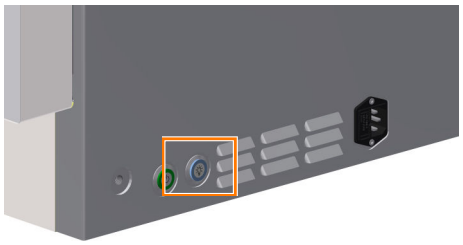
- The HEPA filter may only be replaced by the manufacturer's qualified personnel.
- The provider is obliged to provide suitable personal protective equipment (PPE) based on the risk assessment carried out to ensure that the HEPA filter can be replaced safely.
- Used HEPA filters must be disposed of according to the provider's disposal process and in accordance with local regulations.

4.6 UV Decontamination

4.6.1 Setup and Function

Optional UV decontamination is used to kill microorganisms in the air in the incubation chamber. The option consists of two UV decontamination lamps on the rear wall of the housing. They emit high-energy UV radiation of 253.7 nm. The air drawn in by the axial fans flows past the UV decontamination lamps, thereby killing the microorganisms contained in the air stream through UV radiation.

4.6.2 Operating the UV Decontamination

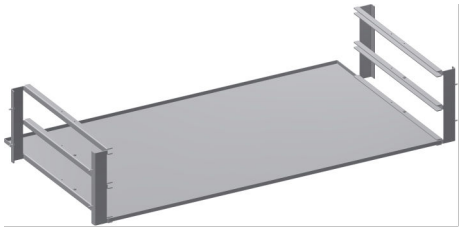


UV decontamination is controlled using a pushbutton on the right side of the device. The pushbutton lights up when UV decontamination is active.

Observe the following points when using UV Decontamination:

- The “Temperature” parameter must be activated.
- For safety reasons, the UV decontamination lamps are switched off when the door is open.

4.7 Removable Shelf

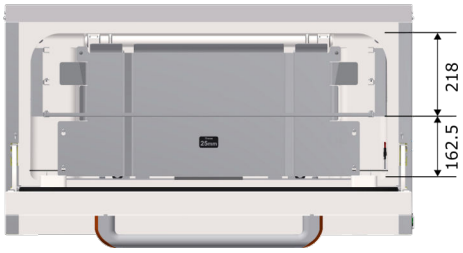
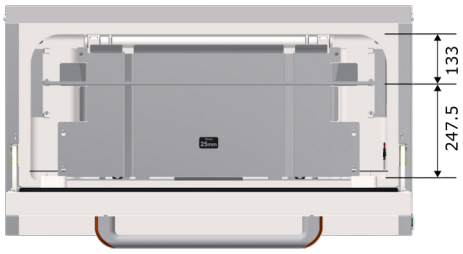
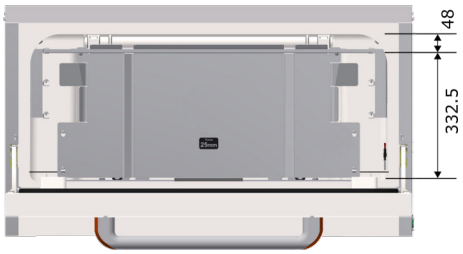


A shelf (approx. 865 mm x 490 mm) for static incubation is available as an option. This facilitates static incubation in climatic conditions almost identical to the cultures on the shaking table.

NOTICE

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

The removable shelf can be inserted at three different heights into rails attached to the side wall in the interior.

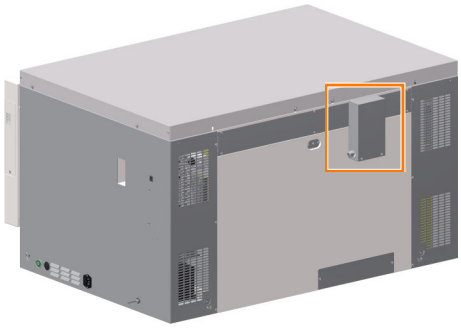
Lower position	If the shelf is in the lower position, flasks with a volume of up to 250 millilitres (maximum height: 150 mm) can be placed on the shaking table.	
Middle position	If the shelf is in the middle position, flasks with a volume of up to 1 litre (maximum height: 220 mm) can be placed on the shaking table.	
Upper position	If the shelf is in the upper position, flasks with a volume of up to 3 litres (maximum height: 320 mm) can be placed on the shaking table.	

4.8 Darkening

The glass pane of the door can be covered with white adhesive foil on the inside. This is used for darkening as well as to ensure better light distribution in the incubation chamber when using LED lighting.

4.9 Analog Output

4.9.1 Setup and Function



The device can optionally be equipped with an analog output module. This provides 8 channels via which actual values and setpoints can be transferred to an external device.

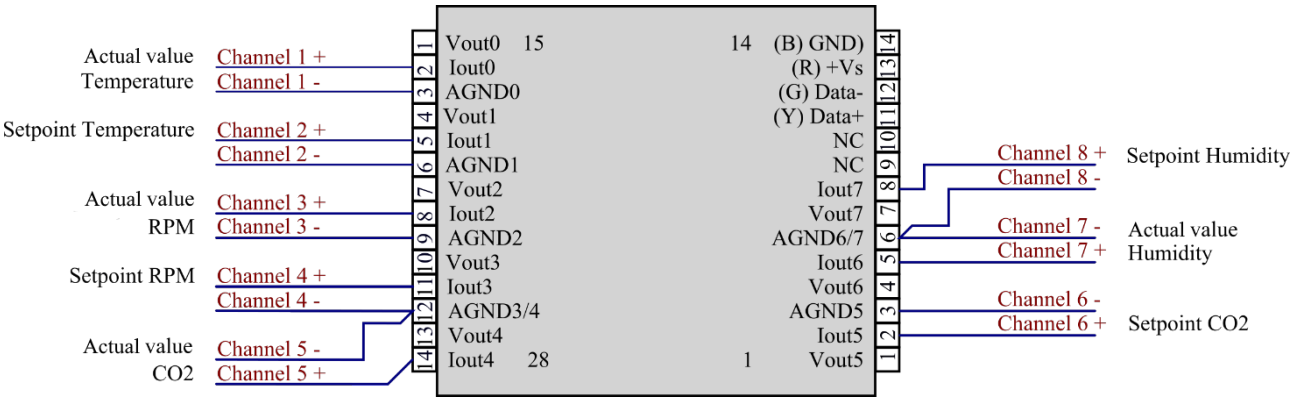
The analog output module is located on the rear and is in its own housing. The signal range corresponds to 4 mA to 20 mA with a precision of ± 0.05 mA.

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

4.9.2 Connection Assignment

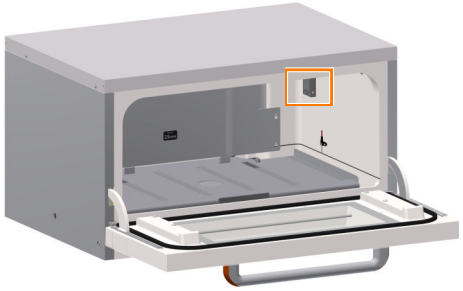
The connections of the analog output module are assigned as follows:

Channel	Connection	Function	Signal range
1	Iout0 / AGND0	Temperature actual value	0 °C to 100 °C = 4 mA to 20 mA
2	Iout1 / AGND1	Temperature setpoint	
3	Iout2 / AGND2	Rotation speed actual value	**25/50 mm and adjustable throw:**
4	Iout3 / AGND3/4	Rotation speed setpoint	0 min^{-1} to 500 min^{-1} = 4 mA to 20 mA **3 mm throw:** 0 min^{-1} to 1000 min^{-1} = 4 mA to 20 mA
5	Iout4 / AGND3/4	CO_2 actual value	0 % to 20 % = 4 mA to 20 mA
6	Iout5 / AGND5	CO_2 setpoint	
7	Iout6 / AGND6/7	Humidity actual value	0 % to 100 % = 4 mA to 20 mA
8	Iout7 / AGND6/7	Humidity setpoint	



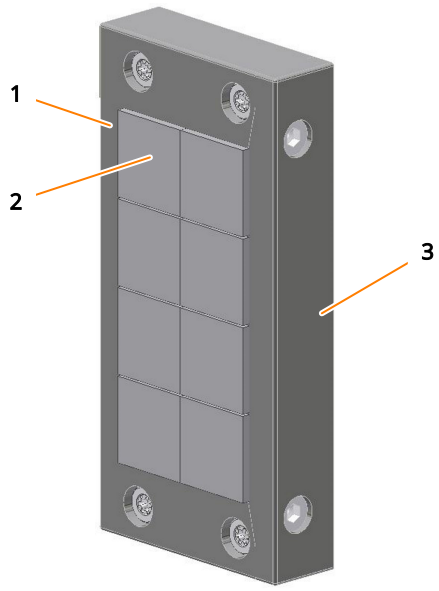
4.10 Cable Pass-through

4.10.1 Setup and Function



A pass-through for cables and hoses can be installed on the right side of the housing. This can be used to guide additional sensors or gassing into the incubation chamber.

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.



The cable pass-through consists of a dividable cable-pass-through bar (1) into which slotted sealing elements (cable sleeves) (2) can be inserted. The cables are affixed and strain-relieved using cable sleeves. Openings that are not required are sealed using a dummy sleeve.
The cable pass-through is screwed onto the inside of the housing. A suitable screwdriver (SW 4) is included to dismantle the removable part of the cable pass-through (3).

4.10.2 Using the Cable Pass-through

WARNING

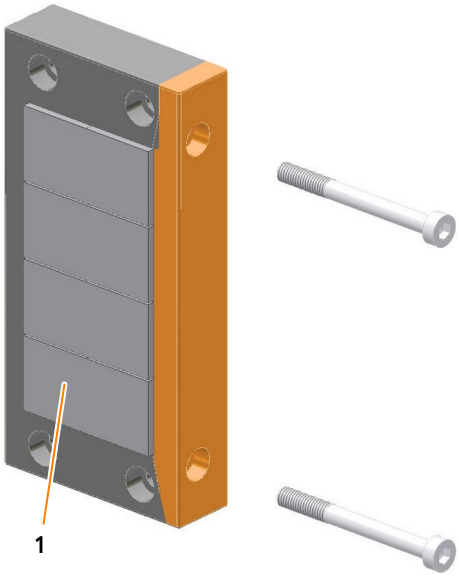
If an external device that is supplied with mains voltage is operated on the shaking table whilst it is operating, there is a risk that the cable might break or get jammed. This poses a risk of death by electrocution.

- Any mains voltage operated devices may only be used when the shake function is switched off (e.g. in conjunction with the “Temperature” parameter.)
- Any mains voltage operated devices may only be used in conjunction with the “Humidity” parameter if the device is adequately protected against humidity. Observe the permissible environmental conditions for operating the device.

NOTICE

To avoid damages when installing the cables and/or hoses in the incubation chamber, make sure that they do not rub and do not get jammed.

To correct insert cables and hoses into the incubation chamber, proceed as follows:



1. Dismantle the removable part of the cable pass-through (highlighted in orange) by removing the two cylinder screws. A suitable screwdriver with SW 4 is included in the device's scope of delivery.
2. If necessary, remove the inserted dummy sleeves (1).
3. Place the cable in a suitable cable sleeve.
4. Insert the cable sleeve into the cable pass-through.
5. Use dummy sleeves to seal any openings that you do not require.
6. Install the removable part of the cable pass-through by using the two cylinder screws.

4.11 Antimicrobial Coating



The housing of the device is optionally available with an antimicrobial coating. This contains a coating additive of pure metallic silver that reliably kills microorganisms that come into contact with the surface. This can inhibit the growth of bacteria, fungi and other microorganisms on the walls in the incubation chamber.

The door of the device always has an antimicrobial coating, even if the option has not been ordered.

The inside of the housing as well as the door can discolour slightly due to the silver additive in the varnish. This discoloration has no negative effect on the antimicrobial properties of the coating or the cultured product.

5 Accessories

The following chapters describe all accessories that are generally available for the device. For special applications, our customer service is available for consultation.

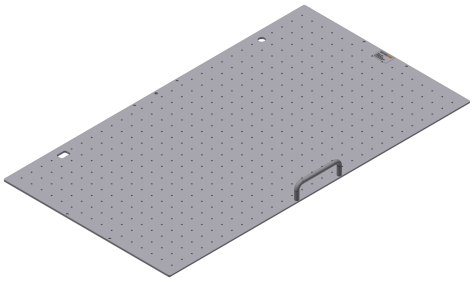
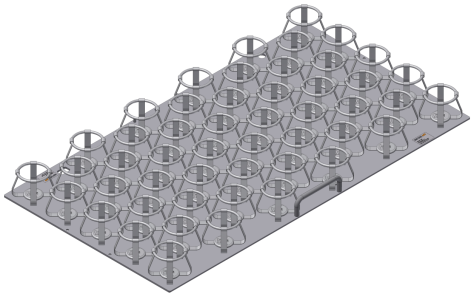
Detailed information and order details for our accessories can be found in our accessories catalogue. This can be obtained from INFORS HT or your local licensed dealer.

5.1 Trays

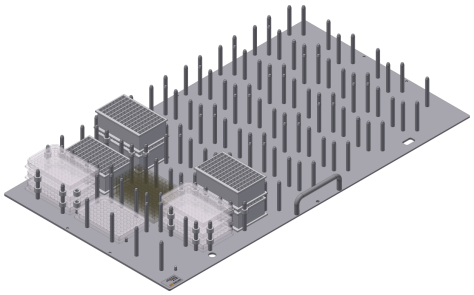
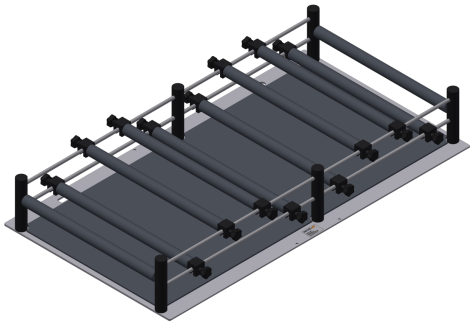
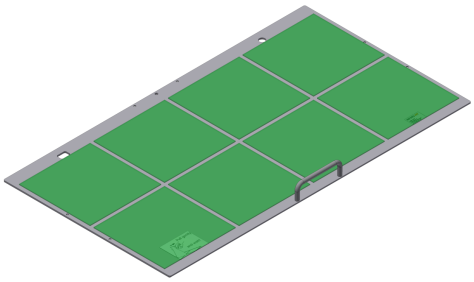
Different trays are available for the device; these can be purchased individually or ordered with the device.

In addition to the universal table tray, which can be equipped as desired, various trays with fixed features are available for different purposes. 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 tasks. In contrast to the universal table tray, their holders cannot be changed. Pre-fitted trays feature a capacity that is up to 20% 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.

The following trays are available:

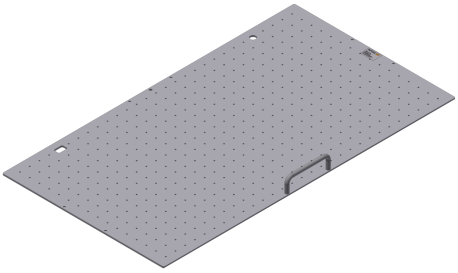
Figure	Designation
	Universal table tray
	Tray with steel clamps

Accessories

Figure	Designation
	Tray with pin holders for microtitre and deep-well plates
	Tray with clamping assembly for microtitre and deep-well plates
	Tray with sliding bars
	Tray with Sticky Stuff

5.1.1 Universal Table Tray

Overview



The tray referred to as “universal table tray” features drill holes on a grid so that it can be equipped as desired. For equipping, various clamps and test tube holders are available; these can be combined as desired (➦ Chapter 5.2 ‘Clamps and Other Holders’ on page 69).

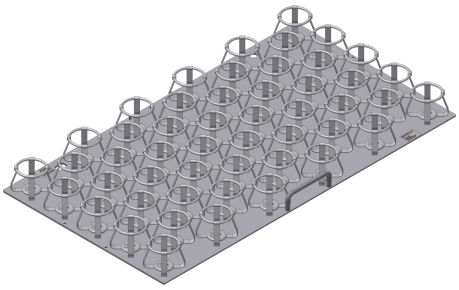
The universal table tray is made of anodised aluminium and can be sterilised in the autoclave if required.

The separately available Sticky Stuff adhesive matting can also be stuck onto the universal table tray.

Technical Data

Data	Value
Material	Aluminium
Size	850 x 470 mm
Weight	4.5 kg
Threaded holes	M4
Threaded holes	462
Threaded hole grid	28.28 x 28.28 mm
Sterilisation in an autoclave	YES

5.1.2 Tray with Steel Clamps

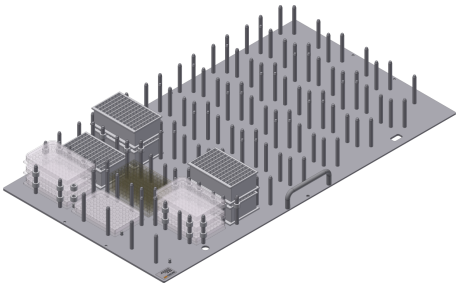


Fitting identical clamps on the entire tray results in the following capacities:

Flask size [mL]	Number of flasks per M tray
25	197
50	131
100	91
250	48
500	31
1000	19
2000	13
3000	9
4000	8
5000	6

5.1.3 Tray with Pin Holders

Overview

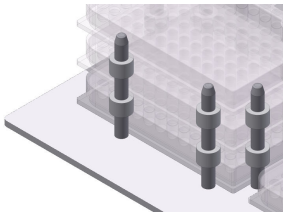


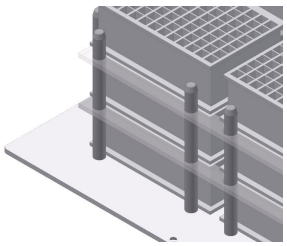
For applications in which large numbers of microtitre or deep-well plates need to be incubated, various trays with pin holders are available. These enable loading with several layers of microtitre and deep-well plates.

The plates can be stacked. This allows you to simultaneously incubate up to 72 deep-well plates and up to 144 microtitre plates on one M tray.

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

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

	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 allowing you to save time while loading.

NOTICE

The spacers are made of plastic and therefore cannot be autoclaved.

Technical Data

Data	Value
Material	Aluminium
Fastening screws	M5 x 12
Cleaning	Mild neutral cleaning agent
Disinfection	Commercially available disinfectant
Sterilisation in an autoclave	YES
External dimensions of the microtitre plates	85.1 x 127 mm
Height of the deep-well plates	42 mm

5.1.4 Tray with Clamping Assembly

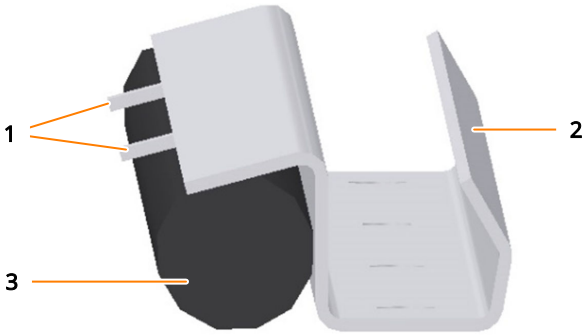
Overview



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

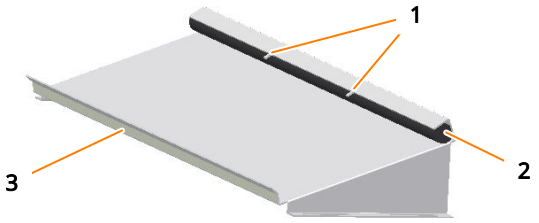
Tray with flat clamping assembly (horizontal incubation): The flat clamping assembly is a profile made of sheet metal that is equipped with an angled strip (2). On the other side, there is an edge featuring a foam rubber strip (3). There are two spacers on the edge (1) for positioning microtitre plates or deep-well plates.

Accessories

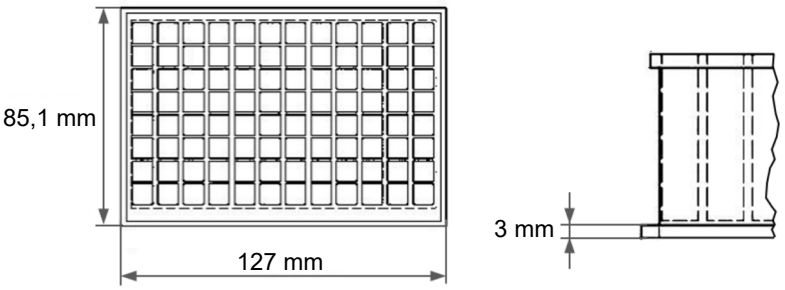




Tray with clamping assemblies tilted at an angle of 20° (angled incubation): The folded clamping assembly is wedge-shaped metal sheet with two profiles. The lower profile is an angled bar (3). The upper profile is a U profile into which the cellular rubber string (2) is inserted. There are two spacers on the upper edge (1) for positioning the microtitre plates or deep-well plates.



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.

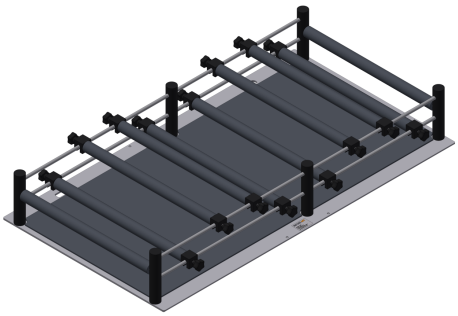


Technical Data

Data	Value
Rail material	Aluminium
Foam rubber material	CR rubber
Temperature range	≤ 80°C
Cleaning	Mild neutral cleaning agent
Disinfection	Commercially available disinfectant
Sterilisation in an autoclave	NO
Size of microtitre plates/deep-well plates	85.1 x 127 mm

5.1.5 Tray with Sliding Bars

Overview



Trays with sliding bars enable the affixing of vessels of various shapes and sizes. The sliding bars can be affixed to any point on the support bars. This also allows you to affix bottles with vertical walls and a curved base.

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

The scope of delivery for the tray includes the fixed mounted frame and 8 movable sliding bars.

Technical Data

Data	Value
Material	Aluminium, plastic
Cellular rubber mat	EPDM cellular rubber
Cellular rubber cover	Armaflex
Cleaning	Mild neutral cleaning agent
Disinfection	Commercially available disinfectant
At operating temperature	65 °C
Sterilisation in an autoclave	NO

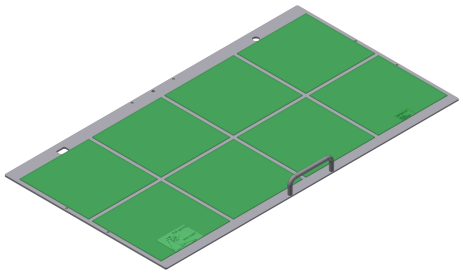
5.1.6 Tray with Sticky Stuff

NOTICE

If condensate forms on the tray or the culture vessels, 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 Sticky Stuff:

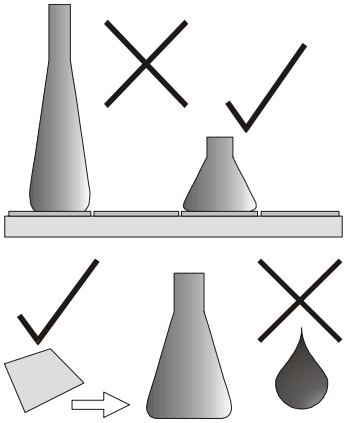
- Ensure that condensate does not form on the tray or the culture vessels. This is particularly necessary when cultivation is started at low temperatures and the temperature is then increased.
- Let cultivation vessels that were stored in the fridge warm up to ambient temperature first before placing them on the adhesive matting.



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

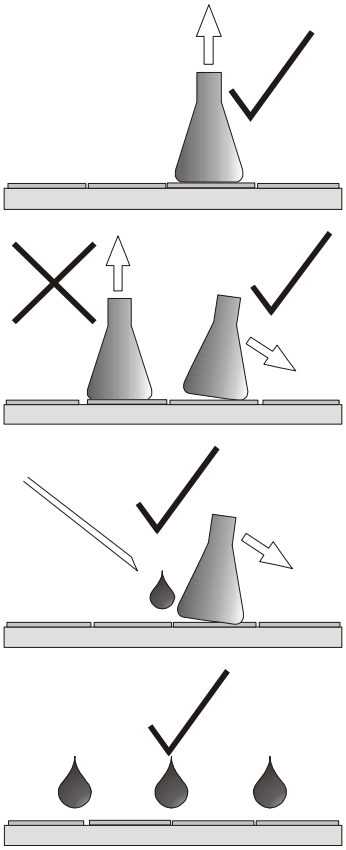
Due to limited resistance to disinfectants as well as the risk of unintentional detaching of flasks, Sticky Stuff is not suitable for cultivating pathogenic microorganisms.

Using Sticky Stuff



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

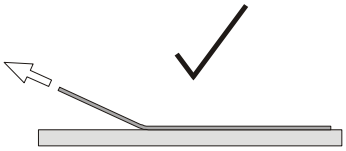
  Never use damaged vessels!
- Prior to putting down any vessel, ensure that its base is dry, clean and grease-free.



- 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 apply 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 can deteriorate 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 allow to dry overnight.
- Quaternary ammonium compounds are suitable for disinfection.
- Note the application time and rinse thoroughly with water afterwards. If the adhesive matting is disinfected at regular intervals, it might need to be replaced sooner.

Replacing the Adhesive Matting



To replace the adhesive matting proceed as follows:

1. Thoroughly moisten the tray with water.
2. Release the adhesive matting on one side of the tray and then pull upwards at an angle.
3. Degrease the tray with acetone and apply new wet adhesive matting (as per separate installation instructions). Only remove protective foil prior to use.

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

Accessories

Service Life

Sticky Stuff is a consumable that typically has to be replaced every 2 to 5 years. The service life depends on how the material is used and cleaned. If you are regularly using aggressive chemicals to clean or disinfect, we recommend replacing the Sticky Stuff every 2 years.

NOTICE

Normal ageing and/or use of aggressive chemicals reduces the adhesiveness. This can result in vessels coming lose and thus damaging the device.

- Replace severely worn adhesive matting.
- Only use absolutely clean, dry and grease-free adhesive matting.
- Check the adhesiveness prior to use. If you are unsure, slowly increase the rotation speed and check that the vessels adhere safely.

Suitable/Unsuitable Vessels

Sticky Stuff is suitable for use in combination with the following vessels:

- Erlenmeyer or Fernbach flasks made from glass or polycarbonate with a smooth bottom and without crowning

When using unsuitable vessels, the adhesive power is reduced significantly. If unsuitable vessels are used in combination with Sticky Stuff, it is the user's responsibility to check if the adhesiveness suffices.
In addition, only reduced rotation speeds are possible when using unsuitable vessels. Unsuitable vessels include, for example:

- High and narrow vessels
- Bottles
- Erlenmeyer flasks with crowning and correspondingly reduced contact area

Maximum Rotation Speeds with Sticky Stuff

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



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

Schott Duran® glass Erlenmeyer flask	Filling	Maximum permissible rotation speed	
		25 mm throw	50 mm throw
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 rotation speed	
		25 mm throw	50 mm throw
125 to 3000 mL	20 %	300 min^{-1}	200 min^{-1}

Corning plastic Fernbach flask	Filling	Maximum permissible rotation speed	
		25 mm throw	50 mm throw
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.

5.2.1 Clamps

For fitting a universal table tray, clamps of various sizes are available. These can be ordered individually and mounted on the universal table tray.

Accessories

Stainless Steel Clamps

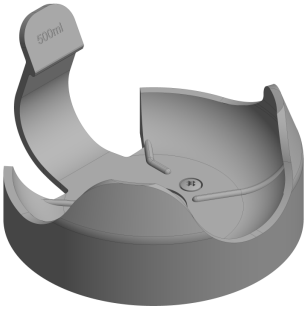


The following stainless steel clamps are available:

For flask type	Volume, mL
Erlenmeyer	25, 50, 100, 250, 500, 1000, 2000, 3000, 4000, 5000
Fernbach	1800, 2800
Thomson Optimum Growth®	7000

Data	Value
Material	Stainless steel
Fastening screws	25 to 50 mL: M4 x 6 100 to 7000 mL: M4 x 8
Temperature range	95 °C
Cleaning	Mild neutral cleaning agent
Disinfection	Commercially available disinfectant
Sterilisation in an autoclave	YES

Plastic Clamps



The following plastic clamps are available:

For flask type	Volume, mL
Erlenmeyer	100, 500

Data	Value
Material	POM Co polymer
Fastening screws	M4 x 6
Temperature range	65 °C
Cleaning	Mild neutral cleaning agent
Disinfection	Commercially available disinfectant
Sterilisation in an autoclave	NO

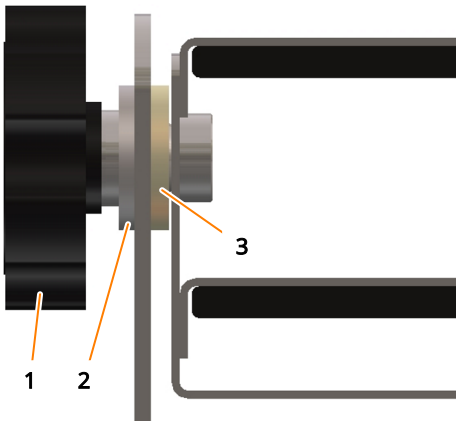
5.2.2 Test Tube Holder



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 (details and special variants on request):

- For long test tubes; Ø 8 to 30 mm
- For short test tubes; Ø 12 to 18 mm
- For plastic tubes with ventilation lid; Ø 16 and 30 mm
- Special holders, e. g. for 600 mL culture vessel



If necessary, the inserts with the tubes can be tilted by loosening the black nuts (1). 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 (3) and the Teflon washer (2).

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

NOTICE

The test tube holders adhere extremely strongly to the Sticky Stuff 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



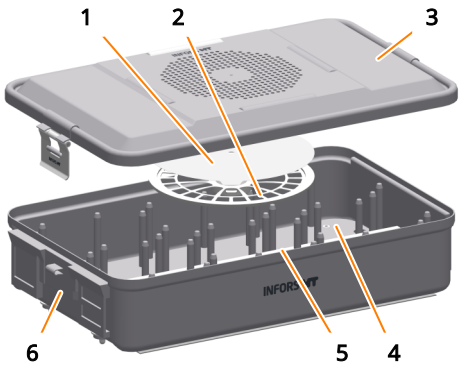
The box for microtitre plates is used for low-vapour cultivation of microtitre plates and deep-well plates. It protects cultures from drafts in the incubation chamber and also offers a stable container in which cultures can be transported.

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.

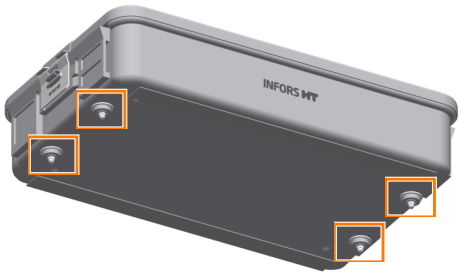
Accessories

Setup



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

Installation

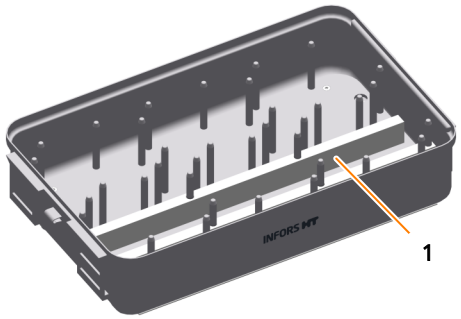


The box for microtitre plates is affixed to the tray with four Philips head screws. When delivered, the fastening screws are covered with plastic cap nuts. These must be removed prior to installation.

Alternatively, the box for microtitre plates can be placed on the 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.

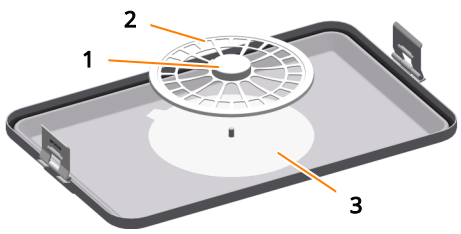
Loading



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

Limiting the Rotation Speed

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

Tray	25 mm throw	50 mm throw
On universal table tray	350 min^{-1}	250 min^{-1}
On Sticky Stuff	150 min^{-1}	150 min^{-1}

Technical Data for Container with Top Plate and Tray

Data	Value
Dimensions	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

Technical Data of the Quickload Spacer

Data	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

Data	Value
Microtitre plates	18 units
Deep-well plates, height 42 mm	12 units



Valid for standard plate size 85.1 x 127 mm.

5.4 Profibus DP and Modbus TCP Gateways

The Profibus DP gateway and the Modbus TCP gateway are used to connect the incubator shaker to a PLC. The gateways translate the communication protocol of the incubator shaker into Profibus DP / Modbus TCP and thus enable data to be exchanged between the incubator shaker and a SCADA system.

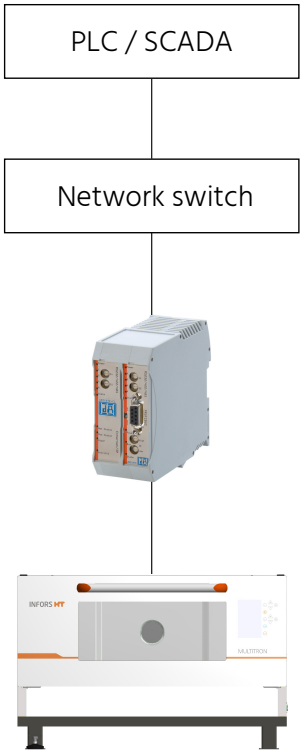
The gateways can be used for the following purposes:

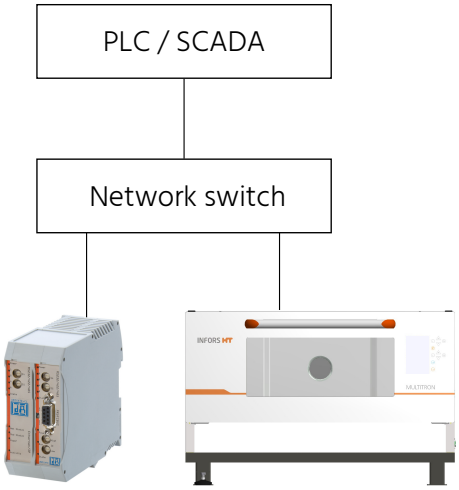
- Record and archive the parameter data of the incubator shaker on a SCADA system (reading setpoints and parameter values as well as door status and PIN function)
- Control the incubator shaker via a SCADA system (sending new parameter setpoints)

The incubator shaker and the gateways can either be connected directly (only Profibus DP Gateway) or integrated through a common network. For stacked devices, one gateway is required per device unit.

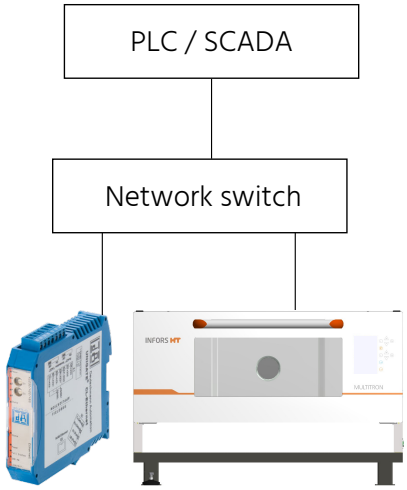
For further information on the gateways, refer to the Device Descriptions.

Profibus DP Gateway





Modbus TCP Gateway



5.5 Water for Incubators



This water, specially developed for incubators with humidification, is double-distilled and sterilized through a 0.1-µm filter. Its optimized formulation removes selected divalent ions and raises the pH level, thereby inhibiting the growth of bacteria and fungi. In this way, it contributes to a sterile culture environment, reduces the risk of microbial contamination, and helps extend the service life of the device.

Data	Value
pH value	7 to 9
Conductivity	1 to 20 µS cm^{-1}
Resistivity	0.05 to 1 MΩ-cm

5.6 eve®



eve® is a platform software for planning, execution and analysis of bioprocesses. eve® makes it possible, for example, to record bioprocess data and store it in a central database. The software offers workflows from simple bioprocesses to the planning and execution of complex strategies with various process phases.

eve® makes it possible to generate and store bioprocess knowledge. For example, various libraries for storing information on organisms and culture media are available. Thanks to soft-sensors, additional knowledge can be generated.

In addition to INFORS HT products, biotech machines and analysis devices from third-part manufacturers can be connected. 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. Bioprocess data is therefore available directly via the browser and independent of the operating system.

Various packages of the software are available. This makes it possible to adapt it to the individual needs and requirements of its users. eve® (the premium version) is also suitable for working in a validated environment as per FDA CFR 21 Part 11.

6 Installation and Commissioning

Only the manufacturer's qualified expert personnel or persons authorised by the manufacturer may install and initially commission the device. Hence, the following section only lists the requirements for the installation location to be observed by the provider.

⚠ 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 persons authorized by the manufacturer may install and initially commission the device.
- Contact the manufacturer if the device is to be placed in a different location.

6.1 Operating Conditions at the Installation Location

Operating Conditions

To achieve optimal and reproducible results, the device should be set up in stable ambient conditions without significant temperature and humidity fluctuations. Changes in ambient temperature and humidity (even short-term) can have a negative impact on the climate in the incubation chamber.

Temperature range	▪ Without HEPA filter: 10 °C to 30 °C ▪ With HEPA filter: 20 °C to 25 °C
Humidity	▪ Without HEPA filter: 10 % to 85 % ▪ With HEPA filter: 10 % to 60 %
Restrictions	▪ Do not expose to direct sunlight ▪ Do not expose to dust ▪ Do not expose to vibrations
The device may only be set up indoors.	

Unsuitable Installation Sites

In order to achieve the desired climate in the incubation chamber and to be able to control it as precisely as possible, the following installation locations must be avoided at all costs:

- Poorly ventilated recesses or areas in the exhaust heat air stream of air conditioners or other sources of heat
- 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)
- Directly next to device with strong heat radiation, such as heaters or autoclaves, or in their exhaust heat stream
- Directly next to refrigeration devices, such as deep freezers or refrigerated centrifuges, or in their exhaust heat air stream



To be able to achieve the desired temperature in the incubation chamber, the ambient temperature directly at the device is decisive. This can be considerably higher than the temperature at other positions in the room due to the waste heat of the unit or due to other devices with strong heat radiation in the immediate vicinity!

6.2 Requirements for the Mains Connection

To avoid dangers due to electrical current, the in-house mains connection must meet the following requirements:

- Constant power supply
- Recommendation: in the building, secure the power supply using a fault current protection switch (RCD – Residual Current Device).

In addition to that, ensure the following:

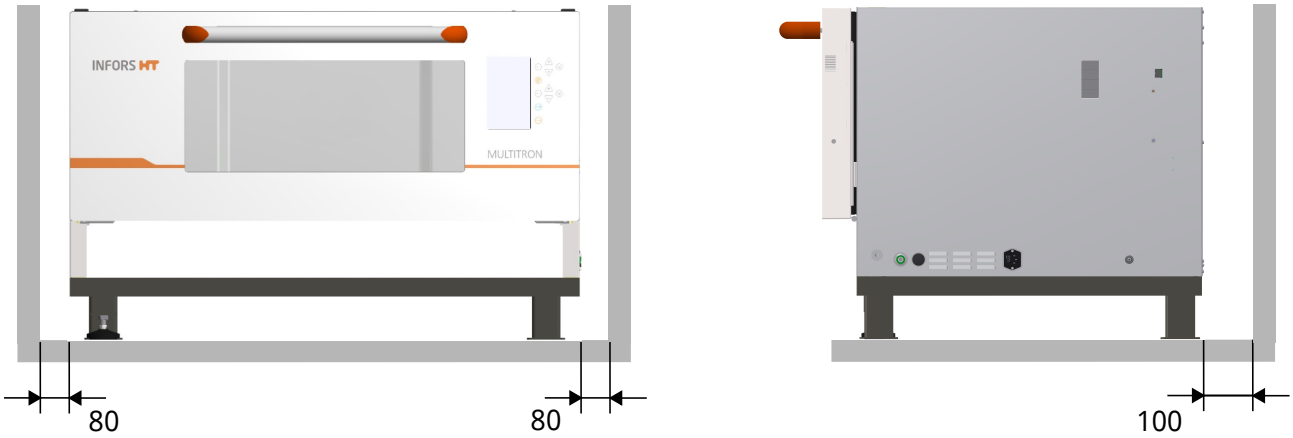
- The voltage values of the device match those of the local mains voltage. Note the information on the identification plate.
- Use the power cable provided. If the power cable becomes defective, replace it with a power cable of the same type.
- The mains connection can be accessed at all times.

Refer to the technical data for the electric connection values.

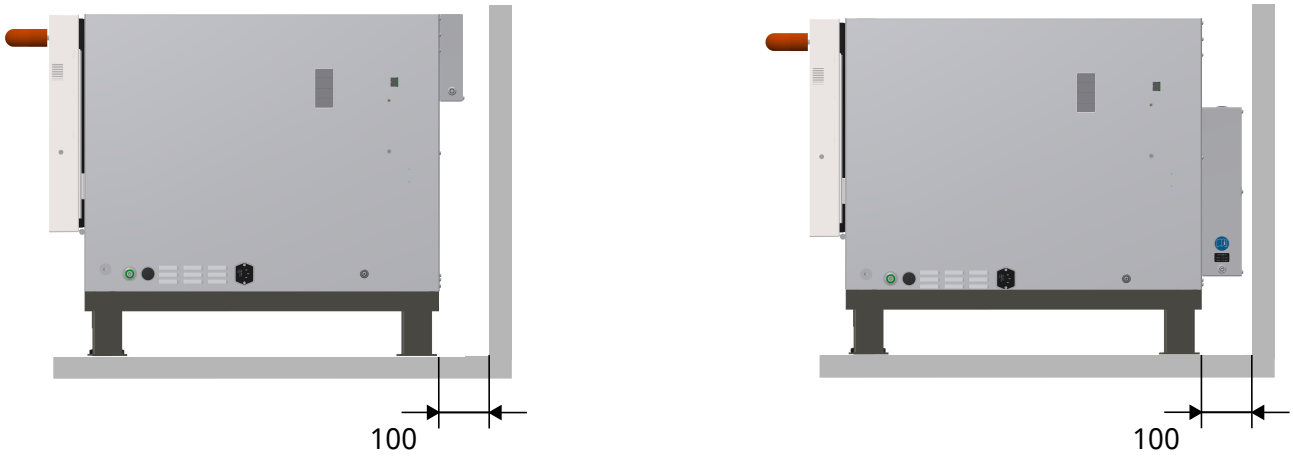
6.3 Minimum Distances to the Device

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

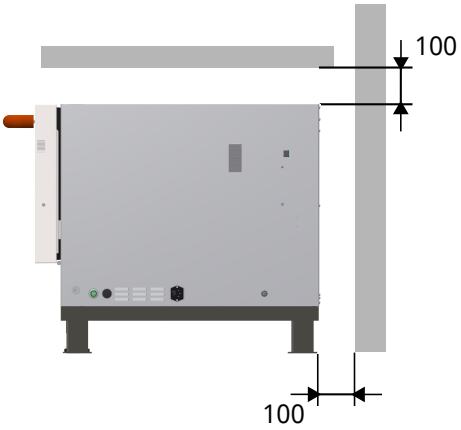
Minimum Distances to the Basic Device



Minimum Distances with Options (Analog Output and Humidity Control)



Placing the Device under a Table



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

- You must leave a ventilation gap of at least 100 mm between the device and rear wall of the table to ensure heat produced by the device can escape.
- The minimum distance between the device and the underside of the table top is 100 mm.
- When operating devices with installed cooling, heat can accumulate under a closed laboratory bench. This can result in the desired temperature not being achieved in the incubation chamber. Furthermore, heat accumulation increases energy consumption because more cooling is required. Hence, we recommend only installing the device under a laboratory bench with an ventilation opening.

NOTICE

Failure to comply with the required minimum distances can result in components of the device overheating and the device being damaged. As such, please observe the following points:

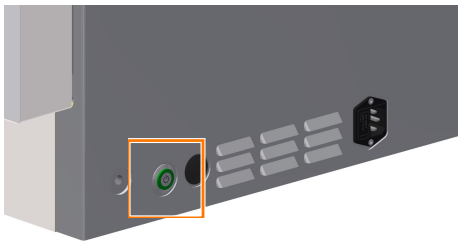
- Never cover the air vents on the right-hand side or those on the rear of the device.
- Never position the device right up against a wall.

7 Operation

7.1 Switching the Device on

NOTICE

The shaker drive can start up automatically, if the device was not switched off correctly beforehand. Loose items in the incubation chamber can damage the device and cultivation vessels if this happens.



→ Activate the power switch on the right side of the housing.

➡ Once switched on, the power switch will light up in green and the device will automatically run a self-test. As soon as the initialisation process is complete, the device is ready for operation.

7.2 Loading the Device

7.2.1 Opening the Door

The door can be opened while the device is running. The shaker drive, temperature control and all other parameters are stopped automatically. If the door is opened completely, the tray is released and can be pulled out if required.

At rotation speeds of up to 200 min^{-1}, the door can be opened without restrictions. If the device is operated at a rotation speed of more than 200 min^{-1}, the door opening is locked temporarily. It is not possible to open the door fully until the shaking table has come to a full stop.

To open the door during operation at rotation speeds above 200 min^{-1} proceed as follows:

1. → Open the door half way and wait until the shaking table has stopped.

➡ You can hear a click when the door opening is released.

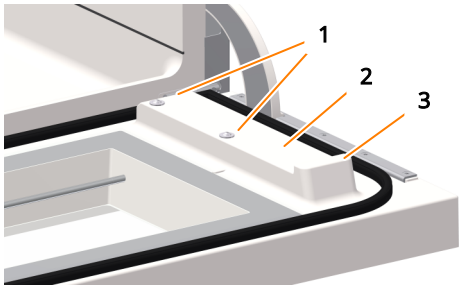
2. → Open the door completely. If the door does not unlock straight away, lift the door up slightly to take the load off the locking mechanism.

As soon as the door is closed again, the shaker drive and all other parameters restart automatically.

If you wish to stop the shaker drive slowly, e.g. to avoid culture liquid from spilling out, you have to set the "Rotation speed" parameter to *OFF* prior to opening the door. In this case, the shaker drive stops slowly, with the brake force set in the Settings menu (➥ 'Set Brake Power' on page 101).

7.2.2 Inserting and Removing the Tray

Removing the Tray



To remove the tray, pull it onto the door by hand. Slide rails (2) and cylindrical ball casters (1) embedded in the door guide the tray. Two mechanical stop bars (3) in the slide rails limit how far the tray can be pulled out. When pulled out all the way, the tray lies partially on the door and partially on the shaking table. Proceed as follows:

1. Open the device door all the way.

   ➥ **Devices with 25 mm or 50 mm throw:** The safety mechanism lifts the tray out of the cones at the back. The tray is thus free and can be pulled out of the incubation chamber.

2. **Devices with 3 mm throw:** Loosen the knurled screw and remove it.

3. Lift the tray by the handle.

4. Pull the tray over the front stop bar and onto the open door.

If you cannot pull the tray out, check whether the door is open all the way. Push the door down to the mechanical stop.

Inserting the Tray

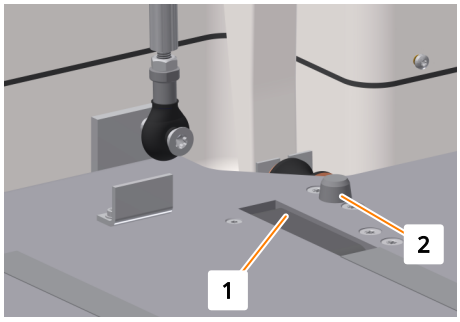
To insert the tray, proceed as follows:

1. Open the device door all the way.

2. Place the tray on the door slide rails.

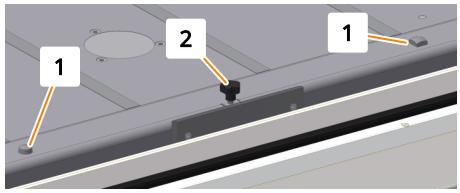
3. Push the tray between the guide rails over the front mechanical stop bar up to the mechanical stop at the back of the incubation chamber. The tray must audibly click into place behind the front stop bar.

4. Check whether the tray is placed properly behind the front stop bar.



5. **Devices with 25 mm or 50 mm throw:** Close the device door.

   ➡ When the door closes, the ejection levers lower (1) and the tray is lowered into the two cones (2). The tray is thus securely affixed to the shaking table.



6. **Devices with 3 mm throw:** Ensure that the tray is correctly snapped into the two conical plugs on the shaking table (1).

7. Insert the knurled screw (2) and tighten it by hand. Tighten the knurled screw so that it cannot come lose during operation.

NOTICE

If the tray is not held in place securely on the table, the tray's movement may damage the interior of the device.

- Do not start up the device unless the tray has been inserted correctly and affixed securely.
- If you are using devices with a 3 mm throw, make sure the knurled screw is inserted and tightened correctly.

If you are unable to insert the tray correctly, perform the following checks:

- Remove the tray and check it is not twisted or bent.
- Check the incubation chamber for foreign objects and remove these.
- If it is still not possible to insert the tray correctly, contact your nearest INFORS HT representative.

7.2.3 Mounting the Holders

NOTICE

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.

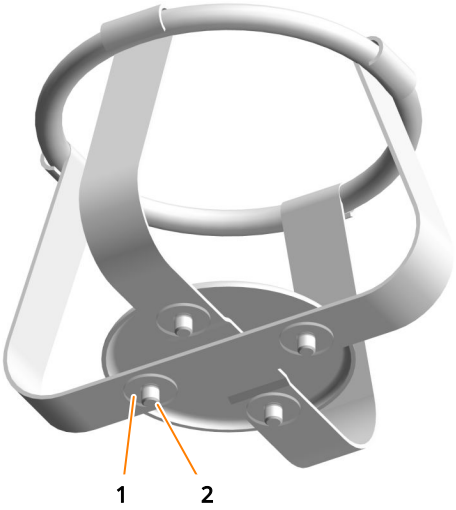
NOTICE

All holders are supplied with pre-fitted screws. If a test tube holder or 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 microtitre plates on the Sticky Stuff adhesive matting.

Mounting a Holder

Clamps, test tube holders and boxes for microtitre plates are fixed to the tray using screws. The device is delivered with pre-fitted screws. The screws are each secured with one flat gasket at the bottom so that they cannot fall out. Only use the screws provided or screws of the same size for mounting.



To mount a holder, proceed as follows:

1. Loosen the flat gaskets (1).
2. Position the holder on the tray.
3. Centre a screw (2) 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 the screws loosely. Ensure that the screws are screwed in straight and do not tilt.
6. Evenly tighten all screws cross-wise.

Screw Sizes

NOTICE

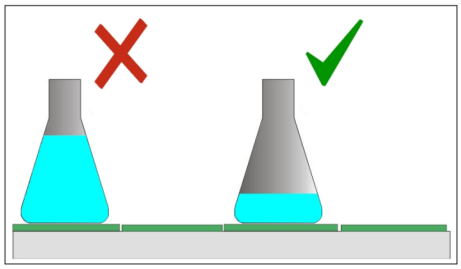
If screws that are too long are used to install the holders, these will stick out at the bottom of the tray. This has the effect that the tray can no longer be inserted and affixed correctly.

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

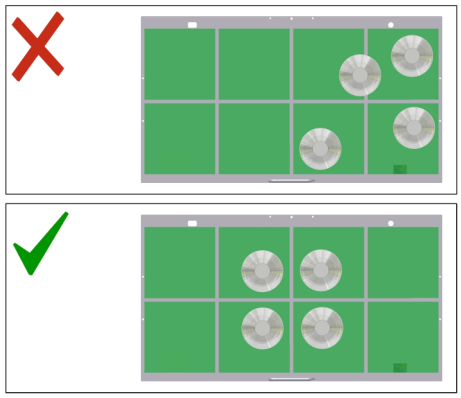
Holder	Size	Screw	Flat gasket
Steel clamps	< 100 mL	Flat head screw with Phillips head M4 x 6 A4	D = 3.2 x 12 x 0.5
	≥ 100 mL	Flat head screw with Phillips head M4 x 8 A4	D = 3.2 x 12 x 0.5
Plastic clamps	100 to 500 mL	Flat head screw with Phillips head M4 x 6 A4	D = 3.2 x 12 x 0.5
Test tube holder	Ø 8 to 30 mm	Oval head screw with Phillips head M4 x 6 A2	D = 3.2 x 12 x 0.5
Boxes for micro-titre plates	n. a.	Oval head screw with Phillips head M4 x 12 A2	D = 3.2 x 12 x 0.5

7.2.4 Tips & Tricks for Loading the Tray

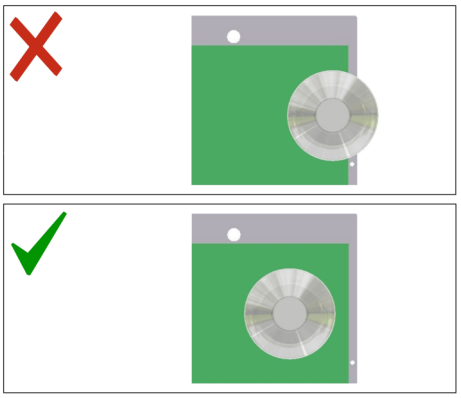
Observe the following notices when loading the tray:



- The working volume should not exceed 1/3 of the total volume of the vessel.



- To ensure smooth operation, place the cultivation flasks symmetrically in the middle of the tray. Do not place heavy vessels at the edge of the tray.



- If the flasks extend beyond the edge of the tray, they may be damaged or broken if they collide with the wall of the device. Therefore, always position cultivation vessels on the tray so that they do not protrude.
- If the tray is only loaded lightly and is going to be run at high rotation speeds, place additional cultivation vessels filled with water on the tray. This will make the device run smoothly.

  At shaker speeds of approx. 200 min^{-1} to 250 min^{-1} (depending on the throw and the position of stacked device units), the load distribution plays only a minor role.

CAUTION

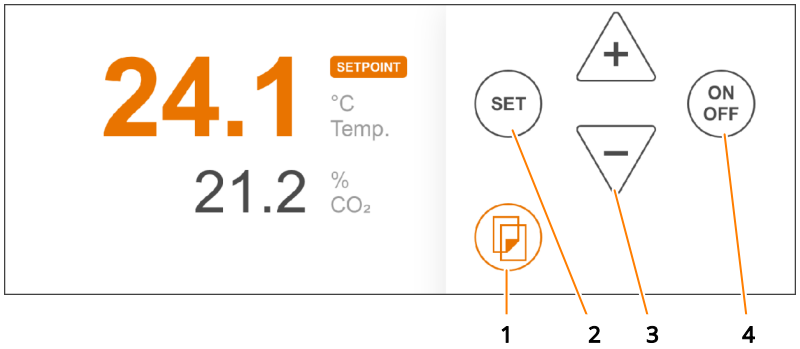
If the loading mass of the table is too high or too low or the load is distributed unevenly, high rotation speeds can cause vibrations. This can result in the device moving uncontrollably.

– Never operate the device without a tray and loading.
– In case of strong vibrations, reduce the rotation speed and check the loading weights or the distribution of the load.

7.3 Setting, Activating and Deactivating Parameters

Setting the Setpoint and Switching on the Parameter

To set the setpoint for a parameter and switch on the parameter, proceed as follows:



1. Use the **Scroll** key (1) to select the desired parameter pair.

   ➡ The view box shows the actual values of the selected parameters.

2. To activate programming, press the upper or lower **SET** key (2), depending on which parameter is to be set.

   ➡ The view box shows the last setpoint value of the parameter. The *SETPOINT* lettering indicates that the parameter can be adjusted.

   If no input is made 10 seconds after pressing the **SET** key, the **SET** key must be pressed again.

3. Use the **Plus** or **Minus** key (3) to set the setpoint you want to use for the selected parameter.

   ➡ The entered value is saved automatically. A separate confirmation is not necessary. If the parameter is not activated thereafter, the change is discarded.

4. To activate the parameter, press the **ON/OFF** key (4) on the corresponding control panel.

   ➡ The parameter is activated immediately.

   ➡ *SETPOINT* goes out. The *ON* message briefly appears in the view box. Following that, the actual value of the parameter is displayed.



When starting up the shaker drive, use the time until the setpoint is reached to check whether the cultivation flasks are secured on the tray.



The parameters need a little time to reach their set setpoints. Until they have done so, the messages *HIGH* or *LOW* is displayed, depending on whether the actual value is higher or lower than the setpoint.

Deactivating the Parameters

The parameters are deactivated using the same procedure as for activation. Select the parameter you wish to deactivate using the **Scroll** key, and then press the **ON/OFF** key to deactivate it. When a parameter is deactivated, the view box shows the message *OFF*.





If a parameter is switched off, the parameter is no longer controlled, but continues to be measured. The measured value (actual value) is displayed in greyed out text.

7.4 Timer Function

7.4.1 Overview

NOTICE

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. When using the device in conjunction with the Sticky Stuff adhesive matting, this can lead to the flasks coming off the adhesive matting.

The timer function can be used to set defined sequences. For example, the parameter setpoints can be changed after a certain time or the starting of the cultivation can be delayed. The timer can be programmed in two different modes:

- One-time change from phase 1 to 2
- Cyclical changing between phases 1 and 2

More complex sequences or processes can be programmed using the eve® bioprocess platform software.

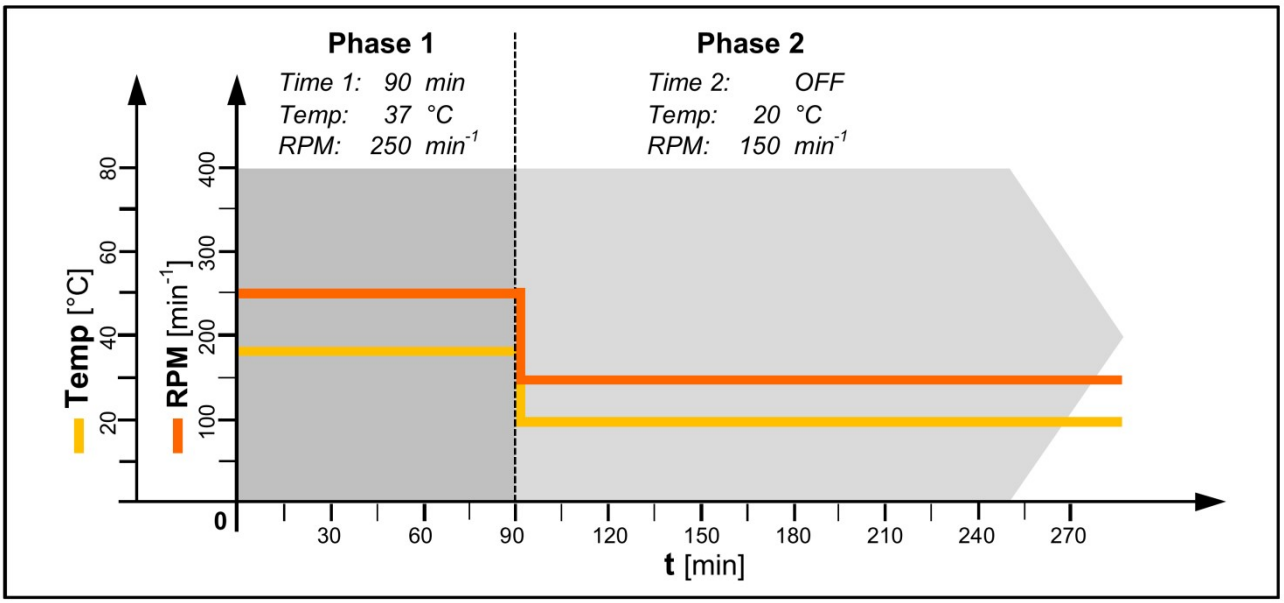
If the device is controlled remotely via the Ethernet interface (e.g via eve®), the timer function is blocked. Running timers are interrupted.

One-Time Change from Phase 1 to 2

If the device is programmed this way, the setpoint settings for the cultivation process parameters will change when the specified time expires. The device will then keep running using the setpoints specified for the second phase until the device is stopped by deactivating the parameters.

Example applications:

- Starting the cultivation process on a time delay
- Induction of a protein expression
- Stopping or slowing down a cultivation process after a defined period of time



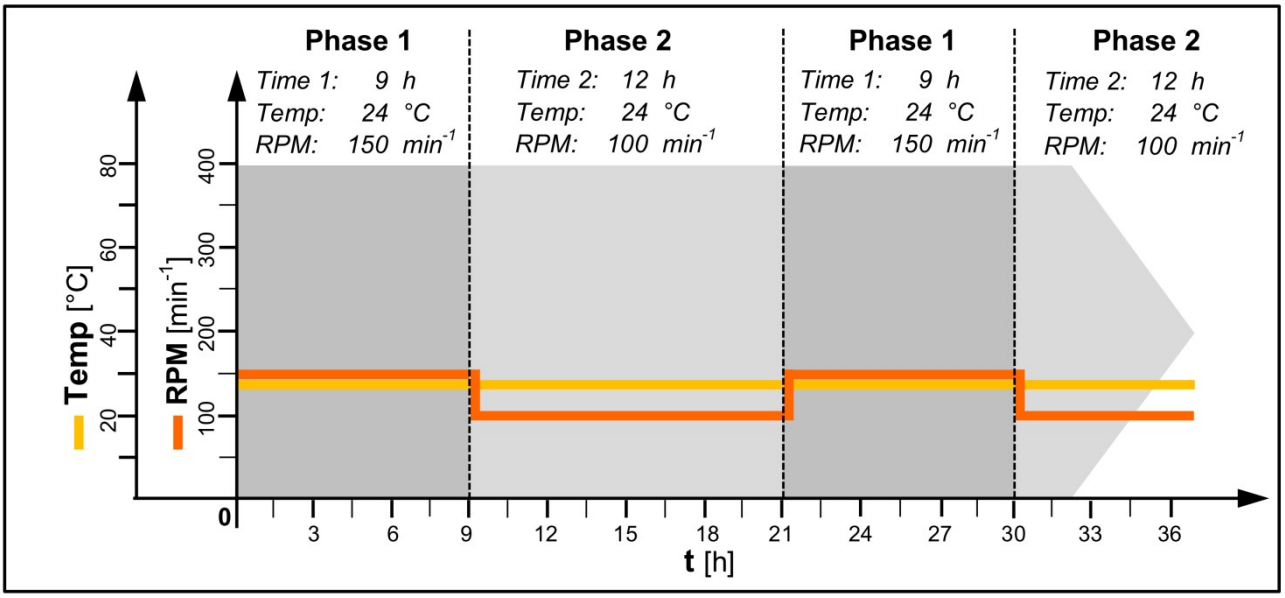
To program a one-time change from phase 1 to phase 2, the timer must be deactivated for the second phase (*Time 2 = OFF*). If the timer is activated for the second phase (*Time 2 = ON*), the device switches cyclically between phases (see next example).

Cyclical Changing Between Phases 1 and 2

If the device is programmed this way, two different parameter settings will be repeated on an endless, precisely timed cycle. The two intervals (phase 1 and phase 2) alternate until the cultivation process is stopped manually by deactivating the parameters.

Example application:

- Simulation of day and night



7.4.2 Programming Timer

To programme the timer, proceed as follows:

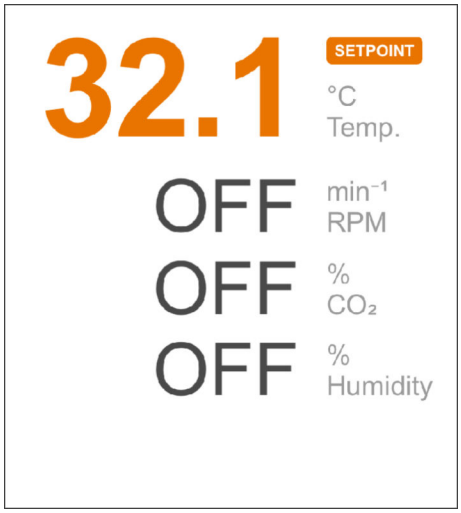
1. Press the **TIMER** key to select the timer function.

   ➡ The Timer overview is opened.

2. Press the **TIMER** key again to programme phase 1 of the timer.



3. Switch on phase 1 and set the time. To do so, press the upper **ON/OFF** key and then use the upper **Plus** or **Minus** key to set the desired runtime of phase 1.



4. Set the parameters for phase 1:

- Use the **Select** key to select the desired parameter.
- Activate the parameter with the lower **ON/OFF** key.
- Use the lower **Plus** or **Minus** key to set the setpoint.
- Repeat the process for all desired parameters.

5. Once all parameters have been set, press the **TIMER** key to switch to phase 2.

6. Depending on whether a simple change from phase 1 to phase 2 or a cyclic change between both phases is to be programmed, the procedure differs as follows:

- Simple change: Ensure that the second timer is switched off. If necessary, switch off timer 2 with the upper **ON/OFF** key.
- Cyclic change: Use the upper **ON/OFF** key to switch on the timer for phase 2 and then use the upper **Plus** or **Minus** key to set the desired runtime of phase 2.

7. Set the parameters for phase 2 analogous to those for phase 1.

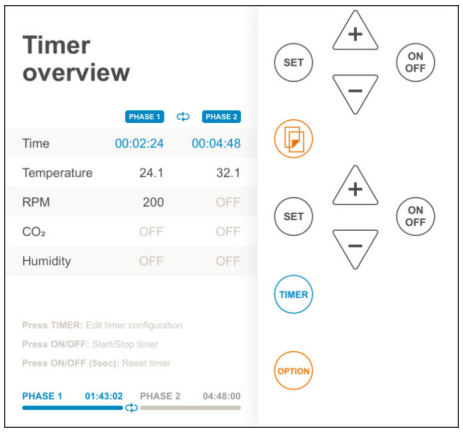
If the cultivation process is to be stopped after a defined time, all parameters can be switched off in the second phase. This causes the parameters to be switched off after the entered time for phase 1 has elapsed and the cultivation process is thus stopped.

8. Once all parameters have been set up, press the **TIMER** key. The timer overview appears again with information on the parameters of the two phases.

Next steps:

- By pressing the **TIMER** key, the settings of the two phases can be viewed again and adjusted if necessary.
- By pressing the upper or the lower **ON/OFF** key, the timer can be started (➥ Chapter 7.4.3 ‘Starting the Timer’ on page 92).
- You can reset the timer settings by means of a long press (5 s) of the upper or lower **ON/OFF** key.
- To leave the Timer menu, press the **Select** key. All settings are saved.

7.4.3 Starting the Timer



To start a programmed timer, proceed as follows:

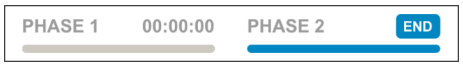
→ In the Timer overview, press either the upper or the lower **ON/OFF** key.

➡ As soon as the timer function has been activated, the two phases incl. their runtimes are displayed on the lower edge of the display.

Simple Change



The cultivation process now runs with the parameters of the first phase until the time entered in the first timer (*PHASE 1*) has elapsed.



At the end of the entered time, the setpoints for phase 2 are activated. They remain active until the setpoints are changed manually.

The end of the timer is indicated by the *END* message in the status bar. In addition, an acoustic alarm sounds every 60 seconds. The message and the acoustic alarm can be cancelled by switching off the timer. To do this, open the timer menu using the **TIMER** key and then switch off the timer with the upper or lower **ON/OFF** key.

Cyclic Change



Once the timer has been started, the cultivation process runs alternately with the setpoints for the first and second phases until the timer is manually switched off. The active phase is shown in blue.

7.4.4 Viewing and Changing Timer Settings

The settings (duration of the phases as well as parameter setpoints) of a running timer can be viewed and adjusted if necessary. Depending on whether the setpoints or the duration of the phases are changed, the timer behaves as follows:

- If the duration of the active phase is changed, the active phase is restarted.
- If only the setpoints or the duration of the non-active phase are changed, the timer continues to run without interruption.

To change the settings of a running timer, proceed as follows:

1. Press the **TIMER** key to select the timer function.
   ➡ The Timer overview is opened.
2. Switch to the timer programming mode by pressing the **TIMER** key again.
3. If necessary, reset the duration of the two phases and the set-points of the parameters (➥ Chapter 7.4.2 'Programming Timer' on page 90).
4. Use the **TIMER** key to confirm.
5. If you want to accept the changes, confirm the message with **SET**. If you want to discard the change, confirm with **Select**.



When the timer is active, it is not possible to change the parameter setpoints in normal mode. To change the setpoints, you have to either adjust the settings of the timer or switch off the timer.

7.4.5 Stopping the Timer

The timer can be stopped at any time. To do so, proceed as follows:

1. Press the **TIMER** key to select the timer function.
2. Press the **ON/OFF** key on the upper or lower control panel to switch off the timer function.
   - If you only press the **ON/OFF** key briefly, the timer is switched off and the settings (time and setpoints) of the two phases are saved.
   - If you press the **ON/OFF** key for five seconds, the timer is switched off and the settings (time and setpoints) are reset.

   ➡ The timer display at the bottom of the display disappears, phase 1 and phase 2 are set to *OFF*.
3. Press the **Select** key to return to normal operating mode.



Opening the door or a power interruption do not deactivate the timer function.

Deactivating an Individual Timer

Alternatively, the two timers (*Time 1* and *Time 2*) can also be deactivated separately. Please note:

- If the first timer (*Time 1*) is deactivated, the second timer (*Time 2*) is also deactivated.
- If the second timer (*Time 2*) is deactivated, the first timer (*Time 1*) remains active.

7.5 Using eve® to Operate the Device

Overview



For detailed information on how to use eve® to operate the device, please read the documentation supplied with eve®.

The Ethernet interface of the device allows the device to be operated via an external software (eve® or laboratory management/monitoring system from a third-party manufacturer, for details on the Ethernet interface, see ➥ Chapter 3.2.3 'Ethernet Interface' on page 34). The following points must be observed if the device is operated via the Ethernet interface:

- The parameters cannot be activated and deactivated manually via eve®. If a permissible setpoint is sent to the device, the parameter is activated automatically. A parameter can be deactivated by sending the setpoint 0 to the device.
- For a parameter to be activated and deactivated via eve®, it must be activated manually once on the device. If a parameter is deactivated on the device, this remains deactivated, even if eve® sends a setpoint.
- If the device is connected to eve®, all setpoints set in eve® are applied automatically. Any setpoints manually set on the device are overwritten.
- If the device is connected to eve®, the timer function of the device is blocked. Running timers are interrupted automatically.

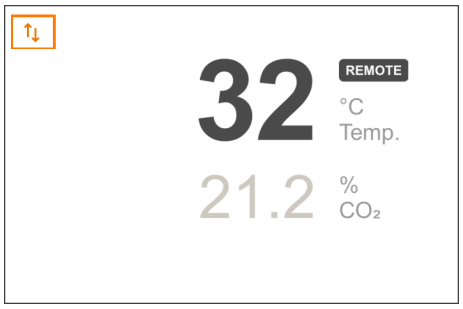
Requirements

To ensure the device can be operated via the Ethernet interface, the function must be activated in the Settings menu. Here, you can choose between the *Read only* and *Read & write* options (➥ 'Ethernet Connection' on page 99).

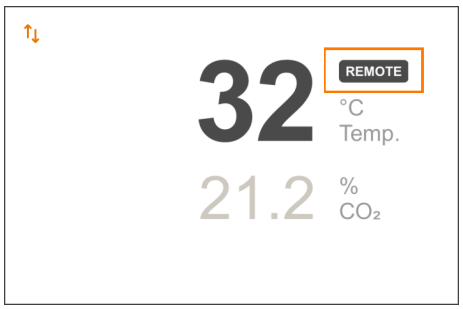
Displays on the Device

If the device is controlled using eve®, this is displayed on the device as follows:

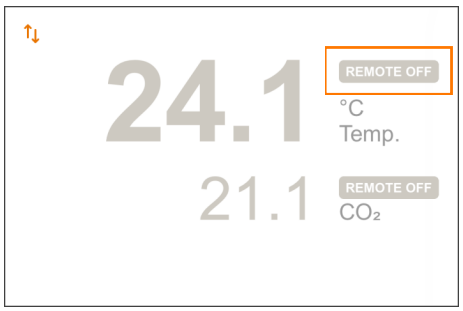
- While the device is being registered in eve®, the working light of the device flashes. This is used, in particular, to identify the device when devices are stacked.



- Arrow symbols indicate the connection status:
  - No symbol visible: Not connected
  - Arrows greyed out: Connected and IP received from DHCP, but no communication
  - Arrow symbols light up in orange with each read and write access. If only one arrow lights up, the device is in *Read only* mode. If both arrows light up, the device is in *Read & write* mode.



- If setpoints are written to the device, *REMOTE* flashes next to the changed setpoint. If there is an alarm for a parameter marked *REMOTE*, the writing *REMOTE* alternates with the red alarm symbol (*HIGH*/*LOW*) in one-second intervals.



- If a parameter has been deactivated by sending setpoint 0, this is indicated with *REMOTE OFF*.

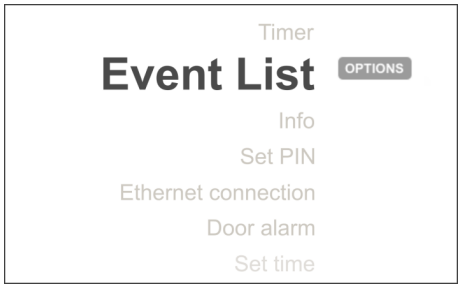
Displaying the IP Address of the Device

The IP address of the device is displayed in the Setting menu, in the *Ethernet connection* option (➥ 'Ethernet Connection' on page 99).

7.6 Settings Menu (Option Function)

7.6.1 Opening the Settings Menu

The Settings menu enables you to adjust the main device settings. To open the device's Settings menu, proceed as follows:



→ Press the **OPTION** key.

➡ The functions in the Settings menu are displayed as a list. The selected function is displayed in a large black font.

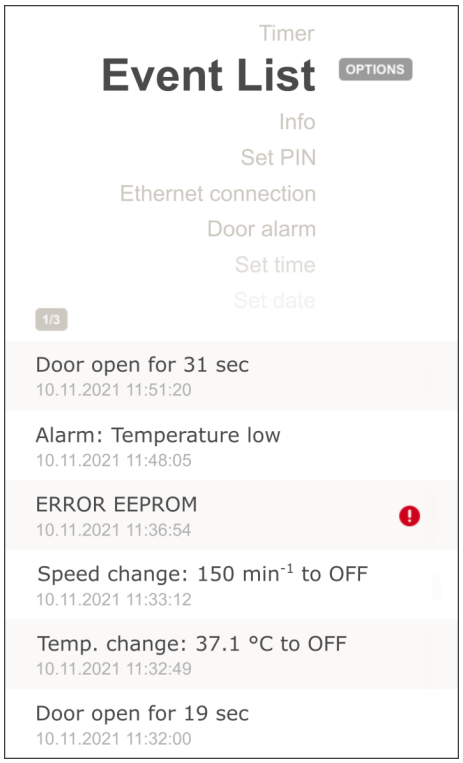
7.6.2 Using the Settings Menu

- You can use the upper **Plus** and **Minus** keys to select the desired setting, and the lower **Plus** and **Minus** keys to set a value.
- ON/OFF functions can be activated or deactivated with the lower **ON/OFF** key.
- There is no need to save changes, they are applied automatically.
- You can leave the Settings menu by pressing the **OPTION** key or the **Select** key. The Settings menu also closes automatically, if no key is pressed for 20 seconds.

The limits for the allowed setpoints of the parameters can only be set within the factory-set values. If the setpoint for a parameter is limited in the Settings menu of the device and a user attempts to enter a higher value, the *MIN* or *MAX* message appears.

7.6.3 Settings

Event List



The event list shows the last 18 events including their timestamps (date and time). The latest event is always at the top.

The following events are displayed in the event list:

- Activating/deactivating parameters (manually on the device, remotely or by the timer)
- Changing of setpoints
- Opening the door (incl. duration)
- Alarms and error messages (alarms and error messages are additionally marked with a red exclamation mark symbol)

The event list consists of a maximum of three pages with six entries each. Use the lower **Plus** or **Minus** key to scroll through the different pages of the event list.

The event list can only be displayed locally on the device and cannot be exported.

The event list does not correspond to an audit trail in the sense of FDA 21 CFR Part 11. The data stored in the event list can and may therefore not be used in the regulated environment.

To record and store the data under GMP conditions, you need eve® or comparable software with an audit trail function.

Info

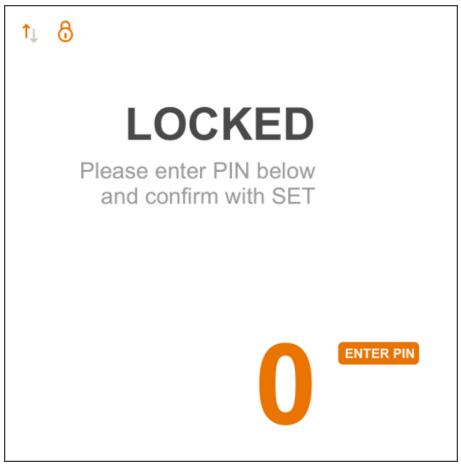
Display of device and status information. The following information is displayed:

- *Mainboard Firmware*: Shows the version of the controller firmware that is currently installed.
- *Display Firmware*: Shows the version of the display firmware that is currently installed.
- *Operating hours shaker*: Shows the operating hours of the shaker.
- *Operating hours fans*: Shows the operating hours of the fans.
- *Number of door openings*: Shows how often the door of the device has been opened.
- *Number of pulses humidifier pump*: Shows how many switching cycles (pulses) the humidity control pump (HHC) has run through. This item is only displayed if the humidity control option (HHC) is installed.

Set PIN

To prevent unauthorised persons making entries on the operating panel, the key pad can be locked using a PIN.

To set a PIN, use the lower **ON/OFF** key to activate the key pad lock. Then press the lower **Plus** or **Minus** key to set a PIN (a number between 0 and 9999).



If the control panel has been locked with a PIN, a small lock symbol appears at the top left of the display.

If you try to press a key while the PIN is active, *LOCKED* appears on the display and you are prompted to enter the PIN. This can be set with the arrow key and confirmed by pressing the **SET** key. If the entry is correct, the lock symbol disappears and the control panel is unlocked.

If no entry is made for a minute, the PIN is activated again and the control panel is locked again.

If the key pad lock is active, this information can be read via the Ethernet interface. In this way, when the device is controlled remotely (e.g. via eve®), it can be determined and logged whether the key pad lock is active or not.

Ethernet Connection

Set whether and in which direction data can be sent via the Ethernet interface. The following settings are possible:

- *Read & write*: Send and receive data, i.e. information from the device can be recorded but commands can also be sent to the device (e.g. changes to the setpoints).
- *Read only*: Only receive data, i.e. only data sent from the device can be recorded.
- *OFF*: The Ethernet interface is deactivated; no communication can take place.

If the device is in a network and an IP has already been assigned (manually or via DHCP), the IP address of the device is displayed in the lower area.

Door Alarm

To prevent the door from being left open unintentionally, the device has a door alarm (beeping). This is triggered if the door is left open for longer than the set time. If no parameter was active prior to opening the door, the door alarm is not triggered. The time until the door alarm is triggered can be set in the Setting menu (1 to 59 minutes). If necessary, the door alarm can also be deactivated completely.

To set the period until the door alarm is triggered, use the **ON/OFF** key to activate the door alarm. Then press the lower **Plus** or **Minus** key to set the duration (1 to 59 minutes).

Set Time

Setting the local time. This is necessary to ensure that the timestamp in the event list is displayed correctly.

To set the time, use the lower **SET** key to select the part of the time (hour or minutes) that is to be changed. Following that, use the lower **Plus** or **Minus** key to set the desired value.

The newly set time does not have to be saved. The time is saved automatically as soon as the menu item is closed using the upper **Plus** or **Minus** key or the Settings menu is closed.

NOTICE

If the device is switched off, the set time is stored for approx. 7 days. After this time has elapsed, the time is reset again and must be set again.

The time does not adjust automatically when the clock is changed and must be changed manually.

Set Date

Setting the current date. This is necessary to ensure that the correct date is displayed in the event list.

To set the date, use the lower **SET** key to select the part of the date (day, month or year) that is to be changed. Following that, use the lower **Plus** or **Minus** key to set the desired value.

NOTICE

If the device is switched off, the set date is stored for approx. 7 days. After this time has elapsed, the date is reset again and must be set again.

Set Max. Temperature

Setting the maximum temperature that can be entered as a setpoint.

Set Min. Temperature

Setting the minimum temperature that can be entered as a setpoint.

Set Max. Speed

Setting the maximum rotation speed that can be entered as a set-point.

Set Brake Power

Setting the braking power with which the shaker drive is stopped when the “Rotation speed" parameter is switched off.

- At brake force level 0 the shaking table is stopped by reducing the rotation speed very slowly.
- At brake force level 1 the shaking 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.
- At brake force level 3 the motor is short-circuited to stop the shaking table as quickly as possible.

The brake force setting is effective only when the “Rotation speed" parameter is switched off manually, but not when the door is opened. When the door is opened, the shaking table is automatically stopped with the maximum brake force, regardless of which brake force has been set. To activate the brake force setting, always deactivate the “Rotation speed” parameter first, before opening the door.

Humidity High Alarm

Activating or deactivating the HIGH alarm of the *Humidity* parameter. If the alarm is deactivated, no alarm is triggered if the humidity exceeds the upper limit value. As the humidity in the incubation chamber is usually not a critical parameter that has a direct impact on the success of cultivation, the HIGH alarm is switched off by default.

Illumination

Setting the behaviour of the working light.

- *Auto*: The working light is switched on by pressing any key or when the door is opened. After 2 minutes the working light switches off again automatically.
- *OFF*: The working light is switched off permanently.

The brightness of the display is synchronised with the working light of the device. As soon as the working light is switched off, the brightness of the display is reduced.

Button Sounds

Activating or deactivating the key sound (clicking sound when pressing a key).

Altitude and CO_2

The digital CO_2 sensor GMP251 is pressure-dependent. To achieve precise measuring results, the altitude of the device's location can be set.

Timer

Activating or deactivating the timer function. If the timer function is set to *OFF*, it can no longer be selected by using the **Timer** key.

7.7 Setting the Adjustable Throw

CAUTION

Improper modification of the shaking throw of the device with a variable shaking throw is a safety risk. The shaking throw may therefore only be moved by qualified personnel that has received appropriate training and authorisations. If you have any questions, contact INFORS HT.

7.8 Switching off the Device

NOTICE

Parameters that have not been deactivated before the device is switched off are automatically activated when the device is switched on again. This can damage the device and the cultivation vessels.

- Deactivate all active parameters before switching off the device.
- Do not leave any objects in the incubation chamber when the device is switched off.

The parameter setpoints are stored for approx. one month.

To switch off the device, proceed as follows:

1. Deactivate all active parameters. You must make sure that, in addition to the rotation speed, parameters that are not visible such as "Temperature", "Humidity" or "CO_2" are also switched off.
2. Press the power switch of the device.
3. If the device is not going to be used for an extended period of time, unplug the power plug.

7.9 Behavior in Case of a Power Interruption

If the power supply to the device is interrupted during a running cultivation process (e.g. by pressing the power 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 the power supply is restored, the device automatically restarts with the last stored setpoints. If a timer was active prior to the interruption to power supply, the device restarts with the residual time of the last active phase and the setpoints stored for this phase.

INFO: RESTARTED

Device restarted after power loss of < 10 min with saved parameter setpoints.

After the restart, the *INFO: RESTARTED* message appears on the display. In addition to the notice about the restart, the duration of the power interruption is also indicated. The message can be confirmed by pressing any key.

8 Rectifying Faults

The following chapter describes possible reasons for faults and how to resolve them.

WARNING

Improper rectification of faults may lead to dangerous situations.

- To prevent life-threatening electric shocks, always switch off the device and disconnect it from the power supply before carrying out any work to find the cause of the fault or to rectify the fault.
- Never remove the covers of the device.
- Damaged parts may only be replaced by an INFORS HT service technician, a licensed dealer or authorised expert personnel.
- Contact the manufacturer in case of faults that cannot be resolved by following the notices below. For service contact details, see page 2.

8.1 Alarm Messages

An alarm (*ALARM*) does not directly affect the process; the device can continue running without any restrictions. Alarms are triggered, for example, if the actual value of a parameter deviates too much from the setpoint or the door is open for too long. Alarms are indicated with the alarm symbol and an acoustic signal. Alarm messages can be confirmed by pressing any key. If an alarm is not confirmed manually, it disappears as soon as the condition that triggered the alarm is no longer met.

8.1.1 Parameter Alarms (*HIGH/LOW*)



A parameter alarm is triggered if the actual value of a parameter deviates too much from the setpoint after a set waiting time. In the example on the left, the temperature is too high. The maximum permissible deviation from the setpoint and the waiting time are set in the factory and cannot be changed.

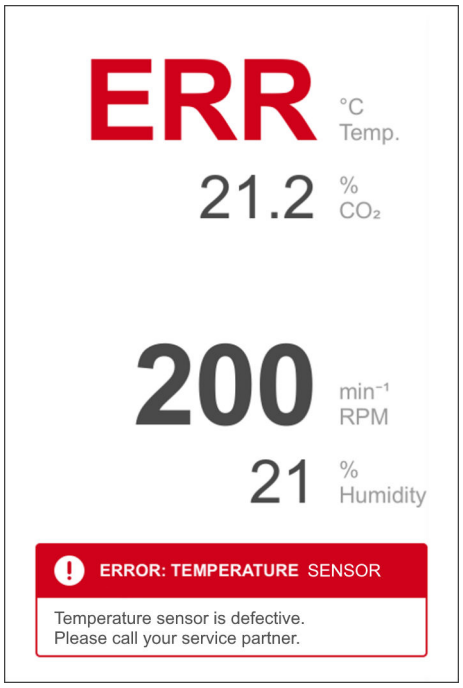
An alarm is only triggered if the actual value of the parameter does not change for a certain period of time. If there is a fluctuation, the counter for triggering the alarm is reset.

Alarm	Meaning	Deviation from setpoint	Waiting time
Temp HIGH/LOW	Temperature too high/low	> ± 1 °C	20 min (18 °C to 40 °C)
			75 min (< 18 °C / > 40 °C)
			300 min (with option "HEPA filter")
RPM HIGH/LOW	Rotation speed too high/low	> ± 10 min^{-1}	2 min
CO_2 HIGH/LOW	CO_2 concentration too high/low	> ± 0.5 %	15 min
Humidity HIGH/LOW	Humidity is too high/low	> ± 5 %	15 min
	Note: The *Humidity HIGH* alarm is deactivated ex factory. If required, the alarm can be switched on in the settings menu (➥ Chapter 7.6 'Settings Menu (Option Function)' on page 97).		

8.1.2 Device-specific Messages

Alarm	Meaning
INFO: RESTARTED	The device has been automatically restarted after a power interruption. For details, see ➥ Chapter 7.9 'Behavior in Case of a Power Interruption' on page 103.
INFO: HEPA-FILTER CHANGE	The HEPA filter (optional) must be replaced annually by the manufacturer's specialist personnel. Please contact your nearest INFORS HT representative.
ALARM: DOOR OPEN	The door has been open for longer than permissible. You can set in the settings menu whether an alarm is to be triggered and after what period of time (1 to 10 minutes).
ALARM: FAN X	The device is equipped with four independent axial fans to circulate the air in the incubation chamber. To prevent the device from stopping if a single fan fails (e.g. due to a blockage or defect), only an alarm is triggered in this case. The device continues to run without restrictions. An error is triggered and the device is stopped only if two or more axial fans fail. As soon as the blockage has been cleared or the defective axial fan has been replaced, the temperature parameter has to be deactivated and then re-activated once. This clears the alarm message.

8.2 Error Messages



An error (*ERROR*) is triggered if there is a technical device fault. The affected parameters are deactivated automatically. Instead of the parameter value, *ERR* appears in red writing. An error is also indicated by an error message as well as an acoustic signal. Errors can be confirmed by pressing the **Select** key.

The faults listed here can often not be resolved by the operator. If an error message is displayed, one of the manufacturer's service technicians often needs to be consulted.

Error message	Description	Solution
ERROR: TEMPERATURE SENSOR	The measured temperature falls outside the permissible range. The temperature sensor is defective.	Contact your local INFORS HT representative.
ERROR: FAN 1-4	At least two of the four axial fans are blocked or defective.	Contact your local INFORS HT representative.
ERROR: MOTOR OVERHEAT	The controller of the motor has overheated because of excessively high rotation speed or excess loading.	**1.** Let the motor cool down. **2.** Reduce the load. **3.** Start the device. **4.** If the error message appears again, contact INFORS HT.
ERROR: DRIVE BLOCKED	The drive or the shaking table is blocked.	**1.** Remove foreign objects from the incubation chamber, if necessary, dismount the shaking table to do so (➥ chapter 9.2.3, page 117). **2.** If this does not help, contact your local INFORS HT representative.

Error message	Description	Solution
ERROR: DRIVE BELT BROKEN	The drive belt is torn.	Contact your local INFORS HT representative.
ERROR: MOTOR CONTROL	The motor or the controller of the motor is defective.	Contact your local INFORS HT representative.
ERROR: HUMIDITY SENSOR	The humidity sensor is not returning any readings (humidity sensor not connected or defective).	**1.** Check and ensure that the sensor is connected correctly to the cable. **2.** If this does not help, contact your local INFORS HT representative.
ERROR: WATER HUMIDIFICATION	The water supply for humidification is interrupted (empty water tank, defective hose or defective pump).	**1.** Check and, if appropriate, fill the water tank. **2.** Check the hose line between the water tank and the device. **3.** If this does not help, contact your local INFORS HT representative.
ERROR: HUMIDIFICATION HEATER	The humidity control heater is defective.	Contact your local INFORS HT representative.
ERROR: HUMIDITY HEATER OFF	The temperature sensor or the electronics of humidity control are defective.	Contact your local INFORS HT representative.
ERROR: CO2 SENSOR	The CO_2 sensor is not returning any readings (CO_2 sensor not connected or defective).	**1.** Check and ensure that the sensor is connected correctly to the cable. **2.** If this does not help, contact your local INFORS HT representative.
ERROR: CO2 CONTROL	The CO_2 actual value does not rise (CO_2 supply interrupted, pressure too low or door not closed correctly).	**1.** Ensure that the door is closed completely. **2.** Check the CO_2 supply. If appropriate, install a new CO_2 cylinder. **3.** Check inlet pressure and flow rate and increase if necessary. **4.** If this does not help, contact your local INFORS HT representative.

Error message	Description	Solution
ERROR: EEPROM	The EEProm has been initialized. The error may occur if there are problems with the EEProm or if there are problems with one of the internal data buses. Depending on which part of the EEProm was affected by the error, settings or calibrations of the sensors may have been reset to the factory settings. After the error has occurred, the device can normally continue to be used. Nevertheless, an INFORS HT representative should be contacted to check the device and the settings.	**1.** Confirm the error message by pressing the **OPTION** key. **2.** Check the parameters and the general settings in the settings menu and adjust if necessary. **3.** Contact your local INFORS HT representative to have the other device settings checked.
ERROR: DISPLAY HW	The display unit is defective.	Contact your local INFORS HT representative.

8.3 Fault Tables

The tables below describe potential faults that do not usually trigger an error message on the display or – with a few exceptions – an alarm signal.

General Faults

Fault description	Cause	Remedy	Personnel
After activating the power switch, the display and the power switch do not light up.	Power supply of the device interrupted.	▪ Check if the plugs are plugged in correctly. ▪ Check the mains connection.	Operator
	A fuse (230 V version) or thermal protection switch (115 V version) has triggered.	Change the fuse or reset the thermal protection switch (➥ chapter 8.4, page 112). If the fuses/thermal protection switches trigger several times, contact your local INFORS HT representative.	Operator
The tray cannot be locked.	There is a foreign object jamming the locking mechanism.	Remove the foreign object.	Operator
	The tray is jammed due to foreign objects under the shaking table.	Detach the shaking table from its axle, tip it up and remove the foreign objects (➥ chapter 9.2.3, page 117).	Operator
	The tray is bent.	Replace the tray.	Operator
The working light does not work.	The working light is deactivated.	Activate the working light (➥ 'Illumination' on page 101).	Operator
	The lighting element is defective.	Contact your local INFORS HT representative.	INFORS HT service technician or licensed dealer

Faults in Conjunction with the "Rotation Speed" Parameter

Fault description	Cause	Remedy	Personnel
Strong vibrations occur.	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 device is not standing straight.	Level the table or the device (adjustable foot on the base).	INFORS HT service technician or licensed dealer
	The substrate is too weak.	Place the device on a stable substrate.	INFORS HT service technician or licensed dealer

Rectifying Faults

Faults in Conjunction with the “Temperature” Parameter

Fault description	Cause	Remedy	Personnel
The temperature fails to reach the desired set-point.	The door is not closed completely.	Close door completely.	Operator
	The internal cooling unit or external cooling is not switched on.	Switch on cooling.	Operator
	No cooling is available and the difference to the ambient temperature is too small.	Increase the setpoint or equip the device with cooling.	Operator
	Error during temperature measurement.	Check whether the Pt100 sensor is working properly. In case of a defect, contact your local INFORS HT representative.	Operator
	Fans are defective, air circulation in the incubation chamber is therefore insufficient.	Contact your local INFORS HT representative.	INFORS HT service technician or licensed dealer
Poor cooling performance. The desired set-point cannot be reached even though the cooling unit is in operation.	The door is not closed completely.	Close door completely.	Operator
	The ambient temperature is too high. **IMPORTANT:** The ambient temperature refers to the temperature directly on the device. This can be significantly higher than the temperature in other parts of the room.	**1.** Reduce the ambient temperature. **2.** Use a fan to improve air circulation. **3.** Move the device.	Operator INFORS HT service technician or licensed dealer
	Other devices with strong heat radiation are located in the immediate vicinity of the device (e.g. ultra-low freezers or refrigerated centrifuges).	**1.** Use a fan to improve air circulation. **2.** Place a barrier between the devices. **3.** Move the device.	Operator INFORS HT service technician or licensed dealer
	A barrier in the room prevents circulation of cold air.	**1.** Remove the barrier. **2.** Move the device.	Operator INFORS HT service technician or licensed dealer

Fault description	Cause	Remedy	Personnel
Poor cooling performance. The desired set-point cannot be reached even though the cooling unit is in operation.	The ambient temperature is not constant (e.g. because the air conditioning is turned down on the weekend).	Ensure that the ambient temperature is constant.	Operator
	Required minimum distances for air circulation are not observed. The device has been pushed back against the wall.	Move the device to ensure that heat can escape and heat does not accumulate.	INFORS HT service technician or licensed dealer
	The device was positioned under a table without air vent.	Move the device.	INFORS HT service technician or licensed dealer
	The air vents are covered.	Remove all objects that cover air vents.	Operator



Re-measuring the temperature only provides reliable information when using calibrated measuring tools, and only for measurements at points specified by INFORS HT. Measurements taken at undefined points in the housing will not produce any usable data.

For information about temperature measuring, contact your local INFORS HT representative.

Faults in Conjunction with the "CO_2 Concentration" Parameter

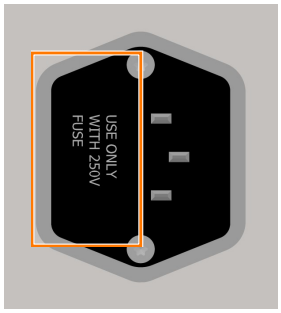
Fault description	Cause	Remedy	Personnel
CO_2 concentration too low (deviation > 1%).	CO_2 cylinder is empty.	Install new CO_2 cylinder.	Operator
	Inlet pressure or flow too low.	Increase inlet pressure or flow.	Operator
	CO_2 valve is closed or blocked.	Contact your local INFORS HT representative.	INFORS HT service technician or licensed dealer
CO_2 concentration too high (deviation < 1%).	CO_2 inlet pressure is too high.	Reduce the inlet pressure.	Operator
The CO_2 value is fluctuating, the actual value is not constant	Inlet pressure or flow too high.	Decrease inlet pressure or flow.	Operator

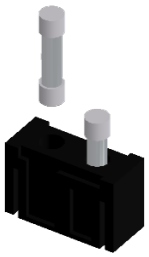
Faults in Conjunction with the "Humidity" Parameter

Fault description	Cause	Remedy	Personnel
The "Humidity" parameter was deactivated automatically.	Transfer error of the humidity sensor or temperature sensor.	Switch the device off and then on again.	Operator
	Inlet pressure is too high.	Reduce inlet pressure (max. 2 bar(g)).	Operator
	The humidity control is defective.	Contact your local INFORS HT representative.	INFORS HT service technician or licensed dealer

8.4 Replacing Device Fuses

The device fuses may only be replaced by fuses of the same rating. For information on the requirements regarding fuses, see ➦ Chapter 12.3.3 ' Electrical Connection and Power Values' on page 127.





To replace a defective device fuse, proceed as follows:

1. Turn off the device and pull out the power plug.
2. Release the slot for the device fuses next to the mains connection by pressing together the two flaps and pulling out at the same time.
3. Remove the defective device fuse.
4. Insert a new device fuse with the correct number of Amperes.
5. Push the plug as far back in the opening as possible until it snaps in.
6. Restore the power supply to the device.

8.5 Returning for Repair

The provider must return the device 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.

If the device, component or accessory has to be returned to the manufacturer for repair, a legally compliant declaration of decontamination is required for the safety of all parties involved and to comply with legal requirements (➥ Chapter 2.10 'Declaration of Decontamination' on page 29).

9 Cleaning and Maintenance

WARNING

Improper cleaning and maintenance of the device may lead to dangerous situations.

- To prevent life-threatening electric shocks, always switch off the device and disconnect it from the power supply before carrying out any maintenance or cleaning.
- Never remove the covers of the device.
- Damaged parts may only be replaced by an INFORS HT service technician, a licensed dealer or authorised expert personnel.

9.1 Maintenance

The device requires hardly any maintenance. This reduces the running costs to certain regular checks and cleaning. The following table describes the maintenance work that is required to ensure optimum, 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. 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 device operation.

Contact the manufacturer if you have questions about maintenance work and intervals.

Interval	Maintenance work	Personnel
Prior to each use	Check hoses and power cables for damage; replace if necessary.	Operator
	Check that hoses (water, CO_2) are connected tightly.	Operator
	Check all seals on the device, especially on the door, and replace if necessary.	Operator
	Check whether the interior working light works; have lighting elements replaced if necessary.	Operator
After each use	Clean the device; if necessary, disinfect thoroughly.	Operator
Annually	If you are using humidity and CO_2 sensors, have these calibrated at least once a year to ensure measuring results remain accurate.	Technician

Interval	Maintenance work	Personnel
Annually	When using the optional Hygienic Humidity Control (HHC): Have maintenance performed annually. This includes replacing the air filter and the seal as well as cleaning the evaporator chamber.	INFORS HT service technician or licensed dealer
	When using the optional HEPA filter: Have the filter replaced (the display of the operating panel shows when a filter change is necessary).	INFORS HT service technician or licensed dealer
Every 3 years	When using the optional LED lighting: Have the LED modules replaced. This is necessary because the light intensity of the LEDs decreases after approx. 3 years of continuous operation due to material fatigue and thermal loads.	INFORS HT service technician or licensed dealer

9.2 Cleaning and Disinfection

If substances, especially substances hazardous to health, have been spilled on or in the device, the device must be thoroughly cleaned and disinfected. The device should also be routinely cleaned and disinfected at regular intervals to ensure trouble-free operation.

If you are not sure about the compatibility of cleaning agents and disinfectants, contact INFORS HT.

NOTICE

Insufficient cleaning and disinfection can lead to damage to cultures due to contamination.

9.2.1 Cleaning the Device

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
- Steel plate covers
- Table
- Trays (incl. clamps and other holders)

NOTICE

Aggressive detergents, solvents and abrasive cleaning utensils (hard sponges, brushes) can scratch surfaces, damage the device and impair its function.

Notices on Cleaning

To clean the surfaces, use a soft cloth, ideally lint-free. This applies in particular to the front window.

Spray

When cleaning the base tray, only use a wet cloth, never pour water into the tray. Make sure that no water splashes into the bearings and the HEPA filter (if fitted). After cleaning the device, especially the interior and the base tray, dry it with a cloth.

Air Vents and Fan

Over time, dust and other contaminants can accumulate on the vents and fans and other exposed areas. This may affect the operation of the device, for example, if the air circulation for cooling the electronic components is restricted. Dust and other impurities can be carefully removed with a damp cloth or with a vacuum cleaner.

9.2.2 Disinfecting the Device

Only use quaternary ammonium compounds for wipe-down disinfection. Approved and recommended disinfectants: Fermacidal D2 and Biocidal ZF.

NOTICE

The use of the recommended disinfectants Fermacidal D2 or Biocidal ZF may have negative effects on the humidity and CO_2 sensors and lead to deviations in the measurement values (sensor drift).

- Before carrying out any cleaning work, remove the sensors from the device.
- If removing the sensors is not possible, cover the sensors completely and securely to prevent any contact with the disinfectant.

NOTICE

Heat (temperatures above 80 °C), aggressive disinfectants such as chlorine bleach and UVC radiation can damage the device and significantly limit the function and service life of the device.

We recommend against using UV lamps for disinfection of the device because the UV rays can massively damage the housing in case of multiple applications.

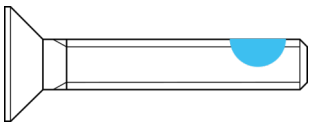
9.2.3 Cleaning and Disinfecting the Base Tray

If glass is broken or large amounts of liquid are spilled, liquid may accumulate underneath the shaking table. To drain leaked liquids, the device has a discharge outlet on the left side. In order to be able to clean the base tray in case of glass breakage or other contamination by culture liquids, the shaking table can also be detached from the counterweight and folded upwards.

CAUTION

After being folded up, the table must be held in position by hand. If the table is not secured properly, there is a risk of it folding back down again. This can cause injuries.

- If possible, have a second person hold the table in place once it has been folded up. Alternatively, you can place an object under the table to stop it from folding back down.
- Proceed with caution when folding the table back down.



NOTICE

The screws of the shaking table must be tightened with the correct tightening torque (10 Nm) so that the screws do not come loose during operation. Therefore, a torque wrench must be used to install the shaking table after cleaning. If the screws are not tightened to the correct torque, there is a risk that the shaking table will come loose during operation and thus damage the device or cultivation vessels!

Furthermore, you must use new, TufLok-coated original screws for mounting the shaking table. Replacement screws are supplied together with the device. If you lose the spare screws or all replacement screws have been used, contact INFORS HT.

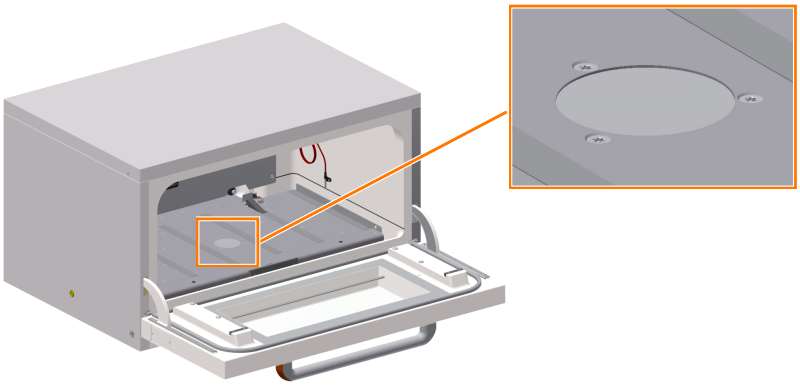
To dismantle the shaking table and to clean the base tray, proceed as follows:

Folding up the Table

1. Open the device door all the way.

Cleaning and Maintenance

2. Remove the tray.
3. Switch off the power switch and pull out the power plug.
4. Loosen the three screws (hexalobular M6x12) in the centre of shaking table using the screwdriver provided.



5. Tilt the shaking table up by a maximum of 30°.
6. Hold the shaking table in its tilted up position (or, ideally, get a second person to do so), or use a suitable object to hold it there.

Cleaning the Base Tray

7. Clean the base tray with a mild cleaning agent. Larger quantities of liquid can be drained off via the discharge outlet on the left side.
8. Thoroughly dry the base tray using paper towels.

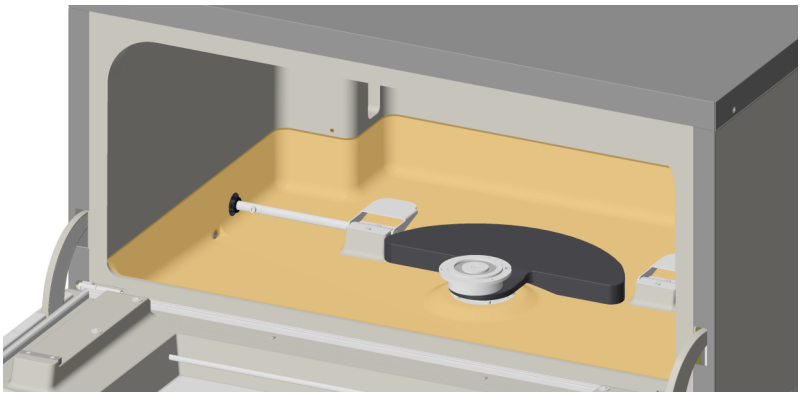
Disinfecting the Base Tray

9. Carefully apply disinfectant to the area of the base tray coloured in the following graphic and let it take effect.

NOTICE

The disinfectant may only be placed in the base tray. It must not come into contact with the metal parts of the shaking mechanism or the components of the upper part of the device.

In particular, all ball bearings of the shaker drive must not come into contact with disinfectants!



10. After the exposure time (see manufacturer's instructions), remove the disinfectant (wipe up).
11. Wipe or rinse with (sterile) water to remove all residues.

Folding Down the Table

12. Carefully place the shaking table on its rotary axis. When doing so, align the rotary axis so that the threaded holes on the shaking table are positioned directly over the holes on the rotary axis.
13. Insert and tighten new TufLok-coated original screws (included in the scope of delivery of the device) (tightening torque: 10 Nm).

10 Transport and Storage

Inbound delivery and transport to the assembly location are performed only by INFORS HT employees or by persons authorized 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, use of incorrect auxiliary tools and careless handling of the device may lead to injuries and significant damage to property.

When transporting the device, observe the following:

- Prior to moving the device, 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 device.
- Especially when using auxiliary tools, it is important to keep in mind that the device's centre of gravity is not in the middle.

10.2 Storage

- Decontaminate, thoroughly clean and dry the device every time before placing it in storage.
- Store the device and its components clean, dry and protected against dust, dirt and liquids.
- Store the device 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 % to 85 %
- Protect the device from aggressive media, direct sunlight and vibrations.

11 Disposal

General Information

Once the end of use has been reached, the device must be dismantled and disposed of in an environmentally friendly manner. The materials must be disposed of in accordance with national and local legislation. The local municipal authority or specialist waste disposal companies can provide information on environmentally friendly disposal.

If no special return arrangements have been agreed, INFORS HT devices can be returned to the manufacturer or liecensed dealer for disposal with the required declaration of decontamination (➥ Chapter 2.10 'Declaration of Decontamination' on page 29).

⚠ 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.
- Before disposal, ensure that the device is free of toxic or infectious substances.

Disposal Information in accordance with the WEEE Directive (2012/19/EU)



The device is marked with the symbol of a crossed-out wheeled bin in accordance with Directive 2012/19/EU on waste electrical and electronic equipment (WEEE). This symbol indicates that the device must not be disposed of with household waste. To prevent environmental damage and health risks caused by improper disposal, the device must be taken to a separate collection point for electrical and electronic equipment at the end of its service life.

Disposal Information Hazardous Substances

Hazardous substance	Use	Disposal instructions
R290	Devices with cooling, primary cooling circuit	The refrigerant R290 is a highly flammable gas under pressure. To avoid environmental damage and health risks, it must not be allowed to enter the sewage system, the ground, or waterways. Disposal may only be carried out by authorized specialist companies that are licensed to handle and take back refrigerants.
Antifrogen L	Devices with cooling, secondary cooling circuit	Antifrogen L is hazardous to water and must therefore not be released into the environment. Residues and contaminated materials must be disposed of as hazardous waste in accordance with local regulations. Disposal may only be carried out by authorized specialist companies.

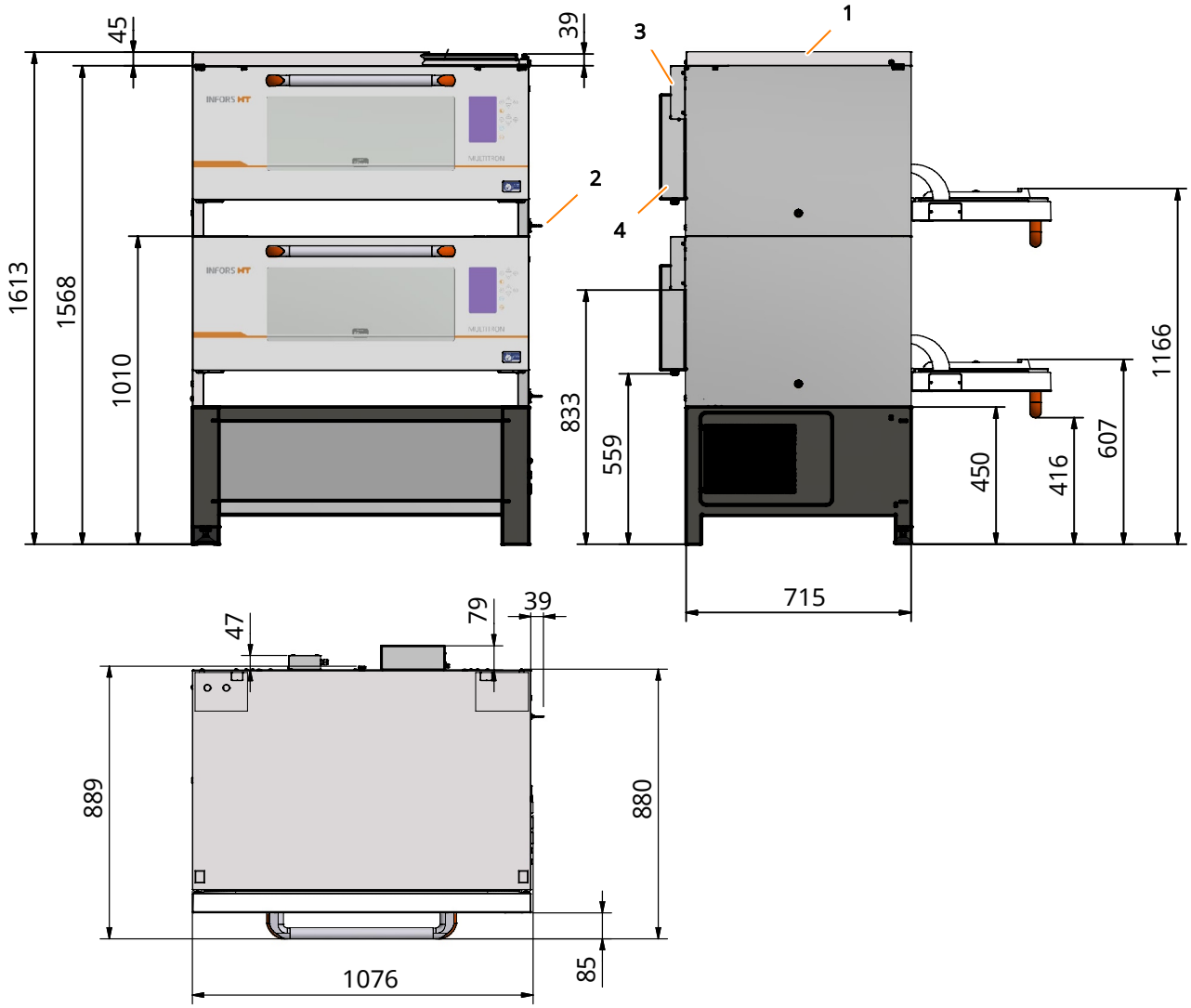
12 Technical Data

12.1 Dimension Drawings

Two units stacked with high base and the following options:

- Low cover (1, only with HHC)
- CO_2 control (2)
- Analog output (3)
- Hygienic Humidity Control (HHC) (4)

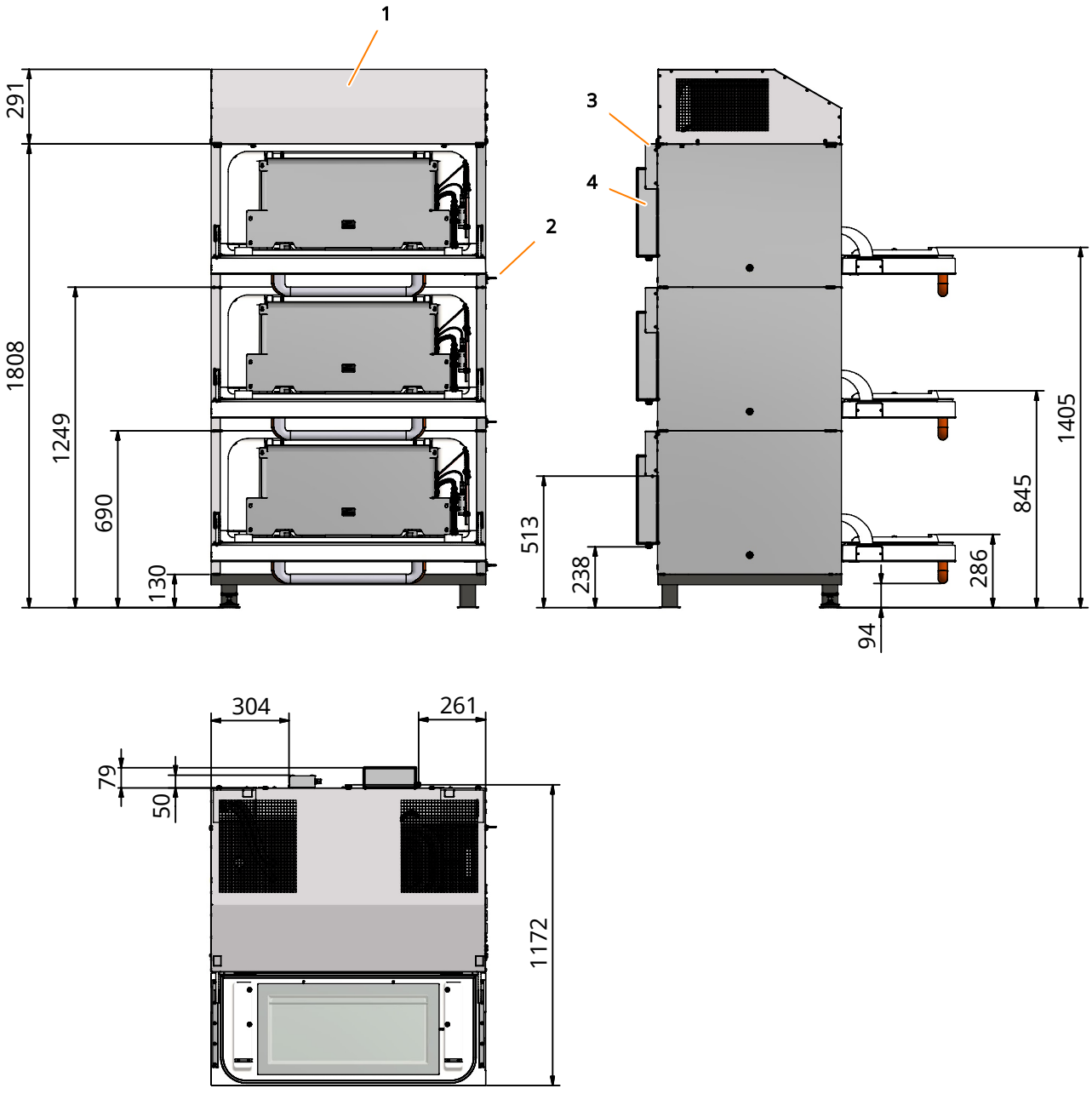
Note: The indicated values apply to the 230 V version. The base of the 115 V version is slightly lower (406 mm instead of 450 mm).



Three units stacked with low base and the following options:

- Top cooling (1)
- CO_2 control (2)
- Analog output (3)
- Hygienic Humidity Control (HHC) (4)

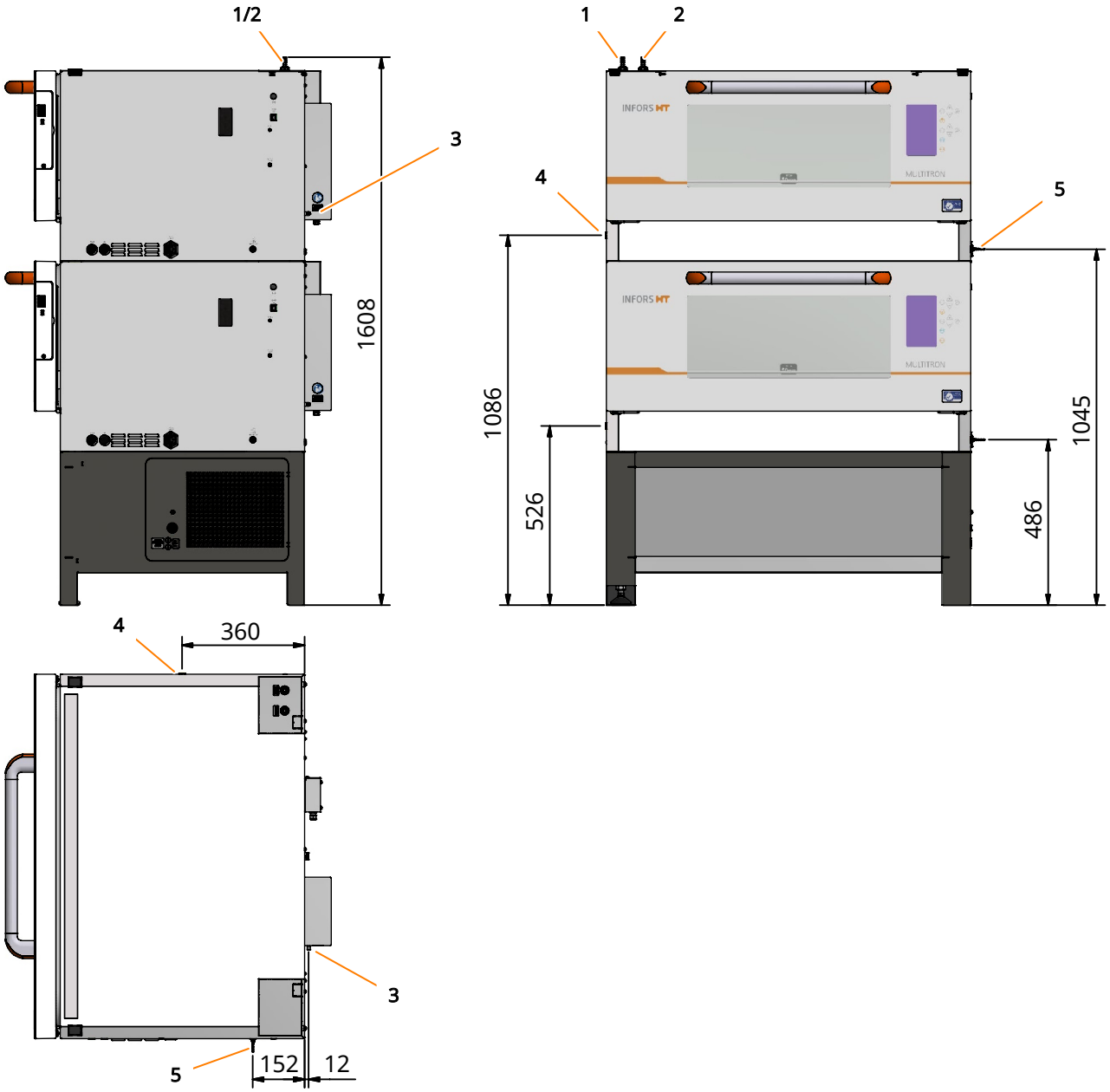
Note: The indicated values apply to the 230 V version. The base of the 115 V version is slightly higher (140 mm instead of 130 mm).



12.2 Connections and Interfaces

Two Units Stacked with a High Base

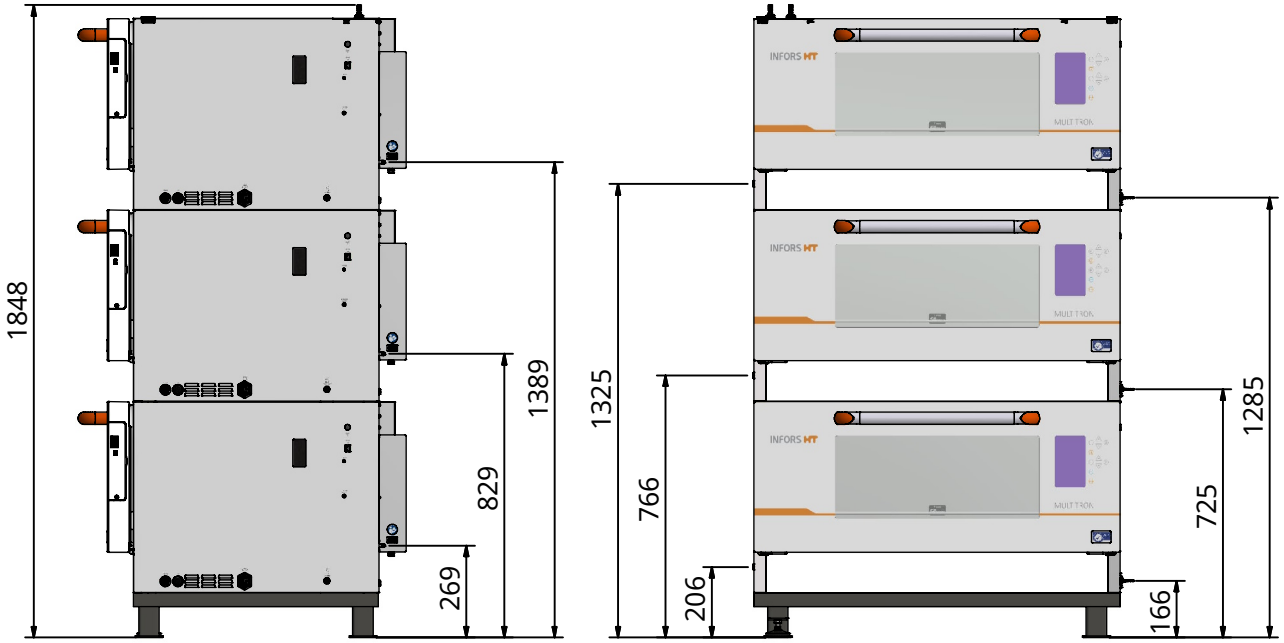
Note: The indicated values apply to the 230 V version. The base of the 115 V version is slightly lower (406 mm instead of 450 mm).

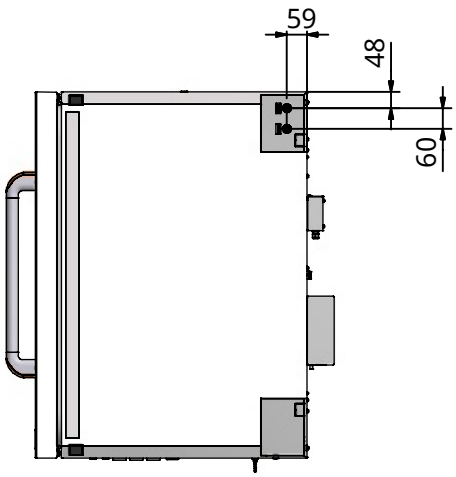


1 Cooling liquid In (hose nozzle DN10) / max 4.0 bar(g)
2 Cooling liquid Out (hose nozzle DN10) / pressureless
3 Demineralised water In (UNF 1/4-28 for hoses 1/8") / max. 2.0 bar(g)
4 Discharge outlet (internal thread G1/4")
5 CO_2 In (hose nozzle DN04) / 0.4 bar(g) to 0.6 bar(g)

Three Units Stacked with a Low Base

Note: The indicated values apply to the 230 V version. The base of the 115 V version is slightly higher (140 mm instead of 130 mm).





12.3 Specifications Basic Unit

12.3.1 Weight

Data	Value	Unit
Single unit (3 mm throw)	129	kg
Single unit (25 mm throw)	137	kg
Single unit (50 mm throw)	144	kg
Single unit (adjustable throw)	143	kg
Low base (230 V)	26	kg
Low base (115 V)	31	kg
High base (230 V)	42	kg
High base (115 V)	45	kg

12.3.2 Dimensions

Dimensions of a Single Unit

Data	Value	Unit
Width	1076	mm
Depth (door closed)	889	mm
Depth (door open)	1172	mm

Interior Dimensions (Incubation Chamber)

Data	Value	Unit
Width	935	mm
Depth	570	mm
Height (without LED lighting)	380	mm
Height (with LED lighting)	350	mm

Volume (Incubation Chamber)

Data	Value	Unit
Total volume	approx. 270	L
Visible volume	approx. 210	L

12.3.3 Electrical Connection and Power Values

Type 230 V

Data	Value	Unit
Voltage	230	VAC
Frequency	50/60	Hz
Max. power consumption	1650	W
Max. current consumption	7.2	A
Device fuses (two 5 x 20 mm fuses, time lag)	10	A
Overvoltage category	II	

Type 115 V

Data	Value	Unit
Voltage	115	VAC
Frequency	60	Hz
Max. power consumption	1700	W
Max. current consumption	15	A
Thermal protection switch	15	A
Overvoltage category	II	

The power and current consumption data apply to a fully equipped device with humidity control, CO_2 control and UV decontamination.

12.3.4 Connections and Interfaces

Alarm Connection

Data	Value
Type	Stereo jack, 3.5 mm
Relay	Rectifier NO / NC max. 1A 34V AC/DC

Ethernet Interface

Data	Value
Type	RJ45
Data transfer	10/100 Mbps Ethernet

Discharge Outlet

Data	Value	Unit
Hose nozzle	1/4	Inch
Hose diameter	10	mm

12.3.5 Working Light

Data	Value	Unit
Power consumption	350	mA
Power	1	W

12.3.6 Materials

Data	Value
Housing	Polyurethane (PUR-IHS) with flame retardant
Door	PUR-IHS, safety glass
Cover plate temperature control	Stainless steel (AISI 304)
Shaking table	Aluminium, anodised

12.3.7 Emissions

Data	Value	Unit
Sound pressure	< 70	dB(C)

12.3.8 Operating Conditions

Data	Value	Unit
Temperature range (w/o HEPA filter)	10 to 30	°C
Temperature range (with HEPA filter)	20 to 25	°C
Relative humidity, non-condensing (w/o HEPA filter)	10 to 85	%
Relative humidity, non-condensing (with HEPA filter)	10 to 60	%
Altitude operating location	max. 2000	M above sea level
Pollution degree as per EN 61010-1	2	
Maximum load	55	kg
Min. distance from walls, ceilings and other devices	80 (side) 100 (back)	mm

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 device can be significantly higher than the room temperature.

12.3.9 Protection Type

Data	Value
Protection class as per DIN EN 60529	IP20

12.4 Specifications of the Standard Parameters

12.4.1 Rotation Speed Parameter (Shaker Drive)

Data	Value
Direction of rotation	Clockwise

Data	Value	Unit
Throw (fixed throw)	3, 25 or 50	mm
Throw (adjustable throw)	12.5, 19, 25, 50	mm
Increment	1	min^{-1}
Accuracy control (at maximum rotation speed, full scale)	± 1	%

Rotation Speeds



The actual rotation speed that can be achieved depends on a variety of factors, such as loading, vessel type (e.g. flasks with baffles) and the fixtures used (e.g. clamps or “Sticky Stuff” adhesive matting).

The minimum rotation speed for all unit variants is 20 min^{-1}. The maximum rotation speed of an equipment unit depends on the throw and the position of the unit in the stack:

Single unit	3 mm	12.5 mm	19 mm	25 mm	50 mm
	1000 min^{-1}		400 min^{-1}		350 min^{-1}

Two units stacked	3 mm	12.5 mm	19 mm	25 mm	50 mm
Top unit	1000 min^{-1}		400 min^{-1}		350 min^{-1}
Bottom unit	1000 min^{-1}		400 min^{-1}		350 min^{-1}

Three units stacked	3 mm	12.5 mm	19 mm	25 mm	50 mm
Top unit	1000 min^{-1}		400 min^{-1}		300 min^{-1}
Middle unit	1000 min^{-1}		400 min^{-1}		350 min^{-1}
Bottom unit	1000 min^{-1}		400 min^{-1}		350 min^{-1}

Maximal Shaking Speeds with Sticky Stuff

For a detailed description of the maximum permissible rotation speeds when using Sticky Stuff adhesive matting, ➦ Chapter 5.1.6 'Tray with Sticky Stuff' on page 66.

12.4.2 Temperature Parameter

Measurement/Control

Data	Value
Control	PID controller
Sensor type	PT100 class 1/3 DIN B

Data	Value	Unit
Setting range (w/o HEPA filter)	4.0 to 65.0	°C
Setting range (with HEPA filter)	28.0 to 50.0	°C
Increment	0.1	°C
Accuracy control 4 °C to 50 °C	± 0.3	°C
Accuracy control > 50 °C	± 0.5	°C

Temperature Distribution without HEPA Filter (Measured in the Cultivation Vessel, at 37 °C)

Data	Value	Unit
Difference between the highest and lowest value	± 0,4	°C
Max. deviation from the displayed actual value	± 0,5	°C

Temperature Distribution with HEPA Filter (Measured in the Cultivation Vessel, at 37 °C)

Data	Value	Unit
Difference between the highest and lowest value	± 0,8	°C

Information on Temperatures that can Actually be Reached

The temperature range limited by the measuring and control unit ranges from 4 °C to 65 °C (without HEPA filter) resp. 28 °C to 50 °C (with HEPA filter). The temperatures that can actually be reached depend on a variety of factors, such as the ambient temperature, the ventilation and the temperature of the other devices in the stack. As such, the following guideline values (no guarantees) only apply under optimal conditions. In order to reach these guideline values, the device must be free-standing and the heat it generates must be able to dissipate unobstructed.

The specified ambient temperature refers to the temperature directly on the device. In case of heat build-up due to insufficient ventilation, the temperatures on the device can be significantly higher than the room temperature.

Configuration	Without cooling	Single-compressor version (w/o HEPA)	Single-compressor version (with HEPA)	Dual-compressor version
Single unit	10 °C above AT [1)]	18 °C below AT	28 °C	25 °C below AT
Two units stacked	10 °C above AT	17 °C below AT	28 °C	24 °C below AT
Three units stacked	10 °C above AT	15 °C below AT	28 °C	22 °C below AT

[1)] *AT = ambient temperature*

12.5 Specifications of the Options

12.5.1 Internal Cooling

The dual-compressor version is available only for the 230 V version.

Technical Data

Specification	Value			Unit
	Single-compressor version (230 V)	Single-compressor version (115 V)	Dual-compressor version (only 230 V)	
Cooling power [1]	900	1200	1800	W
Max. power consumption	350	360	725	W
Fuses (5 x 20 mm, time lag)	10	--	10	A
Thermal protection switch	--	15	--	A
Additional mass [2]	45	29	80	kg
Additional height	290	290	290	mm

[1] *Cooling capacity at temperature of the cooling medium = 20 °C (20 °C ambient temperature)*

[2] *Mass including cooling coil and cover*

Alarm Contacts (only Dual-Compressor Version)

Data	Value	Unit
Resistive load at 250 VAC	6	A
Resistive load at 30 VAC	6	A
Inductive load at 250 VAC	2.5	A
Inductive load at 30 VAC	2	A

Refrigerant / Cooling Liquid

Specification	Approved/applied products
Refrigerant (primary cooling circuit, cooling compressor)	▪ 230 V: R290 (filling quantity: 90 g per compressor) ▪ 115 V: R290 (filling quantity: 80 g)
Cooling liquid (secondary cooling circuit of the internal or external cooling)	▪ Based on 1,2-propanediol with inhibitor (must be suitable for copper) ▪ Approved for the food and pharmaceutical sectors Ex-factory: ▪ 230 V: 30 % Antifrogen L, 70 % water ▪ 115 V: 50 % Dynalene propylene glycol, 50 % water

12.5.2 External Cooling System

Connection Specifications

Data	Value	Unit
Connection (hose Ø)	10	mm
Input pressure	max. 4.0	bar(g)

NOTICE

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

Requirements for the Water Quality

- Water hardness very soft or soft ($CaCO_3$ concentration 0 mmol l^{-1} to 1.5 mmol l^{-1})
- For medium-hard to very hard water quality, use demineralised water as an alternative.

Requirements for the Cooling Liquid

- Based on 1,2-propanediol with inhibitor (must be suitable for copper)
- Approved for the food and pharmaceutical sectors
- Example: Antifrogen L

12.5.3 Hygienic Humidity Control (HHC)

Housing Dimensions

Data	Value	Unit
Height	340	mm
Depth	80	mm
Width	200	mm

Miscellaneous

Data	Value
Sensor type	EE071/EE072 HCT01

Data	Value	Unit
Additional mass	3	kg
Water consumption [1]	10	g h^{-1}
Temperature range for use [2]	28 to 40	°C
Heating time of the unit	approx. 5	min

[1] *At an ambient temperature of up to 20 °C and a temperature of 37 °C and relative humidity of 85 % in the incubation chamber.*

[2] *Temperature in the incubation chamber at which functionality can be guaranteed.*

Control

Data	Value	Unit
Control range	20 to 85	% rH
Increment	1	% rH
Accuracy control	± 3	% rH

Humidity that can be Reached

Data	Value	Unit
Max. humidity without condensation, without HEPA-Filter (at 37 °C in the incubation chamber, 20 °C ambient temperature)	80	% rH
Max. humidity without condensation, without HEPA-Filter (at 37 °C in the incubation chamber, 25 °C ambient temperature)	85	% rH
Max. humidity without condensation, with HEPA-Filter (at 37 °C in the incubation chamber, 20 °C ambient temperature)	80	% rH
Max. humidity without condensation, with HEPA-Filter (at 37 °C in the incubation chamber, 25 °C ambient temperature)	80	% rH
Min. humidity (at 30 °C in the incubation chamber, 25 °C ambient temperature)	70	% rH
Min. humidity (at 40 °C in the incubation chamber, 25 °C ambient temperature)	50	% rH

The humidity in the incubation chamber can never be less than the humidity of the ambient air.

Electric Specifications

Specification	Type 230 V	Type 115 V
Max. power consumption	125 W	125 W

Connection/Water Quality

Data	Value	Unit
Connection (hose Ø) (UNF 1/4-28 for hoses 1/8")	3.2	mm
Input pressure	-0.15 to 2	bar(g)
Water hardness ($CaCO_3$ equivalent)	< 0.01	mmol L^{-1}
Dissolved solids	< 10	mg L^{-1}

NOTICE

Using tap water – even as a minor additive to ultra-pure water – can quickly lead to limescale in the vaporiser of the humidification unit, which would affect correct functioning.

Adding detergents, disinfectants or similar chemicals to the water for the hygienic humidity control can damage the device. Only use water without additions, in accordance to the specification.

For an optimal operation ultra-pure water or WFI (water for injection purposes) is recommended.

12.5.4 CO_2 Control

Connection Data

Data	Value	Unit
Connection (hose Ø)	3 to 4	mm
Input pressure	0.4 to 0.6	bar(g)

Miscellaneous

Data	Value	Unit
Sensor type	GMP251	
Additional mass	0.5	kg
Gas consumption (air vent open, at 5 % CO2)	< 2	NL h^{-1}
Gas consumption (air vent open, at 10 % CO2)	< 3.5	NL h^{-1}
Gas consumption (air vent closed, at 10 % CO2)	< 0.5	NL h^{-1}

Control

Data	Value	Unit
Control range	0.1 to 20	% CO_2
Increment	0.1	% CO_2
Accuracy control (at 1013 hPa, 20 °C to 40 °C, 0 to 20 % CO2)	0.2	% CO_2

12.5.5 UV Decontamination

Data	Value
Type	Philips TUV PL-S 5W/4P

Data	Value	Unit
Power	5.1	W
Wavelength UV-C radiation	200 to 280	nm
Wave length at max. emission	253.7	nm
Lifespan	9000	h
Power output UV-C radiation	1	W
Additional mass	1	kg

12.5.6 LED Lighting

Data	Value	Unit
Setting range	1 to 100	%
Increment	1	%
Light intensity at 15 °C [1)]	2 to 240	µmol m^{-2} s^{-1}
Light intensity at 28 °C	2 to 240	µmol m^{-2} s^{-1}
Light intensity at 65 °C	2 to 220	µmol m^{-2} s^{-1}
Light distribution on the tray [2)]	± 8	%
Nominal power (setpoint 100 %)	120	W
Additional mass	5	kg
Minimum temperature in the incubation chamber	10	°C below AT [3)]

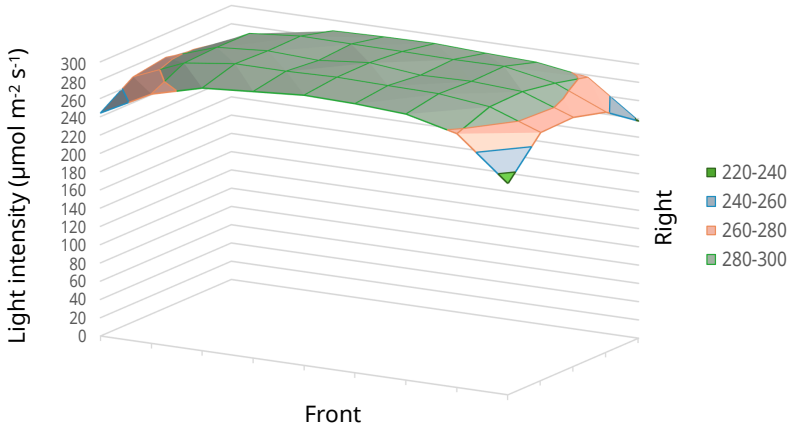
[1)] *Linear, setpoint 1 % to 100 %; temperature in the incubation chamber*

[2)] *Relative standard deviation of the total number of 45 measuring points distributed evenly across the tray, with darkening*

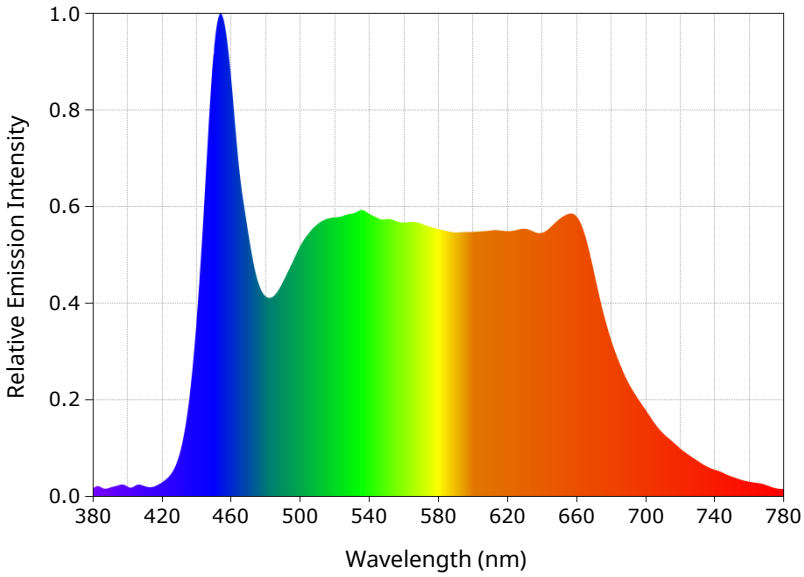
[3)] *AT = Ambient temperature; specification valid for single devices with cooling 900 W and at ambient temperature ≥ 20 °C*

Light Intensity Distribution

The following figure shows the distribution of light intensity on the tray. The measurement was carried out at 45 points evenly distributed on the tray at 100 % light intensity. The base area of the diagram corresponds to the tray; the Z-axis shows the light intensity in µmol m^{-2} s^{-1}.



Emission Spectrum



External Cooling

Due to the waste heat of the LEDs, the LED lighting can only be operated with a cooling system. If the device is connected to an external cooling system, it must meet the following minimum requirements for optimal operation:

Data	Value
Minimum temperature	5 °C to 7 °C below the desired setpoint
Minimum nominal flow	4.5 min L^{-1}

12.5.7 HEPA Filter

Performance Data

Data	Value
Attainable air quality in the incubation chamber	ISO cleanroom class 4 (ISO 14644)
Recovery time [1] (ISO class 9 to ISO class 4)	≤ 10 min
Recovery time (ISO class 6 to ISO class 4)	≤ 3 min

[1] *Time required to reduce the particle load in the air in the incubation chamber to the respective ISO cleanroom class.*

Specifications Filter

Data	Value	Unit
Filter class according to EN 1822-1:2009	H14	
Efficiency (MPPS)	99,995	%

13 EU Declaration of Conformity

EU-Konformitätserklärung

CE-Declaration of conformity

Déclaration CE de conformité

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Hersteller *Manufacturer* *Fabricant*	Infors AG Rittergasse 27 CH-4103 Bottmingen
Bezeichnung *Designation* *Désignation*	Inkubationsschüttler Incubation shaker Incubateur agité
Typ *Type* *Type*	Multitron
Ab Release *From release* *A partir du version*	4.0.0
Ab Seriennummer *From serial number* *A partir du numéro de série*	S-000128630

Dieses Gerät entspricht den grundlegenden Anforderungen der Richtlinien
This device is in compliance with the essential requirements of directives
Cet appareil est conforme aux exigences essentielles des directives

Maschinenrichtlinie 2006/42/EG	*Directive on machinery 2006/42/EC*	*Directive relative aux machines 2006/42/CE*
EMV-Richtlinie 2014/30/EU	*EMC directive 2014/30/EU*	*Directive CEM 2014/30/UE*
RoHS-Richtline 2011/65/EU	*RoHS directive 2011/65/EU*	*Directive RoHS 2011/65/UE*

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Bottmingen, 26. Jan. 2022

Ort, Datum
Place, date
Lieu, date

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