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Assembly Instructions

CyBio QuadStack
Microplate Storage

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For a proper and safe use of this product follow the instructions. Keep the operating manual for future reference.

General Information http://www.analytik-jena.com

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Technical Documentation Analytik Jena GmbH+Co. KG

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1 Basic information

1.1 About this manual

The manual describes the rotating microplate storage CyBio QuadStack with the models:
- CyBio QuadStack M
- CyBio QuadStack L

Depending on the configuration, the microplate storage includes an access module:
- Lift Link Module
- Lift Turn Lift Module

The original manual is written in German. Editions in other languages are translated from the original manual.

The operating manual provides information about the design and operation of the device and provides operating personnel with the necessary know-how for safe handling of the device and its components. Furthermore, the operating manual includes information on the maintenance and servicing of the device as well as information on potential causes of malfunctions and their correction.

Conventions

Instructions for actions occurring in chronological order are numbered and combined into action units.

Warnings are indicated by a warning triangle and a signal word. The type, source and consequences of the hazard are stated together with notes on preventing the hazard.

Elements of the control and analysis program are indicated as follows:
- Program terms are in bold (e.g., the **System** menu).
- Menu items are separated by vertical lines (e.g., **System** | **Device**).

Symbols and signal words used in this manual

The user manual uses the following symbols and signal words to indicate hazards or instructions. These warnings are always placed before an action.

WARNING

Indicates a potentially hazardous situation which can cause death or very serious (possibly permanent) injury.

CAUTION

Indicates a potentially hazardous situation which can cause slight or minor injuries.

NOTICE

Provides information on potential material or environmental damage.

1.2 Intended use

The operator is responsible to use the device as intended.

The microplate storage is designed for the automatic processing of labware in combination with other automatic devices in chemical and biological laboratories. In the field of medicine and diagnostics its use is limited to research.

Its basic functions are picking up, temporarily holding and transferring labware to various different automated transport systems or robots via access modules.

It is possible to manually load and unload the device through the stacker shaft doors. It is, however, not permitted to transfer labware to the access module by hand.

The device can be configured with various access modules.

The labware that can be processed with the device are microplates in ANSI/SLAS format, including deep-well and rigid full-skirted PCR plates. It is not possible to process flexible full-skirted PCR plates and half-skirted PCR plates with this device.

Furthermore, the device is able to handle 96/250 µL, 96/50 µL and 192/60 µL tip boxes provided by the company Analytik Jena in filled or unfilled condition and without lid. 96/1000 µL tip boxes provided by the company Analytik Jena cannot be handled with the device.

Please observe the following:
- The device must only be operated by qualified and trained personnel.
- The device must only be used in accordance with this manual. This applies in particular to the adherence to the connection values, conditions of use and notes on the maintenance, transport, and disposal.
- The safety instructions in this manual must be observed.

It is not permissible
- to operate this equipment in a medical laboratory,
- to work with explosive substances in this device,
- to operate this device in an explosive environment.
- to smoke or use a naked flame at the installation location.

As regards the safe handling of dangerous substances (radioactive, infectious, toxic, corrosive, combustible, and other hazardous substances), the owner/operator will be responsible in accordance with applicable laws and guidelines.

The same applies in terms of compliance with environmental protection rules (e. g. for disposal of reagents and consumables).

The device may only be used for the processes described in the assembly instructions. Only the specified use is regarded to be the intended use. Using the device for any other purpose may compromise the safety of the user and the device.

1.3 Standards and directives

The device was manufactured according to the currently applicable generally recognized codes of practice and the generally accepted safety-related regulations. The relevant safety and health requirements of the applicable laws, standards and regulations were applied during the construction of the device.

EU directives

The device is regulated by the directive 2006/42/EG and is considered an unfinished machine. This means that the safety requirements are specified in the declaration of incorporation.

Furthermore, the following applies in this context: The unfinished machine may only be put into operation if it has been determined that the machine or installation into which the unfinished machine is to be incorporated complies with the provisions of the directive 2006/42/EG and that a corresponding declaration of conformity in accordance with annex II, part 1, section A has been issued.

The device meets the requirements of the directives 2014/30/EU and 2011/65/EU.

Any information regarding safety corresponds to the currently valid regulations of the European Union. Other specific national laws and regulations must be observed.

Guard all hazard zones described in this manual for the safe integration of the device into a machine or installation as far as possible from unintentional access. Preferably, use a separating protective device to do this.

If the unfinished machine is incorporated into an external safety circuit via an E-stop cable, it is not permissible to have an E-stop jumper within the overall system.

2 Safety instructions

2.1 General

For your own safety and to ensure error-free and safe operation of the device, please read this chapter carefully before commissioning.

Screen

Observe all safety instructions listed in these instructions, as well as all messages and instructions displayed by the control and analysis software on the monitor.

Besides the safety instructions in these instructions and the local safety regulations that apply to the operation of the device, the general applicable regulations regarding accident prevention, occupational health and safety and environmental protection have to be observed and complied with.

2.2 Safety markings

Warning and mandatory action labels have been attached to the device and must always be observed.

Damaged or missing warning and mandatory action labels can cause incorrect actions leading to personal injury or material damage. The labels must not be removed. Damaged warning and mandatory action labels must be replaced immediately!

The following warning and mandatory action labels have been attached to the device:

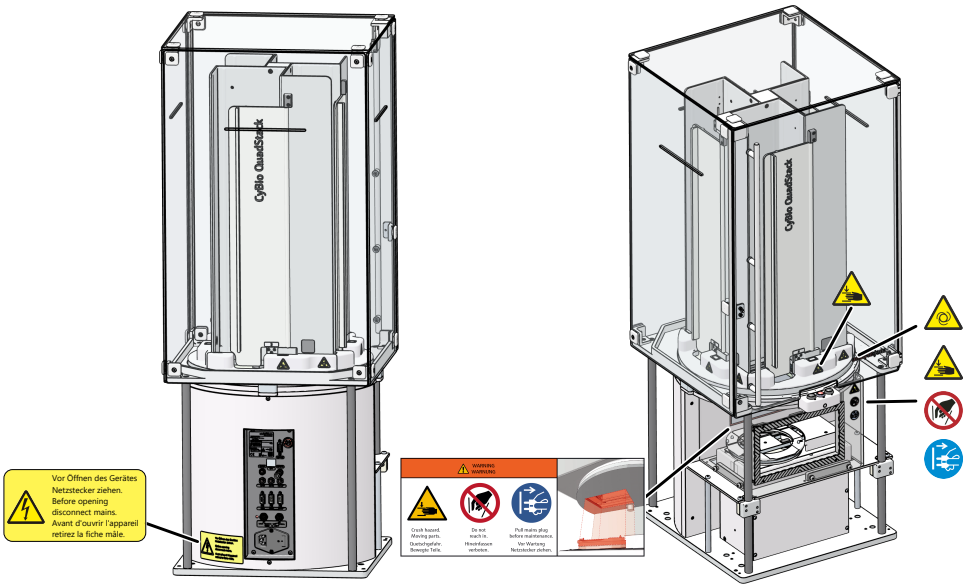
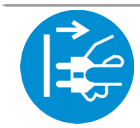


Fig. 1 Safety labeling on the device

Warning symbol	Meaning	Comment
	Warning against dangerous electrical voltage	On the terminal block: Never open the device. All repairs must be performed by qualified personnel only. Only replace defective fuses with fuses with the specified rating.

Warning symbol	Meaning	Comment
	Warning of crushing	On all stacker shafts, on the access module: Warning of hand injuries caused by moving device components
	Warning: automatic start	On all stacker shafts: Warning of automatically rotating stacker shaft during ongoing processes
	Crushing injuries warning. It is forbidden to reach into the device. Unplug the power cord before carrying out any maintenance work on the device.	Risk of irreversible hand injuries due to shearing and crushing caused by moving device components in the area of the lower stacker shaft opening and the vertical lifter of the access module. Unplug the power cord before carrying out any maintenance work on the device.

The following characters can be found on the protective cover preventing the operator from reaching into the access module:

Character	Meaning	Comment
	Warning of crushing	Warning of hand injuries caused by moving device components
	It is forbidden to reach into the device	Do not reach into the range of movement of the access module while the device is running
	Unplug the power cord before servicing the device	Before performing any maintenance work in the area around the device, switch off the device and disconnect the mains plug from the mains socket.

2.3 Hazard zones and protective devices

2.3.1 Hazard zones

The rotary movement of the stacker shaft and the movement of the access module may put the operating personnel at risk. Operating the device without its own protective housing or without the protective housing of the overall system in place does not comply with its intended use and is therefore prohibited.

Not complying with the instructions on the warning notices can lead to serious injury to the hands caused by crushing or shearing. Any interference with the device during operation can result in damage to the device and to the samples.

Devices with their own protective housing have a transparent protective housing around the stacker shaft which ensures that the process is safe for the operating personnel. The protective housing can be opened on the main operating side via a monitored door.

The access module is located behind a transparent protective shield preventing the operator from reaching into the device. There is a risk of crushing and shearing fingers and hands at the lower stacking shaft opening.

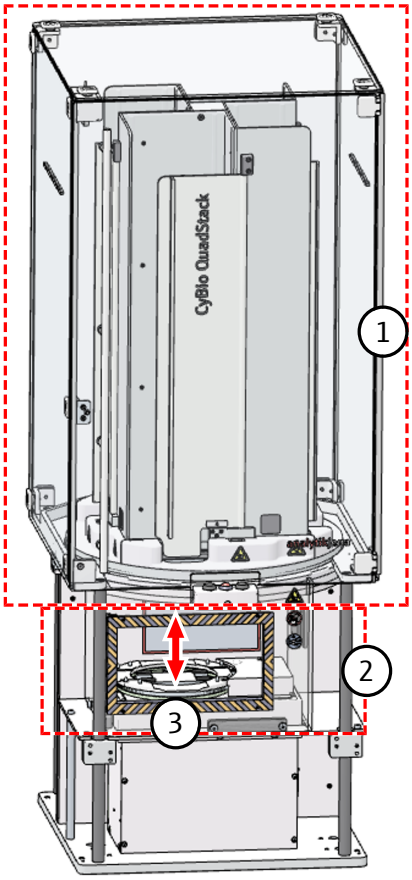


Fig. 2 Hazard zones

1 Range of rotation of the stacker shaft
2 Passage area of the transport system
3 Range of movement of the access module

Warning labels

- Never use the device without its protective housing.
- In the event of malfunction, first switch off the device. Unplug the power cord before, for example, removing microplates that got stuck or clamped inside the device.
- Never reach into the range of movement of the stacker shaft, the access module or any transport system with your hands or any type of object while the device is running. There is a particular risk of injury at the gaps at the 4 stacker shaft doors and at the lower stacker shaft opening. There is a risk of irreversible hand injuries caused by crushing or shearing.
- To abort a program, press the STOP button. All drives stop.
- The stacker shaft only rotates when the doors are closed. The position of the doors is monitored by a magnet.
- Always correct any incorrect movement with the aid of the PC. Incorrect handling and operation can result in material damage and personal injury.

2.3.2 Protective devices

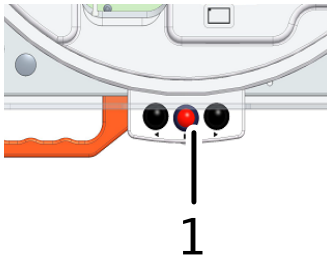


Fig. 3 STOP button

Press the STOP button (1 - see figure) to bring all drives to an immediate stop.

2.4 Requirements for the operating personnel

The device may only be operated by trained specialist personnel instructed in technical safety. The operating personnel must have read and understood the operating instructions.

The personal protective equipment must be worn to operate or service the device.

The operating personnel must be familiar with the dangers arising from the substances used.

2.5 Device-specific safety instructions

The system must be installed by the service personnel of the manufacturer or duly trained and authorized expert personnel under any circumstances.

Do not use aggressive substances of a type that may compromise the stable performance of the system

Before connecting to the mains, check the electrical requirements of the device.

Observe prescribed maintenance intervals!

Only use the accessory items, consumables and spare parts specified in this document or provided or recommended by the manufacturer!

2.5.1 Safety instructions for operation

The operator of the device must ensure that the device is in sound condition before each use. This applies especially after any modification or adaptation of the device or any repair.

Do not operate the system with defective safety devices or with improperly installed safety and protection devices.

Do not remove, modify or disable any safety and protection devices during operation.

Ensure easy access to the main power switch, as well as to any emergency shutdown systems and locks at all times during operation.

Ensure that all ventilation devices on the device are in proper functional condition. Covered ventilation grates or slots, etc. can result in malfunctions or device damage.

Only operate the device when connected to a power socket with grounding conductor. The grounding conductor must not be interrupted (e.g., when using a voltage regulating transformer). Only use extension cables equipped with grounding conductors!

When replacing the power cable, ensure that the new power cable has the proper dimensions for the intended operating voltage (see technical data).

Do not insert any objects into any device openings, and ensure that no liquid can get into the device through openings or joints.

Do not short-circuit the device fuses and only use fuses corresponding to the information in these instructions when replacing these.

2.5.2 Safety instructions: Transport

Only transport the device and its components in the original packaging! Ensure that all transport locks and safety devices have been fitted and that the device components are fully emptied and decontaminated if applicable.

2.5.3 Safety instructions – maintenance and service

Service and repairs and work for the commissioning or dismantling the device for transport must only be carried out by authorized service personnel!

The operator may only carry out the tasks listed in the chapter "Maintenance and care".

Only carry out maintenance and service work on the device when it is switched off. Disconnect the power cord from the mains socket beforehand.

2.6 Safety instructions

2.6.1 Handling hazardous substances

Even with intended use there is a risk of health damage when handling hazardous substances. The operator is solely responsible for the compliance with all safety requirements to protect individuals and property when handling radioactive, infectious, toxic, caustic, flammable and other hazardous substances.

- Control the handling of hazardous substances in accordance with the safety category of the lab, the details in the safety data sheets of the respective substances, the manufacturer recommendations for use and additional national and international regulations (WHO, “Laboratory Biosafety Manual").
- Wear personal protective equipment when working with the device.
- Observe all notices on the cleaning and decontamination of the device.

2.6.2 Chemical resistance

Aggressive substances may damage the device. Although the materials used are resistant to most of the commonly used substances, material damage from aggressive substances cannot be completely excluded.

- Before using any aggressive substances (e.g., bases, acids or organic solutions): Check that the materials with direct contact to these substances are resistant.
- When in doubt, consult the manufacturer.

Prohibited substances
Hydrofluoric acid (HF/hydrofluoric acid)
Highly concentrated acids
Cleaning powder
Paint thinner
Naphtha (crude gasoline)
Gasoline
Acetone
Cleaning spray
Ozone

- Substances not listed in this table are not necessarily suitable.
- Do not use solvents (thinners), aggressive detergents, flammable liquids or caustic alkaline solutions for cleaning. These can lead to damage to the housing components.

Disinfection method	Disinfectant	Can be used for
Wipe disinfection	Incidin Liquid (ECOLAB)	– Housing parts – Accessories

Table 1 Permissible disinfection methods and disinfectants

2.7 Behavior during emergencies

In hazardous situations or in the event of an accident, immediately use the main power switch or actuate the emergency stop pushbutton to turn the device off, then pull the mains plug from the mains socket.

3 Technical description

3.1 Design

The compact and flexible microplate storage has a 4-fold stacker shaft. The stacker shaft is used to hold, pick up and dispense various types of labware.

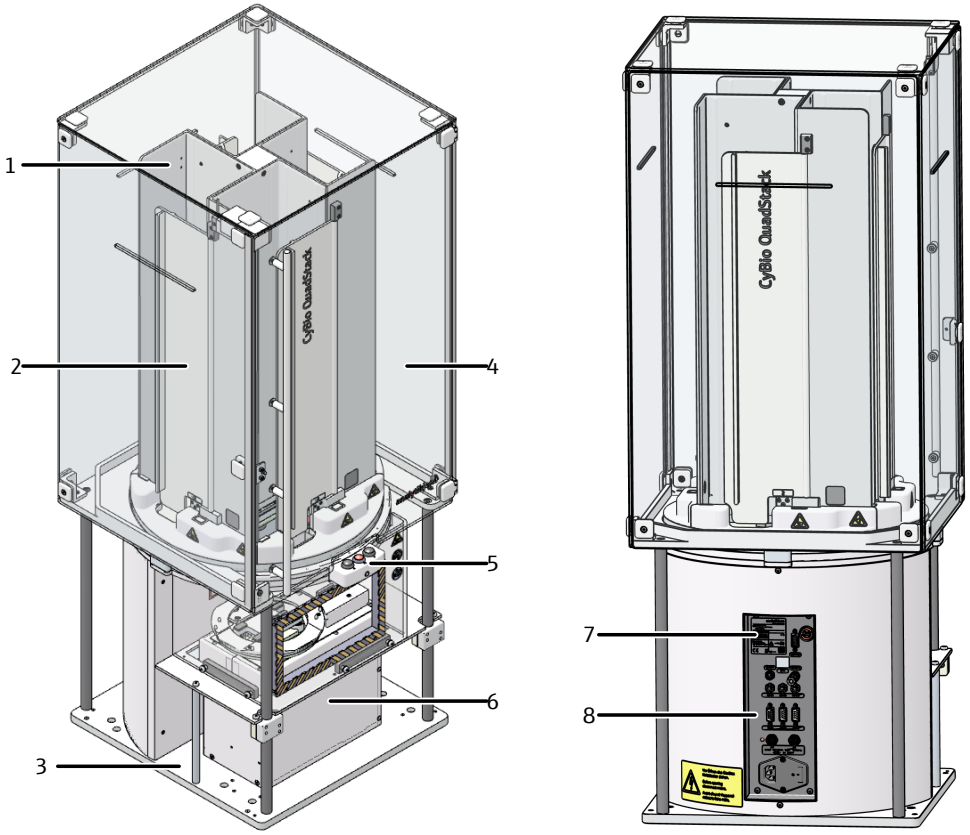


Fig. 4 Device configuration

1 Rotating 4-fold stacker shaft
2 Stack door
3 Bottom plate
4 Protective housing with door
5 Control unit
6 Access module
7 Type plate
8 Connector panel

A sensor monitors the stacking process during stacking and unstacking. A second sensor detects empty stacker shafts.

The rotational movement of the stacker shafts can also be initiated manually. A control panel with buttons and a status LED is located on the main operating side.

Electromechanical components and sensors are integrated in the lower section of the housing. The stacker shaft with its 4 shafts mounted on its rotatable bearing is located on the housing. The rotating unit has a protective housing. The door of this protective housing and the doors of the individual shafts are monitored by sensors.

The labware that can be processed with the device are microplates in ANSI/SLAS format, including deep-well and rigid full-skirted PCR plates. It is not possible to process flexible full-skirted PCR plates and half-skirted PCR plates with this device.

Furthermore, the device is able to handle 96/250 µL, 96/50 µL and 192/60 µL tip boxes provided by the company Analytik Jena in filled or unfilled condition and without lid. 96/1000 µL tip boxes provided by the company Analytik Jena cannot be handled with the device.

Labware is inserted into or taken out of one of the shafts using various access modules. Depending on the design, the access module will transfer the labware to another transport device such as a robot or a transport system.

To ensure error-free and safe operation, the microplate must lie flat on the contact surface of the access module. The edge of the plate must be positioned within the pins of the access module.

In normal operation, the device is operated via a PC. You can stack the labware manually into the shaft to prepare a process. Alternatively, additional devices such as robots can automatically insert the labware into the shafts via access modules.

There are different protective housings for operating the microplate storage with various main devices which can be opened to the left or to the right, for example. Device variants without their own protective housing are available from Analytik Jena for integrating the device into a complete system. In this case, the devices must be integrated into the protective housing of the system.

Connections

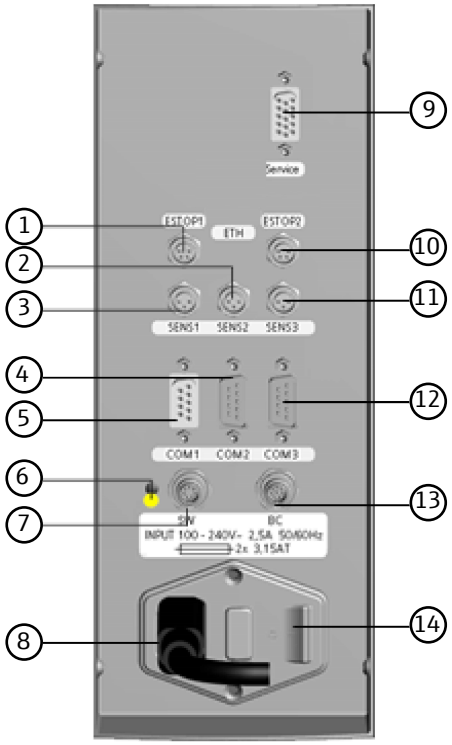


Fig. 5 Connections

1 ESTOP 1 -
Connection of the STOP button to the previous CyBio QuadStack

2 SENS2 -
External sensor

3 SENS1 -
External sensor

4 COM2 -
Main device

5 COM1 -
Previous device
(e.g. CyBio QuadStack)

6 LED -
Status (service only)

7 SW -
Switch output

8 INPUT - Power socket

9 Service -
Service interface

10 ESTOP2 -
Connection of the STOP button to the subsequent CyBio QuadStack

11 SENS3 -
External sensor

12 COM3 -
Subsequent device
(e.g. CyBio QuadStack)

13 BC -
Barcode reader

14 Mains switch

Control elements

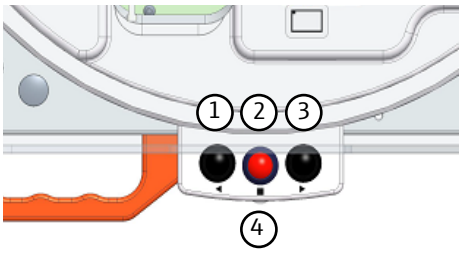


Fig. 6 Control unit

1 Button -
Clockwise rotation

2 STOP button

3 Button -
Counter-clockwise rotation

4 LED –
Operating status display

Operating status display

The device front houses the control panel with an operating status display. This indicates the current operating status of the device:

Display	Operating status
GREEN	The device is ready for operation. It can be operated manually or via PC.
ORANGE	The device is working. A process is currently being carried out.
RED	The device indicates that a shaft door is not closed or an error is present.

3.2 Stacker shaft variants

In normal operation, the microplate storage is controlled and operated via a PC. It is possible to insert individual microplates, plate stacks or tip boxes equipped with pipette tips into the rotating stacker shaft. Verify that the labware actually fits into the stacker shafts.

The doors on the stacker shafts are monitored via an electromagnet. Stacker shafts can only rotate when the doors are closed.

It is possible to manually or automatically load the 4 stacker shafts with labware before the device is put into operation. Various different access modules are available for that purpose.

The microplate storage may be equipped with stacker shafts of different lengths:
- CyBio QuadStack M (shaft length 555 mm)
- CyBio QuadStack L (shaft length 755 mm)

Microplate capacity

Device model	Maximum number of microplates/shaft by height of microplates		
Microplate height	9 mm	14.6 mm	44 mm
CyBio QuadStack M	69	43	13
CyBio QuadStack L	94	58	18

3.3 Access modules

The access module serves the following purposes:

- Placing labware into the stacker shafts
- Removing labware from the stacker shafts
- Transferring labware to another transport device such as a robot
- Rotating the labware (Lift Turn Lift Module only)

Electromagnetically controlled latches retain the microplates inside the stacker shafts. If one shaft is filled, the device will rotate to the next shaft.

Depending on the configuration, the device is equipped with the following access modules:

- Lift Link Module
- Lift Turn Lift Module

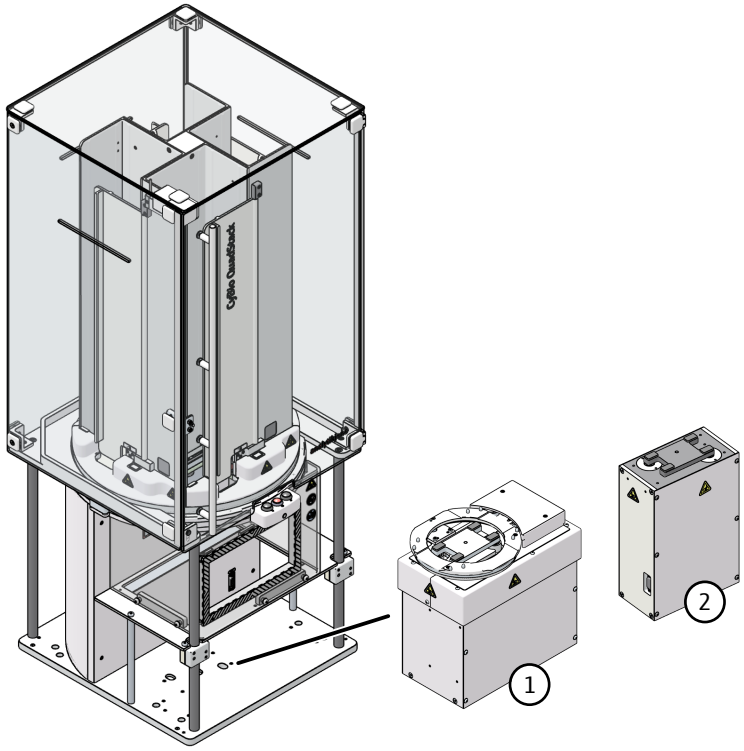


Fig. 7 Device with access modules

1 Lift-turn-lift module 2 Lift-link module

Lift Link Module

Access modules are used when you combine a microplate storage with a main unit, such as an automatic pipetting device (e.g. CyBio Well vario) and a transport system in linear or circular arrangement.

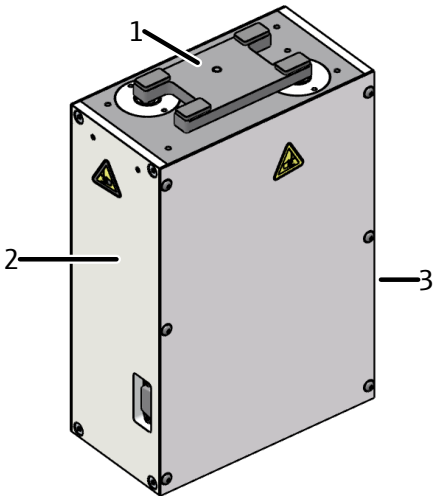


Fig. 8 Lift Link Module

1 Lifter
2 Housing
3 Interface (on the rear)

The access module lifts the labware out of the transport system and loads the stacker shafts via the lower stacker shaft opening. The lifter places the labware inside the shaft onto the electromagnetic latches.

For removing labware from the microplate storage, the lifter will first lift up the labware slightly. The latches are retracted. The lifter places the labware onto the transport system. The transport system will then move the labware on rails below the stacker shaft, for example, to move it to the main unit.

Lift Turn Lift Module

The access module is very flexible. That is why it is often used in more complex installations.

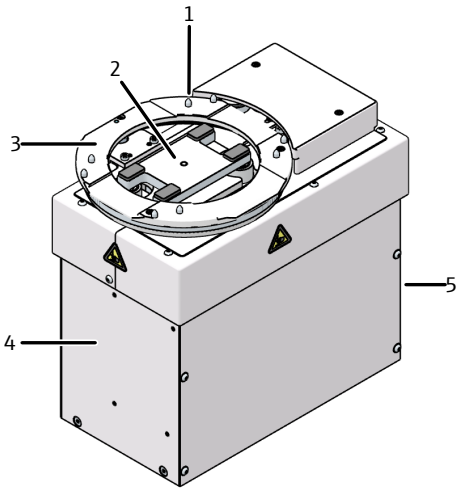


Fig. 9 Lift Turn Lift Module

1 Centering pin
2 Lifter
3 Rotating unit
4 Housing
5 Interface (on the rear)

The access module can perform three different types of movement:

- Lift: The lifter lifts the labware to place it in the stacker shaft or to dispense it from there.
- Turn: The tray rotates the labware.

- Lift: The tray lifts the labware to a height configured in the control software in order to automatically transfer the labware to a robot, for example.

The labware can be taken out of the access module by the gripper of a laboratory robot such as CyBio Carry, for example.

Fig. 10 CyBio QuadStack in an installation with Analytik Jena devices

3.4 Type plate

Type plates are located on the terminal strip of the device as well as on the back of the access module.

The type plate contains the following information:

- Manufacturer address, trademark
- Machine designation
- Serial number
- Conformity markings
- Year of manufacture
- WEEE marking

4 Installation and commissioning

4.1 Location requirements

Installation conditions

The operating room must meet the following climatic conditions:
- Temperature range: +15 to +35 °C
- Allowable relative humidity: ≤75 % (30 °C), non-condensing

For pipettor site selection, the following rules should be observed:
- The installation site must be free of drafts, dust and caustic fumes.
- Smoking is prohibited inside the device's operating room.
- The operating room must have a stable, horizontal, dry and vibration-free floor.
- Do not place the device directly next to doors and windows.
- Do not locate the device near sources of electromagnetic interference.
- Avoid direct sunlight and radiation from heaters onto the device. If necessary, provide air conditioning.
- Keep the ventilation slits free and do not obstruct them with other devices.

Space requirements

The space requirement depends on the device configuration and the dimensions of any other devices or on the transport system that is used for the labware.

You will find the exact dimensions of the device in the chapter "Technical data". You should also provide adequate space for supplementary units and for the PC, monitor and printer.

Power supply

If the protective earth conductor is interrupted, there is a risk of fatal injury due to electric shock.

Only use a mains socket with protective earth contact to plug in the device's mains plug. Make sure that the protection effect is not rendered ineffective by extension cables without a PE contact or by the use of a voltage regulating transformer.

The device operates on single-phase alternating current. The device has a wide-range power supply and operates in the 115/230 V ± 10 % voltage range at a frequency of 50/60 Hz. If the rating of the electric grid in the operating room deviates from the specifications above, the device must not be put into operation.

4.2 Initial commissioning and configuration

Because of the complexity of the device and to ensure its proper functioning, all installation, commissioning and configuration work must be carried out by the manufacturer's customer service personnel or duly authorized expert technicians.

Commissioning essentially includes:
- Installation and adjustment of the device components
- Connecting all cables and plugging in the supply cables
- Software installation and configuration
- Device induction

Check for integrity, completeness and compliance with the packing list as you unpack the product shipment.

After setting up the device, customer service will test the proper functioning of the device and provide documented proof of successful testing.

4.3 Re-commissioning

The operator may put the device back into service after an unforeseeable device failure. Before doing this, make sure that it is safe to put the device back into service. Please refer to the section “Safety instructions” for further information.

When the device displays error messages, please refer to the instructions in the chapter “Troubleshooting”.

5 Operation

5.1 Switching on

CAUTION

Risk of crushing at automatic start-up

There is a risk of crushing fingers and hands within the device's range of movement.

- Do not reach into the device with your hands or any type of object during initialization and after starting the control software.

- Check the correct mains connection of the CyBio QuadStack.
- Switch the mains switch of the CyBio QuadStack on the rear of the device to position "I".
- Initialize the device by pressing one of the black control buttons on the CyBio QuadStack. If there is no error after initialization, the operating status indicator lights up "green". The device is operational.

The device is capable of detecting errors during the initialization process. Communication errors are indicated by red flashing codes. The flashing codes are repeated continuously after a pause.

Flashing code (red)	Error
2 times	Communication error with the memory
3 times	Communication error with the drive of the rotation unit
4 times	Communication error with the lift drive
5 times	Communication error with the access module
6 times	E-stop interface active

What to do in case of an error:

- Switch the device off.
- Switch the device back on after a short while.
- If the device issues a flashing code again: Contact customer service.

5.2 Manual operation

CAUTION

Risk of crushing during manual operation

There is a risk of crushing fingers and hands when rotating the stacker shafts.

- Do not reach into the device with your hands or any type of object when rotating the stacker shafts.

You have the option to operate the device manually via the control elements on the front panel.

Control elements

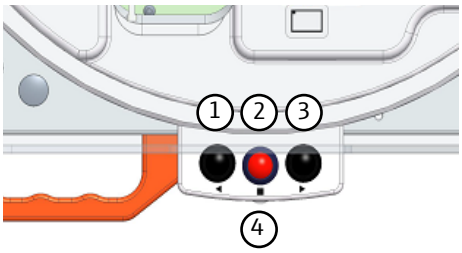


Fig. 11 Control unit

1 Button - Clockwise rotation
2 STOP button
3 Button - Counter-clockwise rotation
4 LED – Operating status display

Use manual operation to load labware to the device or to look for errors.

5.3 Operation via control software

CAUTION

Risk of crushing at automatic start-up

There is a risk of crushing fingers and hands within the device's range of movement.

- Do not reach into the device with your hands or any type of object during initialization and after starting the control software.

In normal operation, the device is operated using a Analytik Jena control software. However, limited manual operation via the operating unit is possible, for example, for loading microplates or for eliminating faults.

When operating the device by these means, please observe the instructions given in the manual for the software CyBio Composer Plugin Erweiterungsmodul/Extension Module provided with the software.

5.4 Loading labware to the shafts

CAUTION

Risk of crushing during manual operation

There is a risk of crushing fingers and hands when rotating the stacker shafts.

- Do not reach into the device with your hands or any type of object when rotating the stacker shafts.

You have the option to manually load the device with labware to prepare a process. To do this, push the labware into the open stacker shaft from the front of the device.

Alternatively, you can use the access module to load the shafts via the control software. The access module uses the lower stacker shaft opening for that.

Only remove or stack labware when the shaft and the access module are not moving.

Manually loading the device

- Verify that the status indicator is green meaning that all running processes have been completed.
- Use the ← or → buttons to rotate the stacker shaft until the desired shaft is accessible.
- Open the door of the protective housing. Indicator of the operating status lights up in red.
- Manually open the door on the shaft.
- Insert the labware from the front and place it onto the magnetic latches or on the uppermost labware in the shaft. Make sure that the labware is facing in the right direction.
- Close the door on the shaft again.
- Close the door of the protective housing again. Indicator of the operating status lights up in green.
- If necessary, use the buttons ← or → to rotate the stacker shaft and to load the next shaft. To do this, repeat the previous steps.

CyBio QuadStack is only ready for operation, if the doors on the shafts and the protective housing are closed. If one of the doors is open, the control software displays the following message: “Safety arrangement has been opened.”

Inserting a microplate

Make sure to insert the microplate in the correct direction (position A1).

There is a small magnetic plate on each shaft. The small magnetic plate indicates in which direction the microplate is supposed to be pointing from position A1.

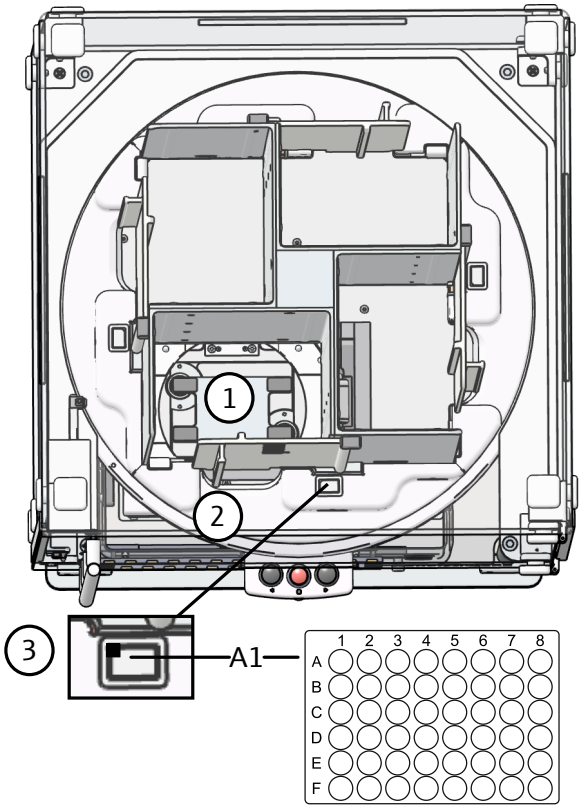


Fig. 12 Inserting microplates

1 Stacker shaft
2 Stacker shaft door
3 Small magnetic plate with marking for A1 alignment

If you wish to insert microplates in the opposite direction (rotated by 180°), turn the small magnetic plate to indicate that the orientation from A1 has changed.

Inserting CyBio Tip Box

Make sure to insert the tip box in the correct direction. The green “OK” sticker must be pointing at you.

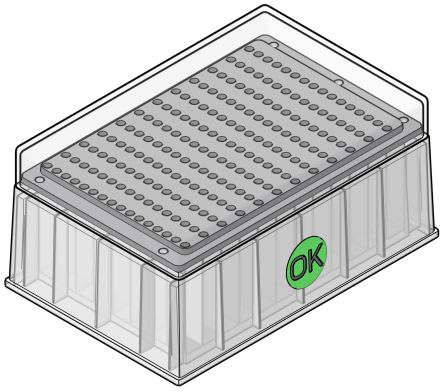


Fig. 13 CyBio Tip Box with “OK” marking

5.5 Switching off

- Wait until the control software has terminated the processes executed on the device and on any additional devices.
- Switch off the power of the device using the mains switch on the back.
  - ✓ The status indicator goes out.
- Switch off all additional devices according to instructions in the respective operating manuals.
- Exit the control software. Shut down the control computer and turn it off.
  - ✓ The device is switched off.

6 Troubleshooting

6.1 General information on troubleshooting

NOTICE

Error messages on the device (indication on the control PC) inform the user about the cause and possible remedy.

Malfunctions are usually reported:

- by the control software
- by the status LED on the control panel (red)

If malfunctions are obviously caused by the operator, work with the device may be resumed after eliminating the fault.

In the event of malfunctions, check all possible sources of error.

If problems remain after this check or if this malfunction is not described in the troubleshooting section, notify the customer service of the manufacturer or an authorized service partner.

6.2 Behavior after fault reports

It is possible for the user to solve the following problems by themselves. If these issues occur more frequently or the fault is not described in this section, please contact the manufacturer's customer service or an authorized service partner.

Only correct such faults which are clearly caused by incorrect operation and if you are authorized to correct such fault.

Never carry out any unauthorized interventions on the control software!

	Simple fault that can be corrected immediately	**Serious fault**
Example	Microplate (missing or inserted in the wrong position in the stacker shaft)	Device failure
Note/Caution	NOTICE! Certain defects on the devices can be corrected while the devices are switched on.	WARNING! Touching voltage-carrying device components can result in injury or death!
Prerequisites	The program on the device is completed! The corresponding warnings in the chapter "Hazard areas and protective devices" have been considered! The corresponding warnings in the chapter "Manual operation" have been considered!	The device is disconnected from the mains! The power cord has been pulled out of the mains socket! The device is secured against unintentional reactivation during the troubleshooting process!

	Simple fault that can be corrected immediately	Serious fault
Steps	■ Follow the instructions of the device program. ■ Fix the condition causing the fault. ■ If possible, resume the device program after that.	■ Switch of the device's mains switch and unplug the power cord from the mains socket. ■ Where applicable, notify the responsible manager and affected specialist personnel. ■ Eliminate the cause of the fault. ■ Establish the defined initial state of the device program (e.g. reload the device). ■ Put the device back into operation. ■ If it is not possible to eliminate the fault, contact the manufacturer's customer service or an authorized service partner.

6.3 Fault removal

Error	Potential causes	Suggestions for troubleshooting
CyBio QuadStack does not respond to commands by the control software	Mains cable not connected to a mains socket	■ Check the mains connection.
	Mains cable not plugged into an IEC socket	■ Correctly insert the mains cable into the mains connection.
	Mains socket powerless	■ Have the mains socket checked by a qualified electrician. ■ Use another mains socket.
	Device fuse malfunction	■ Unplug the CyBio QuadStack mains plug and insert a new device fuse (only use the specified fuse type).
Execution of the program was aborted, drives do not move	STOP button was pressed	■ After the STOP button was pressed, the drives must move back into their initial position. ■ Restart the program on the PC or use the buttons ◂ or ▸ on the QuadStack control panel. The drives move into their initial position.
Stacker shaft does not rotate The control software displays the message: "Safety arrangement has been opened"	A door is open	■ Verify that all shaft doors and the protective housing on the QuadStack are closed.
Microplate is not transported any further.	The microplate got jammed inside the shaft opening (bottom of the stacker shafts)	⚠ CAUTION! Risk of crushing and shearing hands ■ First, disconnect the device from the mains. ■ Remove the jammed microplate from the shaft.

Table 2 CyBio QuadStack: Faults

7 Maintenance and care

7.1 Safety instructions

NOTICE

Important information!

Before starting any work, read the instructions in the main “Safety instructions” chapter.

DANGER

Touching live components may result in serious injury or death!

Switch off the devices and disconnect the power cables from the mains socket before all maintenance and servicing work!

Secure the devices against unintentional reactivation!

The operator is prohibited from carrying out maintenance and servicing work on live devices!

Maintenance, adjustment work and repairs on live devices may be carried out only by a qualified electrician.

CAUTION

Damage to health due to contact with hazardous chemical biological substances.

Before starting maintenance or cleaning work, inform yourself about the substances used on the device and their hazard potential.

If necessary, take suitable protective measures (e.g. wear personal protective equipment).

NOTICE

If the maintenance and servicing instructions are not observed, damage may be caused to the device.

Please observe the instructions in the documentation provided by the manufacturers of the system components!

7.2 Maintenance overview

Maintenance interval	Maintenance task
Weekly	■ Clean the device.
Annually	■ Check the electrical connections for tight fit. ■ Check the fastening screws of all moving components for tight fit. ■ Have the electrical components and cables, including the PE conductor, tested by a qualified electrician.

7.3 Cleaning the device

Use a soft cloth dipped in mild soap solution or disinfectant solution to clean the device housing.

Never use cleaning powder, paint thinners or solvents like petrol or acetone to clean the device! These can corrode the housing surface.

For cleaning the device and any accessories which may only be cleaned by wipe disinfection, use a lint-free cloth with a cleaning agent / disinfectant recommended by WHO guidelines and not excluded in this manual (e.g., Incidin Liquid produced by the company: ECOLAB).

Spraying the device with disinfectant spray or similar can be dangerous and is prohibited for this reason. Sprays contain gases which may ignite.

Contamination and natural wear of assemblies leads to higher stress on the device and thus to a higher probability of device failure. Check for signs of wear on assemblies under mechanical strain and have these replaced when necessary.

8 Transport and storage

8.1 Transport

NOTICE

The transport is carried out by the manufacturer's service or by the service partners authorized by the manufacturer.

CAUTION

Material damage to the device or components!

Environmental influences, impact and condensation can destroy individual components!

Protect all components of the device against environmental stresses, impacts and condensation during transport by taking appropriate measures!

Intermediate storage of the device outdoors is not permitted!

NOTICE

Only transport the device and its components in the original packaging.

Never lift the device by the protective housing. Only hold the device by its frame when lifting it.

To prepare the system for transport, proceed as follows:

- Put the device out of service: To do this, terminate the currently executed process. Remove the labware from the stacker shafts.
- Switch off the device via the mains switch.
- Exit the control software.
- Remove the mains cable from the mains socket and from the device.
- Shut down the control computer and turn it off.
- Remove the interface cables from the device rear.
- Clean and decontaminate the device.
- Attach the transport locks. Secure all moving parts with cable ties and adhesive tape.
- Put the device and its accessories into their original packaging.

Observe the following when moving the device within the laboratory:

- Insufficiently secured components pose a risk of injury!
  Before moving the device, remove all loose parts and disconnect all connections from the device.
- For safety reasons, two persons are required to transport the device, one person on each side of the device.
- As the device does not have carrying handles, grip the device firmly with both hands at the lower end. Lift the device simultaneously.
- Observe the guide values and adhere to the legally mandated limits for lifting and carrying loads without auxiliary means.
- Observe the installation conditions at the new location.

- Never lift the device by the protective housing.

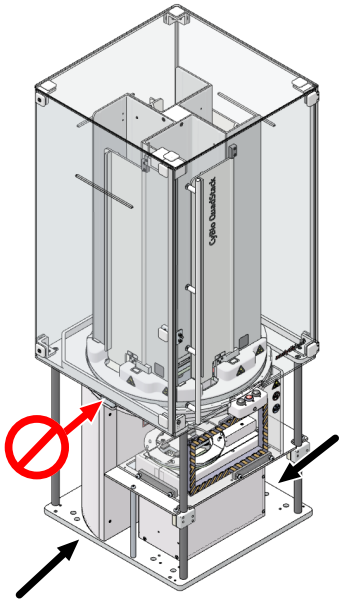


Fig. 14 Transporting the device

8.2 Storage

NOTICE

Risk of device damage due to environmental conditions

Environmental influences and condensation can destroy individual components of the device.

- Only store the device in air-conditioned rooms.
- Ensure that the atmosphere is free of dust and corrosive vapors.

If the device is not installed immediately after delivery or not required for longer periods, it should be stored in its original packaging. A suitable desiccant should be added to the equipment to prevent damage from moisture.

The requirements for the climatic conditions of the storage location can be found in the specifications.

9 Disposal

At the end of its useful life, the device or its components must be disposed of in accordance with the legal regulations. The responsibility rests with the owner of the device.

10 Spare and wear parts, accessories, consumables

NOTICE

The device, accessories and consumables are aligned with each other by the manufacturer.

Damage or malfunction when using other than the specified components

- Only use the components recommended by the manufacturer
- The manufacturer does not accept liability for using any other components

Contact the service department of the manufacturer to obtain the latest catalogs and lists of accessories, consumables and spare parts.

11 Technical data

General characteristics

Name	CyBio QuadStack Rotating microplate storage
Type	■ CyBio QuadStack M ■ CyBio QuadStack L
Access modules	■ Lift Link Module ■ Lift Turn Lift Module All access modules with 1 lifting position and 80 N lifting force
Dimensions ■ CyBio QuadStack M ■ CyBio QuadStack L	(W x H x D) ■ 370.0 x 966.5 x 393.0 mm ■ 370.0 x 1166.5 x 393.0 mm
Floor space	370 x 380 mm
Mass	Approximately 45 kg
■ Shaft length CyBio QuadStack M ■ Shaft length CyBio QuadStack L	■ 555 mm ■ 755 mm
Number of shafts	4
Labware that can be used	■ Microplates in ANSI/SLAS format, including deep-well and rigid full-skirted PCR plates ■ No flexible full-skirted or half-skirted PCR plates ■ Tip boxes provided by the company Analytik Jena 96/250 µL, 96/50 µL, 192/60 µL ■ no 96/1000 µL tip boxes

Process control

Control software	CyBio Composer; CyBio Scheduler as well as software compatible with ActiveX + .Net
Interfaces	RS232 Sub-D, 9-pin RJ45 Ethernet

Operating data

Application class	Table unit, closed and well-maintained rooms
Protection class	I
Protection type	IP 20
General safety (2006/42/EG)	EN ISO 12100
Electrical safety for laboratory devices (2014/35/EU)	EN 61010-1
Electromagnetic compatibility (2014/30/EU)	EN IEC 61326-1
Operating voltage	115/230 V ± 10 %, 2.5/1.3 A
Frequency	50/60 Hz
Fuses	G 5x20 mm T3.15 A
Number of device fuses	2
Maximum power consumption	290 VA
Noise emission	<70 dB(A)

Ambient conditions

Temperature during operation	+15 to +35 °C
Humidity during operation	≤75 % (30 °C), non-condensing
Maximum altitude	2000 m
Temperature and humidity during storage	-10 to +50 °C, ≤85 % (30 °C)
Installation location	Stable, horizontal, dry, free from vibration

List of figures

Glossary

ANSI/SLAS

Standard created by the "Society for Laboratory Automation and Screening". Here, normally reference is made to the standards (formerly SBS standards) for the standardization of Labware dimensions. Footprint: 127.76 x 85.48 mm (±0.5 mm); Source: https://www.slas.org/education/ansi-slas-microplate-standards/

ESTOP

ESTOP is a safety function. It causes the connected components to stop for safety reasons when an ESTOP state is triggered. This state can be triggered by opening a monitored door or pressing an ESTOP button.

Labware

Here, Labware means special containers suitable for use in laboratories (normally micro plates) which are transported by the robot of the equipment. They usually meet the SLAS standard ANSI/SLAS (see SLAS)