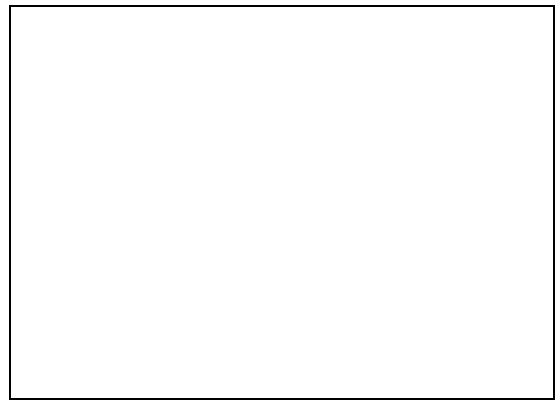


Operating Manual

Autoloader CS-i/CS-d



Translation

ELTRA[®]
ELEMENTAL ANALYZERS

Copyright

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1 Information about the Manual

This Manual provides technical guidelines on the safe operation of the Autoloader. Read the Manual through carefully prior to installing, commissioning, and operating the Autoloader. Reading and understanding this Manual is a requirement for the safe and correct use of the Autoloader.

This Manual does not contain any repair instructions. Please contact your supplier or Eltra GmbH directly in the event of any queries or questions concerning this Manual or the Autoloader, or in the case of any faults or necessary repairs.

Further information about your Autoloader can be found at <http://www.eltra.com/de> on the pages relating specifically to the machine.


	Unless explicitly stated, the illustrations apply to both variants of the autoloader CS-i/CS-d.
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Revision status

Document revision 0002 of the "Autoloader CS-i/CS-d" Manual has been prepared in accordance with the Machinery Directive 2006/42/EC.

1.1 Explanation of signs and symbols

The following signs and symbols are used in this Manual:

Sign	Meaning
 <div style="border: 1px solid black; padding: 2px; display: inline-block;"> Additional or further information is shown here. </div>	Further or additional information.
1. First instruction. 2. Next instruction. Result.	Numbered paragraphs contain a series of instructions. An instruction can end with a result.

Tab 1: Signs and symbols used

1.2 Disclaimer

This Manual has been produced with the greatest care. We reserve the right to make technical modifications. We shall accept no liability for any personal injuries resulting from the failure to comply with the safety information and warnings in this Manual. We shall accept no liability for damage to property resulting from the failure to comply with the instructions in this Manual.

1.3 Copyright

This Manual or parts of it may not be duplicated, distributed, edited or copied in any form without the prior written consent of Eltra GmbH. Damage claims will be asserted in the event of infringement.

2 Safety

Safety officer

The operating company itself must ensure that persons authorised to work on the Autoloader comply with the following points:

- they have noted and understood all regulations regarding the area of safety;
- they are aware before they start work of all instructions and regulations relating to their target group;
- they have easy access to the Manual for this Autoloader at all times;
- they have been familiarised with the safe and correct handling of the Autoloader before starting work on it, either by means of a verbal introduction by a competent person and/or with the help of this Manual.

▲ Incorrect operation may lead to personal injuries. The operating company itself is responsible for its safety and that of its staff. The operating company itself must ensure that no unauthorised personnel have access to the Autoloader.

Target group


This covers everybody who operates, cleans or works on the Autoloader.


This Autoloader is a modern, efficient, state-of-the-art product developed by Eltra GmbH. Reliability is guaranteed when the Autoloader is used correctly and when this Manual is complied with.


▲ Persons under the influence of intoxicating substances (medications, drugs, alcohol) or who are overtired are not allowed to operate the Autoloader or work on the Autoloader.


2.1 Explanation of the safety


The following **warnings** in this Manual alert to potential hazards and damage:


 DANGER	<small>D1.0000</small>
Risk of fatal injuries	
Source of the danger	
<ul style="list-style-type: none">• Possible consequences of failure to heed the danger.• Instructions and advice on how to avoid the risk.	

Fatal or serious injuries may ensue if the “Danger” warnings “ are not complied with. There is a **very high risk** of a life-threatening accident or lasting personal injury. The signal word  **DANGER** is also used in the running text or instructions.

 WARNING	<small>W1.0000</small>
Risk of life-threatening or serious injuries	
Source of the danger	
<ul style="list-style-type: none">• Possible consequences of failure to heed the risk.• Instructions and advice on how to avoid the risk.	

Life-threatening or serious injuries may ensue if the “Warning” signs are not complied with. There is an **increased risk** of a serious accident or potentially fatal injury. The signal word  **WARNING** is also used in the running text or instructions.

 CAUTION	<small>C1.0000</small>
Risk of injuries	
Source of the danger	
<ul style="list-style-type: none">• Possible consequences of failure to heed the risk.• Instructions and advice on how to avoid the risk.	

Moderate or minor injuries may ensue if the “Caution” warnings are not complied with. There is a moderate or slight risk of an accident or personal injury. The signal word  **CAUTION** is also used in the running text or instructions.

NOTICE

N1.0000

Nature of the damage to equipment

Source of the damage to equipment

- Possible consequences of failure to comply with the warnings.
- **Instructions and advice on how to avoid the damage to equipment.**

Damage to equipment may ensue if the notice is not complied with. The signal word **NOTICE** is also used in the running text or instructions.

2.2 General safety instructions

⚠ CAUTION

C2.0002

Risk of injury

Unfamiliarity with the Manual

- The Manual contains all safety-related information. Failure to comply with the Manual can therefore lead to injuries.
- **Read the Manual carefully before using the machine.**



⚠ CAUTION

C3.0015

Risk of injury

Improper modifications to the Autoloader

- Improper modifications to the Autoloader can lead to injuries.
- **Do not make any unauthorised changes to the Autoloader.**
- **Only use spare parts and accessories that have been approved by Eltra GmbH.!**

NOTICE

N2.0012

Changes to the Autoloader

Improper modification

- As a result of improper modification, the conformity with European directives as specified by Eltra GmbH will no longer be valid. All warranty claims will be invalidated.
- **Do not make any modifications to the Autoloader.**
- **Only use spare parts and accessories that have been approved by Eltra GmbH.**



2.3 Repairs

This Manual does not contain any repair instructions. For reasons of safety, repairs may only be carried out by Eltra GmbH, by an authorised agency, or by qualified service technicians.

Please notify the following in the event of a repair ...

- ...the agent representing Eltra GmbH in your country;
- ...your supplier; or
-Eltra GmbH directly.

Service address:

**Eltra GmbH
Retsch-Allee 1-5
42781 Haan
Deutschland**

2.4 Intended use

The Autoloader CS-i/CS-d is used for the automatic supply of 36 or 130 crucibles to the CS-i and CS-d analyzers from Eltra GmbH. Use is only permitted in the laboratory by appropriately qualified and briefed personnel.

2.5 Improper use

Use in the private domain and the use of gases other than those set out in the "[Intended use](#)" chapter is prohibited.

Repairs and modifications may only be carried out by **Eltra GmbH**, by an authorised agency, or by qualified service technicians. Unsupervised operation.

2.6 Safety circuit of the

The safety circuit ensures that the Autoloader can only be commissioned under certain conditions.

The safety circuit checks the following conditions:

- Pneumatic pressure is present
- Furnace cover has been installed and closed
- Crucible bin is present

If one of these conditions is not met, the power supply to the main board and to the valves of the Autoloader will be interrupted. The gripper fingers remain closed. Crucibles are furthermore held for at least 5 minutes in the event of a fault. The following diagram shows the safety circuit procedure:

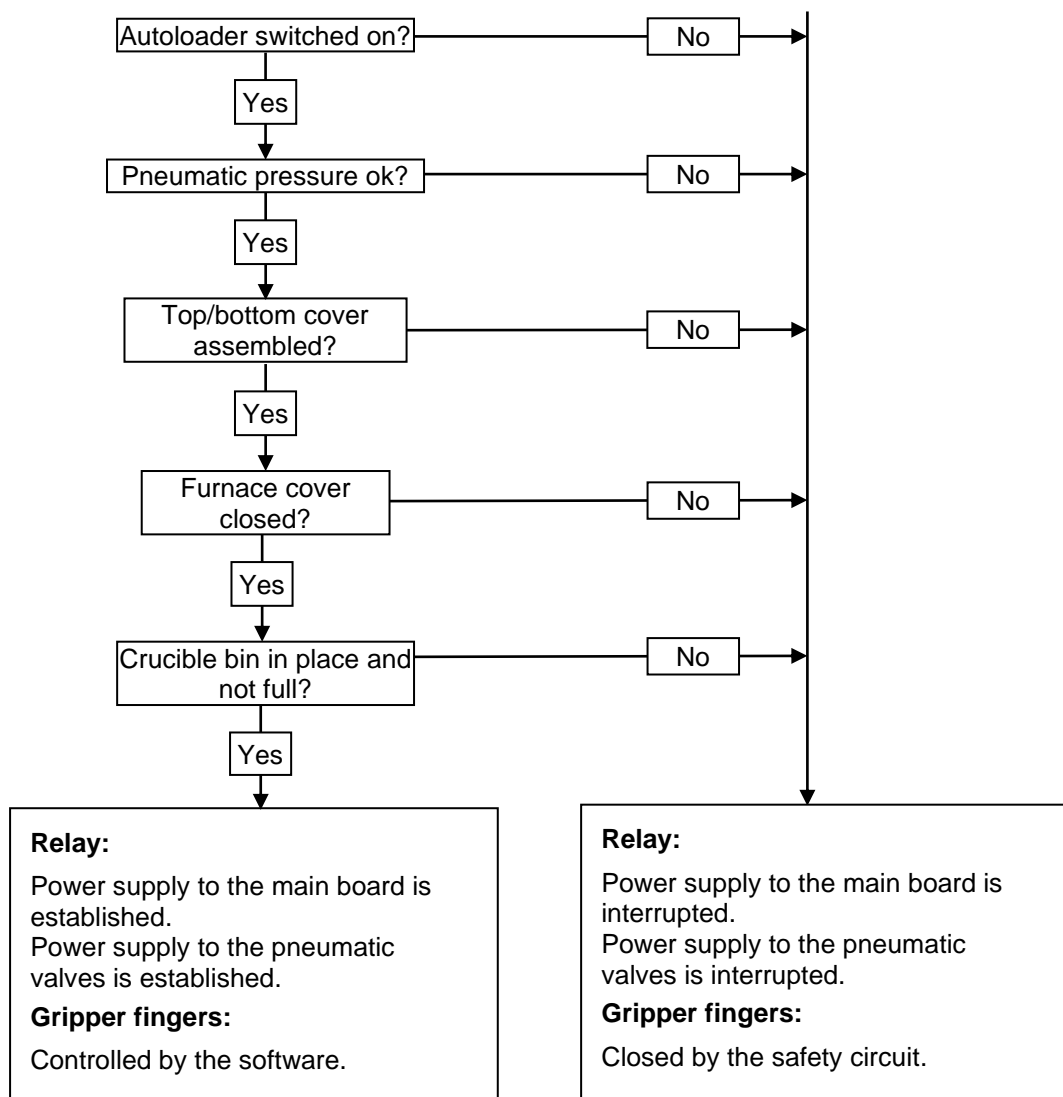



Fig. 1: Flow diagram of the safety circuit

2.7 Safety symbols on the Autoloader

	<p>Unless explicitly stated, the illustrations apply to both variants of the autoloader CS-i/CS-d.</p>
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The following safety symbols can be found on the Autoloader CS-i/CS-d:

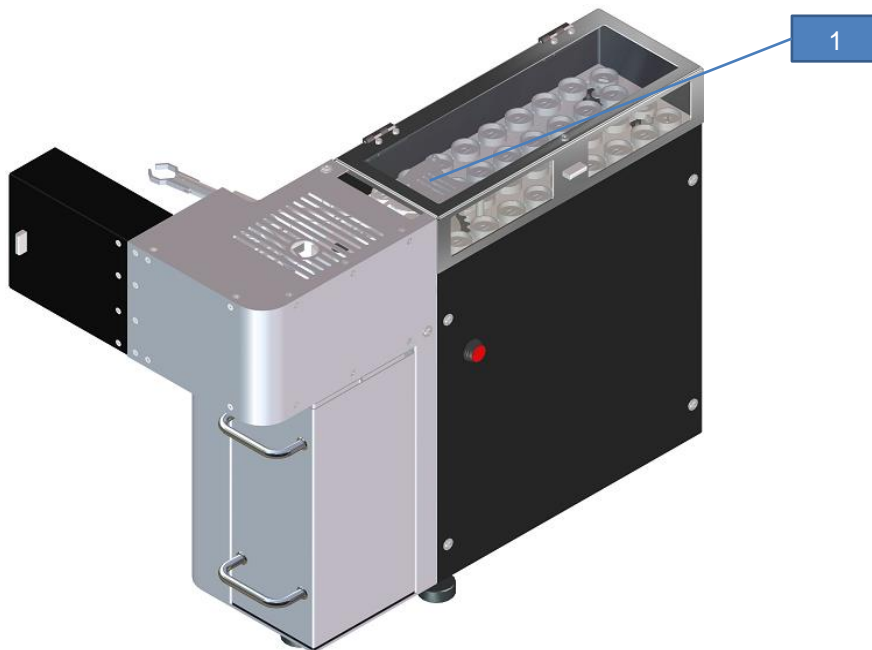
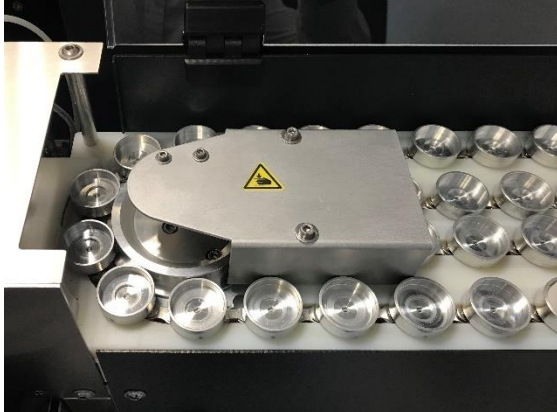


Fig. 2: Safety symbols on the Autoloader CS-i/CS-d

Position	Component	Description
1		<p>The warning sign at the top of the Autoloader warns about the risk of crushing to fingers and hands.</p>

2.8 Emergency stop

An emergency stop is initiated using the main switch on the operating side of the Autoloader CS-i/CS-d:

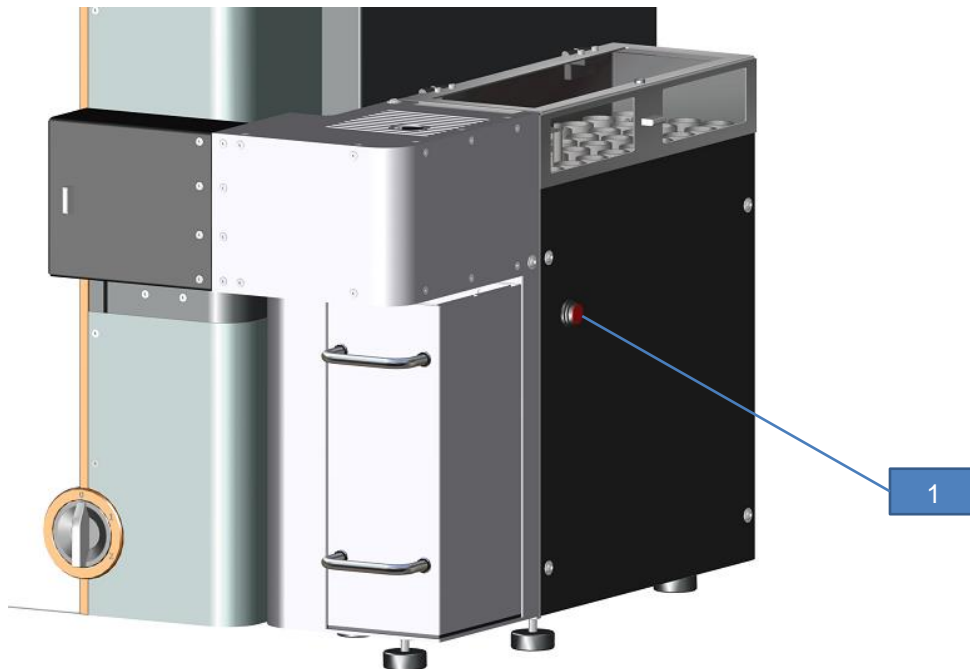


Fig. 3: Main switch on the Autoloader CS-i/CS-d

Position	Component	Description
1	Main switch	Main switch on the operating side of the Autoloader.

Turn the Autoloader off as follows:

1. Turn the Autoloader off by the main switch (1).
The Autoloader has been turned off.

2.9 Residual risks

⚠ DANGER D2.0000


Risk to life caused by an electric shock
Exposed power contacts

- Contact with exposed power contacts can cause life-threatening injuries or death.
- **Turn the main switch to Position 0 and pull out the power plug prior to maintenance work on the analyzer.**
- **Turn the main switch to Position 1 prior to maintenance work on the HTFr resistance furnace and allow the machine to cool down sufficiently. Only set the main switch to Position 0 and pull out the power plug once you have allowed sufficient time for the machine to cool down.**

⚠ WARNING W2.0003

Risk to life caused by an electric shock
Using water to clean live parts

- Using water to clean the Autoloader can lead to life-threatening injuries caused by an electric shock if the Autoloader has not been disconnected from the power supply.
- **Only clean the Autoloader with water when the Autoloader has been disconnected from the power supply.**



⚠ CAUTION C4.0000

Risk of burns
Hot crucibles

- The crucibles are hot when the Autoloader transports the crucibles from the analyzers into the crucible bin. The hot crucibles can ignite the surrounding area and cause burns.
- **Do not reach into the moving Autoloader while the gripper arm is moving hot crucibles.**
- **Always use the crucible tongs to move crucibles.**

⚠ CAUTION

C5.0000

Risk of poisoning and suffocation

Toxic substances

- Hazardous liquids, gases, mist, vapours or dust may be present when working on the Autoloader; these may cause poisoning or suffocation if there is contact with them or they are inhaled.
- **Where necessary, conduct a risk assessment for the samples.**
- **Where necessary, wear suitable goggles or protective gloves.**
- **Ensure there is sufficient ventilation.**
- **Never eat or drink near toxic substances.**

⚠ CAUTION

C6.0000

Risk of injury

Flammable samples

- Flammable or explosive samples may explode and cause injuries.
- **Where necessary, conduct a risk assessment for the samples.**
- **Where necessary, wear suitable goggles or protective gloves.**
- **Ensure there is sufficient ventilation.**

⚠ CAUTION

C7.0000

Risk of burns

Flammable surface

- Crucibles can fall onto the surface or onto the floor, e.g. if the compressed air fails or if the crucible bin is missing. A fire may result if there is a flammable surface beneath the Autoloader or on the floor, causing injuries.
- **Place the Autoloader on a fireproof surface.**
- **Use fireproof flooring.**
- **Operation of the Autoloader should always be supervised.**

⚠ CAUTION

C8.0000

Risk of posture problems

Lifting the Autoloader unaided

- The weight of the Autoloader can cause injuries resulting from posture problems due to an unhealthy posture or inattentiveness when lifting.
- **Ensure you maintain a healthy posture when lifting the Autoloader.**

⚠ CAUTION

C9.0000

Risk of injury

Unsteady position of the Autoloader

- If not set up correctly, the Autoloader may fall down and cause injuries.
- **Set up the Autoloader on a stable, level and non-slip surface.**
- **Ensure that all machine bases are placed securely on the surface.**

⚠ CAUTION

C10.0000

Risk of crushing

Moving parts

- The crucible drive moves the crucibles in the crucible tray. Crushing or broken bones may result if fingers get caught in the movement.
- **Never reach into the crucible tray.**
- **Always use the crucible tongs to move crucibles.**

⚠ CAUTION

C11.0000

Risk of injury

Disregarding the safety devices

- Disregarding the safety instructions results in injuries.
- **Never operate the Autoloader without the safety devices.**
- **Never operate the Autoloader without the protective hood on the front cover.**

⚠ CAUTION

C12.0000

Risk of crushing or abrasions

Moving parts

- Moving parts can cause crushing or abrasions.
- **Ensure that the Autoloader is not in operation before starting maintenance work.**
- **No not reach between moving parts.**

⚠ CAUTION

C13.0000

Risk of injury

Sharp edges

- The sheet metal parts of the Autoloader can have sharp edges and cause injuries if not handled correctly.
- **Make sure to grip the Autoloader securely when transporting it.**
- **Do not handle directly by the underneath of sheet metal parts.**
- **Where necessary, wear suitable gloves when transporting the Autoloader.**

⚠ CAUTION

C14.0000

Risk of injury caused by being pulled in

Moving parts

- The crucible drive moves the crucibles in the crucible tray. If clothing (e.g. long sleeves or ties) or long hair get caught in the crucible transport, they may be pulled in, resulting in injuries.
- **Do not wear loose clothing when operating the Autoloader.**
- **Tie up long hair before operating the Autoloader.**

⚠ CAUTION

C15.0021

Risk of injury

External activation

- There is a risk of the Autoloading starting up inadvertently when it is activated externally by the software.
- **Only operate the Autoloader using the software when you can see the Autoloader.**
- **Comply with the safety information and warnings in the manual for the externally activated Autoloader.**



3 Description

The Autoloader CS-i/CS-d is delivered ready-assembled. Two versions of this Autoloader are sold:

- for 36 crucibles
- for 130 crucibles

This Manual applies equally to both Autoloaders.



Unless explicitly stated, the illustrations apply to both variants of the Autoloader CS-i/CS-d.

3.1 Operating side

The following figure shows the operating side of the Autoloader:

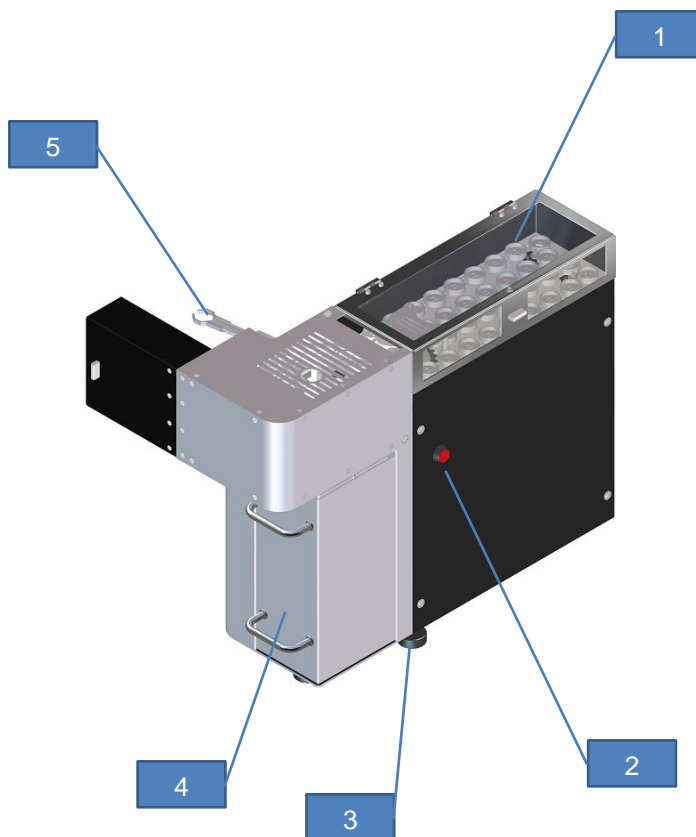


Fig. 4: Operating side of Autoloader CS-i/CS-d (figure shows the 36 crucible Autoloader)

Position	Component	Description
1	Crucible tray	For positioning crucibles with samples for analysis
2	Main switch	For switching the Autoloader on and off
3	Adjustable machine bases (3x)	To adjust the height of the Autoloader
4	Crucible bin	Bin for crucibles after the analysis
5	Gripper arm	Transports the crucibles to the analyzer and crucible bin

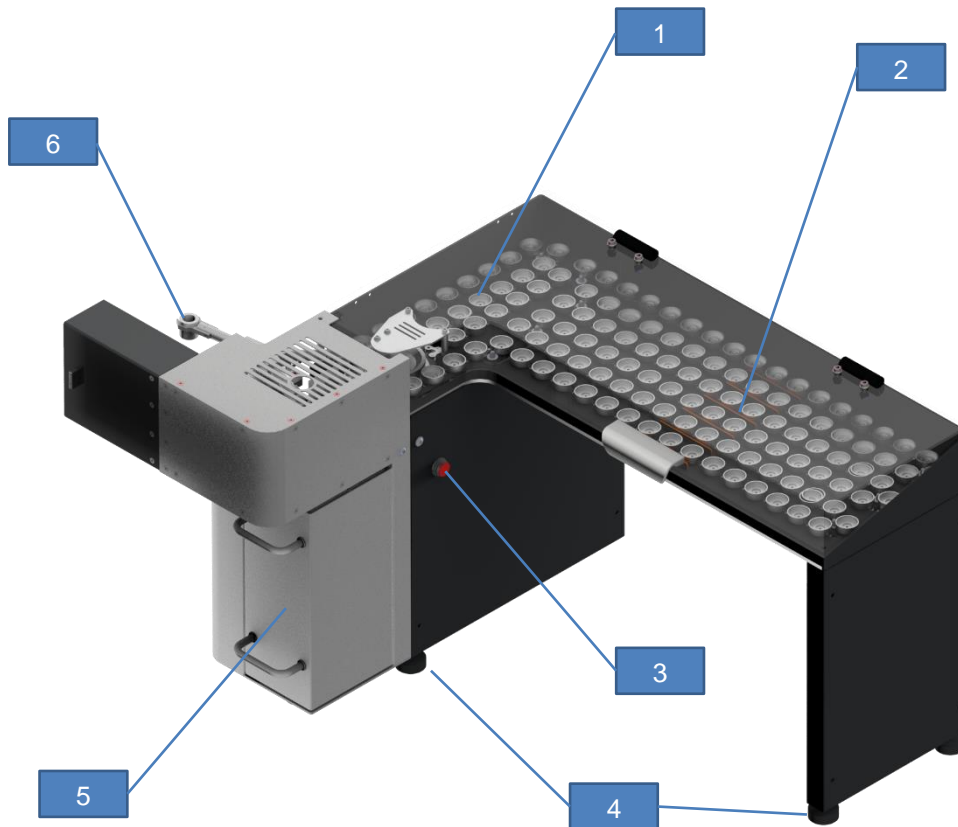


Fig. 5: Operating side of Autoloader CS-i/CS-d (figure shows the 130 crucible Autoloader)

Position	Component	Description
1	Crucible tray	For positioning crucibles with samples for analysis
2	Direction indicator	Indicates the direction of movement of the crucible carrier.
3	Main switch	For switching the Autoloader on and off
4	Adjustable machine bases (3x)	To adjust the height of the Autoloader
5	Crucible bin	Bin for crucibles after the analysis
6	Gripper arm	Transports the crucibles to the analyzer and crucible bin

3.2 Back

The following figure shows the back of the Autoloader:

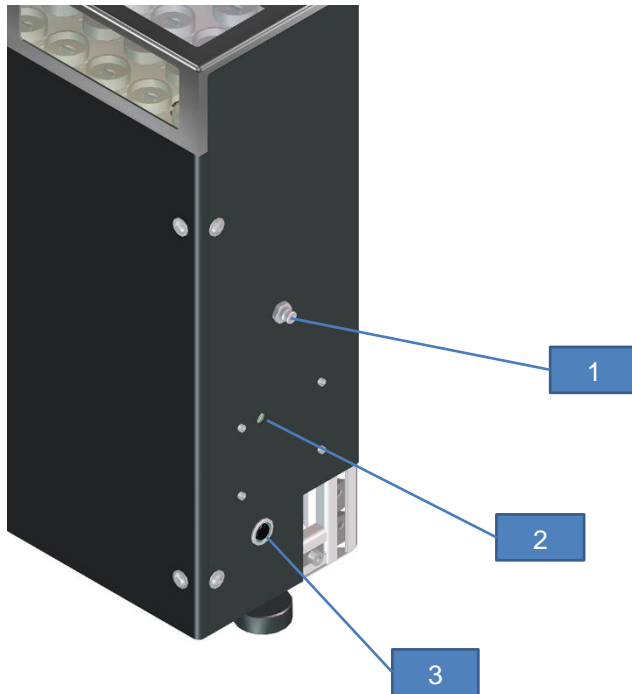


Fig. 6: Back of the Autoloader CS-i/CS-d

Position	Component	Description
1	Compressed air connection	Connection for the compressed air connection from the analyzer to the Autoloader
2	Electrical connection	Connection for the supplied power supply unit
3	Interface to the analyzer	Connection to the analyzer

3.3 Gripper arm

The following figure shows the possible gripper arm positions of the Autoloader:

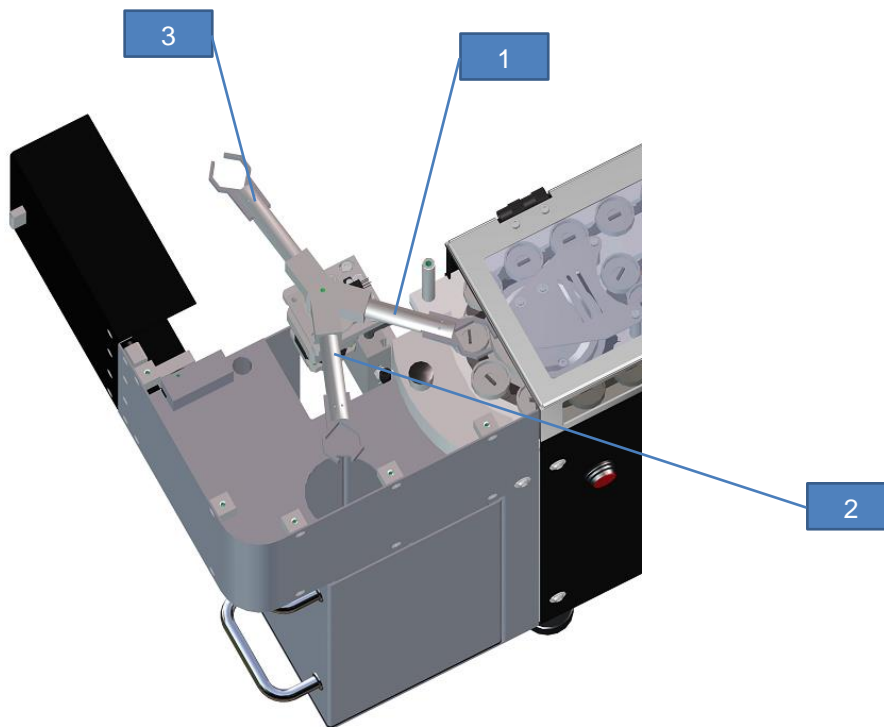


Fig. 7: Gripper arm positions of the Autoloader CS-i/CS-d

Position	Component	Description
1	Gripper arm position of the chain	First step of the motion sequence
2	Gripper arm position for disposal	Third step of the motion sequence
3	Gripper arm position for the analyzer	Second step of the motion sequence

The positioning disc and light barrier determine the position of the gripper arm:

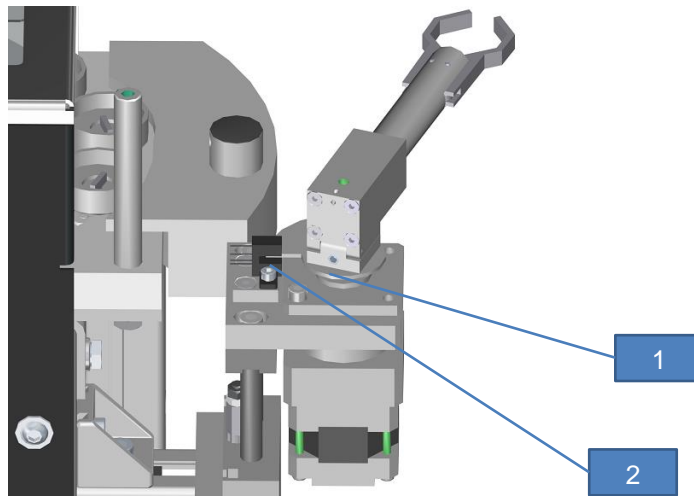


Fig. 8: Position of the light barrier and positioning disc with the front cover removed

Position	Component	Description
1	Positioning disc	For the automatic positioning of the gripper arm
2	Light barrier	Light barrier to detect the position of the gripper arm

3.4 Optical Level Sensor

The following figures depict the sensor that supervises the filling level of the crucible bin and inhibits operation of the autoloader if the bin is near to full.

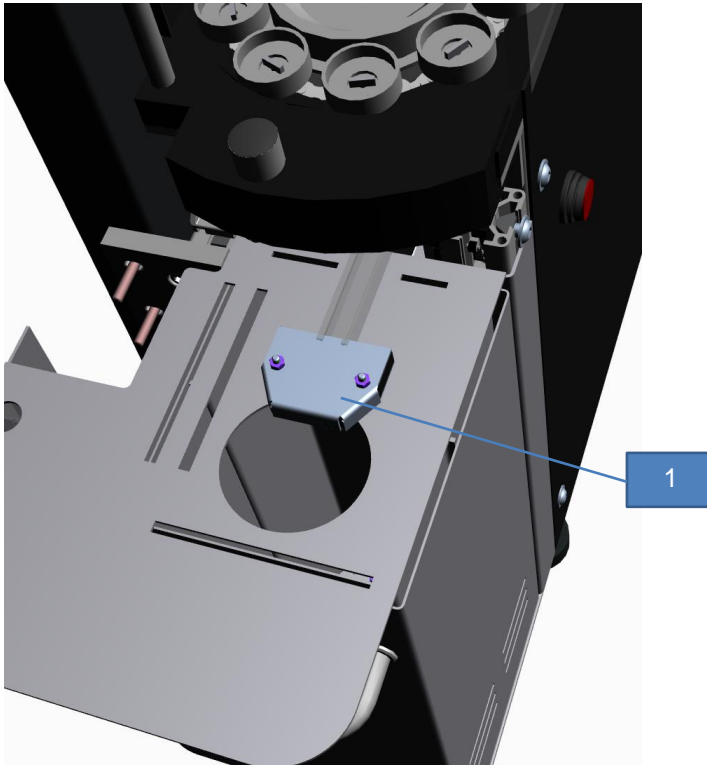


Fig. 9: Position of Optical Level Sensor (1) with the front cover removed

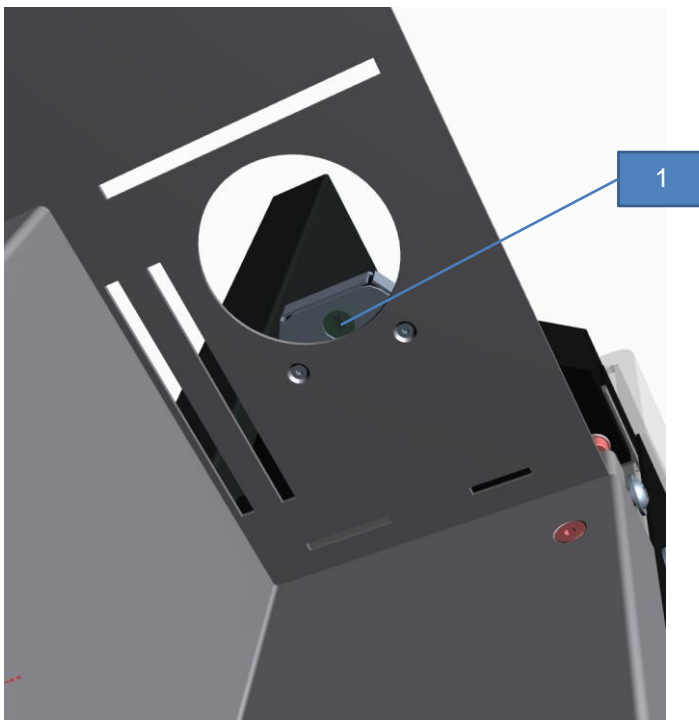



Fig. 10: Viewing window of Optical Level Sensor (1) with the front cover removed

4 Transport and packaging

⚠ WARNING	<small>W3.0005</small>
<p>Risk of injury due to the Autoloader falling down Lifting the Autoloader above head height</p> <ul style="list-style-type: none"> – The Autoloader can fall down and cause serious injuries if lifted above head height. • Transport the Autoloader as close to the floor as possible. In particular avoid lifting the Autoloader above head height. 	
	

⚠ CAUTION	<small>C16.0000</small>
<p>Risk of posture problems Lifting the Autoloader unaided</p> <ul style="list-style-type: none"> – The weight of the Autoloader can cause injuries resulting from posture problems due to an unhealthy posture or inattentiveness when lifting. • Ensure you maintain a healthy posture when lifting the Autoloader. 	

⚠ CAUTION	<small>C17.0000</small>
<p>Risk of injury Sharp edges</p> <ul style="list-style-type: none"> – The sheet metal parts of the Autoloader can have sharp edges and cause injuries if not handled correctly. • Make sure to grip the Autoloader securely when transporting it. • Do not handle directly by the underneath of sheet metal parts. • Where necessary, wear suitable gloves when transporting the Autoloader. 	

4.1 Transport

NOTICE

N3.0017

Damage to components

Transport

- Mechanical or electronic components may be damaged by being knocked, shaken or thrown during transport.
- **Move the Autoloader gently during transport.**

NOTICE

N4.0014

Complaints

Incomplete delivery or transport damage

- The forwarding agent and Eltra GmbH must be informed immediately about transport damage. Under some circumstances it may no longer be possible to take subsequent complaints into consideration.
- **On delivery, please check that the Autoloader is complete and undamaged.**
- **Inform the forwarding agent and Eltra GmbH about transport damage within 24 hours.**

4.2 Temperature fluctuations and

NOTICE

N5.0016

Components damaged by condensation

Temperature fluctuations

- The Autoloader may be exposed to significant temperature fluctuations during transport. The condensation that arises can damage electronic components.
- **Wait until the Autoloader has acclimatised before putting it into operation.**

4.3 Packaging

The packaging is adapted to the transport route, and corresponds to general packaging guidelines.

NOTICE

N6.0001

Complaint or return

Keeping the packaging

- In the case of a complaint or return, the warranty may be jeopardised if the Autoloader is not adequately packed or secured.
- **Keep the packaging for the duration of the warranty.**

5 Installation

5.1 Setting up

CAUTION

C18.0000

Risk of posture problems

Lifting the Autoloader unaided

- The weight of the Autoloader can cause injuries resulting from posture problems due to an unhealthy posture or inattentiveness when lifting.
- **Ensure you maintain a healthy posture when lifting the Autoloader.**

CAUTION

C19.0000

Risk of burns

Flammable surface

- Crucibles can fall onto the surface or onto the floor, e.g. if the compressed air fails or if the crucible bin is missing. A fire may result if there is a flammable surface beneath the Autoloader or on the floor, causing injuries.
- **Place the Autoloader on a fireproof surface.**
- **Use fireproof flooring.**
- **Operation of the Autoloader should always be supervised.**

CAUTION

C20.0000

Risk of injury

Unsteady position of the Autoloader

- If not set up correctly, the Autoloader may fall down and cause injuries.
- **Set up the Autoloader on a stable, level and non-slip surface.**
- **Ensure that all Autoloader bases are placed securely on the surface.**

When viewed from the front, the Autoloader AutoloaderCS-i/CS-d is set up to the right of the analyzer. Follow the steps set out in the following sections.



Fig. 11: Setting up the Autoloader Autoloader CS-i/CS-d

Position	Component	Description
1	Analyzer	Position of the analyzer
2	The Autoloader Autoloader CS-i/CS-d	Position of the Autoloader next to the analyzer
3	Autoloader bases (4x)	Three adjustable bases on the Autoloader (three visible)

Carry out the individual assembly steps in the following chapters 5.2 to 5.11 in sequence to install the Autoloader.

5.2 Removing the front cover

The front covers (top and bottom) must be removed before the Autoloader can be attached to the analyzer.

The following figure shows the screws on the front covers:

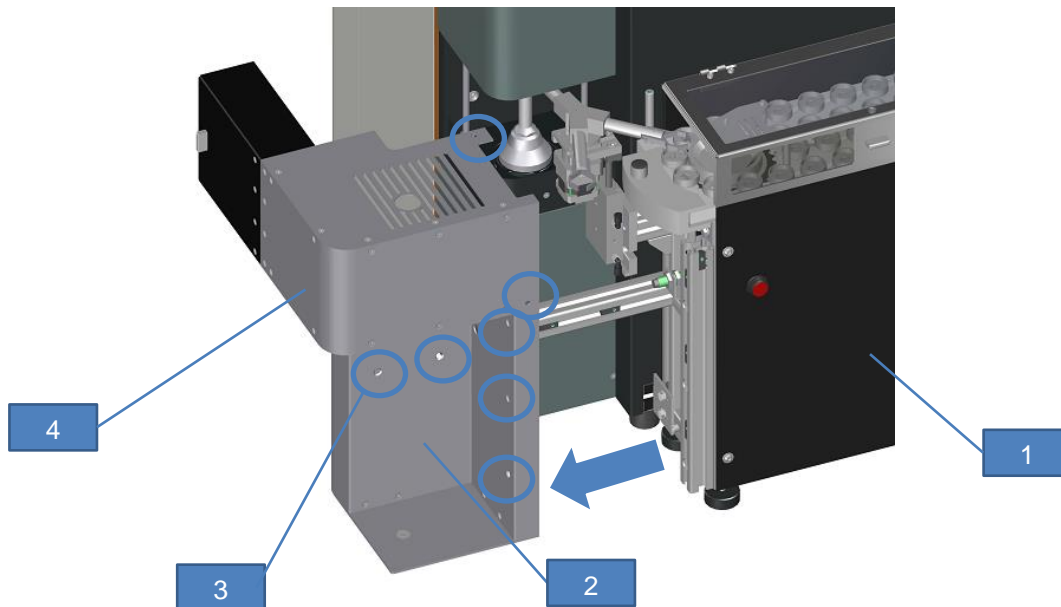


Fig. 12: Removing the front cover

Position	Component	Description
1	Operating side	Operating side of the Autoloader
2	Bottom cover	Bottom cover with space for the crucible bin
2	Position of screws (7x)	Seven screws secure the front cover on the Autoloader
3	Top cover	Top cover with protective hood

Remove the front cover as follows:

1. Unscrew the screws (2) on the front covers (3).
2. Remove the top and bottom cover.

The front covers have been removed.

5.3 Removing the side cover

The side cover of the Autoloader is removed to adjust the alignment of the Autoloader to the front or back or to activate manual operating mode.

The following figure shows the operating side of the Autoloader:

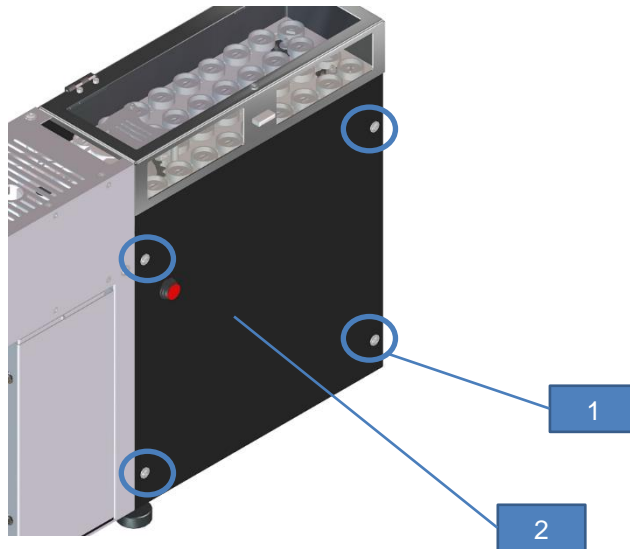


Fig. 13: Operating side of Autoloader CS-i/CS-d with side cover

Position	Component	Description
1	Side cover screws (4x)	For securing the side cover
2	Side cover	Side cover of the Autoloader

Remove the side cover as follows:

1. Remove the side cover screws (1).
2. Remove the side cover (2) from the front.

The side cover has been removed.

5.4 Replacing the side wall of the analyzer

⚠
DANGER

D3.0000

Risk to life caused by an electric shock
Exposed power contacts

- Contact with exposed power contacts can cause life-threatening injuries or death.
- **Turn the main switch to Position 0 and pull out the power plug prior to maintenance work on the analyzer.**

In order to enable the Autoloader to be screwed to the contour of the analyzer profile, the side wall of the analyzer must first be replaced by the supplied side wall. Proceed as follows to do this.

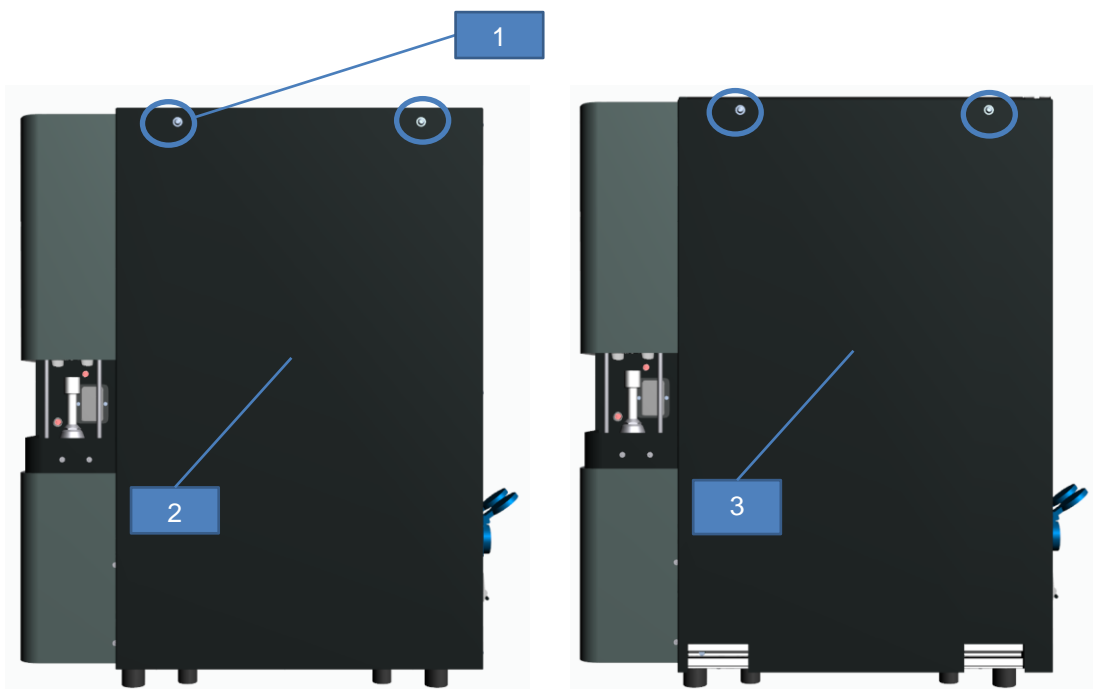


Fig. 14: Side wall with and without cut-outs

Position	Component	Description
1	Side wall screws (2x)	For securing the side wall of the analyzer
2	Side wall without cut-outs	Side wall supplied with the CS-i/CS-d
3	Side wall with cut-outs	Side wall supplied with the Autoloader

1. Remove the screws (1). The side wall continues to be held by two brackets at the bottom.
2. Lift the side wall (2) up a few centimetres to lift the retaining bracket out of the profile, then place it to one side. This side wall will no longer be needed.
3. Hang the prepared side wall with cut-outs supplied for the Autoloader (3) into the profile and secure it using the screws (1).

The side wall has been replaced.

5.5 Installing the furnace sensor

The supplied magnetic switch must be attached to the pneumatic cylinder of the furnace so that the autoloader can recognize the state of the furnace (open / closed). Proceed as follows to do this.

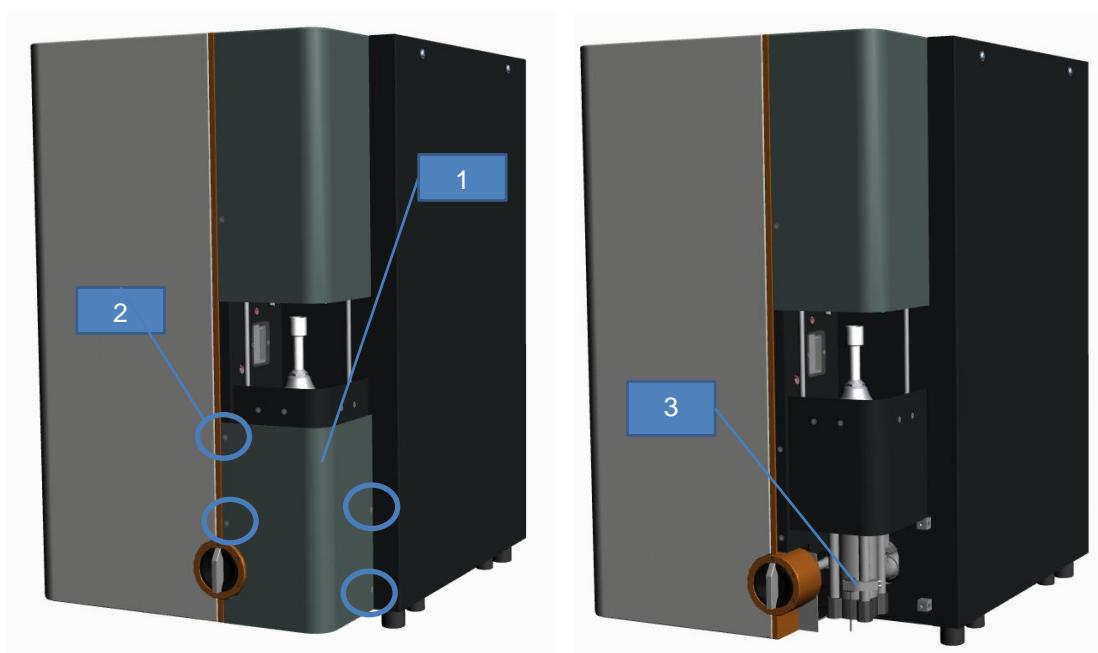


Fig. 15: Furnace Sensor

Position	Component	Description
1	Lower Furnace Cover	
2	Lower Furnace Cover Screws (4)	
3	Furnace Sensor with Bracket	Furnace Sensor w/ Bracket supplied with the Autoloader

4. Ensure that the furnace of the analyzer is open.
5. Remove the screws (2) and the lower furnace cover (1).
6. Attach the magnetic sensor to the fixing bracket. Both parts are supplied with the autoloader.
7. Place sensor and the bracket (3) at the pneumatic cylinder as shown above.
8. Adjust the correct height by moving the sensor vertical up and down. The sensor must switch (closed contact) while the furnace is fully open.
Remark: The sensor must switch (open contact) while the furnace is closed or partial closed.
9. Secure the sensor with the screw of the bracket at the working position.
10. Place the lower furnace cover (1) at the analyzer and secure it using the screws (2).

The furnace sensor has been installed.

5.6 Attaching the Autoloader to the analyzer

The Autoloader is aligned on the analyzer and initially fastened loosely to the analyzer using the supplied mounting brackets and screws.

The following figure shows the position of the mounting brackets:

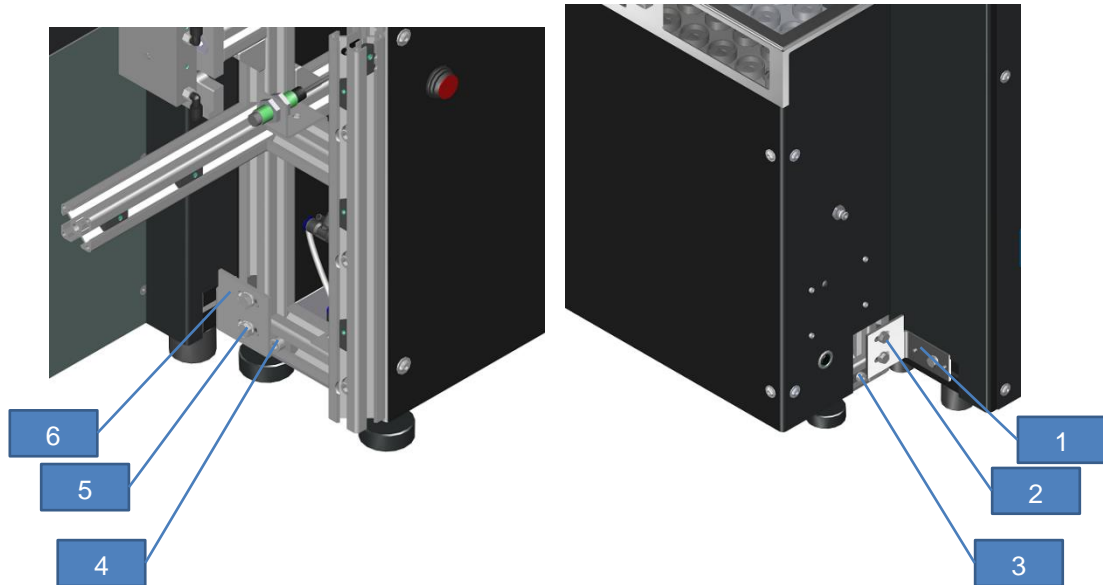


Fig. 16: Bracket for fastening to the analyzer

Position	Component	Description
1	Mounting bracket at the back	For securing the Autoloader to the back of the analyzer
2	Adjusting screw at the back	For aligning the Autoloader
3	Locking screw at the back	For securing the alignment at the back
4	Locking screw at the front	For securing the alignment at the front
5	Adjusting screw at the front	For securing the Autoloader to the front of the analyzer
6	Mounting bracket at the front	For aligning the Autoloader


The Autoloader is screwed to the analyzer as follows:

1. Ensure that the front cover has been removed, see "[Removing the front cover](#)".
2. Remove the mounting brackets (1) and (6) from the Autoloader and remove the sliding blocks from them.
3. Latch the sliding blocks into the analyzer profile and screw the mounting brackets loosely onto this.
4. Screw the mounting brackets at the back (1) and front (6) onto the Autoloader. The position can be adjusted horizontally using the adjusting screws (2) and (5).
5. Press the locking screw (3) at the back against the mounting bracket and initially screw the locking screw in loosely.
6. Press the locking screw (4) at the front against the mounting bracket and initially screw the locking screw in loosely.

The Autoloader has been prepared for alignment.

5.7 Establishing the compressed air supply

The compressed air supply is established using the supplied compressed air hose and a tee.

	See " Technical data " for details of the compressed air supply.
---	--


Establish the compressed air supply as follows:

1. Ensure that the Autoloader has been set up, see "[Setting up](#)".
2. Connect the supplied compressed air hose to the back of the Autoloader, see Pos. (1) in "[Back](#)".
3. Connect the other end of the compressed air hose to the tee.
4. Connect the second compressed air hose to the tee and to the compressed air supply on the analyzer.

The Autoloader has been connected to the compressed air supply.

5.8 Establishing communication with the analyzer

Communication with the analyzer is established using the supplied cable.

	See " Technical data " for details of the port for communicating with the analyzer.
---	---

Establish communication with the analyzer as follows:

1. Ensure that the Autoloader has been set up, see "[Setting up](#)".
2. Connect the supplied data connection cable to the data connection on the back of the Autoloader, see Pos. (3) in "[Back](#)".
3. Connect the other end of the data connection cable to the analyzer data connection (see the analyzer manual).

Communication with the analyzer has been established.

5.9 Activating manual operating mode

The manual mode enables the precise alignment of the gripper arm.

The following figure shows the operating side of the Autoloader with the side cover removed:

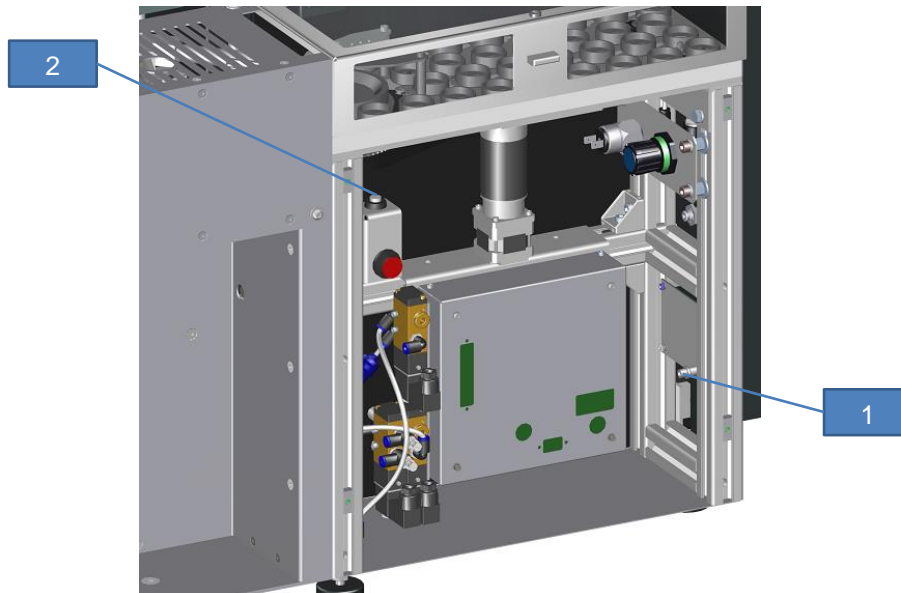


Fig. 17: Operating side of the Autoloader CS-i/CS-d with the side cover removed

Position	Component	Description
1	Electrical connection of the safety circuit	Internal electrical connection for manual mode
2	Button for manual control	For going through the motion sequence of the Autoloader in individual steps

Activate manual mode as follows:

1. Ensure that the assembly steps 5.1 to 5.6 have been carried out.
2. Connect the power plug on the supplied power supply unit to the operating company's power supply.
3. Keep the button for manual control (2) pressed and plug the power cord from the power supply unit into the electrical connection of the safety circuit (1).
4. Let the button (2) go as soon as you hear an acoustic signal from the Autoloader. Manual mode has been activated.

5.10 Aligning the Autoloader

The Autoloader can be aligned to the front or back when the operating side is open. It is necessary here to check the motion sequences of the Autoloader manually to ascertain the correct position and ensure stable operation.

The alignment takes place by adjusting the bases of the machine and by sliding the Autoloader along the side of the analyzer.

In the case of the autoloader with 130 crucibles, the two device feet on the right must also be adjusted so that the autoloader is horizontal across its broad side. Use a spirit level for this. In manual mode it is possible to switch through individual steps of the Autoloader motion sequence. We recommend carrying out multiple motion sequences (cycles) in manual mode when performing the mechanical settings.

The following figure shows the open operating side and one of four Autoloader bases:

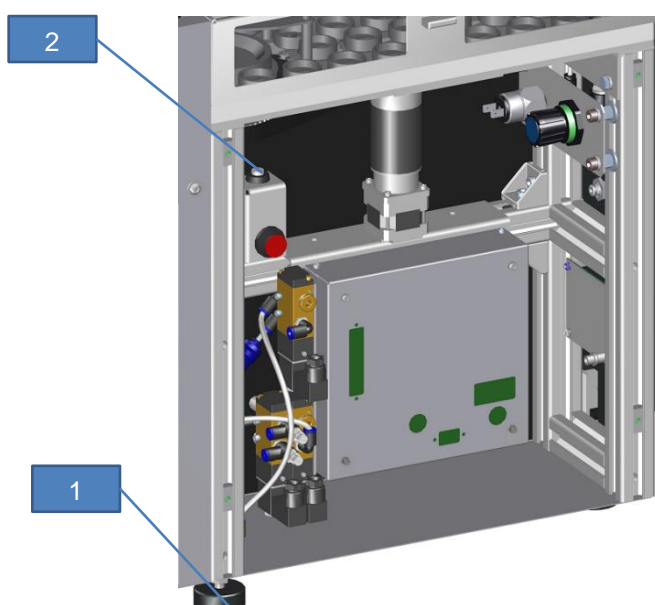


Fig. 18: Button for manual mode and Autoloader base

Position	Component	Description
1	Autoloader base (4x)	
2	Button for manual mode	To manually run through motion sequences

	The position of the gripper arm has been aligned in the factory.
--	--

The following figure shows the open operating side and the screws required for adjustment:

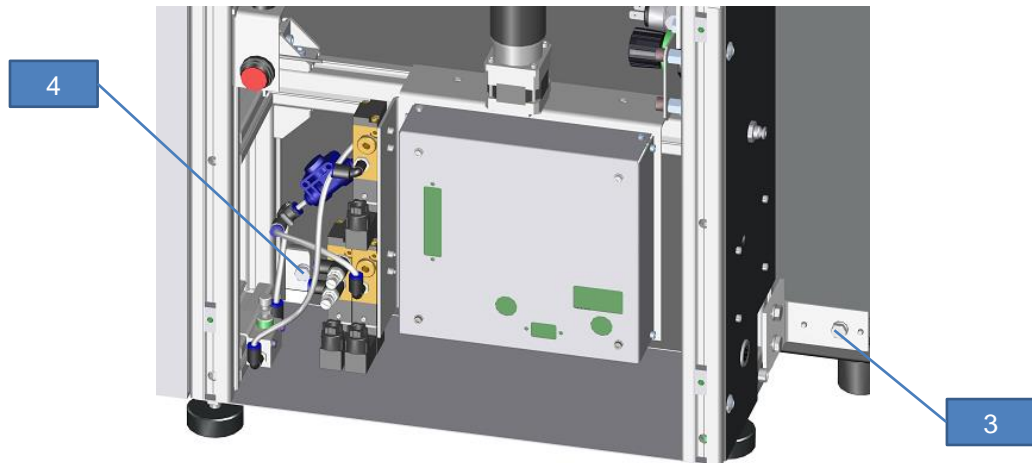


Fig. 19: Screws for aligning the Autoloader to the front or back

Position	Component	Description
3	Back screw	For aligning the Autoloader
4	Front screw	For aligning the Autoloader

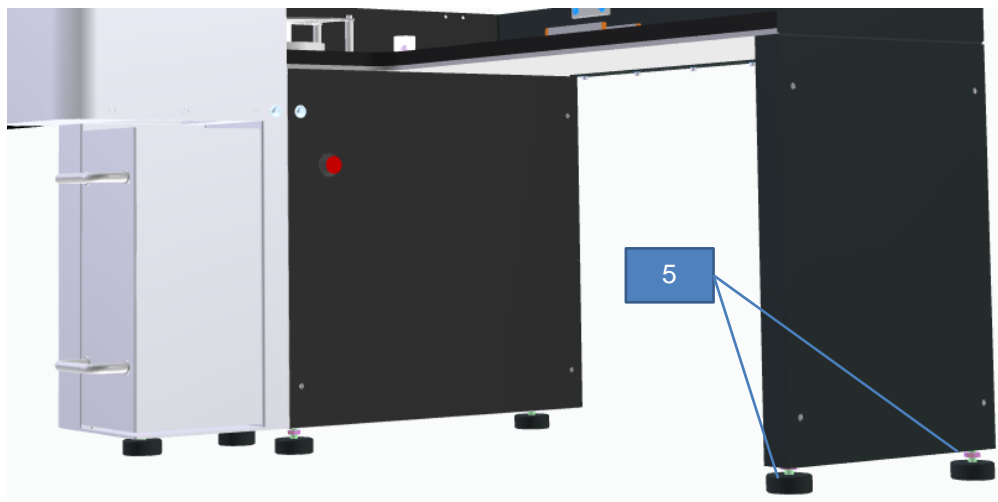


Fig. 20: Screws for aligning the Autoloader to the front or back

Position	Component	Description
5	Autoloader base (2x)	For aligning the Autoloader

Manually run through the motion sequences as follows:

1. Ensure that the assembly steps 5.1 to 5.7 have been carried out.
2. Ensure that several empty crucibles are ready on the crucible tray.
3. Ensure that the crucible bin has been correctly positioned.
4. Press the button **(2)** for manual control. The first step in the motion sequence is carried out. The crucible chain conveys the first crucible to the pick-up position. Each additional press of the button performs the next step in the Autoloader work sequence.
5. Align the Autoloader so that the gripper arm can place the crucible onto the middle of the crucible tray on the analyzer and pick it up again there. To do this, move the Autoloader.
6. Set the adjusting screws on the four Autoloader bases **(1)** as desired to adjust the height of the Autoloader. The height has been correctly set when there is a small gap between the crucible in the gripper arm and the crucible tray on the analyzer before opening the gripper fingers.

Additionally, for the 130 autoloader: Align the autoloader horizontally across the width using a spirit level. Use the two right feet **(5)** for this.

7. Repeat steps 4. to 6. of the motion sequence several times until the crucible is positioned securely by the Autoloader in the middle of the crucible tray and picked up again.
8. Now tighten all loose screws **(3)** and **(4)**.
9. Disconnect the power cord on the power supply unit from the Autoloader.

The Autoloader has been aligned.

5.11 Assembling the front cover

The two front covers must be assembled once the Autoloader has been attached to the analyzer.

The following figure shows the position of the screws on the front cover:

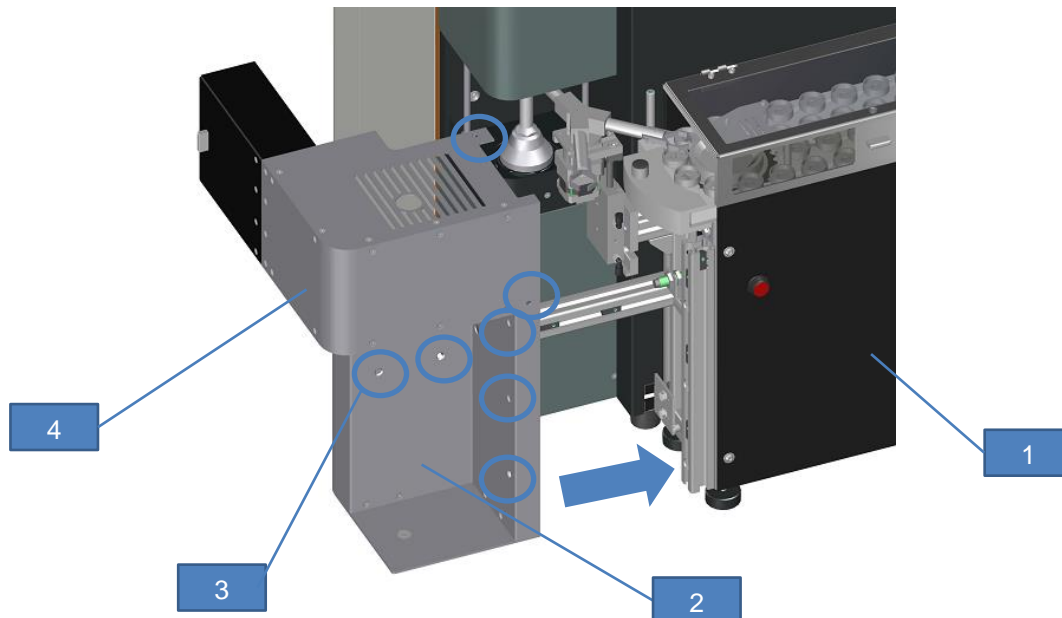


Fig. 21: Mounting the front cover

Position	Component	Description
1	Operating side	Operating side of the Autoloader
2	Bottom cover	Bottom cover with space for the crucible bin
3	Position of screws (7x)	The front cover is secured on the Autoloader by seven screws
4	Top cover	Top cover with protective hood

Assemble the front cover as follows:

1. First place the bottom cover (2) onto the Autoloader (1).
2. Secure the bottom cover (2) using the screws (3).
3. First place the top cover (4) onto the Autoloader (1).
3. Secure the top cover (4) using the screws (2).

The front covers have been assembled.

5.12 Assembling the side cover

The side cover of the Autoloader must be assembled prior to commissioning.
The following figure shows the operating side of the Autoloader:

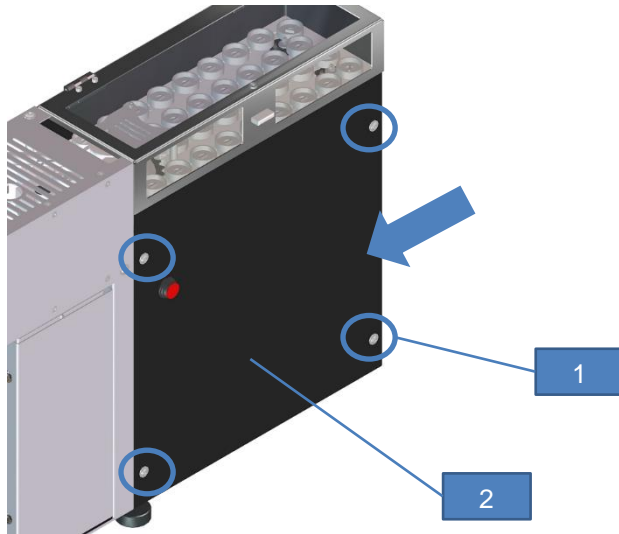


Fig. 22: Operating side of the Autoloader CS-i/CS-d with side cover

Position	Component	Description
1	Screws on the side cover (4x)	For securing the side cover
2	Side cover	Side cover of the Autoloader


Assemble the side cover as follows:

1. Insert the side cover (2) and use the first screw (1) to fix it in place.
2. Screw in the remaining side cover screws (1).

The side cover has been assembled.

5.13 Establishing the power supply

The power supply is established using the supplied power supply unit.

	See " Technical data " for details of the power supply.
---	---

Establish the power supply as follows:

1. Ensure that the assembly steps 5.1 to 5.10 have been carried out.
 2. Connect the supplied power supply unit on the back of the Autoloader, see Pos. (2) in "[Back](#)".
 3. Connect the power plug on the power supply unit to the operating company's power supply.
- The Autoloader has been connected to the power supply and can now be commissioned.

6 Commissioning

The following conditions must be met before commissioning:

- The Autoloader has been installed, see "[Installation](#)".

Commission the Autoloader as follows:

1. Turn the Autoloader on by the main switch, see Pos. (2) in "[Operating side](#)".

The Status LED on the main switch of the Autoloader lights up.

The Autoloader has been commissioned.

7 Operation of the Autoloader

CAUTION

C21.0000

Risk of poisoning and suffocation

Toxic substances

- Hazardous liquids, gases, mist, vapours or dust may be present when working on the Autoloader; these may cause poisoning or suffocation if there is contact with them or they are inhaled.
- **Where necessary, conduct a risk assessment for the samples.**
- **Where necessary, wear suitable goggles or protective gloves.**
- **Ensure there is sufficient ventilation.**
- **Never eat or drink near toxic substances.**

CAUTION

C22.0000

Risk of injury

Flammable samples

- Flammable or explosive samples may explode and cause injuries.
- **Where necessary, conduct a risk assessment for the samples.**
- **Where necessary, wear suitable goggles or protective gloves.**
- **Ensure there is sufficient ventilation.**

CAUTION

C23.0005

Risk of injury

Potentially explosive atmosphere

- The Autoloader is not suitable for use in potentially explosive atmospheres. Operating the Autoloader in a potentially explosive atmosphere can lead to injuries caused by an explosion or fire.
- **Never operate the Autoloader in a potentially explosive atmosphere.**

CAUTION

C24.0000

Risk of burns

Hot crucibles

- The crucibles are hot when the Autoloader transports the crucibles from the analyzers into the crucible bin. The hot crucibles can ignite the surrounding area and cause burns.
- **Do not reach into the moving Autoloader while the gripper arm is moving hot crucibles.**
- **Always use the crucible tongs to move crucibles.**

⚠ CAUTION

C25.0000

Risk of burns

Flammable surface

- Crucibles can fall onto the surface or onto the floor, e.g. if the compressed air fails or if the crucible bin is missing. A fire may result if there is a flammable surface beneath the Autoloader or on the floor, causing injuries.
- **Place the Autoloader on a fireproof surface.**
- **Use fireproof flooring.**
- **Operation of the Autoloader should always be supervised.**

⚠ CAUTION

C26.0000

Risk of injury caused by being pulled in

Moving parts

- The crucible drive moves the crucibles in the crucible tray. If clothing (e.g. long sleeves or ties) or long hair get caught in the crucible transport, they may be pulled in, resulting in injuries.
- **Do not wear loose clothing when operating the Autoloader.**
- **Tie up long hair before operating the Autoloader.**

⚠ CAUTION

C27.0000

Risk of crushing

Moving parts

- The crucible drive moves the crucibles in the crucible tray. Crushing or broken bones may result if fingers get caught in the movement.
- **Never reach into the crucible tray.**
- **Always use the crucible tongs to move crucibles.**

7.1 Loading the crucible tray

⚠ CAUTION

C28.0021

Risk of injury

External activation

There is a risk of the Autoloading starting up inadvertently when it is activated externally by the software.

- **Only operate the Autoloader using the software when you can see the Autoloader.**
- **Comply with the safety information and warnings in the manual for the externally activated Autoloader.**



Before starting an automatic analysis of multiple samples with the Autoloader, the crucibles must be filled with samples in the desired order and placed on the crucible tray. The Autoloader can be loaded with up to 36 or 140 crucibles simultaneously.

The following figure shows the crucible tray from above:

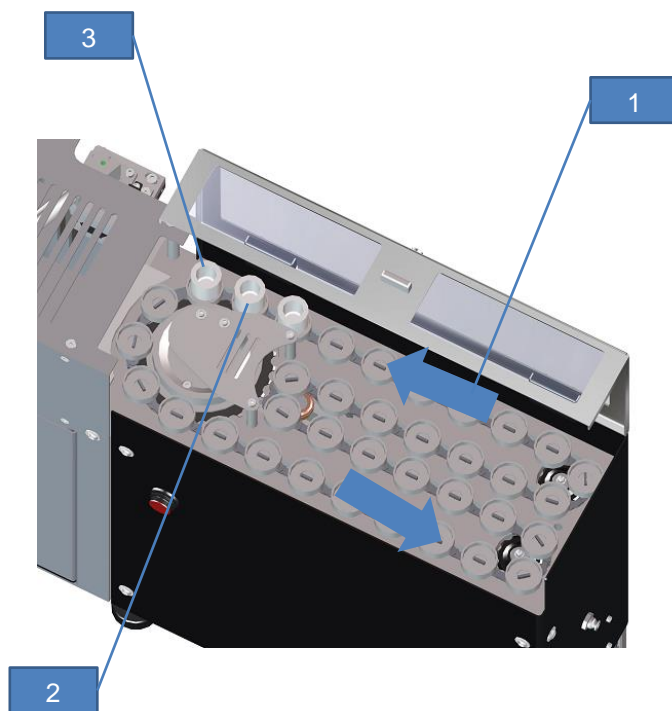


Fig. 23: Crucible tray with crucibles

Position	Component	Description
1	Direction of movement of the transport chain	Direction in which the transport chain moves
2	Crucible position 2	Position of the second crucible
3	Crucible position 1	Position of the first crucible

Load the Autoloader with crucibles as follows:

- 1 Place the first crucible filled with the relevant sample on the crucible tray in Position (3).
2. Place the second crucible (2) behind the first crucible.
3. Continue placing the crucibles filled with your samples on the crucible tray against the direction of movement (1).

The Autoloader has been loaded with crucibles.

7.2 Operating the Autoloader

CAUTION

C29.0021

Risk of injury

External activation

- There is a risk of the Autoloading starting up inadvertently when it is activated externally by the software.
- **Only operate the Autoloader using the software when you can see the Autoloader.**
- **Comply with the safety information and warnings in the manual for the externally activated Autoloader.**



CAUTION

C30.0000

Risk of injury

Disregarding the safety devices

- Disregarding the safety instructions results in injuries.
- **Never operate the Autoloader without the safety devices.**
- **Never operate the Autoloader without the protective hood on the front cover.**



The Autoloader is operated using the analyzer software, see the software manual for the analyzer.

The following conditions must be met for operation using the software:

- The Autoloader has been commissioned, see "[Commissioning](#)".
- The crucible tray has been loaded with the desired samples, see "[Loading the crucible tray](#)".

7.3 Emptying the crucible bin

⚠ CAUTION

C31.0000

Risk of burns

Hot crucible bin

- The crucible bin may be hot and cause burns if touched.
- **Wait until the crucible bin has cooled down before emptying, or wear gloves.**

Up to 140 crucibles can fit in the crucible bin. The crucible bin fill level must always be checked by the operator before starting operation of the Autoloader. Empty the crucible bin to start operation of the Autoloader.

The following figure shows the position of the crucible bin:

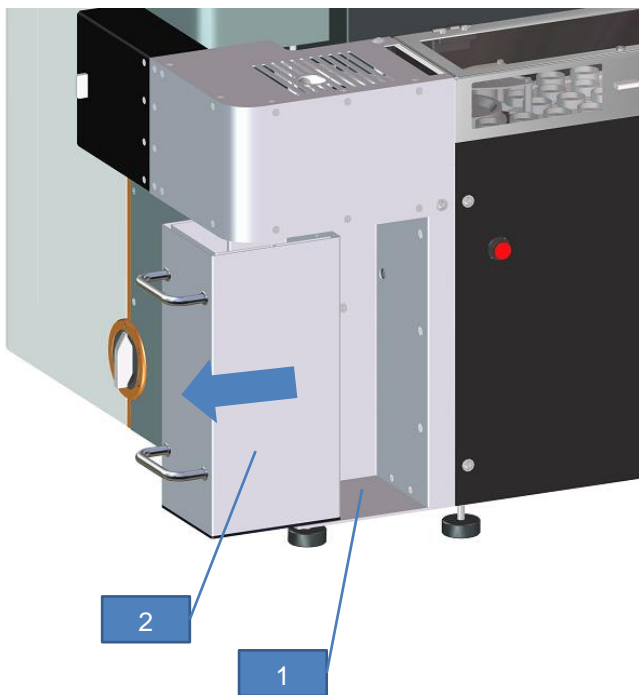


Fig. 24: Emptying the crucible bin

Position	Component	Description
1	Space for the crucible bin	Space for the crucible bin during operation
2	Crucible bin	Container for used crucibles

i The position of the crucible bin is monitored. Automatic operating mode will stop if you remove the crucible bin during operation of the Autoloader.

Empty the crucible bin as follows:

1. Ensure that no analysis procedure is running.
2. Pull the crucible bin (2) out.
3. Empty the contents of the crucible bin into a fireproof waste container.

4. Place the empty crucible bin onto its designated space (1).
The crucible bin has been emptied.

8 Technical data

The following table lists the technical data for the Autoloader CS-i/CS-d:

Definition	Description	Data	
		36er Autoloader	130er Autoloader
Dimensions	Width	20 cm	85 cm
	Depth	65 cm	65 cm
	Height	60 cm	60 cm
	Weight	18 kg	32 kg
Electrical Data	Power Supply	~230 VAC ±10 %	
	Voltage	24 V	
	Frequency	50/60 Hz	
	Power consumption	≤1,4 A	
Safety	Protection class	III	
	Overvoltage category	II	
	Degree of contamination	2	
	Compressed air	5 bis 8 bar	
	Type of environment	Innen	
	Max. Height	≤2000 m	
	Ambient Temperature	+5 bis +40 °C	
	Ambient Humidity	<80 % bei +31 °C <50 % bei +40 °C Non-condensing	
	Type of protection	IP20	

Tab. 1: Technical data for the Autoloader CS-i/CS-d

8.1 Type plate

The following diagram shows an example of the type plate on the Autoloader

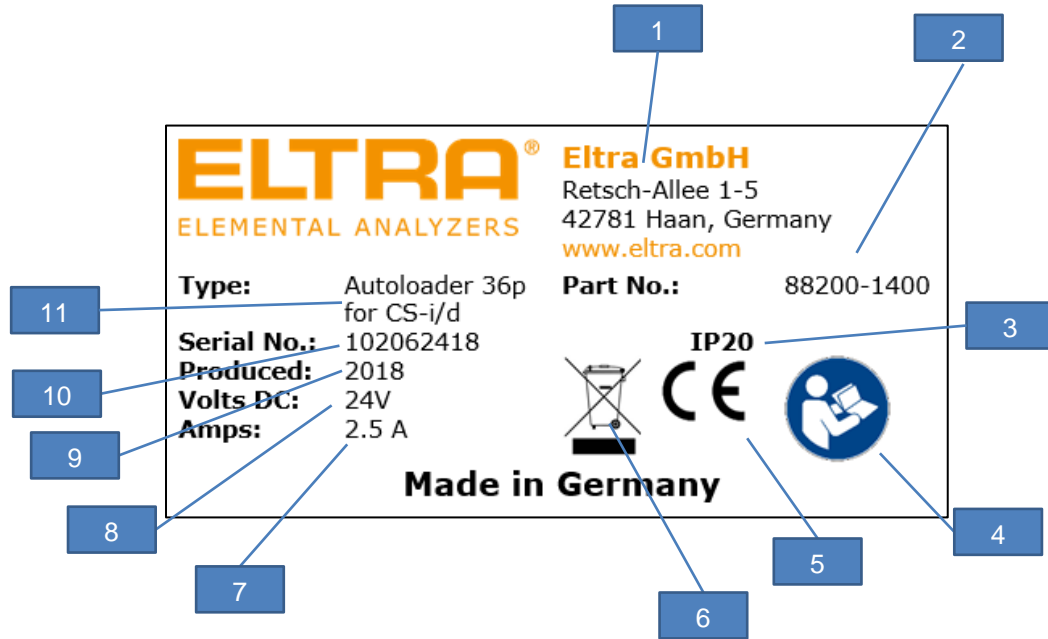


Fig. 25: Type plate on the Autoloader CS-i/CS-d

Position	Component	Position	Component
1	Manufacturer's address	2	Part number
3	Type of protection	4	Read the Manual
5	CE mark	6	Disposal label
7	Current	8	Voltage
9	Year of manufacture	10	Serial number
11	Autoloader designation		

9 Fault signals on the Autoloader

The Autoloader detects certain faults, and emits a predefined number of beeps (sounds) for identified faults via an acoustic signalling device.

The following table lists the number of beeps and the corresponding faults identified:

Number of beeps	Description of the fault
1	The light barrier for detecting the position of the gripper arm (see " Gripper arm positions ") does not detect any light. The light barrier for detecting the position of the gripper arm is faulty. <ul style="list-style-type: none"> • Check the positioning disc.
2	The light from the light barrier is permanently detected. The light barrier is faulty. <ul style="list-style-type: none"> • Check the positioning disc.
3	The command to load the next crucible cannot be executed. <ul style="list-style-type: none"> • There is no crucible in the Autoloader.
4	The horizontal light barrier cannot be detected. <ul style="list-style-type: none"> • Faulty light barrier, crucibles are not moving due to a blockage, faulty motor.
5	The furnace has not been opened. The Autoloader cannot place any crucibles onto the crucible tray. <ul style="list-style-type: none"> • Fault with the furnace control system or with the furnace cylinder.
6	The gripper fingers have not picked the crucible up. <ul style="list-style-type: none"> • The crucible has become stuck in its crucible holder, no compressed air, faulty light barrier.
7	The Autoloader has received the load command but has not executed it. <ul style="list-style-type: none"> • The analyzer furnace is, however, not open or the ram has been lowered with a long delay.
Repeats continuously	Continuously repeated beeps in manual operating mode. <ul style="list-style-type: none"> • The sensor on the cylinder has been incorrectly adjusted (bottom end of the furnace cylinder).



Tab. 2: Number of beeps and corresponding detected faults

10 Cleaning

⚠ WARNING W4.0003

Risk to life caused by an electric shock
Using water to clean live parts

- Using water to clean the Autoloader can lead to life-threatening injuries caused by an electric shock if the Autoloader has not been disconnected from the power supply.
- **Only clean the Autoloader with water when the Autoloader has been disconnected from the power supply.**

The Autoloader CS-i/CS-d must be inspected regularly for spilt sample material.

Remove spilt sample material as follows:

1. Ensure that the Autoloader has been switched off (see Pos. (2) in [“Operating side”](#)).
2. Remove the spilt sample material using an appropriate tool for the properties of the material, e.g. tweezers, vacuum cleaner or damp cloth.
3. Wait until the Autoloader is completely dry if necessary.
4. Switch the Autoloader back on (see Pos. (2) in [“Operating side”](#)).
The spilt material has been removed.

11 Servicing

CAUTION

C32.0021

Risk of injury

External activation

- There is a risk of the Autoloading starting up inadvertently when it is activated externally by the software.
- **Only operate the Autoloader using the software when you can see the Autoloader.**
- **Comply with the safety information and warnings in the manual for the externally activated Autoloader.**



CAUTION

C33.0000

Risk of burns

Hot crucibles

- The crucibles are hot when the Autoloader transports the crucibles from the analyzers into the crucible bin. The hot crucibles can ignite the surrounding area and cause burns.
- **Do not reach into the moving Autoloader while the gripper arm is moving hot crucibles.**
- **Always use the crucible tongs to move crucibles.**

CAUTION

C34.0000

Risk of posture problems

Lifting the Autoloader unaided

- The weight of the Autoloader can cause injuries resulting from posture problems due to an unhealthy posture or inattentiveness when lifting.
- **Ensure you maintain a healthy posture when lifting the Autoloader.**

CAUTION

C35.0000

Risk of crushing

Moving parts

- The crucible drive moves the crucibles in the crucible tray. Crushing or broken bones may result if fingers get caught in the movement.
- **Never reach into the crucible tray.**
- **Always use the crucible tongs to move crucibles.**

11.1 Starting non-stop operation

The automatic repeating of complete cycles is possible as non-stop operation without combustion.

The Autoloader keeps repeating all individual steps until the last crucible has been removed from the crucible tray. If no further crucible is found, the Autoloader continues to turn the chain for a while to look for more crucibles. If no more crucibles are found, the chain is stopped. The non-stop operation is ended.

The following conditions must be met:

- Commissioning must have been completed, see "[Commissioning](#)".

Start non-stop operation as follows:

1. Completely load the Autoloader with empty crucibles.
2. Activate manual mode, see "[Activating manual operating mode](#)".
3. Secure the button for manual control using an elastic ring.
4. Set the mains switch on the analyzer from Position 0 to Position 1.
Non-stop operation has been started.

12 Decommissioning

The Autoloader is decommissioned as follows:

1. Ensure that the Autoloader has been switched off (see Pos. (2) in "[Operating side](#)").
2. Pull out the plug (see Pos. (2) in "[Back](#)").
3. Pull the compressed air hose off (see Pos. (1) in "[Back](#)").
4. Dismantle the compressed air hoses to the analyzer.
5. Pull the cable for the interface to the analyzer off (see Pos. (3) in "[Back](#)").
6. Empty the crucible bin.
7. Place the empty crucibles on the crucible tray.

This ensures that the crucibles do not get lost and are available next time the Autoloader is commissioned.

The Autoloader has been decommissioned.

13 Storage

The following storage conditions apply to storage of the Autoloader CS-i/CS-d:

- Indoor area
- Ambient temperature between +5 and +40 °C
- Ambient humidity <50 % at +40 °C, non-condensing

Store the Autoloader as follows:

1. Decommission the Autoloader, see "[Decommissioning](#)".
2. Store the Autoloader under the specified storage conditions.

The Autoloader has been stored.

14 Disposal

Applicable statutory regulations must be heeded during disposal. Information about the disposal of electrical and electronic machinery in the European Community is set out below.

The disposal of electrically operated equipment is governed within the European Community by national regulations based on EU directive 2012/19/EU for waste electrical and electronic equipment (the WEEE Directive).

According to this, no machinery delivered after 13th August 2005 in the B2B area (which applies to this product) may be disposed of with the municipal or domestic waste. The machines have a disposal label to indicate this.

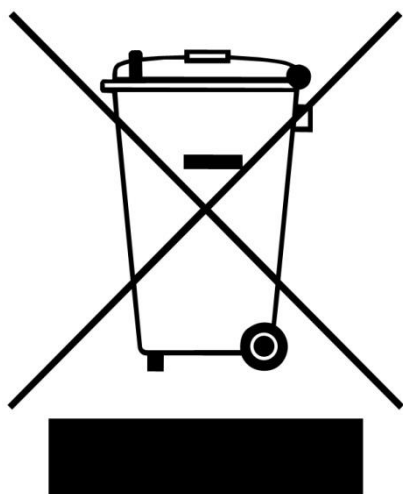


Fig. 26: Disposal label

Since the disposal regulations may differ from country to country throughout the world and within the EU, you should contact the supplier of the machine directly where necessary.

In Germany this labelling duty has applied since 23rd March 2006. As from this date, the manufacturer is required to provide a suitable option for returning any machines. The end user is responsible for correctly disposing of machines delivered before 13th August 2005.

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ELEMENTAL ANALYZERS

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