

Hexamatic

Without Conveyor

Instruction Manual

Original Instructions



CE

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1 About this manual

Instruction Manuals

Struers equipment must only be used in connection with and as described in the instruction manual supplied with the equipment.

**Note**

Read the instruction manual carefully before use.

**Note**

If you wish to view specific information in detail, see the online version of this manual.

1.1 Accessories and consumables

Accessories

For information about the available range, see the brochure for Hexamatic:

- [The Struers Website](http://www.struers.com) (<http://www.struers.com>)

Consumables

The equipment is designed to be used only with Struers consumables specifically designed for this purpose and this type of machine.

Other products may contain aggressive solvents, which dissolve e.g. rubber seals. The warranty may not cover damaged machine parts (e.g. seals and tubes), where the damage can be directly related to the use of consumables not supplied by Struers.

For information about the available range, see:

- [The Struers Consumables Catalogue](http://www.struers.com/Library) (<http://www.struers.com/Library>)

2 Safety

2.1 Intended use

For professional automatic materialographic plan grinding and polishing of materials for further materialographic preparation, including high-pressure and ultrasonic cleaning. The machine is only to be operated by skilled/trained personnel and is only designed to be used with Struers consumables specially designed for this purpose and this type of machine.

The machine is for use in a professional working environment (e.g. a materialographic laboratory).

Do not use the machine for the following

Preparation of materials other than solid materials suitable for materialographic studies. The machine must not be used for any type of explosive and/or flammable material, or materials which are not stable during machining, heating or pressure.

Model

Hexamatic without conveyor

2.2 Safety devices

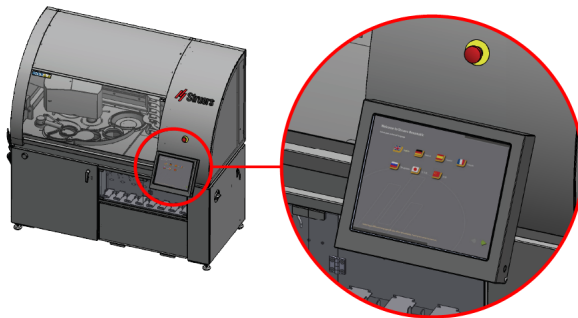
The machine is equipped with the following safety devices:

- Emergency stop
- Self-locking main hood
- Grinding stone guard
- Grinding stone speed monitoring
- Inverter STO module

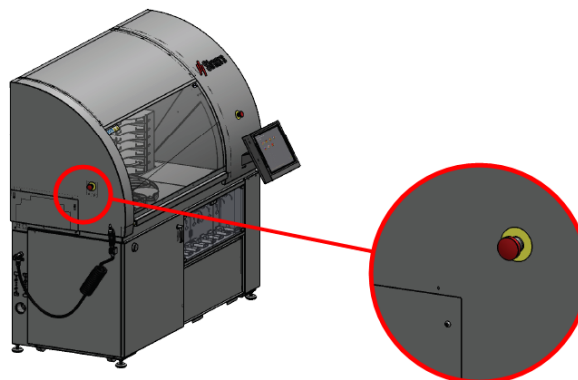
The locking mechanisms are activated during machine initialization.

You cannot start machine processes if the main hood is open. You cannot open the main hood during operation.

Emergency stops



Front view



Side view - left

Accessing the preparation area during preparation

When the machine has completed the preparation you can open the main hood.

**WARNING****Risk of injury.**

If power is interrupted during operation, the main hood lock opens instantly.
Do not open the main hood before all movement has stopped.

2.2.1 Hexamatic safety precautions

**Read carefully before use**

1. Ignoring this information and mishandling of the equipment can lead to severe bodily injuries and material damage.
2. The machine must be installed in compliance with local safety regulations. All functions on the machine and any connected equipment must be in working order.
3. The operator must read the safety precautions and Instruction Manual, as well as relevant sections of the manuals for any connected equipment and accessories.
The operator must read the Instruction Manual and, where applicable, the Safety Data Sheets for the applied consumables.
4. Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine. The machine must be earthed (grounded).
5. Connect the machine to a cold water tap. Make sure that the water connections are leak-proof and that the water outlet is working. Cut off the water supply if the machine is not going to be used for a long period of time.
6. Make sure that the emergency stops are in working order.
7. When using specimen holders, make sure that all specimens are securely clamped before you start the preparation process.
8. If you observe malfunctions or hear unusual noises, stop the machine and call technical service.
9. Struers equipment must only be used in connection with and as described in the instruction manual supplied with the equipment.
10. The equipment is designed to be used only with Struers consumables specifically designed for this purpose and this type of machine.
11. If the equipment is subjected to misuse, incorrect installation, alteration, neglect, accident or incorrect repair, Struers will accept no responsibility for damage to the user or the equipment.
12. Dismantling of any part of the equipment, during service or repair, should always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).

2.3 Safety messages

Signs used in safety messages

Struers uses the following signs to indicate potential hazards.



ELECTRICAL HAZARD

This sign indicates an electrical hazard which, if not avoided, will result in death or serious injury.



DANGER

This sign indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



WARNING

This sign indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



CAUTION

This sign indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



CRUSHING HAZARD

This sign indicates a crushing hazard which, if not avoided, could result in minor, moderate or serious injury.

General messages



Note

This sign indicates that there is a risk of damage to property, or a need to proceed with special care.



Hint

This sign indicates that additional information and hints are available.

2.4 Safety messages in this manual



WARNING
Risk of injury

If power is interrupted during operation, the main hood lock opens instantly. Do not open the main hood before all movement has stopped.



WARNING

If there are visible signs of deterioration or damage to the main hood, it must be replaced immediately. Contact Struers Service.



WARNING

Safety critical components must be replaced after a maximum lifetime of 20 years. Contact Struers Service.

**WARNING**

Do not use the machine with defective safety devices.
Contact Struers Service.

**WARNING**

In case of fire, alert bystanders and the fire brigade.
Use a powder fire extinguisher. Do not use water.

**ELECTRICAL HAZARD**

The machine must be earthed (grounded).
Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine.
Incorrect voltage can damage the electrical circuit.

**ELECTRICAL HAZARD****For electrical installations with Residual Current Circuit Breakers**

For Hexamatic a residual current circuit breaker Type B, 30 mA is required (EN 50178/5.2.11.1).

For electrical installations without Residual Current Circuit Breakers

The equipment must be protected by an insulation transformer (double-wound transformer).

Contact a qualified electrician to verify the solution.

Always follow local regulations.

**ELECTRICAL HAZARD**

Disconnect the electrical power supply before installing electrical equipment.
Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine.
Incorrect voltage can damage the electrical circuit.

**ELECTRICAL HAZARD**

The pump of the recirculation cooling unit must be earthed (grounded).
Make sure that the electrical power supply voltage corresponds to the voltage stated on the type plate of the pump.
Incorrect voltage can damage the electrical circuit.

**ELECTRICAL HAZARD**

Disconnecting the unit from the electrical power supply must only be done by a qualified technician.

**CAUTION**

Struers equipment must only be used in connection with and as described in the instruction manual supplied with the equipment.

**CAUTION**

Do not use Hexamatic if it is damaged.



CAUTION

The safety devices must be tested at least once a year.



CAUTION

Testing should always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).



CAUTION

Prolonged exposure to loud noises may cause permanent damage to a person's hearing.

Use hearing protection if the exposure to noise exceeds the levels set by local regulations.



CAUTION

Do not use the machine with non-compatible accessories or consumables.



CAUTION

Wear suitable gloves to protect fingers from abrasives and warm/sharp specimens.



CAUTION

Make sure that the machine is level.



CAUTION

The machine must not operate when it is resting on its wheels.



CAUTION

Avoid skin contact with the cooling fluid additive.



CAUTION

The recirculation tank is very heavy when it is full.



CAUTION

The pressure of the cooling fluid supplied to the machine must be max. 2 bar.

3 Getting started

3.1 Device description

Hexamatic is an automatic machine for materialographic plan grinding and polishing including preparation with oxide suspensions.

A recirculation cooling unit is connected for supplying cooling water to the plane grinding process.

The operator selects the preparation parameters and the grinding/polishing surfaces.

The process starts by clamping the specimens in the specimen holder and placing it in the machine or in the conveyor. Specimen mover plates with retention rings are also an option for the Hexamatic.

The Hexamatic with a conveyor can hold several specimen holders/mover plates. When a specimen holder/mover plate is placed in the conveyor the machine automatically detect its presence and indicates it on the graphical user interface. The operator can select a different method for each specimen holder/mover plate in the conveyer.

The Hexamatic option without conveyer will prepare 1 specimen holder/mover plate at a time and the operator must remove the prepared specimen holder/mover plate and insert a new one manually.

Grinding/polishing surfaces will automatically change depending on the method chosen. Several different grinding/polishing surfaces can be placed in the machine.

Between each step the specimen holders/mover plates will be cleaned. Cleaning is done via High pressure cleaning and/or Ultrasonic cleaning. These cleanings are done in two separates chambers. Also alcohol can be used for cleaning and drying of water sensitive materials and is a part of the High Pressure cleaning chamber.

After the last preparation step the specimen holder/mover plate is cleaned and dried and will be ready for inspection.

The cover of the machine locks when the operator starts the machine, and it remains locked until the motors are stopped. It is not possible for the machine to run while the cover of the machine is open.

It is not possible to open the cover on the conveyor to remove or insert a specimen holder/mover plate while the machine is preparing a specimen holder/mover plate. To insert specimen holders/mover plate it is mandatory to use the function "add holder". When this function is activated the machine will pause its process and the cover to the conveyor will be released. The cover can now be opened to add additional specimen holdres/mover plates. When the cover is closed the process can be restarted by pressing "continue" on the screen.

The operator starts the machine by pressing the start on the graphical user interface after parameters have been chosen (method).

The machine stops automatically when all specimen holders have been prepared and delivered in the conveyer.

If the emergency stop is activated, the power to all moving parts is cut.

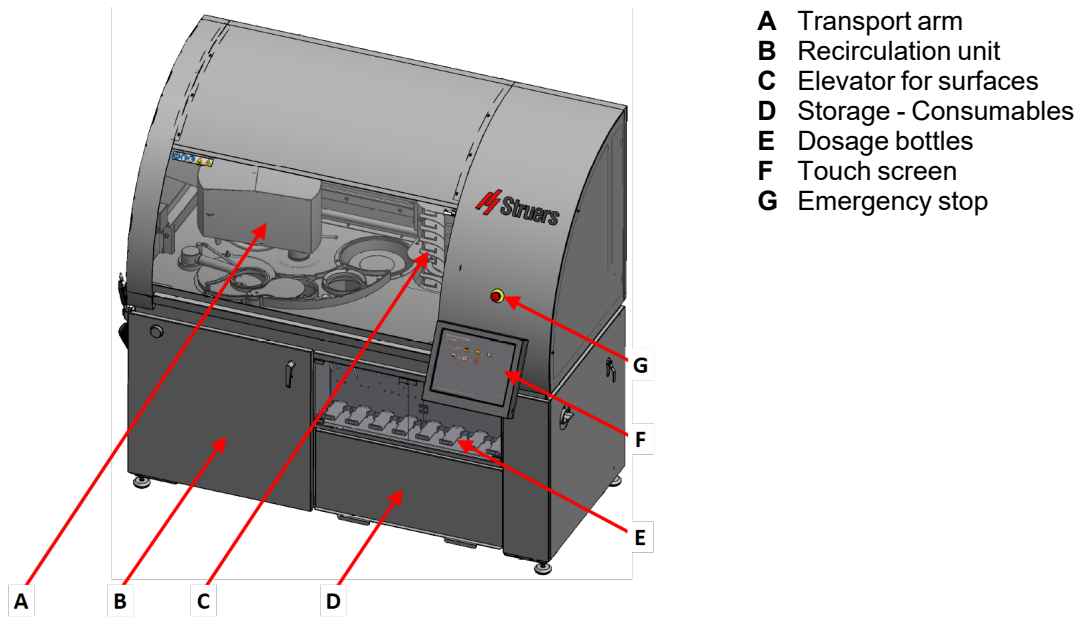
Models

Hexamatic without conveyor

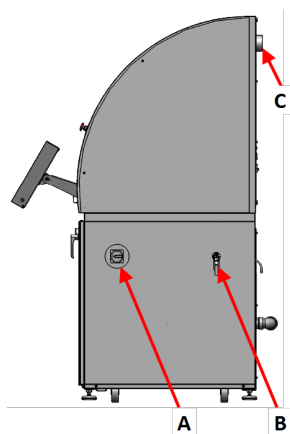
Hexamatic with conveyor

3.2 Overview

Front view

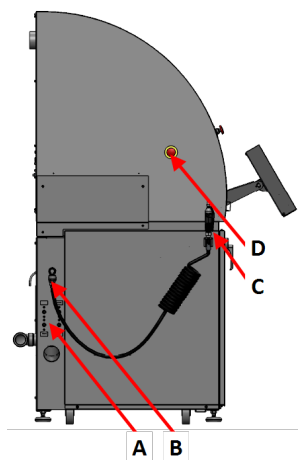


Side view



Right side

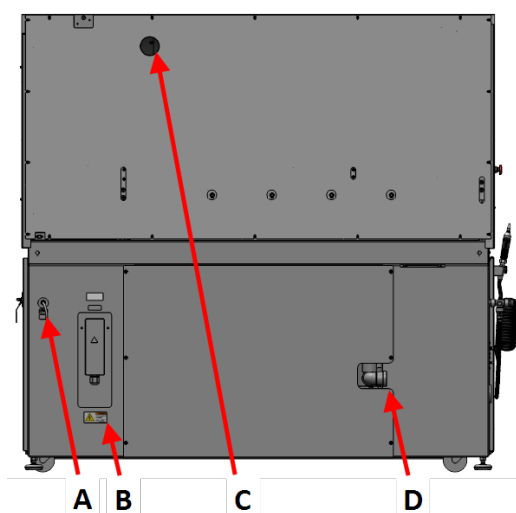
- A Main switch
- B Air inlet valve
- C Exhaust



Left side

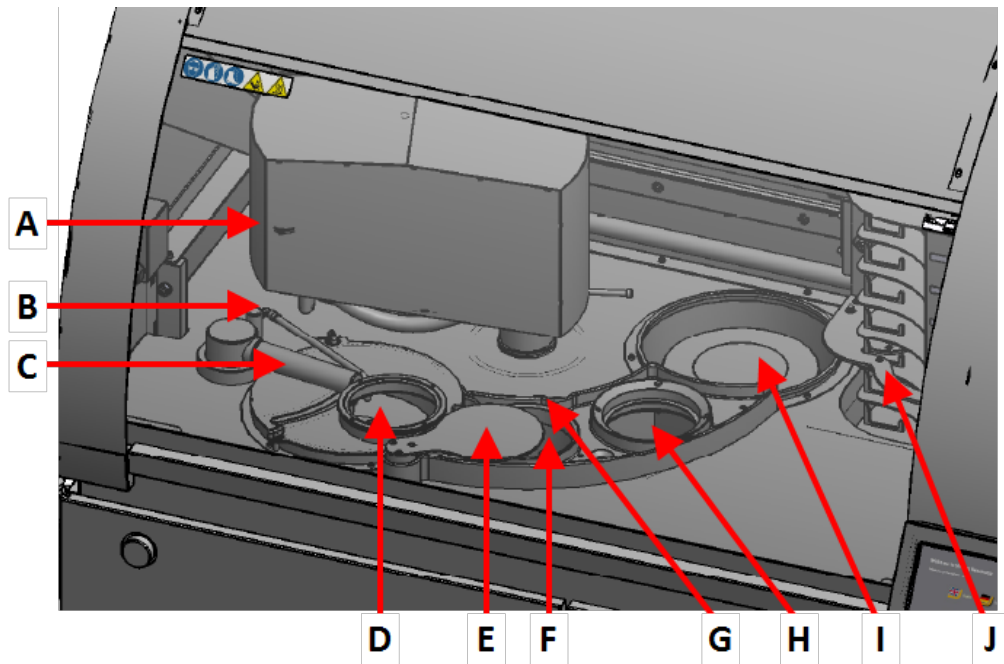
- A Water flow regulators
- B Water inlet
- C Flushing gun
- D Emergency stop

Rear view



- A Compressed air inlet
- B Electrical connection box
- C Exhaust
- D Water outlet

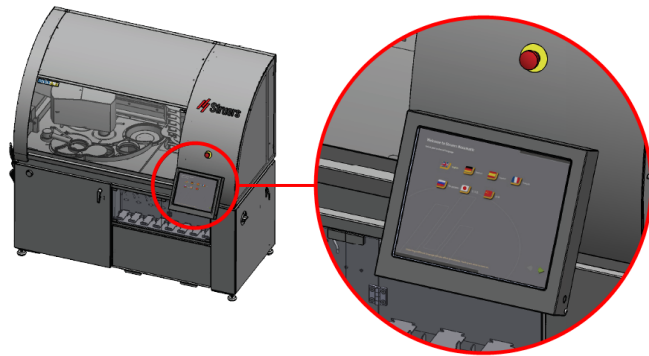
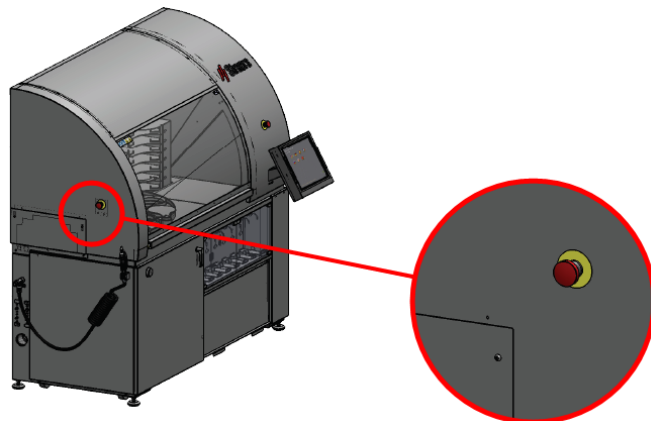
Preparation chamber



- A Pick-up/delivery station (under the transport arm)
- B Cooling fluid
- C Dressing arm
- D Grinding stone chamber
- E Automatic lid for grinding stone chamber
- F Ultrasonic specimen cleaning tub
- G Sensors for ultrasonic tub
- H Soap and alcohol cleaning tub, and air dryer
- I Polishing station
- J MD-consumables elevator

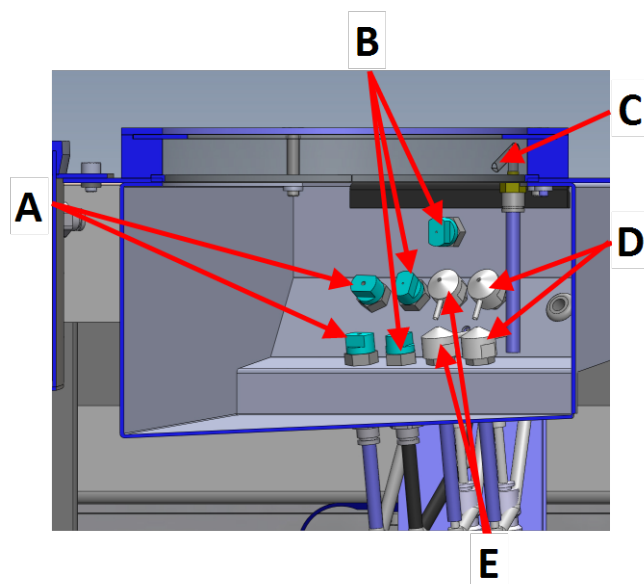
Emergency stop

See [Safety devices](#) ► 8.

Front view**Side view - left****3.3 Cleaning chamber**

The cleaning chamber contains 10 nozzles for various purposes.

- A Lower air nozzles
- B Water nozzles
- C Upper air nozzle
- D Soap nozzles
- E Alcohol nozzles

**Air nozzles**

There are three air nozzles:

- The lower air nozzles for drying the specimens and the holder from beneath.

- The upper air nozzle for drying the holder from above to prevent water from being left on top of the holder and running down after end cleaning.

You can activate the nozzles independently:

- | | |
|-----------------------|---------------------------|
| – Lower air | The two lower air nozzles |
| – Upper air | The one upper air nozzle |
| – Upper and Lower air | – All air nozzles |

Water nozzles

The water nozzles are used for either **High Pressure Water** or **Low Pressure Water**. They are always activated together.

Alcohol nozzles

The alcohol nozzles are used for applying alcohol after the specimens have been rinsed with water. They are always activated together.

Soap nozzles

The soap nozzles are used for applying soap solution on the specimens before cleaning. They are always activated together.

See [Soap and alcohol ▶ 24](#)

The cleaning programs are carried out based on the sequence of the various functions in the selected processes.

If needed, set up user-defined cleaning programs to use the different combinations as effectively as possible.

3.4 The display

The display is a touch screen, where you tap on buttons, icons and specific areas to access a screen or activate a function.

All programming and operation is carried out on the touch screen which is mounted on the machine.

The software is launched when you switch on the machine.

During start-up a splash screen stating the software version is shown briefly.

During normal operation, the screen that was used before the machine was switched off is shown.

Selecting screens, functions and settings

- To activate a screen or function, tap the button or icon associated with this function.

The dashboard

From the dashboard you can quickly access a range of functions:

- **More Functions**

A list of functions related to the screen you are currently viewing.

- **Main**

The main functions in the software: **Main menu, Log off, Shutdown**

- **Recent**

A list of the most recently used functions.

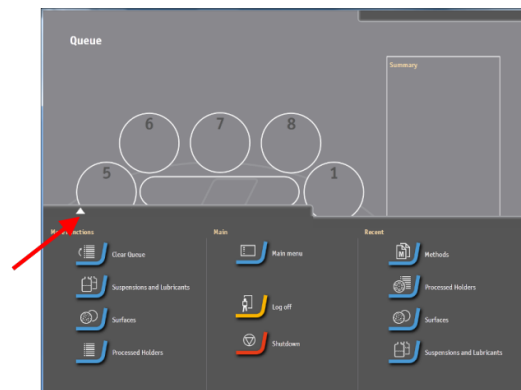
Opening the dashboard

- Tap the dark gray tab at the bottom of the screen to open the dashboard.



Closing the dashboard

- Tap the dark gray tab at the top of the dashboard to close the dashboard.



Changing settings

See [Changing settings and text](#) ► 20.

Sound

Short beep

A short beep, when you press a key, indicates that the selection is confirmed.

You can enable or disable the beep: select **Configuration**.

Long beep

A long beep, when you press a button, indicates that the key cannot be activated at the moment.

You cannot disable this beep.

Standby mode

To increase the lifetime of the display, the back-light is dimmed automatically if the machine has not been used for a while. (10 min)

- Touch the screen to re-activate the display.

3.4.1 Main menu

From the **Main menu** screen you can choose between the following options:



- **Preparation**



- **Maintenance**



- **Configuration**

3.4.2 Changing settings and text

Selecting settings

You can select a setting in a number of ways:

- To select a setting, tap the field showing the value to open the step or expand a drop-down list.

Using the navigation button

- *Example 1*
Tap the right or left arrow on the navigation wheel to move from one setting to the next.
- Tap once more to select a step or a value.
- *Example 2*
If the text **Edit** is shown at the center of the navigation wheel, tap **Edit** to expand the drop-down list.



Changing settings

You can change a setting in a number of ways:

Example 1

1. Select the setting you wish to change.
2. Expand the drop-down list
3. If needed, use the scroll bar to view more values.
4. Tap to select the value.
5. Tap **OK**. The drop-down list closes.



Example 2

1. Select the setting you wish to change.
2. Without expanding the drop-down list, tap the arrows on the navigation wheel to increase or decrease the selected value directly.

Example 3

1. Tap the navigation wheel and move your finger clockwise or counter-clockwise around the wheel.
 - Clockwise increases the value.
 - Counter-clockwise decreases the value.

**Changing text**

You can change the name of folders, methods, consumables, etc.

1. Select **Rename**. The keyboard is shown.
2. Enter a name of your choice.
3. Select **Enter** on the keyboard.

**3.5 Start-up - the first time****CAUTION**

Struers equipment must only be used in connection with and as described in the instruction manual supplied with the equipment.

1. Switch on the machine.
The software is launched.
2. A setup wizard guides you through the configuration process.
See [The display ► 18](#) for instructions on how to navigate in the display.
3. Select the language you wish to use. If needed, you can change the language at a later date. Tap the flag denoting the language of your choice.
4. Tap the arrow to continue.
5. Select the keyboard layout you wish to use.
6. Tap the arrow to continue.
7. Set the correct values for **Date**, **Time** and **Timezone**.
8. Tap the arrow to continue.



To continue, see [Surfaces ► 22](#)

3.5.1 Surfaces



CAUTION

Do not use the machine with non-compatible accessories or consumables.

See also [Surfaces ▶ 54](#).

The MD consumables are placed on shelves in the elevator. See [Overview ▶ 14](#).

The elevator has several shelves that contains individual MD grinding or polishing surfaces to be used for the different steps in a method.

Before you can start a preparation process, you must place the correct MD surface consumables on the correct shelves, and set them up in the software.

Procedure

1. Close the main hood.
2. From the **Main menu** select **Configuration**.
3. From the **Configuration** menu, select **Consumables**.
4. Select **Surfaces**.
The elevator moves into the loading position.
The padlock symbols on the shelves disappear.
5. Open the main hood.
6. Place the MD consumable as indicated on each shelf of the elevator.
The screen shows 8 ellipses representing consumable surfaces. They are usually locked.
7. Tap the **Change Surfaces** button in the lower left corner of the screen.
The machine moves the arm and surface elevator into the correct position for changing consumable surfaces.
The ellipses on the screen are enabled.
8. Tap the text in the ellipse (e.g. **No surface loaded**). The surface selection window is shown.
When you have selected, configured and confirmed a surface, the surface name is shown in the ellipse.
Make sure that the surface you define in the software corresponds to the surface placed on the elevator shelf.
9. Select the desired MD consumable for each disc shown on the screen.
See also [Surfaces ▶ 54](#).
10. When you have inserted and set the MD consumables, close the main hood.



When you have closed the main hood, the elevator moves down and the shelves are locked.

11. Tap the arrow to continue.

This will take you to the **Suspensions and Lubricants** screen.



To continue, see [Suspensions and lubricants ▶ 23](#)

3.5.2 Suspensions and lubricants



CAUTION

Do not use the machine with non-compatible accessories or consumables.

All suspensions and lubricants are contained in 1 l bottles.

All bottles are placed on weighing cells. The contents of the bottles are measured continuously. A warning is shown when the level in the bottle is getting low.

Before you can start a preparation process, you must do the following:

- Fill suspensions and lubricants into the dosage bottles.
- Place the dosage bottles on the bottle shelf.
- Define the suspensions and lubricants in the software.

See also [Suspensions and lubricants ▶ 56](#).

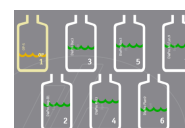
Procedure

Before you carry out this procedure, you must have carried out the procedure described in [Surfaces ▶ 22](#).

1. In the **Suspensions and Lubricants** screen, specify the contents of each bottle. To do so, select the specific bottle on the screen and select the correct suspension or lubricant.



When a bottle has been defined in the system and placed on the shelf, it is weighed, and the approximate level of liquid is shown on the screen as a wave line.



2. Tap the arrow to continue.

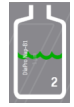


Status

- **None**
No bottles have been defined in the system. No bottles have been placed on the shelf.
- **Yellow triangle**
The bottle has been defined, but has not been placed on the shelf.



- **Yellow triangle/Red wave line**
The bottle has been not been defined, but has been placed on the shelf.
- **Green wave line**
The content level is sufficient.
- **Yellow wave line**
Refill the bottle as soon as possible.
- **Red wave line**
The bottle is empty. Dosing is not possible.



3.5.3 Soap and alcohol



CAUTION

Do not use the machine with non-compatible accessories or consumables.

Filling the soap and alcohol bottles



Note

Make sure that the cleaning liquids are connected to the correct hoses:

- Black hose: Soap
- Blue hose: Alcohol

The bottles for the soap solution and alcohol are placed on a trolley under the bottle compartment.

1. Fill the soap bottle with a soap solution according to the instructions on the label.
2. Fill the alcohol bottle with ethanol or propanol.

Monitoring the soap and alcohol levels

To monitor the soap and alcohol levels, see [Soap/Alcohol ▶ 77](#).

3.5.4 Grinding stone/Diamond grinding disc



CAUTION

Do not use the machine with non-compatible accessories or consumables.

See also

- [Grinding stone/Diamond grinding disc ▶ 57](#)
- [Manual dressing ▶ 68](#)

Selecting the grinding stone or diamond grinding disc

1. Close the main hood.
2. In the **Grinding disc - Configure your grinding disc** screen, tap the grinding disc to select the desired grinding stone or diamond grinding disc.
3. Select **OK** to confirm that you wish to change or insert a new grinding stone or diamond grinding disc.

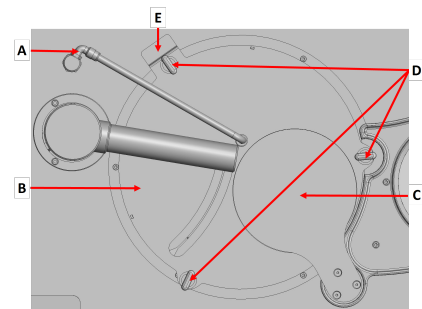


The dresser moves up and to the side.

The lid over the stone opening moves away.

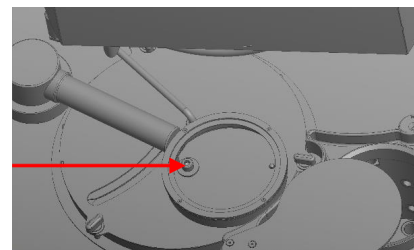
Mounting the grinding stone or diamond grinding disc

1. Open the main hood.
2. Move the water tube on the plane grinding station into an upright position.
3. Unscrew the three finger nuts. **(D)**
4. Remove the cover over the grinding stone.



- A** Water tube
- B** Cover
- C** Lid
- D** Finger nut
- E** Safety switch

5. Use the 8 mm Allen key to remove the screw and washer.
6. Place the grinding stone or diamond grinding disc on the driving plate.
7. Make sure that the two pins from the driving plate engage in the two holes at the bottom of the grinding stone or diamond grinding disc.
8. Remount the washer and the screw and securely tighten the screw with the 8 mm Allen key.
9. Remount the cover over the grinding stone.
10. Tighten the three finger nuts gently.
11. Move the water tube down into the correct position.
12. Close the main hood.



The lid moves back to close the opening of the plane grinding station.

When you have selected a grinding stone on the screen, the dresser automatically moves to detect the top of the stone. When the top of the stone has been detected the dresser moves into its parking position.



Hint

If you select a diamond grinding disc, the dresser remains at the side of the grinding chamber because it is not used.



Hint

Struers recommends that you dress a new stone a couple of times before using it for grinding. This will ensure that it is plane and ready for use.

See [Manual dressing](#) ▶ 68.

When you have entered the desired settings, the screen **Struers Hexamatic is ready** is shown.

Your selections are shown.

13. Make sure that all settings are correct.

If you wish to make further changes, tap the green left arrow to go back and make the changes.



14. Tap the arrow to continue.

The **Main menu** screen is shown.



3.5.5 Clamping and leveling specimens

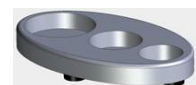


CAUTION

Do not use the machine with non-compatible accessories or consumables.

Individual specimens

1. Place the specimen in the appropriate hole in the leveling device.
2. Slide the stainless-steel retention ring over the specimen.



Note

Make sure that the steel rings are securely fixed on the specimen.

3. Tighten the screw(s) with the Allen key.
4. Transfer the specimen to the specimen mover plate.
5. Place the specimens symmetrically around the center of the specimen mover plate to ensure an even and balanced rotation.

In a specimen holder

If you are using a Uniforce leveling device (option), see the instruction manual for that device.

1. Place the specimen holder on a leveling disc or on the Uniforce leveling device.
2. Place at least three specimens symmetrically around the center of the specimen holder to ensure an even and balanced rotation.
3. Carefully tighten the screws to clamp the specimens.

Always select a length of screw which will leave a minimum part of the screw projecting from the specimen holder and which uses the whole length of the thread through the specimen holder.

4. When you have clamped the specimens, make sure that the fixation of the specimens is secure.

4 Transport and storage

If, at any time after the installation, you have to move the unit or place it in storage, there is a number of guidelines we recommend that you follow.

- Package the unit securely before transportation.
Insufficient packaging could cause damage to the unit and will void the warranty. Contact Struers Service.
- Struers recommends that all original packaging and fittings are kept for future use.

4.1 Storage

**Note**

Struers recommends that all original packaging and fittings are kept for future use.

- Disconnect the unit from the electrical power supply.
- Remove any accessories.
- Clean and dry the unit before storage.
- Place the machine and accessories in their original packaging.

4.2 Transport

**Note**

Struers recommends that all original packaging and fittings are kept for future use.

To transport the machine safely, follow these instructions.

1. Make sure that the following items are available:

4 Transport and storage

- Transport brackets (x 4)
 - Transport crossbar (x 1)
 - The original pallet
2. If needed, disconnect the following:
- Power supply



ELECTRICAL HAZARD

Disconnecting the unit from the electrical power supply must only be done by a qualified technician.

- Compressed air supply
 - Water supply
 - Recirculation unit See the manual supplied with the specific equipment.
 - Disconnect the monitor. This must be done by StruersService.
 - Conveyor
 - Accessories
3. Clean and dry the unit.

Requirements

- Make sure that the floor of the working area and the transportation corridor is designed to carry the following weight:

| Weight | |
|---------------|-------------------|
| Machine | 800 kg (1763 lbs) |

- The weight of the specimen holders and consumables used.
- Make sure that the following facilities are available:
 - Power supply
 - Water supply
 - Compressed air supply
 - Water drain

Moving the machine



Note

The machine must be installed by Struers technicians or by an authorized service technician trained by Struers for this specific task.

See [Lifting](#) ► 174

5 Installation



WARNING

Struers equipment must only be used in connection with and as described in the instruction manual supplied with the equipment.

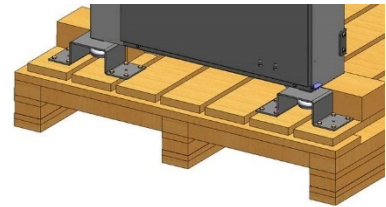
5.1 Unpacking



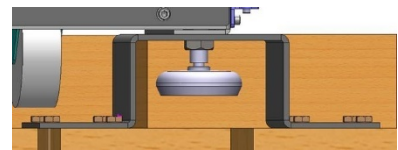
Note

Struers recommends that all original packaging and fittings are kept for future use.

1. Open and remove the sides and the top of the packing box.
2. Unscrew the transport brackets that secure the machine to the pallet.



3. Lift the machine from the ground using a forklift to access the adjustable feet.
4. If needed, turn the adjustable feet so that they move up towards the machine.



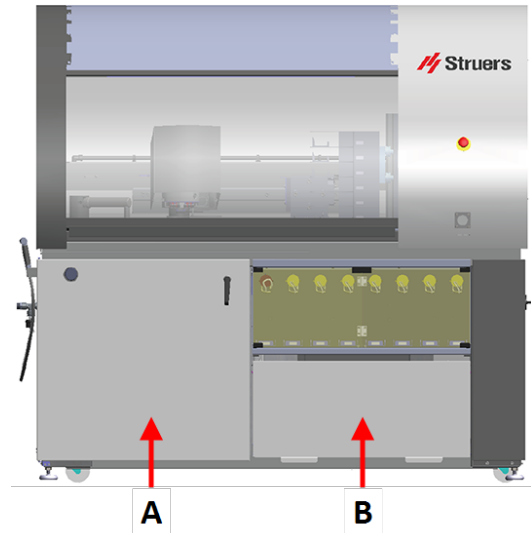
5.2 Lifting

| Weight | |
|---------|-------------------|
| Machine | 800 kg (1763 lbs) |

Moving the machine

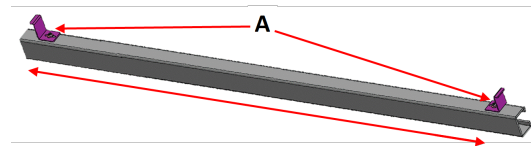
To move the machine, use a fork-lift truck and a crossbar.

1. Open the door on the left and the storage cover on the right.



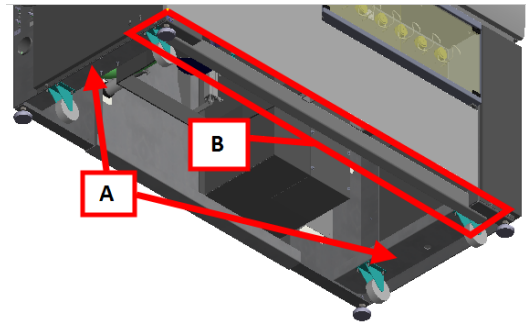
- A Door
- B Cover

2. Make sure that the transportation crossbar supplied with the machine is secured in position before you start lifting.
3. Loosen the brackets on the transportation crossbar to allow movement.
4. Adjust the brackets.
5. Towards the front of the machine, press and hold the crossbar against the bottom of the U-beams.
6. Slide the brackets of the transport crossbar over the edges of the U-beams and tighten the bolts.



- A Bolt

The graphic shows the machine seen from below.



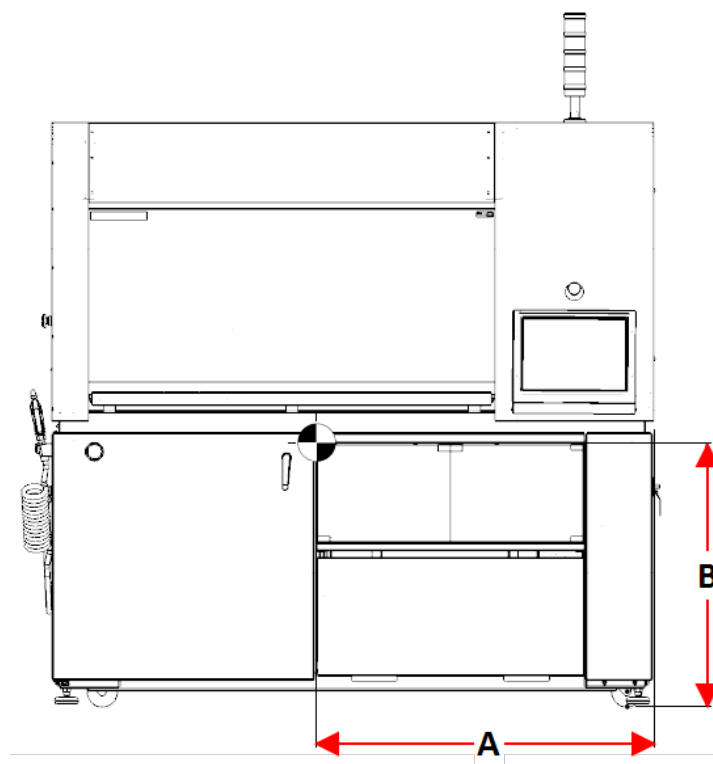
- A U-beams
- B Transportation crossbar

7. Position the forklift as close to the center line of gravity as possible.

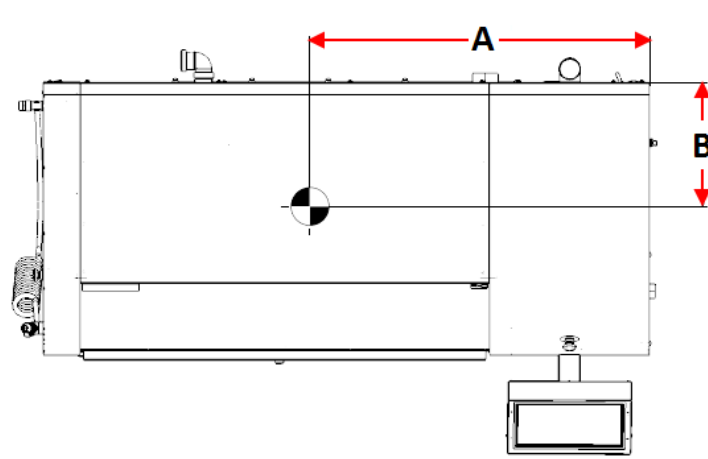
See the following graphics showing the center of gravity.

Center of gravity**Front view**

- A** 111 cm (43.5")
B 87 cm (34")

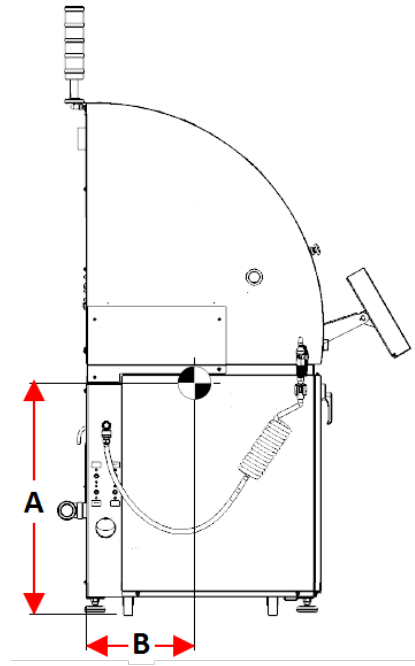
**Top view**

- A** 111 cm (43.5")
B 41 cm (16")

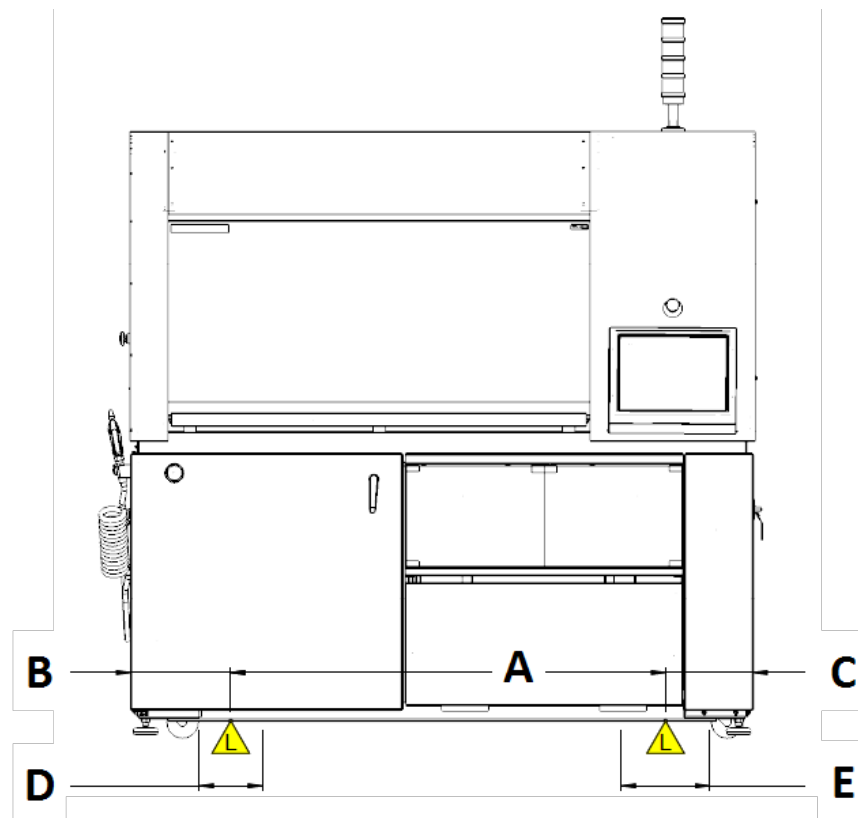


Side view

- A** 87 cm (34")
- B** 41 cm (16")



Lifting points - for lifting straps



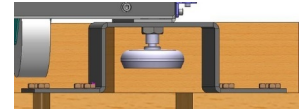
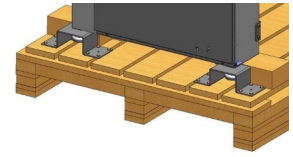
- A** 138 cm (54")
- B** Best position - 32 cm (12.5")
- C** Best position - 28 cm (11")
- D** Area for best lifting position - 20 cm (8")
- E** Area for best lifting position - 28 cm (11")

Lifting the machine with a fork lift

1. Place the forks so that the center of gravity is placed between the forks. Lift the machine from the front.
2. See the following methods of placing the machine.
 - Pushing the machine into position
 - Lifting the machine directly into position

Pushing the machine into position

1. If you cannot place the machine directly in its location, turn the adjustable feet upwards to stand the machine on its wheels.
2. Remove the crossbar and store it for future use. The wheels of the machine cannot swivel when the crossbar is mounted.
3. Move the machine as close to its position as possible.
4. Lower the machine so that the wheels touch the floor.



Note

Place the machine on a plane and horizontal floor.



CAUTION

The machine must not operate when it is resting on its wheels.

5. Push the machine into the correct position.



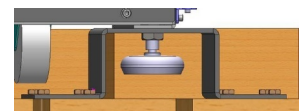
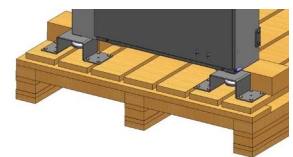
CAUTION

Make sure that the machine is level.

6. Turn the adjustable feet until the machine rests on the feet, and make sure that the machine is level.
7. Remove the crossbar and store it for future use.

Lifting the machine into position

1. If you can place the machine directly in its location, turn the adjustable feet downwards to stand the machine on its feet.
2. Remove the crossbar and store it for future use.
3. Lift the machine into the correct position.
4. Lower the machine so that the feet touch the floor.



Note

Place the machine on a plane and horizontal floor.

5.3 Checking the packing list

Optional accessories may be included in the packing box.

The packing box contains the following items:

| Pcs. | Description |
|------|--|
| 1 | Hexamatic |
| 1 | Inlet hose. Diameter: 19 mm (¾"), Length: 2 m (6.6') |
| 1 | Filter gasket |
| 1 | Reduction ring with gasket. Diameter: ¾" to ½" |
| 1 | Hose clamp. Diameter: 40-60 mm (1.6-2.4") |
| 1 | Exhaust hose. Diameter: 50 mm (2"). Length: 3 m (9.8') |
| 1 | Allen key, T8 x 250 |
| 1 | Combination wrench |
| 1 | Nozzle cleaner |
| 1 | Cover |
| 1 | Rubber plate |
| 1 | Drawer |
| 1 | Hose, silicone. Diameter: 1.6/4.8 mm |
| 1 | Pipe, PVC. Diameter: 0.15m, Diameter 50x2.4 mm |
| 1 | Tank, 50 l |
| 1 | Pump for recirculation unit |
| 1 | Filter bag |
| 7 | Bottle, 1 l. Nipple: 3 mm |
| 1 | Bottle, 1 l. Nipple: 5 mm |
| 1 | Bottle label |
| 1 | Container, Soap, 5 l |
| 1 | Container, Alcohol, 5 l |
| 1 | Instruction Manual set |

5.4 Power supply



ELECTRICAL HAZARD

The machine must be earthed (grounded).

Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine.

Incorrect voltage can damage the electrical circuit.



ELECTRICAL HAZARD

For electrical installations with Residual Current Circuit Breakers

For Hexamatic a residual current circuit breaker Type B, 30 mA is required (EN 50178/5.2.11.1).

For electrical installations without Residual Current Circuit Breakers

The equipment must be protected by an insulation transformer (double-wound transformer).

Contact a qualified electrician to verify the solution.

Always follow local regulations.



ELECTRICAL HAZARD

Disconnect the electrical power supply before installing electrical equipment. Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine. Incorrect voltage can damage the electrical circuit.



WARNING

In case of fire, alert bystanders, the fire brigade and cut power. Use a powder fire extinguisher. Do not use water.

Recommended power supply cable specifications

Local standards can override the recommendations for the main electrical power supply cable. If needed, contact a qualified electrician to verify which option is suitable for the local installation setup.

| Voltage/frequency: 3 x 200-240 V/50-60 Hz | |
|---|---|
| Min. fuse: 35 A | Minimum cable size at minimum fuse: 3 x AWG12/2.5 mm ² + PE |
| Max. fuse: 40 A | Minimum cable size at maximum fuse: 3 x AWG12/2.5 mm ² + PE |

| Voltage/frequency: 3 x 380-480 V/50-60 Hz | |
|---|---|
| Min. fuse: 20 A | Minimum cable size at minimum fuse: 3 x AWG14/1.5 mm ² + PE |
| Max. fuse: 40 A | Minimum cable size at maximum fuse: 3 x AWG12/2.5 mm ² + PE |

Electrical data

The other end of the cable can be fitted with an approved plug or hard-wired into the power supply according to the electrical specifications and local regulations.

| Voltage/frequency: 3 x 200-240 V/50-60 Hz | |
|---|-------------------|
| Power consumption | 200-240 V: 3.6 kW |
| Output, main motor | 200-240 V: 2.2 kW |
| Max. load | 200-240 V: 31 A |

| Voltage/frequency: 3 x 380-480 V/50-60 Hz | |
|---|----------------------------|
| Power consumption | 380-480 V/50-60 Hz: 3.5 kW |
| Output, main motor | 380-480 V/50-60 Hz: 2.2 kW |
| Max. load | 380-480 V/50-60 Hz: 17 A |

| Voltage/frequency: 3 x 360-480V/60 Hz | |
|---------------------------------------|------------------------|
| Power consumption | 360-480V/60 Hz: 3.8 kW |
| Output, main motor | 360-480V/60 Hz: 2.2 kW |
| Max. load | 360-480V/60 Hz: 16 A |

Procedure

For specifications see the section Technical data.

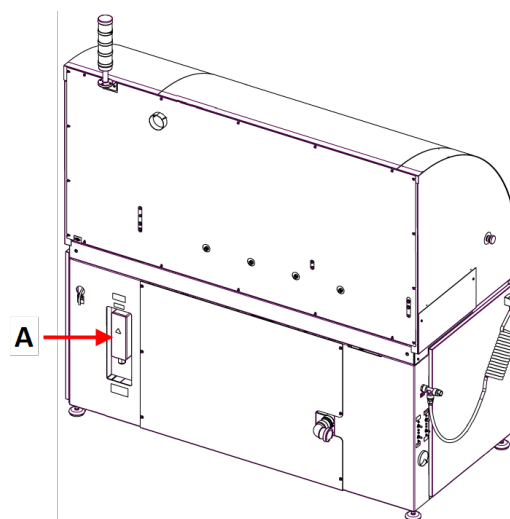
The machine is delivered without a power supply cable.

To install the electrical power supply, the following is needed:

- Electrical power supply cable, 4-lead, three phases and one earth connection

1. Connect the cable to the electrical connection box.

| | |
|----|----------------|
| PE | Earth (ground) |
| L1 | Phase |
| L2 | Phase |
| L3 | Phase |



A Electrical connection box

| EU cable | |
|----------|-------|
| L1 | Brown |
| L2 | Black |

| EU cable | |
|----------------|---------------|
| L3 | Black or Grey |
| Earth (ground) | Yellow/Green |
| Neutral | Blue |


| UL cable | |
|----------------|-------------------------|
| L1 | Black |
| L2 | Red |
| L3 | Orange/Turquoise |
| Earth (ground) | Green (or Yellow/Green) |
| Neutral | White |

The other end of the cable can be fitted with an approved plug or hard-wired into the power supply according to the electrical specifications and local regulations.

External short circuit protection

The machine must always be protected with external fuses. See the electrical table for details on the fuse size required.

Residual Current Circuit Breaker (RCCB)




Note
Local standards can override the recommendations for the main electrical power supply cable. If needed, contact a qualified electrician to verify which option is suitable for the local installation setup.

| Requirements for electrical installations | |
|--|--|
| With Residual Current Circuit Breakers (RCCB) | Type B, 30 mA (EN 50178/5.2.11.1) |
| Without Residual Current Circuit Breaker | The equipment must be protected by an insulation transformer (double-wound transformer). |

5.5 Noise

For information on the sound pressure level value, see this section: [Noise and vibration levels](#) ▶ 142



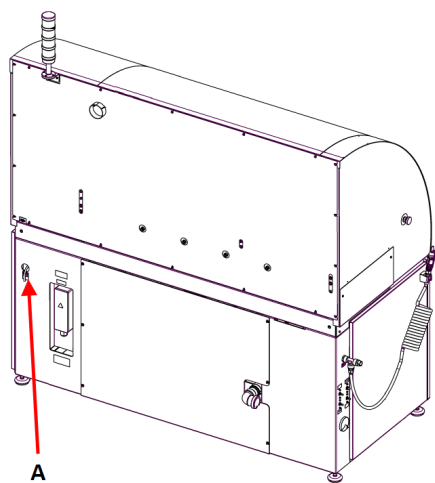
CAUTION
Prolonged exposure to loud noises may cause permanent damage to a person’s hearing. Use hearing protection if the exposure to noise exceeds the levels set by local regulations.

5.6 Vibration

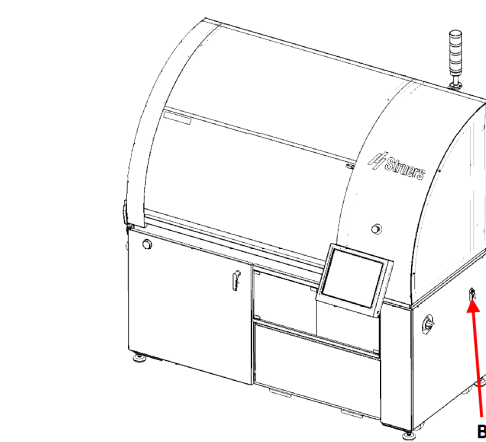
For information on the total vibration exposure to hand and arm, see this section: [Noise and vibration levels](#) ► 142.

5.7 Compressed air supply

| Specifications | |
|--------------------------|---|
| Pressure | Min. 6 bar (90 psi) |
| Air consumption, approx. | Min. 200 l/min (53 gpm) at atmospheric pressure |
| Air quality | Class-3, as specified in ISO 8573-1 |



A Compressed air inlet



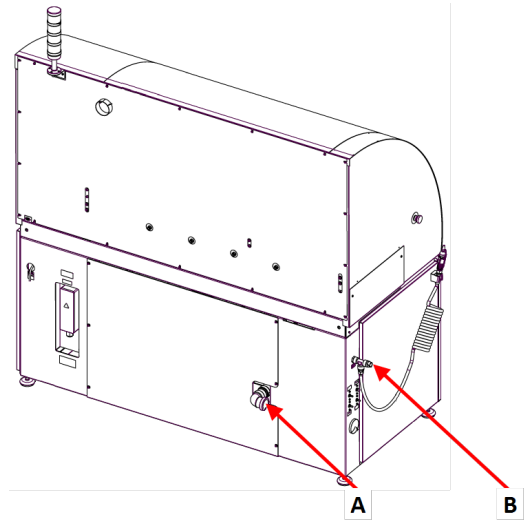
B Air inlet valve

Procedure

1. Connect the compressed air hose to the compressed air inlet on the machine.
2. Connect the air hose to the compressed air supply.
3. Secure the connections with hose clamps.

5.8 Connecting to the water supply

- A** Water outlet
- B** Water inlet



Water inlet



Note

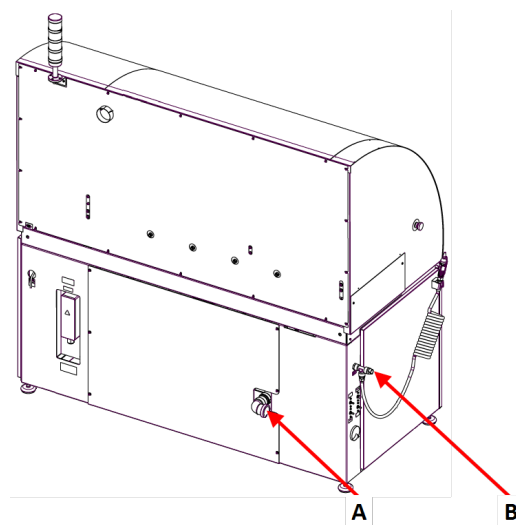
New water pipe installations:
 Leave the water to run for a few minutes to flush any debris from the pipe before connecting the machine to the water supply.

The machine is supplied with a standard hose to connect the machine to the water supply.

| Water supply - Specifications | |
|-------------------------------|---|
| Water pressure | 2 - 9.9 bar (29 - 143 psi) |
| Water flow | Min. 800 l/h (211.5 gph) |
| Hose supplied | Diameter: 3/4". Length: 1.5 m (59"). With standard connector and 90° bend. |
| Tube connection | 3/4" British Standard pipe thread. |

5.9 Connecting to the waste water outlet

- A** Water outlet
- B** Water inlet



Procedure

1. Connect a standard HT water outlet pipe or hose (Diameter: 50 mm) to the water outlet on the back of the machine.

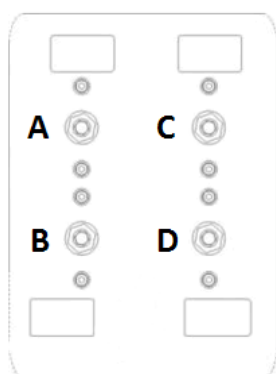
5.10 Adjusting the water flow

The water flow regulators on the machine are adjusted during installation.

The flow regulators are located on the front and the left side of the machine.

If needed, adjust the water flow regulators.

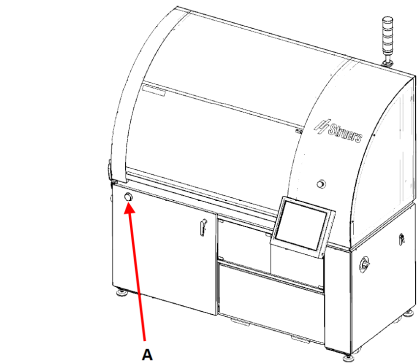
Water flow regulators



- A** Water inlet for disc cooling
- B** Flushing water for polishing disc
- C** Ultrasonic water
- D** OP flush water

Adjusting the water flow for the diamond grinding disc or grinding stone

A Water regulator for grinding stone.



1. Loosen the locknut.
2. Turn the regulator screw to adjust the amount of water applied directly onto the grinding stone.
3. Tighten the locknut.



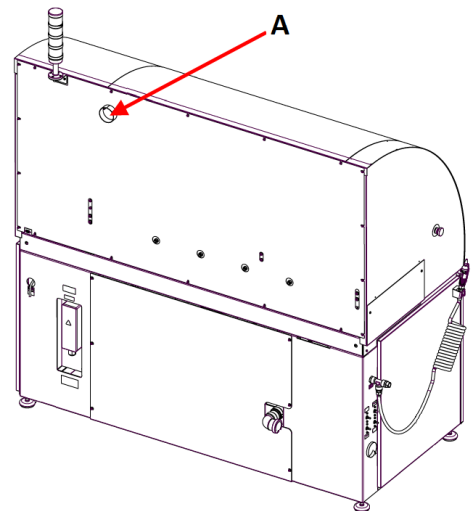
5.11 Connecting to an exhaust system (option)

Specifications

Minimum capacity: 150 m³/h (5297 ft³/h) at 0 mm (0") water gauge.

An exhaust system is required when working with alcohol-based suspensions or lubricants.

A Exhaust



Struers recommends that the machine is connected to an exhaust system.

1. Connect a 52 mm pipe to the exhaust outlet on the machine.
2. Connect the other end of the pipe to the exhaust system.

5.12 Connecting the recirculation unit

To ensure optimal cooling, mount a recirculation unit on the machine.



ELECTRICAL HAZARD

The pump of the recirculation cooling unit must be earthed (grounded). Make sure that the electrical power supply voltage corresponds to the voltage stated on the type plate of the pump. Incorrect voltage can damage the electrical circuit.



CAUTION

The pressure of the cooling fluid supplied to the machine must be max. 2 bar.

The Struers recirculation unit includes

- a recirculation pump
- a recirculation tank
- a filter bag
- a disposable tank liner
- a GEKA coupling for connection to the machine hose

Consumables

- Struers recommends adding a Struers anti-corrosion additive to the cooling water.
- The use of Struers consumables is recommended.

Other products may contain aggressive solvents, which dissolve e.g. rubber seals. The warranty may not cover damaged machine parts (e.g. seals and tubes), where the damage can be directly related to the use of consumables not supplied by Struers.

Filling the recirculation tank

1. Before you fill the tank, make sure that there is room under the machine for the recirculation unit to slide in easily. If this is not the case, use the adjustable feet to adjust the height of the machine.
2. Make sure that the recirculation unit is placed correctly under the machine:
 - The wheels of the unit must be in line with the sides of the compartment so that you can move the unit into position without having to wiggle it from side to side.
 - The pump must be placed on the left hand side and close to the rear end of the recirculation unit.



Note

To prevent corrosion, Struers recommends using a Struers additive in the cooling water. For more information, see the additive container.

3. Line the tank with a clean tank liner.



CAUTION

The recirculation tank is very heavy when it is full.



Note

Do not overfill the tank.

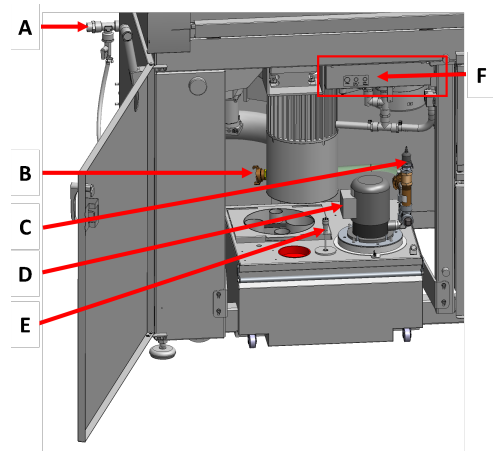
Avoid spilling when you move the tank.

4. Fill up the tank with cooling fluid. Make sure that the water/additive ratio is correct.

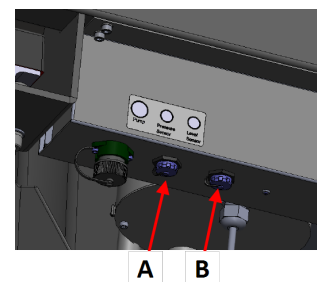
Connecting the unit to the machine

1. Connect the water inlet hose to the quick coupling on the recirculation pump.

- A** Water inlet hose - to machine
- B** Recirculation pump
- C** Quick coupling - on pump
- D** Pressure sensor
- E** Level sensor
- F** Connectors



2. Insert the water outlet hose from the machine into the large hole of the filter unit. If needed, shorten the hose.
3. Connect the cable from the recirculation pump to the electrical power socket of the recirculation unit inside the compartment.
4. Connect the pressure sensor and the level sensor.
5. Make sure that the direction of the flow is as stated with an arrow on the pump. If the direction is incorrect, switch two of the phases:
 - EU cable: switch two of the phases.
 - UL cable: switch phases L1 and L2.



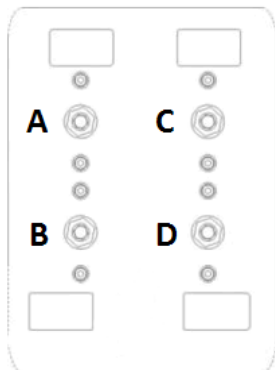
6. Push the unit into place in the compartment under the machine.

5.13 Adjusting disc cooling and OP-flushing

You can set the level of disc cooling and flushing time in the software

If needed, adjust the rate of disc cooling.

Water flow regulators



- A** Water inlet for disc cooling
- B** Flushing water for polishing disc
- C** Ultrasonic water
- D** OP flush water

1. Loosen the locknut.
2. Turn the regulator screw to adjust the amount of water applied directly onto the grinding stone.
3. Tighten the locknut.



Hint
 If needed, use the throttle valves to adjust the maximum water flow for disc cooling and flushing after OP.
 The level of disc cooling and flushing time is set in the software. See [Options](#)
 ▶ 69.

5.14 The dosing pump units

You can configure up to 6 pumps:

Pump 1

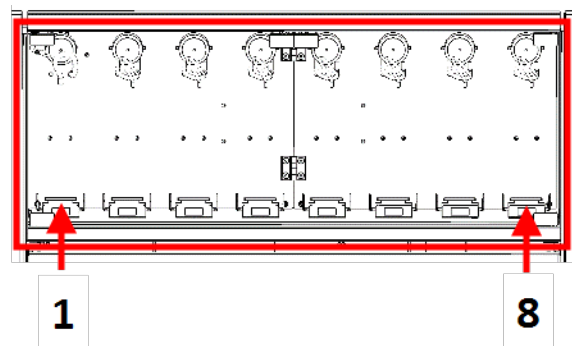
OP polishing

Pumps 2-7

DP Diamond polishing and lubricant

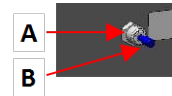
Pump 8

Soap for Ultrasonic cleaning



OP pumps

1. Push the connector disc inwards and remove the bottle plug from the OP flush water connector.
2. Lead the short tube from the OP pump, press the connector disc inwards and insert the tube into the connector.



5.14.1 Placing bottles in the dosing unit

1. Exchange the bottle cap with the cap supplied with the DP/OP pump unit.
2. Place the bottles in the bottle units and connect the tubes to the nipples on top of the caps.
 - DP-pump: Connect the long piece of tube (attached to the y-connector) to the connector on the bottle cap.
 - OP-pump: Connect the long piece of tube to the connector on the bottle cap.
3. Enter the bottle details in the **Bottle configuration** menu to make them available for preparation methods.



Hint

If needed, you can extend the tubes and lead them through the holes in the bottle unit to reach larger containers placed on the floor.

6 Operating the device



WARNING Risk of injury

If power is interrupted during operation, the main hood lock opens instantly. Do not open the main hood before all movement has stopped.



CAUTION

Do not use the machine with non-compatible accessories or consumables.

6.1 Preparation methods

You can edit and save preparation methods from the **Methods** screen.

All methods are saved in these main folders:

- **Struers Methods**

These methods are pre-installed. They cannot be changed or deleted. This is indicated by a locked padlock icon.

You can save these methods under a name of your choice, and adjust them to suit your requirements.

- **User Methods**

This folder is initially empty but is populated when you create new methods. If needed, before you start creating new methods, create relevant subfolders for easy identification of the methods.

6.1.1 Creating a folder

1. From the **Main menu** select **Preparation**.
2. From the **Preparation** menu, select **Methods**.
3. Select the top-level folder where you wish to create a new subfolder.
4. Activate the dashboard and select **Create folder**.
5. Select **Rename** to rename the new folder. See [Changing settings and text](#) ► 20.



6.1.2 Creating a method

1. From the **Main menu** select **Preparation**.
2. From the **Preparation** menu, select **Methods**.
3. Select the folder where you wish to create a method
4. If needed, select **Create** to create a new method.
5. Select **Rename** to rename the new method.



6.1.3 Copying a method

1. From the **Main menu** select **Preparation**.
2. From the **Preparation** menu, select **Methods**.
3. Select the folder where the method you wish to copy is located.



4. If needed, select **Copy** to copy a new method.
5. Select the folder where the method you wish to place the new method.
6. Select **Paste** to paste the new method in the folder.
7. Select **Rename** to rename the new method. See [Changing settings and text](#) ► 20.



6.1.4 Setting up a method

Note
All changes to preparation methods are saved automatically.

1. From the **Main menu** select **Preparation**.
2. From the **Preparation** menu, select **Methods**.
3. Select the folder where the method you wish to set up is located.
4. Select the method you wish to set up.
5. Select **Create** to add steps to the method.
6. Select the first step you wish to add to the method, e.g. **Create plane grinding step**.



Possible selections:

- **Create plane grinding step**
- **Create fine grinding step**
- **Create polishing step**
- **Create cleaning step**



Hint

- When you have added a step, red text on the left-hand side of the step indicates that this step has not been defined completely.
- Text at the bottom of the screen indicates the settings that must be defined.
- Settings that do not apply to the step you have selected are disabled.

**Hint**

You cannot leave a method before you have completed the required steps.

7. Select the field below the **Surface** icon.
8. Select either **Struers Surfaces** or **User Surfaces**.
The screen shows the available plane grinding consumables.
9. Select the disc you wish to use in this step.
10. Adjust the setting for **Force**.
11. In the **Time/Removal** field, select **Time** or **Removal**.
 - If you have selected **Time**, set the grinding time.
 - If you have selected **Removal**, set a removal value.
12. If needed, set the **Dresser Removal** value for this step.
13. When you have defined all the necessary settings for this step, the red text on the left-hand side of the step is not longer shown.
14. Add as many steps as required.
15. Insert cleaning steps between the preparation steps to prevent contamination from a coarse preparation step to a finer preparation step. See [Add cleaning steps to a method](#) ► 49.



6.1.5 Add cleaning steps to a method

**Note**

All changes to preparation methods are saved automatically.

1. From the **Main menu** select **Preparation**.
2. From the **Preparation** menu, select **Methods**.
3. Select the folder where the method you wish to set up is located.
4. Select the method you wish to set up.
5. Select **Create** to add steps to the method.
6. Select **Create cleaning step**.
7. Select the field below the **Cleaning Programs** icon.



8. Select either **Struers Cleaning Programs** or **User Cleaning Programs**.



The screen shows the available cleaning programs.

9. Select the cleaning program you wish to use.



The individual cleaning steps are shown.

6.1.6 Creating fine grinding or polishing steps



Note

All changes to preparation methods are saved automatically.

1. From the **Main menu** select **Preparation**.
2. From the **Preparation** menu, select **Methods**.
3. Select the folder where the method you wish to set up is located.
4. Select the method you wish to set up.
5. Select **Create** to add steps to the method.
6. Select **Create fine grinding step** or **Create polishing step**.
7. Adjust the settings as needed.
8. If needed, add and adjust more steps.



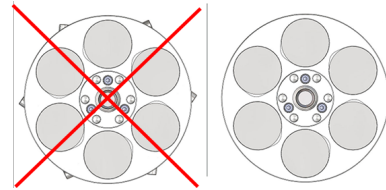
6.2 The specimen holder/specimen mover plate



Note

If you are using a specimen holder, make sure that the screws used for clamping the specimens do not protrude from the specimen holder.

If the clamping screws protrude from the specimen holder, the specimen holder will not be leveled correctly in the pick-up cup and cannot be picked up.

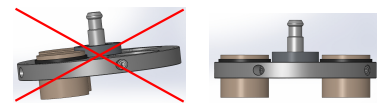


Note

If you are using a specimen mover plate for individual specimens, make sure that the specimen mover plate is balanced.

This means that you must place a minimum of 2 specimens in the specimen mover plate.

If the specimen mover plate is not balanced, it can tilt during transportation or pick-up which can lead to machine damage or failure to pick up the specimen mover plate.



6.3 The preparation process

The **Preparation** screen is used for the daily preparation work.

Activating preparation functions

1. From the **Main menu** select **Preparation**.
2. From the **Preparation** menu, select **Process**.



The white position indicator changes to yellow to indicate that a specimen holder or specimen mover plate has been inserted.



The text **No method** is shown to indicate that no preparation method has been selected yet.

3. Select **No method** to open the **Methods** screen for selecting the preparation method.

The three preparation methods most recently used are shown in the top left area of the screen.



4. Select a preparation method:
 - Select from the top left area of the screen.



or

- Select by expanding the folders **Struers Methods** or **User Methods**.



When you highlight a preparation method, the main settings are shown in the **Summary** box on the right side of the screen.

5. When you have highlighted the preparation method you wish to select, select the **OK** button.

The method is linked to the specimen holder or specimen mover plate.

The screen returns to the **Process** screen.

6.3.1 Consumables

1. From the **Main menu** select **Preparation**.



2. From the **Preparation** menu, select **Process**.



3. Select the **Methods** screen to select a preparation method.

When you have selected a preparation method, all consumables are checked and compared to the consumables required by the method.



If a consumable is missing, the **Consumables Issues** box is shown with a description of the issues to be solved.

4. From the **Consumables Issues** box, access the relevant screen for changing the settings.
5. Change the settings, as needed.

When you have changed the settings, you can start the preparation process.

6. If any issues remain to be solved, select the **Consumables Issues** button to access the **Consumables Issues** box.

6.3.2 Changing from Single to Holder

1. From the **Main menu** select **Preparation**.



2. From the **Preparation** menu, select **Process**.



3. Select the conveyor position icon.

4. Select a conveyor position.

A window for selecting the method is shown.

5. Select a preparation method.

6. Confirm your selection.

One holder with the selected preparation method is shown.

As default, all inserted specimen holders or specimen mover plates are set to **Single**. This means that individual specimens are prepared using a specimen mover plate.

7. If you wish to change to **Holder**, tap **Single** so that it toggles to **Holder**.



6.3.3 Starting the preparation process



CAUTION

Wear suitable gloves to protect fingers from abrasives and warm/sharp specimens.

When you have prepared the specimens and set up the method you wish to use, check the **Summary** box on the right-hand side of the screen.

The **Summary** box shows information about the selected position.

Before you start the preparation process, a list of the different preparation steps is shown.

When the method is running, the progress of the preparation is shown with the time counting down to 0.

If a consumable is shown in blue, this indicates that the consumable is not present on the machine and must be inserted and configured before you can start the preparation process.

1. To start the preparation process, select **Start**.

The machine stops automatically when the process is completed.



7 Configuration

From the **Configuration** screen you can select screens for editing the configuration of consumables such as disc, surface, cloth, lubricants, suspensions, cleaning programs, dressing of the grinding stone and various options.

1. From the **Main menu** select **Configuration**.

2. From the **Configuration** menu, select:

– **Consumables**

– See [Consumables](#) ► 54.



- **Cleaning Programs**
- See [Cleaning Programs ▶ 64](#).
- **Configure Preparation**
- See [Configure Preparation ▶ 65](#).
- **Configure Dressing**
- See [Configure Dressing ▶ 67](#)
- **Options**
- See [Options ▶ 69](#).



7.1 Consumables

From the **Consumables** screen you can select screens for editing the configuration of consumables.

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** screen, select **Consumables**.



From the **Consumables** screen you can select the following:

- **Surfaces**
Grinding surface or polishing cloth: See [Surfaces ▶ 54](#).
- **Suspensions and Lubricants**
Suspensions and lubricants: See [Suspensions and lubricants ▶ 56](#).
- **Grinding disc**
Grinding disc: See [Grinding stone/Diamond grinding disc ▶ 57](#).
- **Surface Lifetime**
The lifetime of the various MD consumables used for preparation: See [Surface lifetime ▶ 58](#).
- **User defined consumables**
User defined surfaces, suspensions and lubricants: See [User defined consumables ▶ 59](#).



7.1.1 Surfaces

The MD consumables are placed on shelves in the elevator.

Before you can start a preparation process, you must place the correct MD surface consumables on the correct shelves, and then set them up in the software.

You can change the grinding surface or polishing cloth on one of the stations.

Procedure

1. Close the main hood.
2. From the **Main menu** select **Configuration**.



- From the **Configuration** menu, select **Consumables**.



- Select **Surfaces**.

The elevator moves into the loading position.

The padlock symbols on the shelves disappear.



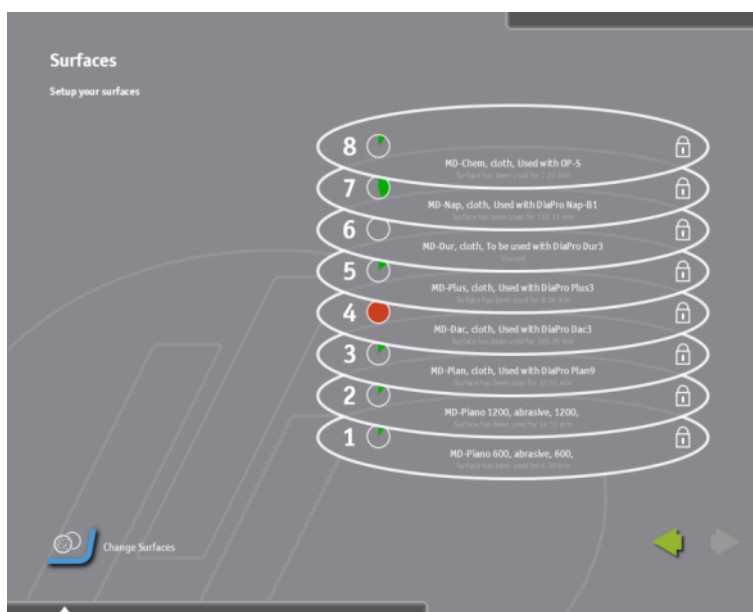
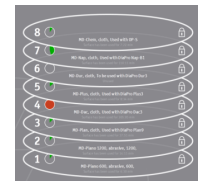
- Open the main hood.

- Place the MD consumable as indicated on each shelf of the elevator.

- Tap the **Change Surfaces** button in the lower left corner of the screen.

The machine moves the arm and surface elevator into the correct position for changing consumable surfaces.

The ellipses on the screen are enabled.



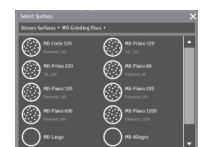
- To change the preparation surface that has been allocated to a certain position in the elevator, tap the text in the ellipse .

The surface selection window is shown.

- Select either **Struers Surfaces** or **User Surfaces**.

- Select the consumable name corresponding to the surface you wish to change.

Make sure that the surface you define in the software corresponds to the surface placed on the elevator shelf.



- Tap the desired preparation surface to return to the **Surfaces** screen. The selected preparation surface is shown.

- When you have inserted and set the MD consumables , close the main hood.

When you have closed the main hood, the elevator moves down and the shelves are locked.



13. Tap the arrow to continue. This will take you to the **Consumables** screen.



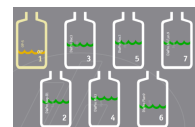
7.1.2 Suspensions and lubricants

Before you can start a preparation process, you must fill suspensions and lubricants into the dosage bottles, place them on the shelf for dosage bottles, and set them up in the software.

Procedure

Before you carry out this procedure, you must have carried out the procedure described in [Surfaces](#) ► 22.

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** menu, select **Consumables**.
3. Select **Suspensions and Lubricants**.
4. In the **Suspensions and Lubricants** screen, specify the contents of each bottle. To do so, select the specific bottle on the screen.
5. Select the correct suspension or lubricant.



When a bottle has been defined in the system and placed on the shelf, it is weighed, and the approximate level of liquid is shown on the screen as a wave line.

6. Tap the arrow to continue. This will take you to the **Consumables** screen.



- **None**
No bottles have been defined in the system. No bottles have been placed on the shelf.
- **Yellow triangle**
The bottle has been defined, but has not been placed on the shelf.



- **Yellow triangle/Red wave line**

The bottle has been not been defined, but has been placed on the shelf.



7.1.3 Grinding stone/Diamond grinding disc

Selecting the grinding stone or diamond grinding disc

1. Close the main hood.
2. From the **Main menu** select **Configuration**.
3. From the **Configuration** menu, select **Consumables**.
4. Select **Grinding disc**.
5. In the **Grinding disc - Configure your grinding disc** screen, tap the grinding disc to select the desired grinding stone or diamond grinding disc.
6. Select **Struers Surfaces** or **User Surfaces**.
7. Select **OK** to confirm that you wish to change or insert a new grinding stone or diamond grinding disc.

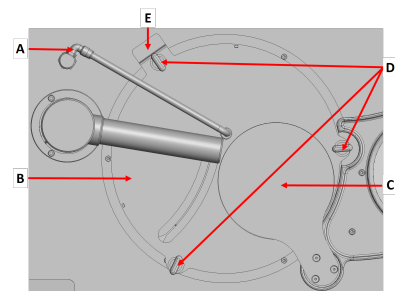


The dresser moves up and to the side.

The lid over the stone opening moves away.

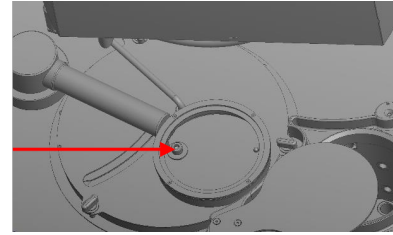
Mounting the grinding stone or diamond grinding disc

1. Open the main hood.
2. Move the water tube on the plane grinding station into an upright position.
3. Unscrew the three finger nuts.
4. Remove the cover over the grinding stone.



- A** Water tube
- B** Cover
- C** Lid
- D** Finger nut
- E** Safety switch

5. Use the 8 mm Allen key to remove the screw and washer.
6. Remove the grinding disc.
7. Clean the grinding station with clean water from the cleaning hose.
8. Place the grinding stone or diamond grinding disc on the driving plate.
9. Make sure that the two pins from the driving plate engage in the two holes at the bottom of the grinding stone or diamond grinding disc.
10. Remount the washer and the screw and securely tighten the screw with the 8 mm Allen key.
11. Remount the cover over the grinding stone.
12. Tighten the three finger nuts gently.
13. Move the water tube down into the correct position.
14. Close the main hood.



The lid moves back to close the opening of the plane grinding station.

When you have selected a grinding stone on the screen, the dresser automatically moves to detect the top of the stone. When the top of the stone has been detected the dresser moves into its parking position.



Hint

If you select a diamond grinding disc, the dresser remains at the side of the grinding chamber because it is not used.



Hint

Struers recommends that you dress a new stone a couple of times before using it for grinding. This will ensure that it is plane and ready for use.

See [Manual dressing](#) ► 68.

15. If needed, repeat the procedure to define more surfaces.
16. Tap the arrow to continue. This will take you to the **Consumables** screen.



7.1.4 Surface lifetime

In order to see when a specific polishing cloth or grinding disc surface should be replaced, you can check the surface lifetime indicated by the system, or adjust the surface lifetime based on your experience.

Procedure

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** menu, select **Consumables**.
3. Select **Surface Lifetime**.



The **Surface Lifetime** screen shows a list of available MD surfaces.

- The **Calculated** column
A value stating for how long a specific MD surface has been used. A value is shown as soon as 3 values have been registered, i.e. you have changed the consumable 3 times. The average value is shown.
- The **Configured** column
A user-definable value, where you can set your own values based on your experience. The surfaces that have been used are shown.
 - To add other surfaces, select **Add Surface**.



4. Tap the arrow to continue. This will take you to the **Consumables** screen.

**7.1.5 User defined consumables**

You can configure your own preparation surfaces, suspensions and lubricants.

Procedure

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** menu, select **Consumables**.
3. Select **User defined consumables**.



From the **User Consumables** screen, you can access these functions:

- **User Surfaces**. See [User Surfaces ▶59](#).
- **User Suspensions**. See [You can configure your own suspensions. ▶61](#).
- **User Lubricants**. See [You can configure your own lubricants. ▶63](#).

**User Surfaces**

You can configure your own preparation surfaces, suspensions and lubricants.

Creating a user surface

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** menu, select **Consumables**.
3. Select **User defined consumables**.



From the **User Consumables** screen, select **User Surfaces**



4. If needed, select **Create** to create a new surface.
5. Select **Rename** to rename the new user surface.
6. Select **Enter**.



Setting up a user surface

1. When you have created a new user surface, select **Surface type**.
2. Select the surface type you wish to use:
 - **User defined surface**
A user defined surface can be used on the fine grinding/polishing station.

or

 - **User defined stone**
A user defined stone can only be used on the plane grinding station.



Selecting lubricant

1. When you have created a new user surface, select **Lubricant rule**.
2. Select the lubricant to be used on the user defined surface:
 - **No lubricant**
The surface is used without any lubricant, i.e. with DiaPro or DiaDuo suspension.
 - **Any lubricant but water**
You can select all lubricants except water.
 - **Only water**
Use only water with this surface.
 - **Waterfree lubricant**
Use only a water-free lubricant with this surface.
 - **Special conditions**
Not used

Selecting the abrasive surface

Depending on the selection made here, the relevant suspensions and lubricants will be displayed when a new method or preparation step is created.

1. When you have created a new user surface, select **Abrasive rule**.
2. Select the abrasive to be used:
 - **Abrasive surface**
The abrasive is contained in the surface already. No suspension is added. Water is selected automatically as lubricant.
 - **Diamond suspension**
Use only diamond suspensions with this surface.
 - **Oxide suspension**
Use only oxide polishing suspensions with this surface.
 - **Diamond or oxide suspension**
Use only diamond or oxide polishing suspension with this surface.

Selecting default speed

1. When you have created a new user surface, select **Default speed**.
2. Select the correct speed for the surface:
 - For abrasive surfaces a default speed of 300 rpm is recommended.
 - For surfaces that are used with suspensions a speed of 150 rpm is recommended.
 - Speeds from 500 – 1,500 rpm can only be used on the plane grinding position.
 - For all consumables used on position 2, select speeds between 50 and 500 rpm.

Selecting default pre-dosing

1. When you have created a new user surface, select **Default pre-dosing**.

Pre-dosing is used on surfaces that are used with diamond or oxide polishing suspensions.

Depending on the type of cloth and suspension, pre-dosing values of 2 – 5 are recommended.

Completing the setup

1. Tap the arrow to continue. This will take you to the **Consumables** screen.



User Suspensions

You can configure your own suspensions.

Procedure

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** menu, select **Consumables**.
3. Select **User defined consumables**.
4. From the **User Consumables** screen, select **User Suspensions**.
5. If needed, select **Create** to create a new suspension.
6. Select **Rename** to rename the new suspension.
7. Select **Enter**.



Selecting the abrasive type

1. When you have created a new suspension, select **Abrasive type**.
2. Select the abrasive type to be used:
 - **Diamond**
Applies to all types of diamond suspensions.
 - **Oxide**
Applies to colloidal silica, Al_2O_3 , or other oxide polishing suspensions.
 - **Diamond suspension**
Use only diamond suspensions with this surface.
 - **Oxide suspension**
Use only oxide polishing suspensions with this surface.
 - **Diamond or oxide suspension**
Use only diamond or oxide polishing suspension with this surface.

Selecting lubricant

1. When you have created a new suspension, select **Lubricant rule**.
2. Select the lubricant to be used with the suspension:
 - **No lubricant**
The suspension already contains a lubricant. No additional lubricant is added during preparation.
 - **Any lubricant but water**
Both water-free and water-based lubricants can be used together with the suspension.

- **Waterfree lubricant**
Use the suspension only be with a water-free lubricant, e.g. for the preparation of water sensitive materials.
- **Special conditions**
Not used

Completing the setup

1. Tap the arrow to continue. This will take you to the **Consumables** screen.



User Lubricants

You can configure your own lubricants.

Procedure

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** menu, select **Consumables**.
3. Select **User defined consumables**.
4. From the **User Consumables** screen, select **User Lubricants**.
5. If needed, select **Create** to create a new lubricant.
6. Select **Rename** to rename the new lubricant.
7. Select **Enter**.



Selecting the lubricant type

1. When you have created a new lubricant, select **Lubricant type**.
2. Select the lubricant type to be used:
 - **Containing water**
 - **Waterfree**

Completing the setup

1. Tap the arrow to continue. This will take you to the **Consumables** screen.



7.2 Cleaning Programs

The software contains pre-defined Struers cleaning programs which can be used for most requirements.

- You can define your own cleaning programs.
- You can use the pre-defined Struers cleaning programs as a basis and add your changes, instead of creating a new cleaning program.

See also [Cleaning chamber](#) ► 17.

Creating a cleaning program

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** screen, select **Cleaning Programs**.
3. If needed, select **Create** to create a new cleaning program.
4. Select **Rename** to rename the new cleaning program.
5. Select **Enter**.



Editing a cleaning program

You can set up a cleaning program, edit a pre-defined cleaning program, or edit a copy of a pre-defined cleaning program.

1. Select the cleaning program you wish to use.
2. Select **Create step** to create steps in the cleaning program.
You can combine a range of steps. Your selections depend on the type of material to be cleaned and the preparation step that has been carried out.
3. You can select the following steps:



- **Wait**
 - **High Pressure Water**
 - **Low Pressure Water**
 - **Soap**
 - **Alcohol**
 - **Lower Air**
 - **Upper Air**
 - **Ultrasonic**
 - **Upper and Lower Air**
4. Select the step you wish to include.
 5. Select **Time** to set the required time for this step.
 6. Select as many steps as needed.



7.3 Configure Preparation

You can adjust a number of preparation settings.

Configuring preparation settings

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** menu, select **Configure Preparation**.



| Surface Preparation | |
|--|--|
| When a new preparation surface is used, extra pre-dosing is necessary for optimum performance. | |
| Multiply predosing on a new surface | <ul style="list-style-type: none"> • To do this automatically, select Yes. |
| Multiply predosing times | <ul style="list-style-type: none"> • 1 – 10. |

| Ultrasonic Tub | |
|---|--|
| Different concentrations may be necessary depending on the type of soap used for ultrasonic cleaning. | |
| Soap concentration | <ul style="list-style-type: none"> • 0 – 5%. |
| Automatic exchange of cleaning liquid | <ul style="list-style-type: none"> • For an automatic exchange of liquid, select Yes. |
| Exchange cleaning liquid after using it | <ul style="list-style-type: none"> • 1 – 100. <p>Specifies how often the cleaning liquid should be changed.</p> |

| Drying of Holder | |
|---|--|
| Specimens can be dried after the preparation is finished and the next holder has been moved into the machine. | |
| Drying on | <ul style="list-style-type: none"> To enable drying, select Yes. |
| Drying time | <ul style="list-style-type: none"> Select a value of max. 9 minutes 50 seconds. |
| Configure Holder | |
| <p>The default setting in the Queue screen when a specimen holder or specimen mover plate is inserted in the conveyor is Single (for individual specimens in a specimen mover plate).</p> <p>You can change the default setting as needed.</p> <p><i>If only specimen holders or only specimen mover plates are to be used</i></p> <p>You need not use the option of changing between Queue or Single. In this case:</p> <ul style="list-style-type: none"> Set Enable holder type selection to No. Set Default holder type to either Holder (when specimen holders are used) or Single (when specimen mover plates are used). <p><i>If both specimen holders and specimen mover plates are to be used</i></p> <p>When both types are used, set Enable holder type selection to Yes.</p> <p>Set Default holder type to either Holder or Single, depending on which type is used most.</p> | |
| Enable holder type selection | <ul style="list-style-type: none"> Yes or No. |
| Default holder type | <ul style="list-style-type: none"> Holder or Single. <p>When a specimen mover plate for individual specimens is used, always make sure that Single is selected.</p> <p>If Single is not selected, the specimen mover plate will not be in the correct position relative to the pressure feet, and the individual specimens will not be loaded with a minimum force.</p> <p>This can result in specimens being thrown out of the specimen mover plate and damage to the specimens, the specimen mover plate and the machine.</p> <p>The machine checks for the type of specimen holder or specimen mover plate being used. If the selection is not correct, an error message is shown.</p> |
| Use most recent preparation method as default method | <ul style="list-style-type: none"> Yes or No. <p>If, for instance, you prepare a large number of identical samples, you can set the most recent method as default.</p> |

| OP Flush Time | |
|--|---|
| We recommend using at least 15 seconds of flushing to prevent tubes from becoming clogged. | |
| OP Flush Time | <ul style="list-style-type: none"> 0 – 60 seconds. <p>The default setting is 15 seconds.</p> |

7.4 Configure Dressing

You can adjust the settings for dressing the grinding stone.



Hint

The dressing settings are not available if **Diamond Grinding Disc** or **No Disc** is selected.

- From the **Main menu** select **Configuration**.
- From the **Configuration** menu, select **Configure Dressing**.



If you wish to carry out manual dressing, select **Manual dress**. See [Manual dressing ▶ 68](#).



| Dresser interval |
|---|
| <ul style="list-style-type: none"> Set a value in hours and minutes. |

| Dresser speed |
|--|
| <ul style="list-style-type: none"> Define the speed of dressing from the center to the outer edge of the grinding stone |

| Automatic dressing during process | |
|---|--|
| Grinding on the grinding stone can be carried out either for a specified time or to remove a specific amount of material. When Removal is selected, set Automatic dressing during process to Yes . | |
| The machine monitors the removal rate and dresses the stone as soon as the removal rate decreases below a certain level. | |
| Automatic dressing during process | <ul style="list-style-type: none"> Yes or No. |

| Automatic dressing after process | |
|---|--|
| When grinding is carried out for a specific time, set Automatic dressing after process to Yes to make sure that the stone is working perfectly when a new set of specimens is prepared. | |
| When longer grinding times (> 30 seconds) are selected, set Automatic dressing after process to Yes . This ensures that the grinding stone is kept sharp and efficient at all times. | |
| Automatic dressing after process | <ul style="list-style-type: none"> Yes or No. |

| Dresser sensitivity | |
|---|---|
| <ul style="list-style-type: none"> Low setting: 20 – 40% The removal rate goes quite low before the stone is dressed. Low sensitivity dressing is less frequent and can increase the preparation time. High setting: 70 – 100% The dresser is activated if the removal rate only decreases slightly. High sensitivity - the stone is dressed more often, which reduces the lifetime and increases the cost. | |
| Dresser sensitivity | <ul style="list-style-type: none"> 20 to 100%. |

| Remaining height of stone | |
|---|--|
| <ul style="list-style-type: none"> This value indicates the remaining height of the stone. | |

7.4.1 Manual dressing

Struers recommends that you dress a new stone a couple of times before using it for grinding. This will ensure that it is plane and ready for use.

Settings

| Dresser step | |
|---|--|
| <p>To obtain an active and plane grinding stone surface, make sure that the dresser steps are large enough to adequately dress the grinding stone.</p> <p>To obtain the longest possible lifetime of the grinding stone, make sure that the steps are as small as possible.</p> | |
| Dresser step | <ul style="list-style-type: none"> From 20 to 100 µm, in intervals of 10 µm.. |

| Rotate Time | |
|--------------------|---|
| Rotate Time | <p>Set the rotation time.</p> <ul style="list-style-type: none"> From 1 to 9 minutes, in steps of 1 min. |

Procedure

- From the **Main menu** select **Configuration**.
- From the **Configuration** menu, select **Configure Dressing**.
- Select **Manual dress**. The **Dressing and Stone Check** screen is shown.
- Select **Dress grinding stone** to start the dressing process.



5. Set **Rotate Time**.

When a new grinding stone has been installed, you can rotate the grinding stone for a specified period of time to make sure that the grinding stone is not damaged and is rotating correctly.

6. Select **Rotate grinding stone** to start the process.

7.5 Options

From the **Options** screen, you can select screens for setting up a range of options.

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** screen, select **Options**.



From the **Options** screen you can select the following:

- **Basic Options**
See [Basic Options](#) ▶ 69.
- **Advanced Options**
See [Advanced Options](#) ▶ 70.
- **Users**
See [Users](#) ▶ 71.
- **Beacon Options**
See [Beacon Options](#) ▶ 72.
- **About Hexamatic**
See [About Hexamatic](#) ▶ 74.



7.5.1 Basic Options

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** screen, select **Options**.



From the **Options** screen, select **Basic Options**.



Settings

Automatic logon

A specific user can be selected to be logged in automatically when the machine is started.

| |
|--|
| Password |
| <p>Define a password for accessing the user interface of the machine.</p> <p>This function should not be used if several users with different access levels are using the machine frequently.</p> <p>When automatic log-on is used, the user must enter the password associated with this user. To do so, create a password for this user's profile.</p> <ul style="list-style-type: none"> • Use the keyboard to enter a password. |

| |
|---|
| Audio feedback |
| <p>Enable or disable audio feed-back when you activate keys on the touch screen.</p> <ul style="list-style-type: none"> • Yes or No. |

| |
|---|
| Show startup wizard |
| <p>If needed, select Yes to show the start-up wizard.</p> <ul style="list-style-type: none"> • Yes or No. |

7.5.2 Advanced Options

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** screen, select **Options**.



From the **Options** screen, select **Advanced Options**.



Settings

| |
|--------------------------------------|
| Language |
| Select the language you wish to use. |

| |
|--|
| Units |
| Select the type of unit you wish to use. |

| | |
|---|--|
| Backup | |
| Define the backup requirements: | |
| Backup if previous backup is older than - days/hours | <ul style="list-style-type: none"> • Set the backup interval. |

Save back-ups to USB drive

- Select **Save back-ups to USB drive** to save backups to a USB drive. The USB ports are located under the monitor.

**Restore backed-up configuration and data**

- Select **Restore backed-up configuration and data** to restore backed up configuration and data from a USB drive.

**Back-up now**

- Select **Back-up now** to make a backup.



| Change Date/Time |
|---------------------------------|
| Set the date and time settings. |

7.5.3 Users

In the **Users** screen you can create, rename, and delete users, and set up user profiles.

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** screen, select **Options**.



From the **Options** screen, select **Users**.



3. If needed, select **Create** to create a new user.
4. Select **Rename User** to rename the new user.
5. Select **Enter**.



6. Specify the group to which the new user should belong:
 - Select **Group**.
 - Select **User** or **Admin**.



| User rights | User | Admin |
|--|------|-------|
| View methods | X | X |
| Create/edit/delete user methods | | X |
| Create/edit/delete cleaning programs | | X |
| Create/edit/delete user consumables | | X |
| Create/edit/delete users of type User or Admin | | X |
| Export methods | X | X |
| Import methods | | X |
| Import consumables table | | X |
| Print methods/cleaning programs/processed holders | X | X |
| Add holders to queue | X | X |
| Run queue | X | X |
| Set up consumables (lubrications,suspensions,surfaces) | X | X |
| Change basic and advanced options | | X |

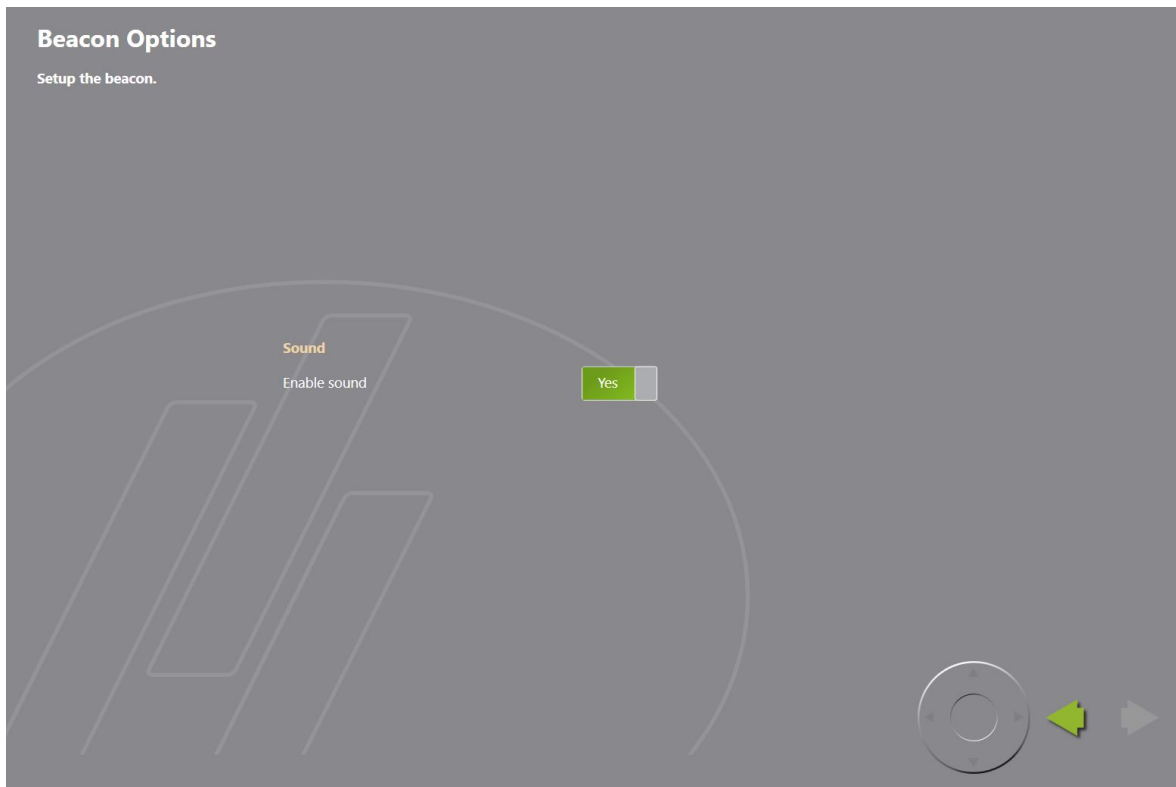
7. Select **Password**.
8. Enter the password for the new user.
9. Select **Retype password**.
10. Retype the password.

7.5.4 Beacon Options

1. From the **Main menu** select **Configuration**.
2. From the **Configuration** screen, select **Options**.

From the **Options** screen, select **Beacon Options**.





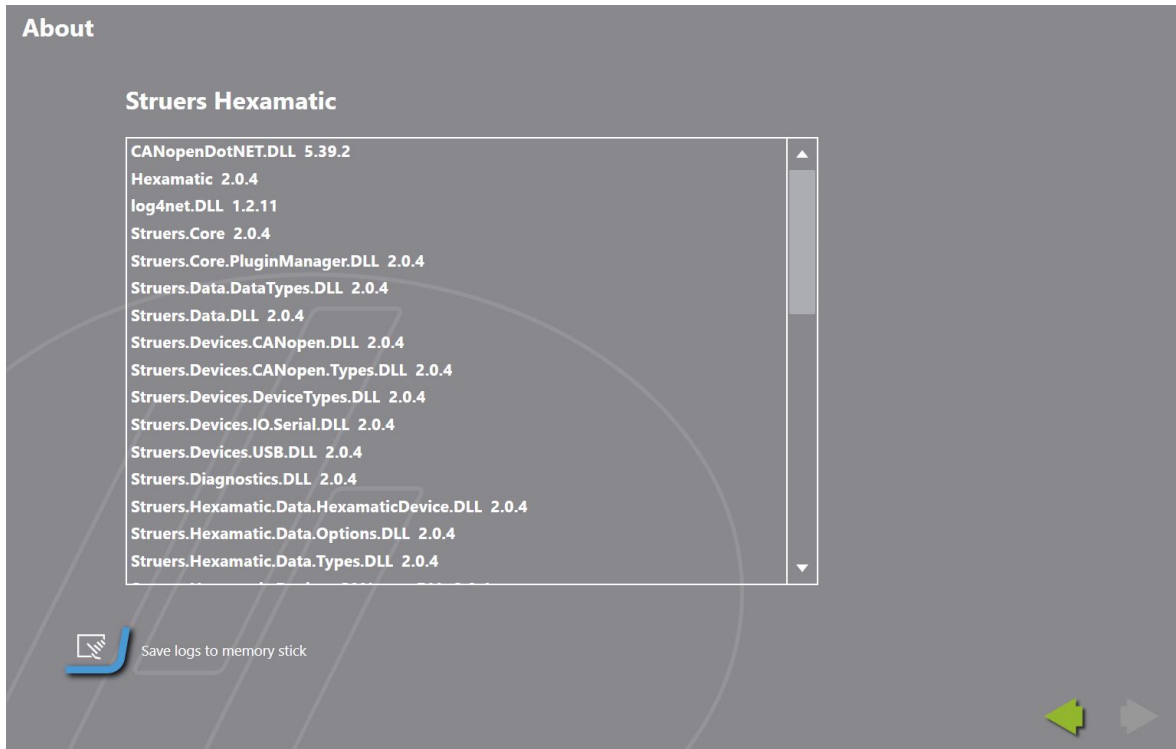
Beacon signals

The beacon mounted on top of the machine indicates the current status of the machine.

To enable or disable the sound, tap **Yes** or **No** in the toggle box next to **Enable sound**.

- To view information about the cause of the beacon sound, tap the pop-up message to confirm that you have seen the message.

7.5.5 About Hexamatic



1. From the **Main** menu select **Configuration**.
2. From the **Configuration** screen, select **Options**.



From the **Options** screen, select **About Hexamatic**.



A log is shown.

You can save the log on a USB stick.

3. Insert a USB stick in the USB port under the monitor.
4. Select **Save logs**.

The screen is greyed-out while the logs are saved on the USB stick.

The log files are in .txt format.

8 Maintenance and service - Hexamatic

Proper maintenance is required to achieve the maximum up-time and operating lifetime of the machine. Maintenance is important in ensuring continued safe operation of your machine.

The maintenance procedures described in this section must be carried out by skilled or trained personnel.

Maintenance tasks

For instructions on how to carry out maintenance, see the following sections:

- [Daily ▶ 80](#)
- [Every two days ▶ 82](#)
- [Ultrasonic cleaning station ▶ 85](#)
- [Monthly ▶ 87](#)
- [Annually ▶ 89](#)

Maintenance with help from the software

From the **Maintenance** screen you can access functions for carrying out a number of maintenance tasks.

From the **Main menu** screen select **Maintenance**.

- See [Dressing and Stone Check ▶ 75](#).
- See [Cleaning of tubes ▶ 76](#).
- See [Soap/Alcohol ▶ 77](#).
- See [Ultrasonic Cleaning ▶ 78](#).
- See [Cleaning the machine ▶ 78](#).
- See [Import Struers Consumables Table ▶ 79](#).



Safety Related Parts of the Control System (SRP/CS)

For specific safety related parts, see the section "Safety Related Parts of the Control System (SRP/CS)" in the section "Technical data" in this manual.

Technical questions and spare parts

If you have technical questions or when you order spare parts, state serial number and voltage/frequency. The serial number and the voltage are stated on the type plate of the machine.

8.1 Dressing and Stone Check

From the **Dressing and Stone Check** screen you can dress the stone even when no grinding operation is going on or no specimen holder is currently prepared.

1. From the **Main menu** select the **Maintenance** screen.
2. From the **Maintenance** screen, select **Dressing and Stone Check**. The **Dressing and Stone Check** screen is shown.



Dressing the grinding stone

1. Set **Dresser step**: 20 to 100 μm .
If you set **Dresser step** at a value higher than 50 μm , the stone will be dressed twice, removing half the specified amount every time.
2. Select **Dress grinding stone** to start the dressing process.
3. If needed, repeat the dressing operation until the noise created during dressing is uniform across the entire stone surface.

Rotating the grinding stone

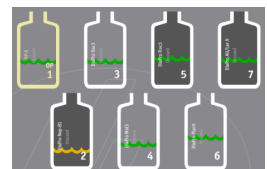
When a new grinding stone has been installed, you can rotate the grinding stone for a specified period of time to make sure that the grinding stone is not damaged and is rotating correctly.

1. Set **Rotate Time**: 20 to 100 minutes.
2. Select **Rotate grinding stone** to start the process.
3. Make sure that the grinding stone is even and running smoothly.

8.2 Cleaning of tubes

If you have changed the type of liquid, or if the machine is not going to be used for a period of time, you can select functions to clean one or all tubes from the bottles to the dosing nozzles.

1. Close the main hood.
The preparation head will move to the cleaning station so that the water used for cleaning runs into the drain.
2. From the **Main menu** select the **Maintenance** screen.
3. From the **Maintenance** screen, select **Cleaning of tubes**.
4. To clean specific tubes, e.g. to change from one suspension to another, select the bottle where the connected tube is to be cleaned.
5. Select **Clean selected tubes** to start the process.



6. The following message is shown:

The Hexamatic has determined that you have inserted suspensions or lubricants as shown below. Please specify the types.

7. Follow the on-screen instructions.

- **Cleaning of tubes has started.**

Fluids are being pumped back into the bottles.

- **The selected tubes are empty. Disconnect the tubes from the bottles and place the tubes in a container filled with water.**

Touch Next to continue.

- **Cleaning of tubes has started.**

Pumps are being cleaned by water.

- **Cleaning of tubes is finished.**

Remove the tubes from the container and connect them back to the bottles.

Touch Done to continue.

8.3 Soap/Alcohol

In the **Soap/Alcohol** screen you can monitor the level of liquid in the bottles for the second cleaning station.

Status

- **Green wave line**
The content level is sufficient.
- **Yellow wave line**
Refill the bottle as soon as possible.
- **Red wave line**
The bottle is empty. Dosing is not possible.



Filling the consumables bottles

To fill the soap and alcohol bottles, see [Soap and alcohol ► 24](#).

8.4 Ultrasonic Cleaning

In the **Ultrasonic Cleaning** screen, you can see the level of fluid in the soap bottle that is placed in position 8 in the bottle compartment.

You can empty, fill or change the ultrasonic bath.

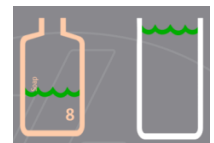
1. From the **Main menu** select the **Maintenance** screen.



2. From the **Maintenance** screen, select **Ultrasonic Cleaning**.



The level of the soap bottle and the level of the ultrasonic bath are shown.



Emptying the ultrasonic bath

1. Select **Empty**.

The valve at the bottom of the ultrasonic bath opens.

The cleaning liquid drains away.

You can now fill the bottle or exchange it with another full bottle.



Filling the ultrasonic bath

1. When the bottle has been emptied, select **Fill** to refill the ultrasonic bath.



Emptying and refilling the ultrasonic bath

1. To refill the ultrasonic bath in one process, select **Exchange**.



8.5 Cleaning the machine

The machine is equipped with an automatic function for accessing all positions for cleaning.

1. From the **Main menu** select the **Maintenance** screen.



2. From the **Maintenance** screen, select **Clean the Hexamatic**.



3. Close the main hood.



4. Select **Start Cleaning**.



- The grinding stone cover moves aside.
 - The ultrasonic cleaning chamber is emptied.
 - The center part of the MD disc moves upwards.
 - The elevator with the MD consumables moves to its top position.
 - The specimen mover head moves over the cleaning stations.
 - The pressure feet for individual specimens move downwards.
5. Clean the various positions. See [Daily ▶ 80](#)
 6. Close the main hood when cleaning is complete.

8.6 Import Struers Consumables Table

When Struers supplies new consumables, the database file (the Struers Consumables Table), is updated. The most recent consumables table can be obtained from Struers.

1. From the **Main menu** select the **Maintenance** screen. 
2. From the **Maintenance** screen, select **Import Struers Consumables Table**. 
3. Unzip and copy the consumables table onto a USB stick.
4. Insert the USB stick in the USB port under the touch screen.
5. Select the folder containing the Struers Consumables Table.
6. Select the **Struers Consumables Table** file.
7. Select **Yes** to import the file.
8. When the message **Importing consumables done.** is shown, select **OK**.

8.7 General cleaning

To ensure a longer lifetime for your machine, Struers strongly recommends regular cleaning.



Note

Do not use a dry cloth as the surfaces are not scratch resistant.



Note

Do not use acetone, benzol or similar solvents.

If the machine is not to be used for a longer period of time

- Clean the machine and all accessories thoroughly.

8.8 Daily

Preparing the machine for cleaning

1. From the **Main menu** select the **Maintenance** screen.
2. From the **Maintenance** screen, select **Clean the Hexamatic**.
3. Close the main hood.



Cleaning the machine

4. Select **Start Cleaning**. See [Cleaning the machine](#) ▶ 78
5. Clean the various positions.
6. Clean all accessible surfaces with a soft, damp cloth.



Completing the cleaning process

7. Close the main hood when cleaning is complete.

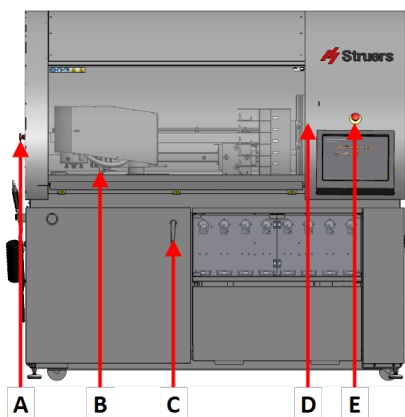
8.8.1 Daily - Safety parts



WARNING

If there are visible signs of deterioration or damage to the main hood, it must be replaced immediately.
Contact Struers Service.

- Inspect the main hood for signs of wear or damage (e.g. dents, cracks, damage to edge sealing).
- Make sure that the interlock locks are functioning correctly.



- A** Emergency stop
- B** Grinding stone cover switch, mounted under the cover
- C** Recirculation unit, panel switch
- D** Main hood safety switch, behind partition
- E** Emergency stop

8.8.2 Daily - MD surfaces

MD surfaces

Check the MD surfaces every day to make sure that they are clean and undamaged:



1. Open the main hood and check each MD surface.
2. Replace damaged MD surfaces. Select the replaced surface to reset the usage counter in the software.
3. Clean the MD MD surfaces:
 - Carefully brush the surface with a clean, soft nail brush under lukewarm running water.
 - Rinse the surface with distilled water.
 - Dry the surface.
 - Place the surface in the correct position in the elevator.
4. Close the main hood. The elevator moves into its parked position.

8.8.3 Daily - MD-Disc

MD-Disc

1. Clean the MD-Disc with a damp cloth.

8.8.4 Daily - OP tubes

1. From the **Main menu** select the **Maintenance** screen. 
2. From the **Maintenance** screen, select **Cleaning of tubes**. 
3. Select the OP bottle to be cleaned.
4. Follow the on-screen instructions.
 - **Disconnect the tubes from the bottles and place the tubes in a container filled with water.**
Touch Next to continue.
 - **Cleaning of tubes has started.**
Pumps are being cleaned by water.
 - **Cleaning of tubes is finished.**
Touch Done to continue.
5. If needed, refill the bottle before you reinsert it.

8.8.5 Ultrasonic cleaning station

1. From the **Main menu** select the **Maintenance** screen.

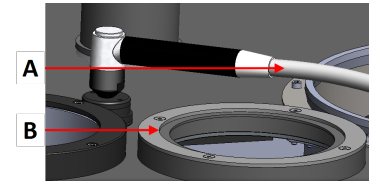


2. From the **Maintenance** screen, select **Ultrasonic Cleaning**.



3. Select **Empty** to empty the ultrasonic bath.

4. Use the cleaning hose to flush the level sensors in the ultrasonic bath.



A Cleaning hose
B Housing for level sensors

5. Check the bottom of the ultrasonic bath.

6. Use clean water from the cleaning hose and a brush to remove any dirt.

7. Select **Empty** to empty the bath again.



8. Select **Fill** to fill the ultrasonic bath automatically with the correct amount of water and soap.



8.9 Every two days



CAUTION

Avoid skin contact with the cooling fluid additive.

Checking the recirculation cooling unit



Note

If the cooling fluid is contaminated by algae or bacteria, replace the cooling fluid immediately.

- Check and, if needed, replace the cooling fluid. See [Recirculation unit ▶ 88](#).
- Clean the filter unit of the recirculation tank.
- Use the cleaning hose to clean the level sensor.

Filling the recirculation tank

A level indicator shows when the water is too low.

- If needed, use the cleaning hose to fill the tank.

- Add additional cooling fluid. The cooling fluid level should be approx. 3 cm below the upper edge of the tank.

8.10 Weekly



Note

Do not use a dry cloth as the surfaces are not scratch resistant.



Note

Do not use acetone, benzol or similar solvents.



Hint

Grease and oil can be removed with ethanol or isopropanol.

8.10.1 The machine



Note

Do not use a dry cloth as the surfaces are not scratch resistant.



Note

Do not use acetone, benzol or similar solvents.



Hint

Grease and oil can be removed with ethanol or isopropanol.

The machine

1. Clean all painted surfaces with a soft damp cloth and common household detergents.
2. For heavy duty cleaning, use a heavy duty cleaning agent such as Solopol Classic.
3. Clean the main hood with a soft damp cloth and a common household anti-static window cleaning agent.

8.10.2 Touch screen



Note

Do not use a dry cloth as the surfaces are not scratch resistant.



Note

Do not use acetone, benzol or similar solvents.

1. Clean the touch screen with an LCD cleaning agent.

8.10.3 MD-Disc



Note

Do not use a dry cloth as the surfaces are not scratch resistant.



Note

Do not use acetone, benzol or similar solvents.



Hint

Grease and oil can be removed with ethanol or isopropanol.

MD-Disc

1. Use a cleaning agent with a slight grinding effect.
2. Scrub the contact face with a brush or a hard sponge.
3. Clean the contact face with a soft sponge.
4. Rinse the contact face with clean water.
5. Wipe the contact face thoroughly with a soft cloth.

8.10.4 The spill pan



Note

Do not use a dry cloth as the surfaces are not scratch resistant.



Note

Do not use acetone, benzol or similar solvents.



Hint

Grease and oil can be removed with ethanol or isopropanol.

1. Remove the splash guard.
2. Use a scraper to remove accumulated grinding/polishing waste.
3. Use a small brush and some water to clean the spill pan.
4. Wash the splash guard and remount it.

8.10.5 Cleaning station

**Note**

Do not use a dry cloth as the surfaces are not scratch resistant.

**Note**

Do not use acetone, benzol or similar solvents.

**Hint**

Grease and oil can be removed with ethanol or isopropanol.

1. Clean the nozzles.
2. If the nozzle holes are clogged, carefully remove the waste by using the supplied cleaning tool or a thin needle

8.10.6 Ultrasonic cleaning station

**Note**

Do not use a dry cloth as the surfaces are not scratch resistant.

**Note**

Do not use acetone, benzol or similar solvents.

**Hint**

Grease and oil can be removed with ethanol or isopropanol.

1. Empty the ultrasonic bath. See [Ultrasonic Cleaning ▶ 78](#)
2. Use a brush and soap to clean the inner wall of the ultrasonic bath.
3. Use the cleaning hose to rinse the ultrasonic bath with water.
4. Empty the ultrasonic bath. See [Ultrasonic Cleaning ▶ 78](#)
5. Fill the ultrasonic bath. See [Ultrasonic Cleaning ▶ 78](#)

8.10.7 Grinding stone station

**CAUTION**

Avoid skin contact with the cooling fluid additive.

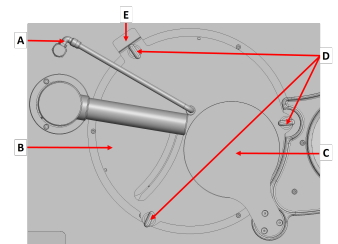
**Note**

Do not use a dry cloth as the surfaces are not scratch resistant.

Note
Do not use acetone, benzol or similar solvents.

Hint
Grease and oil can be removed with ethanol or isopropanol.

1. Close the main hood.
2. From the **Main menu** select **Configuration**.
3. From the **Configuration** menu, select **Consumables**.
4. Select **Grinding disc**.
5. Move the water tube on the plane grinding station into an upright position.
6. Unscrew the three finger nuts.
7. Remove the cover over the grinding stone.
8. Use the 8 mm Allen key to remove the screw and washer.
9. Remove the grinding disc.
10. Remove accumulated abrasive grains and grinding dust from the plane grinding station.
11. Pull out the recirculation tank and place a bucket under the drain hose of the grinding station.
12. Use a brush to clean the tray.
13. Rinse with plenty of clean water from the cleaning hose.
14. Remove the bucket and push the recirculation tank back in place.
15. Place the grinding stone or diamond grinding disc on the driving plate.
16. Make sure that the two pins from the driving plate engage in the two holes at the bottom of the grinding stone or diamond grinding disc.
17. Remount the washer and the screw and securely tighten the screw with the 8 mm Allen key.
18. Remount the cover over the grinding stone.



- A** Water tube
- B** Cover
- C** Lid
- D** Finger nut
- E** Safety switch

19. Tighten the three finger nuts gently.
20. Move the water tube down into the correct position.
21. Close the main hood.

The lid moves back to close the opening of the plane grinding station.

When you have selected a grinding stone on the screen, the dresser automatically moves to detect the top of the stone.

When the top of the stone has been detected the dresser moves into its parking position.

8.10.8 The specimen mover head



Note

Do not use a dry cloth as the surfaces are not scratch resistant.



Note

Do not use acetone, benzol or similar solvents.



Hint

Grease and oil can be removed with ethanol or isopropanol.

1. Clean the pressure feet for the individual specimens.
2. Clean the driving pins for the specimen holder and the specimen mover plate.

8.11 Monthly



Note

Do not use a dry cloth as the surfaces are not scratch resistant.



Note

Do not use acetone, benzol or similar solvents.



Hint

Grease and oil can be removed with ethanol or isopropanol.

8.11.1 Cleaning station

1. Use a damp cloth to clean the rubber seals.

8.11.2 Grinding stone station

1. Use a damp cloth to clean the rubber seals.

8.11.3 Recirculation unit

1. Clean the recirculation tank and the connected tubes thoroughly.
2. If you use a soap solution to clean the bowl or the recirculation tank, rinse with clean water before filling the recirculation tank.



Note

If the cooling fluid is contaminated by algae or bacteria, replace the cooling fluid immediately.

3. If the cooling water has been infected with bacteria or algae, clean the tank and tubes with a suitable antibacterial disinfectant.
4. Clean the static filter: Remove it and rinse it with water.

Changing the cooling fluid



CAUTION

Avoid skin contact with the cooling fluid additive.



Note

The cooling unit fluid contains additive and grinding residue and you must not dispose of it into the waste water drain. Cooling fluid must be disposed of in compliance with local safety regulations.

Emptying the recirculation tank



CAUTION

Make sure that the main guard and the lower doors on the machine are closed before you start emptying the recirculation tank.

5. Disconnect the drain from the main machine to the cooling unit and place it in the collecting container.
6. Use an external hose to empty the tank.
7. Close the doors, main guard and conveyor lid before starting the recirculation unit.
8. Empty the cooling unit by starting the equipment and stopping it when the tank is empty. Remove the plastic liner and clean out all water and debris from the tank.
9. Clean the recirculation tank and the connected tubes thoroughly.
10. If the cooling water has been infected with bacteria or algae, clean the tank and tubes with a suitable antibacterial disinfectant.



CAUTION

The recirculation tank is very heavy when it is full.

8.12 Annually



WARNING

Do not use the machine with defective safety devices.
Contact Struers Service.



WARNING

Safety critical components must be replaced after a maximum lifetime of 20 years.
Contact Struers Service.



CAUTION

The safety devices must be tested at least once a year.



CAUTION

Testing should always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).



CAUTION

Do not use Hexamatic if it is damaged.



Note

Replacement of safety critical components must only be performed by a Struers engineer or a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).
Safety critical components must only be replaced by components with at least the same safety level.
Contact Struers Service.

8.12.1 Main hood

Inspecting the main hood



Hint

If the machine is used for more than one 7-hour shift per day, carry out inspection more often .

1. Visually inspect the main hood for signs of wear or damage such as cracks, dents, or damage.

Replacing the main hood



CAUTION

The main hood must be replaced by a Struers technician.

Note
 The main hood must be replaced immediately if it has been weakened by collision with projectile objects or if there are visible signs of deterioration or damage.

Note
 The main hood must be replaced to remain compliant with the safety requirements stated in EN 16089.

To ensure its intended safety, the main hood must be replaced every 5 years. A label on the main hood indicates when it must be replaced.

Struers
 Safety glass
 Sicherheitsglas
 Verre sécurité



8.12.2 Testing safety devices

The safety devices must be tested at least once a year.

WARNING
 Do not use the machine with defective safety devices.
 Contact Struers Service.



Note
 Testing should always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).



- See [Emergency stop](#) ►90.



8.12.3 Emergency stop

| Test 1 | |
|--------|---|
| | 1. Start a polishing process. The machine starts operating. |
| | 2. Press the emergency stop. |
| | 3. If operation does not stop, press the Stop button. 4. Contact Struers Service. |

Main hood

| Test 1 | |
|---|--|
|  | 1. Start a polishing process. The machine starts operating. |
| | 2. Try to open the main hood while the machine is operating. |
|  | 3. If you can open the main hood while the machine is operating, press the emergency stop. |
| | 4. Contact Struers Service. |

| Test 2 | |
|---|---|
| | 1. Open the main hood. |
|  | 2. Start a polishing process. |
|  | 3. If the machine starts, press the emergency stop. |
| | 4. Contact Struers Service. |

| Test 3 | |
|---|--|
|  | 1. Start a polishing process. The machine starts operating. |
|  | 2. Press the emergency stop. |
| | 3. If the main hood remains locked when movement has stopped: Contact Struers Service. |

8.12.4 Grinding stone cover**WARNING**

Safety critical components must be replaced after a maximum lifetime of 20 years. Contact Struers Service.

The cover has a safety switch system that ensures that the grinding stone cover is closed correctly.

Testing the cover

1. Remove the grinding stone cover.
2. Close the main hood.
3. Start a grinding process.
4. If the grinding stone begins to spin, press the emergency stop.

5. Contact Struers Service.

9 Spare parts

Technical questions and spare parts

If you have technical questions or when you order spare parts, state serial number and voltage/frequency. The serial number and the voltage are stated on the type plate of the machine.

For further information, or to check the availability of spare parts, contact Struers Service. Contact information is available on Struers.com.

10 Service and repair

Struers recommends that a regular service check be carried out yearly or after every 1500 hours of use.

When the machine is started up, the display shows information about total operation time and the machines service information.

After 1000 hours of operation time, the display will show a message reminding the user that a service check should be scheduled.



Note

Service must only be performed by a Struers engineer or a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).
Contact Struers Service.

Service check

Struers offers a range of comprehensive maintenance plans to suit the requirements of our customers. This range of services is called ServiceGuard.

The maintenance plans include equipment inspection, replacement of wear parts, adjustments/calibration for optimal operation, and a final functional test.

11 Disposal



Equipment marked with a WEEE symbol contains electrical and electronic components and must not be disposed of as general waste.

Contact your local authorities for information on the correct method of disposal in accordance with national legislation.



For disposal of consumables and recirculation fluid, follow local regulations.

11.1 Environmental considerations



WARNING

In case of fire, alert bystanders, the fire brigade and cut power. Use a powder fire extinguisher. Do not use water.



Note

Swarf must be disposed of according to the current safety regulations for handling and disposal of swarf/ additive in the cooling fluid.



Note

The cooling fluid will contain additive and swarf and may NOT be disposed of into a main drain.

Cooling fluid must be disposed of in compliance with local safety regulations.

12 Troubleshooting - Hexamatic

| Error | Cause | Action |
|---|---|---|
| Continuous, irregular wear on a grinding/polishing surface. | Coupling on the specimen holder/mover plate or the specimen mover head is worn. | Replace the coupling. Contact Struers Service. |

12.1 Messages and errors - Hexamatic

Errors must be corrected before operation can be continued.

Messages provide information about the machine's status and minor errors.

Press **Enter** to acknowledge the error/message.

| # | Error message | Cause | Action |
|------|-------------------------------------|------------------------|--------|
| 1 | Failed creating new database | | |
| 2 | Database error | | |
| 3 | Restart failed | | |
| 999 | General platform exception | | |
| 1000 | | No error from firmware | |

| # | Error message | Cause | Action |
|------|--|--|---|
| 1001 | No specimen holder in specimen mover head | <p>No specimen holder was detected during a "Pick-up" sequence.</p> <p>No specimen holder has been placed in the conveyor hook, or there are problems with the optical sensor located under the process arm.</p> | <p>If no specimen holder has been placed in the conveyor hook:</p> <p>Clear the specimen holder from the Queue screen.</p> <p>Press Start to start processing the next specimen holder.</p> |
| 1002 | Specimen holder not dropped in "cup" | <p>The specimen holder is apparently still attached to the specimen holder head after a "Deliver" sequence.</p> <p>A coupling error in the mechanics, or a defective air valve, or problems with the optical sensor located under the process arm.</p> | <p>If the specimen holder is still attached to the specimen holder head, activate the manual function Deliver holder.</p> <p>If the error remains, contact Struers Service.</p> |
| 1004 | Specimen holder "cup" not lowered | <p>The specimen holder "cup" has not returned to its parked position after either a "Pick up" or "Deliver" sequence.</p> <p>Air pressure is too low, or movement is obstructed, or a valve is defective, or a lower sensor at the up/down cylinder is defective.</p> | <p>Before you restart the machine, make sure there are no specimen holders in the specimen holder "cup" or in the conveyor hooks.</p> <p>Make sure the air pressure is okay. Shut down and restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1005 | Specimen holder "cup" not raised | <p>The specimen holder "cup" is not raised during a "Pick up" or "Deliver" sequence.</p> <p>Air pressure is too low, or movement is obstructed, or a valve is defective, or an upper sensor at the up/down cylinder is defective.</p> | <p>Before you restart the machine, make sure there are no specimen holders in the specimen holder "cup".</p> <p>Make sure the air pressure is okay. Shut down and restart the machine.</p> |

| # | Error message | Cause | Action |
|------|--|--|---|
| 1006 | Grinding station lid not moved to the right (towards cleaning) | <p>Before grinding, the moveable lid must move to the right. This has not happened.</p> <p>Air pressure is too low, or movement is obstructed, or a valve is defective, or a sensor at the lid cylinder is defective.</p> | <p>Make sure the air pressure is okay. Shut down and restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1007 | Grinding station lid not moved to the left (the "well" is not closed) | <p>After grinding, the moveable lid must move to the left. This has not happened.</p> <p>Air pressure is too low, or movement is obstructed, or a valve is defective, or a sensor at the lid cylinder is defective.</p> | <p>Make sure the air pressure is okay. Shut down and restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1008 | Center part of polishing plate not raised | <p>The center of the polishing plate is not raised during a "Disc load" or "Disc unload" operation.</p> <p>Air pressure is too low, or movement is obstructed, or a valve is defective, or an upper sensor at the up/down cylinder is defective.</p> | <p>Make sure the air pressure is okay. Press Continue to continue the disc change sequence.</p> <p>Before you restart the machine, make sure that there is no MD-disc at the "fork".</p> <p>If the error remains, shut down and restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|--|--|--|
| 1009 | Center part of polishing plate not lowered | <p>The center of the polishing plate is not lowered during a "Disc load" or "Disc unload" operation.</p> <p>Air pressure is too low, or movement is obstructed, or a valve is defective, or a lower sensor at the up/down cylinder is defective.</p> | <p>Make sure the air pressure is okay. Press Continue to continue the disc change sequence.</p> <p>Before you restart the machine, make sure that there is no MD-disc at the "fork". If the center is fully raised, operate the machine very carefully to prevent the "fork" from colliding with the center piston.</p> <p>If the error remains, shut down and restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1010 | The process arm obstructs the "fork" movement | <p>The process arm is too close to the disc changing area.</p> <p>The process arm is placed correctly before a disc change operation. If this error occurs, the process arm may have been manually pushed towards the disc changing area.</p> | <p>Open the main hood. Move the process arm slightly towards the front of the machine.</p> <p>Press Continue.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|--|--|--|
| 1011 | A MD-Disc is placed on the "fork" | <p>The "Disc on fork" sensor" has detected an MD-Disc on the "fork" prior to a reference search or a disc change operation.</p> <p>The disc has been placed incorrectly on the "fork", or a disc change operation has ended incorrectly or the "Disc on fork" sensor is defective.</p> | <p>Open the main hood. Remove the MD-disc from the "fork". If the machine registers the disc as being placed at the polishing station, load the disc manually with precision. Alternatively, move the elevator to its top position and place the disc on the correct shelf.</p> <p>If no disc is placed on the "fork", check the "disc on fork" sensor": Place a piece of metal on top of the sensor, and read the status of the small red LED. If the sensor does not react, contact Struers Service.</p> |
| 1012 | No MD-Disc on the "fork" | <p>The "Disc on fork" sensor" has not detected an MD-Disc on the "fork" during a "Load" or "Unload" operation.</p> <p>The disc has been placed incorrectly on the "fork" or the elevator shelf, or the "Disc on fork" sensor is defective.</p> | <p>Open the main hood. Place an MD-disc on the "fork" with precision. Alternatively, load the elevator and the polishing station according to the status shown in the Surfaces screen. Press Continue. If the error remains, check the function of the "Disc on fork" sensor: Place a piece of metal on top of the sensor, and read the status of the small red LED. If the sensor does not react, contact Struers Service.</p> |
| 1013 | "Fork" movement error | <p>A "fork" movement has been started but the target position was not reached.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or a stepper motor or power supply is defective.</p> | <p>Remove any visible obstruction to the movement. Press Continue.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|---|--|---|
| 1014 | Elevator movement error | <p>An elevator movement has been started but the target position was not reached.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or a stepper motor or power supply is defective.</p> | <p>Remove any visible obstruction to the movement. Press Continue.</p> <p>If the error remains, contact Struers Service.</p> |
| 1015 | "Fork" reference search failed | <p>The "fork" actuator tried to find the "fork" reference position, but the reference sensor was not activated.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or a stepper motor or power supply is defective, or a reference sensor is defective.</p> | <p>Remove any visible obstruction to the movement. Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1016 | Elevator reference search failed | <p>The elevator actuator tried to find the elevator reference position, but the reference sensor was not activated.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or a stepper motor or power supply is defective, or a reference sensor is defective.</p> | <p>Remove any visible obstruction to the movement. Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1017 | Specimen holder up movement failed | <p>The upwards movement of the specimen mover head is too slow, or the specimen mover head is not raised.</p> <p>Air pressure is too low, or the movement is obstructed, or a valve is defective, or a sensor at the up/down cylinder is defective.</p> | <p>Make sure the air pressure is okay. Remove any visible obstruction to the movement. Press Continue.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|---|--|---|
| 1018 | Specimen holder down movement failed | <p>The specimen mover head should move downwards, but the movement is too slow, or the specimen mover head is not lowered.</p> <p>Air pressure is too low, or the movement is obstructed, or a valve is defective, or a linear potentiometer is defective, or a force adjustment is incorrect.</p> | <p>Make sure the air pressure is okay. Remove any visible obstruction to the movement. Press Continue.</p> <p>If the error remains, contact Struers Service.</p> |
| 1019 | The process arm obstructs the dresser movement | <p>The process arm is too close to the dresser arm.</p> <p>The process arm is placed correctly before a dresser operation. If this error occurs, the process arm may have been manually pushed towards the dresser, or the process has been stopped by an emergency stop.</p> | <p>Open the main hood. Move the process arm to the right of the grinding station.</p> <p>Press Continue.</p> <p>If the error remains, contact Struers Service.</p> |
| 1020 | Dresser sweep movement error | <p>A dresser sweep movement has been started but the target position was not reached.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or the stepper motor or power supply is</p> | <p>Remove any visible obstruction to the movement.</p> <p>Press Continue.</p> <p>If the error remains, contact Struers Service.</p> |
| 1021 | Dresser up/down movement error | <p>A dresser up/down movement has been started but the target position was not reached.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or the stepper motor or power supply is defective.</p> | <p>Remove any visible obstruction to the movement.</p> <p>Press Continue.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|---|---|--|
| 1022 | Dresser sweep reference search failed | <p>The dresser sweep actuator tried to detect the horizontal dresser reference position, but the reference sensor was not activated.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or the stepper motor or power supply is defective, or a reference sensor is defective.</p> | <p>Remove any visible obstruction to the movement.</p> <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1023 | Dresser vertical reference search failed | <p>The dresser up/down actuator tried to find the vertical dresser reference position, but the reference sensor was not activated.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or the stepper motor or power supply is defective, or a reference sensor is defective.</p> | <p>Remove any visible obstruction to the movement.</p> <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1024 | Disc changer adjustment error | <p>An adjustment command for the disc changer position was activated (either left/right or up/down or stop adjustment), but the disc changer function is not ready to execute the command.</p> <p>The adjustment was not carried out as described in the Service Manual.</p> | <p>Carry out the adjustment procedure as described in the Service Manual.</p> |

| # | Error message | Cause | Action |
|------|--|--|--|
| 1025 | No air or air pressure too low | <p>The force function tried to raise or lower the specimen mover head, or update the actual force, but failed.</p> <p>The pressure of the compressed air supply is too low, or there is no air supply. Alternatively, the 3 bar pressure regulator or the BP2 pressure transmitter is defective.</p> | <p>Make sure that the pressure at the air inlet is between 6 and 10 bar.</p> <p>If the error remains, contact Struers Service.</p> |
| 1026 | Prcs_ERROR_CLEAN_ULTRA_ILLEGAL_ERROR_CODE | Internal control system error. | <p>Send a copy of the system log to Struers Service.</p> <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1027 | The Ultrasonic Tub is not ready | The ultrasonic tub is active and cannot currently fill, empty, or renew. | <p>If the error is shown when the operator has manually requested filling, emptying, or renewing:</p> <p>Wait for the current operation to finish, then try again.</p> <p>If the error is shown during an automatic process:</p> <p>Ignore the message, or wait for the current operation to finish, then try again.</p> |
| 1028 | The contents of the Ultrasonic Tub is unknown | <p>The control system has lost control of the level of content of the ultrasonic tub.</p> <p>The error may be caused by too slow filling, or by defective sensors.</p> | Empty or renew the content of the ultrasonic tub. |
| 1029 | Filling the Ultrasonic Tub failed | <p>Filling the ultrasonic tub failed.</p> <p>The error may be caused by too slow filling, or by defective sensors.</p> | <p>Check the water supply.</p> <p>Check the level switches. One of them may be stuck.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|---|---|---|
| 1030 | Prcs_ERROR_CLEAN_ULTRA_ILLEGAL_STATE | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1031 | Erroneous Ultrasonic Tub level sensors | An incorrect signal from the ultrasonic tub level sensors is detected. | Check the level switches. One of them may be stuck. If the error remains, contact Struers Service. |
| 1032 | The Ultrasonic Tub is not filled | An attempt to use the ultrasonic unit is rejected. The ultrasonic tub is not filled. | Renew the content of the ultrasonic tub. |
| 1033 | Illegal conveyor hook number | The IPC tries to access a conveyor hook number outside the range 1-8. An error in the PC software. | Send a copy of the system log to Struers Service. If the error remains, contact Struers Service. |
| 1034 | Prcs_ERROR_UNHANDLED_E_STOP_COMMAND | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1035 | Prcs_ERROR_DRYING_FAN_ILLEGAL_ERROR_CODE | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1036 | Prcs_ERROR_DRYING_FAN_ILLEGAL_STATE | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1037 | The drying fan is not ready | The drying fan is active and cannot be started. Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|--|---|--|
| 1038 | Specimen holder already picked up | A "Pick-up" command is sent, but a specimen holder has already been picked up. The status can be incorrect if the optical sensor under the process arm is incorrectly adjusted. | Press Deliver holder . Make sure that the specimen holder is delivered to an empty conveyor hook. Restart the preparation process. |
| 1039 | Frequency inverter error | A preparation process is started or attempted to start, but the process is stopped by the frequency inverter. The frequency inverter has detected a problem which is not known by the machine. Alarm code: \$SUBCODE1\$ Fault code: \$SUBCODE2\$ | Press Continue . If the error remains, shut down and restart the machine. If the error remains, contact Struers Service. |
| 1040 | Prcs_ERROR_FW_TIMING_ISSUE | This is an internal control system error. | Send a copy of the system log to Struers Service. If the error remains, contact Struers Service. |
| 1041 | No specimen holder in the specimen mover head | A preparation process or a cleaning process was started, but the "Pick-up" status is "No holder picked up". The status can be incorrect if the optical sensor under the process arm is incorrectly adjusted. | Press Deliver holder , even if no physical specimen holder is attached. Restart the process. If needed, edit the Queue screen to match the actual specimen holder setup in the conveyor. |
| 1042 | Conveyor movement error | A conveyor movement has been started but the target position was not reached. The movement is obstructed, or there is too much friction in the actuator mechanism, or the stepper motor or power supply is defective. | Remove any visible obstruction to the movement. Press Continue . If the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|---------------------------------------|--|---|
| 1043 | process arm movement error | <p>A process arm movement has been started but the target position was not reached.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or the stepper motor or power supply is defective.</p> | <p>Remove any visible obstruction to the movement.</p> <p>Press Continue.</p> <p>If the error remains, contact Struers Service.</p> |
| 1044 | Dresser sweep movement error | <p>A dresser sweep movement was started but the target position was not reached.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or the stepper motor or power supply is defective.</p> | <p>Remove any visible obstruction to the movement.</p> <p>Press Continue..</p> <p>If the error remains, contact Struers Service.</p> |
| 1045 | Dresser up/down movement error | <p>A dresser up/down movement has been started but the target position was not reached.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or the stepper motor or power supply is defective.</p> | <p>Remove any visible obstruction to the movement.</p> <p>Press Continue.</p> <p>If the error remains, contact Struers Service.</p> |
| 1046 | "Fork" movement error | <p>A "fork" movement was started but the target position was not reached.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or the stepper motor or power supply is defective.</p> | <p>Remove any visible obstruction to the movement.</p> <p>Press Continue.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|--|--|--|
| 1047 | Elevator movement error | An elevator movement was started but the target position was not reached. The movement is obstructed, or there is too much friction in the actuator mechanism, or the stepper motor or power supply is defective. | Remove any visible obstruction to the movement. Press Continue . If the error remains, contact Struers Service. |
| 1048 | Disc changer is busy | A disc changer operation has attempted to start, but the previous disc changer operation is still in progress. | Wait until the current disc changer operation is completed before the next can be started. |
| 1049 | Dresser is busy | A dresser operation has attempted to start, but the previous dresser operation is still in progress. | Wait until the current dresser operation is completed before the next is started. |
| 1050 | Prcs_ERROR_UNHANDLED_process_COMMAND | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1051 | Prcs_ERROR_UNHANDLED_STOP_COMMAND | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1051 | Prcs_ERROR_UNHANDLED_STOP_COMMAND | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1052 | Prcs_ERROR_MISSING_ANSWER_FROM_DISC_CHANGE_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1053 | Prcs_ERROR_MISSING_ANSWER_FROM_DRESSER_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |

| # | Error message | Cause | Action |
|------|---|--------------------------------|---|
| 1054 | Prcs_ERROR_MISSING_ANSWER_FROM_WATER_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1055 | Prcs_ERROR_MISSING_ANSWER_FROM_DISC_COOLING_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1056 | Prcs_ERROR_MISSING_ANSWER_FROM_FORCE_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1057 | Prcs_ERROR_MISSING_ANSWER_FROM_SPECIMEN_MOTOR_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1058 | Prcs_ERROR_MISSING_ANSWER_FROM_DISC_MOTOR_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1059 | Prcs_ERROR_MISSING_ANSWER_FROM_STEPPER_MOTOR_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1060 | Prcs_ERROR_MISSING_ANSWER_FROM_DOSING_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1061 | Prcs_ERROR_MISSING_ANSWER_FROM_CUP_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1062 | Prcs_ERROR_MISSING_ANSWER_FROM_LID_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1063 | Prcs_ERROR_MISSING_ANSWER_FROM_CLEAN_ULTRA_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1064 | Prcs_ERROR_MISSING_ANSWER_FROM_CLEANING_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |

| # | Error message | Cause | Action |
|------|---|---|--|
| 1065 | Prcs_ERROR_MISSING_ANSWER_FROM_DRYING_FAN_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1066 | Specimen mover head not raised before reference search | <p>The vertical level of the specimen mover head is checked during a reference search operation. If the specimen mover head is not in its top position, the process is stopped.</p> <p>Air pressure is too low, or the movement is obstructed, or a valve is defective, or a "Head raised" sensor located on the up/down cylinder is defective.</p> | <p>Make sure the air pressure is okay. Remove any visible obstruction to the movement.</p> <p>Shut down and restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1067 | | (Not used) | |
| 1068 | Prcs_ERROR_ILLEGAL_EVENT_CODE_DISC_CHANGE | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1069 | Prcs_ERROR_ILLEGAL_EVENT_CODE_DRESSER | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1070 | Prcs_ERROR_ILLEGAL_EVENT_CODE_WATER | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1071 | Prcs_ERROR_ILLEGAL_EVENT_CODE_DISC_COOLING | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1072 | Prcs_ERROR_ILLEGAL_EVENT_CODE_FORCE | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1073 | Prcs_ERROR_ILLEGAL_EVENT_CODE_SPECIMEN_MOTOR | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1074 | Prcs_ERROR_ILLEGAL_EVENT_CODE_DISC_MOTOR | Internal control system error. | Send a copy of the system log to Struers Service. |

| # | Error message | Cause | Action |
|------|--|---|--|
| 1075 | Prcs_ERROR_ILLEGAL_EVENT_CODE_STEPPER_MOTOR | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1076 | Prcs_ERROR_ILLEGAL_EVENT_CODE_DOSING | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1077 | Prcs_ERROR_ILLEGAL_EVENT_CODE_CUP | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1078 | Prcs_ERROR_ILLEGAL_EVENT_CODE_LID | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1079 | Prcs_ERROR_ILLEGAL_EVENT_CODE_CLEAN_ULTRA | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1080 | Prcs_ERROR_ILLEGAL_EVENT_CODE_CLEANING | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1081 | Prcs_ERROR_ILLEGAL_EVENT_CODE_DRYING_FAN | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1082 | Conveyor hood not closed | A conveyor movement has started, but failed. The conveyor cover is not closed, or the "Hood closed" supervision switch is defective. | Close the conveyor cover. Press Continue . If the error remains, contact Struers Service. |
| 1083 | Grinding stone worn down | A preparation process or a manual dressing has started, but failed. The grinding stone is worn down to a critical level. | Replace the grinding stone. |

| # | Error message | Cause | Action |
|------|---|---|---|
| 1084 | Dresser arm not parked | <p>A manual dressing or a dressing during preparation has started, but failed.</p> <p>The dresser arm is too far away from the parked position. The previous dressing process may have ended incorrectly.</p> | <p>To force the dresser arm back to normal position, perform a "Stone exchange" function without actually changing the stone. When this is completed, restart the dressing process.</p> <p>If the error remains, contact Struers Service.</p> |
| 1085 | Surface search at stone not performed | <p>A manual dressing or a dressing during preparation has started, but failed.</p> <p>A surface search process at the grinding stone has not been performed, or has been stopped before completing.</p> | <p>Force the dresser arm to perform a surface search process, for instance by performing a "Stone exchange" function but without actually changing the stone. When this is completed, restart the dressing process.</p> <p>If the error remains, contact Struers Service.</p> |
| 1086 | Dresser adjustment error | <p>A dresser position adjustment command is activated (either left/right, or up/down, or stop), but the dresser function is not ready to execute the command.</p> <p>The adjustment was not carried out as described in the Service Manual.</p> | <p>Carry out the adjustment procedure as described in the Service Manual.</p> |
| 1087 | Prcs_ERROR_CLEANING_ILLEGAL_ERROR_CODE | <p>Internal control system error.</p> | <p>Send a copy of the system log to Struers Service.</p> <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1088 | The cleaning unit is not ready | <p>The cleaning unit is active and cannot be started.</p> | <p>Send a copy of the system log to Struers Service.</p> <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|---|--|---|
| 1089 | Prcs_ERROR_CLEANING_ILLEGAL_STATE | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. |
| 1090 | Prcs_ERROR_CLEANING_ILLEGAL_MEDIA | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. |
| 1091 | Prcs_ERROR_DOSING_ILLEGAL_ERROR_CODE | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. |
| 1092 | Prcs_ERROR_DOSING_PARAMETER | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. |
| 1093 | The Dosing system is not ready | The dosing system is active and cannot start a tube cleaning operation. | Try again when the current operation has finished. |
| 1094 | Force regulation error | A preparation is in progress and the force regulation system tries to keep the force (air pressure) close to the set value, but fails. Air pressure is too low, or an air valve is defective, or a pressure transmitter is defective. | This error can be fatal. Make sure the air pressure is okay. Press Continue to restart the preparation. If the error remains, contact Struers Service. |
| 1095 | Recirculation water level low | A grinding process has started, but failed. The level of the recirculated water is critically low, or the level sensor is defective or stuck. | Press Continue . Refill the tank as soon as possible. |
| 1096 | Recirculation water level too low | A grinding process has started, but failed. The level of the recirculated water is too low to ensure a stable water supply, or the level sensor is defective or stuck. | Refill the recirculation tank with water and additive. Check the function of the level sensor. The float lever must be able to move freely. |

| # | Error message | Cause | Action |
|------|--|--|--|
| 1097 | Prcs_ERROR_UNHANDLED_DISC_CHANGE_STOP_COMMAND | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. |
| 1098 | Prcs_ERROR_UNHANDLED_DISC_CHANGE_E_STOP_COMMAND | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. |
| 1099 | Prcs_ERROR_UNHANDLED_DRESSER_STOP_COMMAND | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. |
| 1100 | Head not raised prior to process arm movement | A preparation process or a manual function has started, but failed because the specimen mover head is raised only partly or not at all. The movement is obstructed, or there is too much friction in the up/down mechanism, or an air valve is defective, or a "Head raised" sensor located on the up/down cylinder is defective. | This error can be fatal. Make sure the air pressure is okay. Make sure that the "Up-movement" is not obstructed. Shut down and restart the machine. The specimen mover head must be raised to its top position. If the error remains, contact Struers Service. |
| 1102 | Illegal shelf number | The IPC tries to access a shelf number outside the range 1-8. This is a PC software error. | Contact Struers Service. |
| 1103 | Illegal disc changer parameter | The IPC tries to access the disc changer, but an illegal parameter value has been detected. This is a PC software error | Contact Struers Service. |
| 1104 | Dressing on diamond disc not allowed | A preparation process or a manual function has started, but failed. A diamond disc is mounted in the grinding station, and a diamond disc cannot be dressed. | Check the preparation methods in the queue. If needed, perform a stone change operation, and exchange the diamond disc with a stone. |

| # | Error message | Cause | Action |
|------|---|---|--|
| 1105 | Head not lowered | <p>A preparation process or a manual function has attempted to lower the specimen mover head, but has failed because the specimen mover head is lowered only partly or not at all.</p> <p>The movement is obstructed, or there is too much friction in the up/down mechanism, or an air valve is defective, or a "Head raised" sensor located on the up/down cylinder is defective.</p> | <p>This error can be fatal.</p> <p>Make sure the air pressure is okay.</p> <p>Make sure that the "Up-movement" is not obstructed.</p> <p>Shut down and restart the machine. The specimen mover head must be lowered.</p> <p>If the error remains, contact Struers Service.</p> |
| 1106 | Stepper motor start error, conveyer | <p>Service mode only: The stepper motor has attempted to start, but failed.</p> <p>There is a CANopen network error or a defective SMU (stepper motor unit).</p> | <p>Check the status of the CANopen bus. If all nodes are operational, exchange the SMU.</p> |
| 1107 | Stepper motor start error, process arm | <p>Service mode only: The stepper motor has attempted to start, but failed.</p> <p>There is a CANopen network error or a defective SMU (stepper motor unit).</p> | <p>Check the status of the CANopen bus. If all nodes are operational, exchange the SMU.</p> |
| 1108 | Stepper motor start error, dresser sweep | <p>Service mode only: The stepper motor has attempted to start, but failed.</p> <p>There is a CANopen network error or a defective SMU (stepper motor unit).</p> | <p>Check the status of the CANopen bus. If all nodes are operational, exchange the SMU.</p> |
| 1109 | Stepper motor start error, dresser up/down | <p>Service mode only: The stepper motor has attempted to start, but failed.</p> <p>There is a CANopen network error or a defective SMU (stepper motor unit).</p> | <p>Check the status of the CANopen bus. If all nodes are operational, exchange the SMU.</p> |

| # | Error message | Cause | Action |
|------|--|---|---|
| 1110 | Stepper motor start error, "fork" | Service mode only: The stepper motor has attempted to start, but failed. There is a CANopen network error or a defective SMU (stepper motor unit). | Check the status of the CANopen bus. If all nodes are operational, exchange the SMU. |
| 1111 | Stepper motor start error, elevator | Service mode only: The stepper motor has attempted to start, but failed. There is a CANopen network error or a defective SMU (stepper motor unit). | Check the status of the CANopen bus. If all nodes are operational, exchange the SMU. |
| 1112 | Stepper motor stop error, conveyor | The stepper motor has attempted to stop, but failed. There is a CANopen network error or a defective SMU (stepper motor unit). | This error can be fatal. If the motor cannot stop, press the emergency stop. Shut down and restart the machine. If the error remains, contact Struers Service. |
| 1113 | Stepper motor stop error, process arm | The stepper motor has attempted to stop, but failed. There is a CANopen network error or a defective SMU (stepper motor unit). | This error can be fatal. If the motor cannot stop, press the emergency stop. Shut down and restart the machine. If the error remains, contact Struers Service. |
| 1114 | Stepper motor stop error, dresser sweep | The stepper motor has attempted to stop, but failed. There is a CANopen network error or a defective SMU (stepper motor unit). | This error can be fatal. If the motor cannot stop, press the emergency stop. Shut down and restart the machine. If the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|--|---|---|
| 1115 | Stepper motor stop error, dresser up/down | The stepper motor has attempted to stop, but failed. There is a CANopen network error or a defective SMU (stepper motor unit). | This error can be fatal. If the motor cannot stop, press the emergency stop. Shut down and restart the machine. If the error remains, contact Struers Service. |
| 1116 | Stepper motor stop error, "fork" | The stepper motor has attempted to stop, but failed. There is a CANopen network error or a defective SMU (stepper motor unit). | This error can be fatal. If the motor cannot stop, press the emergency stop. Shut down and restart the machine. If the error remains, contact Struers Service. |
| 1117 | Stepper motor stop error, elevator | The stepper motor has attempted to stop, but failed. There is a CANopen network error or a defective SMU (stepper motor unit). | This error can be fatal. If the motor cannot stop, press the emergency stop. Shut down and restart the machine. If the error remains, contact Struers Service. |
| 1118 | Stepper motor stopped by mechanical stop, conveyor | N/A | |
| 1119 | Stepper motor stopped by mechanical stop, process arm | The machine is trying to find the reference position for the process arm, but failed. The reference sensor for the process arm is defective, or the process arm stepper motor unit is defective. | This error can be fatal. Shut down and restart the machine. If the error remains, contact Struers Service. |
| 1120 | Stepper motor stopped by mechanical stop, dresser sweep | This error number is not yet implemented. | |
| 1121 | Stepper motor stopped by mechanical stop, dresser up/down | This error number is not yet implemented. | |

| # | Error message | Cause | Action |
|------|---|---|---|
| 1122 | Stepper motor stopped by mechanical stop, "fork" | This error number is not yet implemented. | |
| 1123 | Stepper motor stopped by mechanical stop, elevator | This error number is not yet implemented. | |
| 1124 | Illegal holder no. for drying | The IPC tries to access a specimen holder number for drying outside the range 1-8. May be caused by an error in the PC software. | Contact Struers Service. |
| 1125 | Emergency stop activated | The machine has entered the emergency stop state. The emergency stop button is activated. | If a mechanical obstruction is the reason for activating the emergency stop, open the hood and remove the problem before releasing the emergency stop button. Before you release the emergency stop button, make sure that the main hood and the conveyor cover are closed. Depending on the cause of the emergency stop, you can press Continue to restart the current process. Contact Struers Service immediately. |

| # | Error message | Cause | Action |
|------|--|--|---|
| 1126 | Emergency stop activated, but the circuit does not work correctly | <p>The machine has entered the emergency stop state.</p> <p>The emergency stop button is activated, but at the same time a serious fault in the emergency stop function has been detected. This is a serious issue.</p> <p>The 24V power supply is disconnected.</p> | <p>If a mechanical obstruction is the reason for activating the emergency stop, open the hood and remove the problem before releasing the emergency stop button.</p> <p>Before you release the emergency stop button, make sure that the main hood and the conveyor cover are closed.</p> <p>Depending on the cause for the emergency stop, you can press Continue to restart the current process.</p> <p>Contact Struers Service immediately.</p> |
| 1127 | Unexpected disc at "fork" | <p>A preparation process has started and the disc changer has attempted to load a new disc, but failed.</p> <p>The disc changer has detected a disc placed on the "fork" prior to a "Load disc" operation. The "Unload disc" operation may have ended incorrectly, or a "Disc on fork" sensor is defective.</p> | <p>Open the main hood.</p> <p>Remove the MD-disc from the "fork". If the disc should have been placed in the elevator but is not, place the disc in the elevator when possible.</p> <p>Press Continue to restart the machine.</p> |
| 1128 | Disc not placed on "fork" | <p>A preparation process has started and the disc changer has attempted to unload the disc, but failed.</p> <p>The disc changer could not detect a disc placed on the "fork" after the first part of the "Unload disc" operation. A disc may not have been present, or a "Disc on fork" sensor is defective.</p> | <p>If no MD-disc is present, select the Surfaces screen.</p> <p>Load the elevator and the polishing station according to the status shown. If you place a disc on the polishing station, do so with precision. If not, a new error will occur.</p> <p>Deliver the specimen holder.</p> <p>Restart the process.</p> |

| # | Error message | Cause | Action |
|------|---------------------------------------|--|---|
| 1129 | Unexpected disc at "fork" | <p>A preparation process has started and the disc changer has attempted to load a new disc, but failed.</p> <p>The disc changer has detected a disc placed on the "fork" when the disc is supposed to be lifted off the "fork" because of an incomplete lift function (too low air pressure), or a "Disc on fork" sensor is defective.</p> | <p>Make sure the air pressure is okay. Press Continue.</p> <p>If the error remains, contact Struers Service.</p> <p>To check the "Disc on fork" sensor, place a piece of metal on top of the sensor, and read the status of the small red LED.</p> |
| 1130 | Disc not placed on "fork" | <p>A preparation process has started and the disc changer has attempted to load a disc from the elevator, but failed.</p> <p>The disc changer could not detect a disc placed on the "fork" after the first part of the "Load disc" operation. A disc may not have been present on the shelf, or the disc was misplaced, or a "Disc on fork" sensor is defective.</p> | <p>If no MD-Disc is present on the shelf, select the Surfaces screen. Load the elevator according to the status shown. When you close the main hood, the disc changer will park. Deliver the specimen holder and restart the process.</p> |
| 1131 | Stack size limit exceeded | This error number is not yet implemented. | |
| 1132 | Message buffer limit exceeded | <p>An internal software problem is detected.</p> <p>Too few process task message buffers are available.</p> | Contact Struers Service. |
| 1133 | Dresser up/down movement error | <p>A dresser up/down movement has been started during a "Surface search" operation, but no movement was detected.</p> <p>The movement is obstructed, or there is too much friction in the actuator mechanism, or a stepper motor or power supply is defective.</p> | <p>Remove any visible obstruction to the movement. Press Continue if this is an option.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|--|--|---|
| 1134 | Grinding disc center not found | A dresser down movement has been started during a "Surface search" operation, but the center level was not found (the diamond tip met no resistance). The dresser mechanism is not adjusted correctly. | This error can be fatal. Shut down and restart the machine. If the error remains, contact Struers Service. |
| 1135 | Disc changer not parked | A polishing process has been started, but was forced to wait for a disc change operation to conclude. The disc changer may not be in its parked position. A previous disc change operation ended incorrectly. | Send a copy of the system log to Struers Service. Restart the machine. |
| 1136 | No surface on polishing disc | No surface was found on the polishing disc after a change of surface. | Check the Surfaces configuration. Press Continue . Restart the machine. |
| 1137 | Main hood not closed | The main hood is open, and the requested action cannot be initiated. | Close the main hood. Resume the process. |
| 1138 | No 24 Volt power to the conveyor motor | The 24 Volt power supply to the conveyor stepper motor is missing. This usually triggers a specific error message. | Send a copy of the system log to Struers Service. Make sure both hoods are closed. Restart the machine. If the error remains, contact Struers Service. |
| 1139 | No 24 Volt power to the process arm motor | The 24 Volt power supply to the process arm stepper motor is missing. This usually triggers a specific error message. | Send a copy of the system log to Struers Service. Make sure both hoods are closed. Restart the machine. If the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|--|--|---|
| 1140 | No 24 Volt power to the dresser sweep motor | The 24 Volt power supply to the dresser sweep stepper motor is missing. This usually triggers a specific error message. | Send a copy of the system log to Struers Service. Make sure both hoods are closed. Restart the machine. If the error remains, contact Struers Service. |
| 1141 | No 24 Volt power to the dresser feed motor | The 24 Volt power supply to the dresser feed stepper motor is missing. This usually triggers a specific error message. | Send a copy of the system log to Struers Service. Make sure both hoods are closed. Restart the machine. If the error remains, contact Struers Service. |
| 1142 | No 24 Volt power to the disc changer fork motor | The 24 Volt power supply to the disc changer fork stepper motor is missing. This usually triggers a specific error message. | Send a copy of the system log to Struers Service. Make sure both hoods are closed. Restart the machine. If the error remains, contact Struers Service. |
| 1143 | No 24 Volt power to the disc changer elevator motor | The 24 Volt power supply to the disc changer elevator stepper motor is missing. This usually triggers a specific error message. | Send a copy of the system log to Struers Service. Make sure both hoods are closed. Restart the machine. If the error remains, contact Struers Service. |
| 1144 | High temperature in the conveyor motor | Too high a temperature is detected in the conveyor stepper motor. This may be caused by very intensive use, or the movement may be blocked. | Let the motor cool for some minutes. Press Continue to resume the process. If the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|--|---|--|
| 1145 | High temperature in the process arm motor | <p>Too high a temperature is detected in the process arm stepper motor.</p> <p>This may be caused by very intensive use, or the movement may be blocked.</p> | <p>Let the motor cool for some minutes. Press Continue to resume the process.</p> <p>If the error remains, contact Struers Service.</p> |
| 1146 | High temperature in the dresser sweep motor | <p>Too high a temperature is detected in the dresser sweep stepper motor.</p> <p>This may be caused by very intensive use, or the movement may be blocked.</p> | <p>Let the motor cool for some minutes. Press Continue to resume the process.</p> <p>If the error remains, contact Struers Service.</p> |
| 1147 | High temperature in the dresser feed motor | <p>Too high a temperature is detected in the dresser feed stepper motor.</p> <p>This may be caused by very intensive use, or the movement may be blocked.</p> | <p>Let the motor cool for some minutes. Press Continue to resume the process.</p> <p>If the error remains, contact Struers Service.</p> |
| 1148 | High temperature in the disc changer fork motor | <p>Too high a temperature is detected in the disc changer fork stepper motor.</p> <p>This may be caused by very intensive use, or the movement may be blocked.</p> | <p>Let the motor cool for some minutes. Press Continue to resume the process.</p> <p>If the error remains, contact Struers Service.</p> |
| 1149 | High temperature in the disc changer elevator motor | <p>Too high a temperature is detected in the disc changer elevator stepper motor.</p> <p>This may be caused by very intensive use, or the movement may be blocked.</p> | <p>Let the motor cool for some minutes. Press Continue to resume the process.</p> <p>If the error remains, contact Struers Service.</p> |
| 1150 | SPECIMEN_MOTOR_NOT_RUNNING | <p>A preparation process has attempted to start, but failed because the specimen mover head was unable to rotate.</p> <p>The movement is obstructed, or there is too much friction in the specimen mover head, or there is an electrical fault in the motor or the PCB.</p> | <p>This error can be fatal.</p> <p>Remove any visible obstruction to the movement.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|--------------------------------------|--|---|
| 1151 | SPECIMEN_MOTOR_ OVERLOADED | <p>A preparation process has started, but was stopped suddenly due to a high load on the specimen mover motor.</p> <p>The specimen mover motor has not for longer than 10 sec. been able to run at the set speed due to a high load.</p> | Reduce the sample mover force, or, if the machine is running in counter rotation mode, select co-rotation mode. |
| 1152 | SPECIMEN_MOTOR_ OVERVOLTAGE | <p>A preparation process has started, but was stopped suddenly due to a high voltage in the specimen mover motor circuit.</p> <p>The specimen mover motor is running as a generator and not as a motor. The center of the sample mover may be too close to the center of the polishing disc.</p> | <p>Increase the distance between the center of the specimen mover and the center of the polishing disc.</p> <p>Reduce the speed of the polishing disc motor</p> <p>Reduce the force</p> |
| 1153 | SPECIMEN_MOTOR_ REG_IS_ZERO | <p>A preparation process has started, but was stopped suddenly due to an error condition in the specimen mover motor circuit.</p> <p>The specimen mover motor is running as a generator, or the motor controller is defective.</p> | <p>Increase the distance between the center of the specimen mover and the center of the polishing disc.</p> <p>Reduce the speed of the polishing disc motor.</p> <p>Reduce the force.</p> <p>If the error remains, contact Struers Service.</p> |
| 1154 | FREQ_INV_ UNDERVOLTAGE_ ERROR | <p>A preparation process has started, but was stopped suddenly due to an error condition in the frequency inverter.</p> <p>The main supply voltage is too low, or the frequency inverter is defective.</p> | Measure the main supply voltage (this must be done by authorized personnel). If the voltage is within normal tolerance, and the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|--|--|--|
| 1155 | FREQ_INV_OVERVOLTAGE_ERROR | <p>A preparation process has started, but was stopped suddenly due to an error condition in the frequency inverter.</p> <p>The main supply voltage is too high, or the frequency inverter is defective.</p> | <p>Measure the main supply voltage (this must be done by authorized personnel). If the voltage is within normal tolerance, and the error remains, contact Struers Service.</p> |
| 1156 | FREQ_INV_OVERLOAD_ERROR | <p>A preparation process has started, but was stopped suddenly due to an error condition in the frequency inverter.</p> <p>The grinding disc motor or the polishing disc motor is overloaded, or the frequency inverter output current has been high for too long, or the frequency inverter is defective.</p> | <p>Reduce the sample mover force, or, if the machine is running in counter rotation mode, select co-rotation mode.</p> <p>If the error remains, contact Struers Service.</p> |
| 1157 | FREQ_INV_SAFETY_INPUT_ERROR | <p>A preparation process has attempted to start, but failed because the frequency inverter safety circuit was not activated.</p> <p>The main hood was not closed properly, or an error in the safety system has occurred, or the frequency inverter is defective.</p> | <p>Close the main hood. Restart the preparation process.</p> <p>If the error remains, contact Struers Service.</p> |
| 1158 | FORCE_SYSTEM_ERROR_OR_NO_AIR | <p>This error number is not yet implemented.</p> | |
| 1159 | High pressure water for cleaning, low limit | <p>The pressure of the high pressure water for cleaning is too low.</p> | <p>Check the water supply.</p> <p>Inspect the pump and hoses for any leakage.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|--|---|--|
| 1160 | High pressure water for cleaning, high limit | The pressure of the high pressure water for cleaning is too high. | Make sure that the nozzles in the cleaning chamber are not blocked. Inspect the tubes for any bends blockage. If the error remains, contact Struers Service. |
| 1161 | Prcs_ERROR_TUBES_UNHANDLED_STATE | Internal control system error. | Send a copy of the system log to Struers Service. If the error remains, contact Struers Service. |
| 1162 | Prcs_ERROR_SUB_process_ULTRASONIC_UNHANDLED_STATE | Internal control system error. | Send a copy of the system log to Struers Service. If the error remains, contact Struers Service. |
| 1163 | Prcs_ERROR_SUB_process_DRYING_UNHANDLED_STATE | Internal control system error. | Send a copy of the system log to Struers Service. If the error remains, contact Struers Service. |
| 1164 | Prcs_ERROR_process_UNHANDLED_STATE | Internal control system error. | Send a copy of the system log to Struers Service. If the error remains, contact Struers Service. |
| 1165 | POST_BLDC_MOTOR_VOLTAGE_ERROR | Internal control system error. | |
| 1166 | The 24V DC supply is out of range | The power-on self-test has detected that the main 24V DC supply voltage is out of range. There is an error in the power supply or in the electrical circuit. | Restart the machine. If the error remains, contact Struers Service. |
| 1167 | The 12V DC supply is out of range | The power-on self-test has detected that the main 12V DC supply voltage is out of range. There is an error in the power supply or in the electrical circuit. | Restart the machine. If the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|--|---|---|
| 1168 | The 5V DC supply is out of range | <p>The power-on self-test has detected that the main 5V DC supply voltage is out of range.</p> <p>There is an error in the power supply or in the electrical circuit.</p> | <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1169 | The Y1 Valve for pressure increase is missing | <p>The power-on self-test has not detected the Y1 Valve for pressure increase.</p> <p>An electrical connection is missing or there is a faulty device.</p> | <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1169 | The Y2 Valve for pressure decrease minor is missing | <p>The power-on self-test has not detected the Y2 Valve for pressure decrease minor.</p> <p>An electrical connection is missing or there is a faulty device.</p> | <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1169 | The Y3 Valve for pressure decrease major is missing | <p>The power-on self-test has not detected the Y3 Valve for pressure decrease major.</p> <p>An electrical connection is missing or there is a faulty device.</p> | <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1169 | The Y4 Valve for single specimen feet activation is missing | <p>The power-on self-test has not detected the Y4 Valve for single specimen feet activation.</p> <p>An electrical connection is missing or there is a faulty device.</p> | <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1169 | The Y5 Valve for head forced down is missing | <p>The power-on self-test has not detected the Y5 Valve for specimen mover head forced down.</p> <p>An electrical connection is missing or there is a faulty device.</p> | <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |

| # | Error message | Cause | Action |
|------|--|--|--|
| 1169 | The Y6 Valve for single specimen mover fixation is missing | The power-on self-test has not detected the Y6 Valve for single specimen mover plate fixation. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1169 | The Y7 Valve for release of holder is missing | The power-on self-test has not detected the Y7 Valve for release of holder. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1169 | The Y8 Valve for single specimen feet retraction is missing | The power-on self-test has not detected the Y8 Valve for S.S feet retraction. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1169 | The Y30 Water valve for polishing cleaning water is missing | The power-on self-test has not detected the Y30 Water valve for polishing cleaning water. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1169 | The Y34 Water valve clean water disc cooling is missing | The power-on self-test has not detected the Y34 Water valve clean water disc cooling. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1169 | The Y33 Water valve clean water OP flushing is missing | The power-on self-test has not detected the Y33 Water valve clean water OP flushing. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|--|--|--|
| 1169 | The Y10 Valve for CY1 throttle is missing | The power-on self-test has not detected the Y10 Valve for CY1 throttle. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1169 | The Y12 Valve for CY1 6 bar (lower pressure) is missing | The power-on self-test has not detected the Y12 Valve for CY1 6 bar lower. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1169 | The Y11 Valve for CY1 15 bar (back pressure) is missing | The power-on self-test has not detected the Y11 Valve for CY1 15 bar (back pressure) . An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1169 | The Y35 Water valve H.P. Pump water is missing | The power-on self-test has not detected the Y35 Water valve H.P. Pump water. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1169 | The Y13 Valve for CY1 clamp is missing | The power-on self-test has not detected the Y13 Valve for CY1 clamp. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1170 | The Pressure sensor top (BP1) is missing | The power-on self-test has not detected the Pressure sensor top (BP1). An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|--|---|--|
| 1170 | The Pressure sensor bottom (BP2) is missing | The power-on self-test has not detected the Pressure sensor bottom (BP2). An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1171 | The dosing pump no. 1 is missing | The power-on self-test has not detected the dosing pump no. 1. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1171 | The dosing pump no. 2 is missing | The power-on self-test has not detected the dosing pump no. 2. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1171 | The dosing pump no. 3 is missing | The power-on self-test has not detected the dosing pump no. 3. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1171 | The dosing pump no. 4 is missing | The power-on self-test has not detected the dosing pump no. 4. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1171 | The dosing pump no. 5 is missing | The power-on self-test has not detected the dosing pump no. 5. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|---|---|---|
| 1171 | The dosing pump no. 6 is missing | The power-on self-test has not detected the dosing pump no. 6. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1171 | The dosing pump no. 7 is missing | The power-on self-test has not detected the dosing pump no. 7. An electrical connection is missing or there is a faulty device. | Restart the machine. If the error remains, contact Struers Service. |
| 1172 | Pressure system not calibrated | The pressure system for the force regulation is not yet calibrated. | Contact Struers Service. |
| 1173 | Struers memory module is missing | The Struers memory module was not detected during power up. | Contact Struers Service. |
| 1174 | No 24 Volt power to the stepper motor \$SUBCODE2\$ | The 24 Volt power supply to the stepper motor (\$SUBCODE2\$) is missing, even though the main hood is closed. Cause: An error in the power supply or the electric circuit. | Send a copy of the system log to Struers Service. Open and close the main hood. Restart the machine. If the error remains, contact Struers Service. |
| 1174 | No 24 Volt power to \$SUBCODE2\$ stepper motors | The 24 Volt power supply to \$SUBCODE2\$ of stepper motors is missing, even though the main hood is closed. Cause: An error in the power supply or the electric circuit. | Send a copy of the system log to Struers Service. Open and close the main hood. Restart the machine. If the error remains, contact Struers Service. |
| 1175 | Too long delay between ejecting and loading of surface | A polishing step has been sent and processing waits for a disc change operation to finish. The loading of the surface has not started. | Send a copy of the system log to Struers Service. Deliver the specimen holder. Restart the process. Restart the machine. If the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|--|--|---|
| 1176 | Prcs_ERROR_UNEXPECTED_DISC_CHANGE_OPERATION_STARTED | This is an internal control system error. | Send a copy of the system log to Struers Service. If the error remains, contact Struers Service. |
| 1177 | Holder type mismatch | The machine has picked up a specimen holder where a mover plate is expected, or the machine has picked up a specimen mover plate where a specimen holder is expected. The specimen holder/specimen mover plate will be delivered. | Make sure that the specimen holder or specimen mover plate is defined correctly in the Queue screen. |
| 1178 | Possible obstruction of the process arm | The dresser is not parked correctly, and may obstruct the movement of the process arm. | Carefully move the dresser arm into its parked position. Resume the process. Carry out a manual dressing of the stone. Restart the machine. If the error remains, contact Struers Service. |
| 1179 | Too high holder or mover plate detected | An attempt to pick up a specimen holder or specimen mover plate failed. | If there is a wrong specimen holder/specimen mover plate in the cup, remove it from the machine. Remove the method from the queue. If a holder is misaligned, make sure that the screws are not too long. Place the specimen holder correctly in the cup. If a specimen mover plate is misaligned, place it correctly in the cup. If there is an obstruction to the specimen mover head, remove the obstruction. |

| # | Error message | Cause | Action |
|------|--|--|---|
| 1180 | Too low holder or mover plate detected | An attempt to pick up a specimen holder or specimen mover plate failed. | <p>If there is a wrong specimen holder/specimen mover plate in the cup, remove it from the machine. Remove the method from the queue.</p> <p>If there was no specimen holder/specimen mover plate at the specified hook, place the specimen holder/specimen mover plate in the hook.</p> <p>If there was no specimen holder/specimen mover plate at the specified hook, remove the method from the queue.</p> |
| 1181 | Holder present in the machine | The maintenance function cannot be performed because a specimen holder is present in the machine. | Use the "Deliver" function to remove the specimen holder from the machine. |
| 1182 | Force too high | <p>The pressure regulating loop cannot maintain the air pressure. The pressure, and thus the force, is too high.</p> <p>Faulty regulation valves, or blocked relief nozzles.</p> | <p>Press Continue.</p> <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1183 | Force too low | <p>The pressure regulating loop cannot maintain the air pressure. The pressure, and thus the force, is too low.</p> <p>Insufficient air supply, faulty regulation valves, or leakages.</p> | <p>Make sure the air pressure is okay.</p> <p>Press Continue.</p> <p>Restart the machine.</p> <p>If the error remains, contact Struers Service.</p> |
| 1184 | Emergency stop activated, but the circuit does not work correctly | The 24V supply is constantly disconnected. | Contact Struers Service. |
| 1184 | Emergency stop activated, but the circuit does not work correctly | The supervision switch is not activated | Contact Struers Service. |

| # | Error message | Cause | Action |
|------|---|---|---|
| 1184 | Emergency stop activated at power on | The machine has entered the emergency stop state. The emergency stop button is activated. | Check and correct the cause. Release the emergency stop |
| 1185 | Prcs_ERROR_CLEAN_ULTRA_AUTOMATIC_REFILL_FAILED | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1186 | Prcs_ERROR_SUB_process_US_TUB_COMMAND_REJECTED | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1187 | Prcs_ERROR_SUB_process_DRYING_COMMAND_REJECTED | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1188 | High temperature in the grinding motor | Too high a temperature is detected in the grinding motor. Cause: Very intensive use, or excess force needed to turn the specimen mover plate. | Let the motor cool for some minutes. Press Continue . If the error remains, contact Struers Service. |
| 1189 | High temperature in the polishing motor | Too high a temperature is detected in the polishing motor. Cause: Very intensive use, or excess force needed to turn the specimen mover plate. | Let the motor cool for some minutes. Press Continue . If the error remains, contact Struers Service. |
| 1190 | Prcs_ERROR_SUB_process_SERVICE_UNHANDLED_STATE | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |

| # | Error message | Cause | Action |
|------|---|---|--|
| 1191 | Prcs_ERROR_SUB_process_SERVICE_ILLEGAL_PARAMETER | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1192 | Prcs_ERROR_SUB_process_SERVICE_COMMAND_REJECTED | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1193 | Dresser tip worn down | A manual dressing has started, but with a remark. Cause: The dresser tip is worn down to a critical level. | Replace the worn-out dresser tip with a new dresser tip. |
| 1194 | Prcs_ERROR_RECIRC_ILLEGAL_STATE | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1195 | No flow of recirculated water | A grinding or dressing process has attempted to start, but failed. Cause: There is no flow of recirculated water, or the flow sensor is defective. | Check the water level in the recirculation unit. Inspect the recirculation unit for any disconnected or bent hoses. If the error remains, contact Struers Service. |
| 1196 | Prcs_ERROR_RECIRC_ILLEGAL_ERROR_CODE | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1197 | Prcs_ERROR_MISSING_ANSWER_FROM_RECIRC_TASK | Internal control system error. | Send a copy of the system log to Struers Service. |
| 1198 | Prcs_ERROR_ILLEGAL_EVENT_CODE_RECIRC | Internal control system error. | Send a copy of the system log to Struers Service. |

| # | Error message | Cause | Action |
|------|--|--|---|
| 1199 | Grinding motor is not stopped | The frequency inverter was not able to stop the grinding motor within the expected time limit. Cause: A high supply mains voltage. | Wait and see whether the motor stops and the process continues. Press the emergency stop. Release the emergency stop Press Continue . Restart the machine. If the error remains, contact Struers Service. |
| 1200 | Polishing motor is not stopped | The frequency inverter was not able to stop the polishing motor within the expected time limit. Cause: A high supply mains voltage. | Wait and see whether the motor stops and the process continues. Press the emergency stop. Release the emergency stop Press Continue . Restart the machine. If the error remains, contact Struers Service. |
| 1201 | Conveyor hood not locked | The conveyor hood is not locked, and the requested action cannot be initiated. | Activate the conveyor hood lock. Resume the process. |
| 1202 | Main hood not locked | The main hood is not locked, and the requested action cannot be initiated. | Activate the main hood lock. Resume the process. |
| 1203 | Machine idle state not achieved | The machine was not able to detect its idle state. Cause: Faulty parts, or an internal control system error. | Press the emergency stop. Release the emergency stop Press Continue . Deliver the specimen holder. Restart the machine. Resume the process. If the error remains, contact Struers Service. |
| 1204 | The Leak Test system is not ready | The Leak Test system is active and cannot currently initiate a testing operation. | Resume the process when the current operation has finished. |

| # | Error message | Cause | Action |
|------|--|--|--|
| 1205 | Prcs_ERROR_LEAK_TEST_ILLEGAL_STATE | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1206 | Prcs_ERROR_LEAK_TEST_ILLEGAL_TEST_NO | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1207 | Prcs_ERROR_LEAK_TEST_ILLEGAL_ERROR_CODE | Internal control system error. | Send a copy of the system log to Struers Service. Restart the machine. If the error remains, contact Struers Service. |
| 1208 | Prcs_ERROR_MISSING_ANSWER_FROM_LEAK_TEST_TASK | Internal control system error. | Send a copy of the system log to Struers Service. If the error remains, contact Struers Service. |
| 1209 | Prcs_ERROR_ILLEGAL_EVENT_CODE_LEAK_TEST_FAN | Internal control system error. | Send a copy of the system log to Struers Service. If the error remains, contact Struers Service. |
| 1210 | No water flow in ultrasonic cleaning chamber | An ultrasonic cleaning process has attempted to start, but failed. Cause: There is no flow of water, or the flow sensor is defective. | Check the water inlet. Inspect the ultrasonic cleaning unit for any disconnected or bent hoses. If the error remains, contact Struers Service. |
| 1211 | Grinding process lasted too long | A grinding process had been running but failed. Cause: Required removal cannot be reached within time. | Check the dresser configuration. Press Continue to resume the process, or abort the process by delivering the specimen holder. |
| 1212 | Polishing process lasted too long | A polishing process has been running but failed. Cause: Required removal cannot be reached within time. | Press Continue to resume the process, or abort the process by delivering the specimen holder. |

| # | Error message | Cause | Action |
|------|---|---|--|
| 1500 | Cannot start process | The process cannot be started. Cause: The machine is initializing | Wait until initialization is done and the machine goes into idle mode. Press Retry if this option is available. If the error remains, contact Struers Service. |
| 1501 | Cannot start process | The emergency stop is activated | Check and correct the cause. Release the emergency stop Press Retry if this option is available. |
| 1502 | Cannot start process | The main hood is open | Close the main hood. Press Retry if this option is available. |
| 1503 | Hexamatic has detected a holder conflict | You have inserted a specimen holder at a hook which is in use. | Remove the specimen holder from the hook that is in use. |
| 1504 | Possible holder conflict when delivering | The machine has detected a holder at a hook which is in use. | Remove the specimen holder from the hook that is in use. Press Retry to continue delivering. |
| 1505 | Hexamatic cannot finish initializing | The hoods are open, or the emergency stop is pressed. | Make sure that the hoods are closed. Check and correct the cause, if any. Release the emergency stop |
| 1506 | Hexamatic was reset while processing | The machine was reset with pending processes. This error may occur because there was a short loss of power. | Press Cancel to reset all ongoing processes (recommended). |
| 1507 | Cannot start process | The conveyor hood is open | Close the conveyor hood. Press Retry if this option is available. |
| 1550 | Cannot change surface | The machine does not know the surface number. | |
| 1551 | Cannot eject surface | There is already a surface on the shelf. | |

| # | Error message | Cause | Action |
|------|---|---|---|
| 1570 | Error processing step | There was an error processing the step: \$SUBERROR1\$ | Press Retry to skip the step and process the next step, or press Cancel to deliver the specimen holder. |
| 1571 | Error processing step | There was an error processing the step: \$SUBERROR1\$ | Press Retry to skip the step and process the next step, or press Cancel to deliver the specimen holder. |
| 1580 | Cannot unload loaded surface | A preparation process has started and the disc changer attempted to unload the disc, but failed. Cause: The disc changer could not detect a disc placed on the "fork" after the first part of the "Unload disc" operation. No disc is present, or a "Disc on fork" sensor is defective. Reference: \$SUBERROR1\$ | Press Retry to reset the loaded surface and continue changing the surfaces. |
| 1581 | Cannot change stone | A stone exchange process has started and the dresser arm attempted to move out of the stone area, but failed. Cause: \$SUBERROR1\$ | Press Retry to revert the grinding surface change. |
| 1600 | USB-CAN module initialization failed | | Switch off the machine. Press the power switch. |
| 1601 | There is a surface on the fork and it is not possible to start properly. | | Switch off the machine. Remove the surface. |
| 1602 | Hexamatic device initialization failed | | Contact Struers Service. |
| 1603 | Hexamatic failed to communicate via the CANopen network | | Contact Struers Service. |

| # | Error message | Cause | Action |
|------|--|---|--|
| 1604 | Hexamatic has experienced a critical network failure and any ongoing process (es) may not be completed correctly. | The connection to the control PCB node has been lost. Faulty electrical connection. | Switch off the machine. Contact Struers Service. |
| 1701 | Current firmware version v\$PARAM1\$ is lower than required v\$PARAM2\$. | The firmware version is not the correct version and no update was found on the USB. | Update the firmware manually in the Service menu. |
| 1702 | Hexamatic is unable to start. Invalid firmware. | The firmware version is not the correct version and the update found on the USB is older than required. | Update the firmware manually in the Service menu. |
| 1703 | Hexamatic is unable to start. Invalid firmware. | The firmware version is not the correct version and no update was found on the USB. | Update the firmware manually in the Service menu. |


13 Technical data

13.1 Technical data - Hexamatic

| Subject | Specifications | |
|--------------------------------|-----------------------------------|--|
| Safety standards | See the Declaration of Conformity | |
| Discs - Specimen holder | Diameter | 140 mm (5.5") |
| Specimen mover head | Speed | 50-300 rpm, in steps of 10 |
| | Force | <ul style="list-style-type: none"> • Specimen holder: 30-400 N in steps of 10 N • Specimen mover plate: 5-65 N in steps of 5 N |
| | Motor - Power consumption | 50-250 rpm, 0.44 kW (0.59 hp) |

| Subject | Specifications | |
|---|-------------------------|--|
| Plane grinding work station | Main motor | 2.2 kW |
| | Rotational speed | 500 - 1500 rpm |
| | Grinding stone | Diameter: 270 mm grinding width: 115 mm |
| | Dressing | Automatic dressing |
| | Recirculation unit | 60 l/min Container capacity: 50 l |
| Fine grinding and polishing work station | Main motor | 0.75 kW (1.0 hp) |
| | Rotational speed | 50 - 500 rpm |
| | Grinding/polishing disc | Diameter: 250 mm |
| Cleaning station | Cleaning time | User-defined |
| | Cleaning method | Ultrasound, Water, Detergent, Alcohol, Air |
| | Cleaning programs | 10 Struers programs, indefinite number of user-defined programs |
| Recirculation unit | Motor | 0.13 kW (0.17 hp) |
| | Water tank | 50 l |
| | Weight | Empty: 20 kg (44 lb) Full: 70 kg (154 lb) |
| Dosing system | Bottle unit capacity | <ul style="list-style-type: none"> • DP suspension: 1 l (0.26 gal) • DP lubricant: 1 l (0.26 gal) • OPS/OPU suspension: 1 l (0.26 gal) • Soap, ultrasonic cleaning: 1 l (0.26 gal) • Bottle for soap solution, cleaning: 5 l (1.3 gal) • Bottle for alcohol, cleaning: 5 l (1.3 gal) |
| Operating environment | Surrounding temperature | 5 - 40°C (41 - 104°F) |
| | Humidity | 35-85 % RH non-condensing |
| Storage and transport conditions | Surrounding temperature | 10 – 35°C (40 – 105°F) |
| | Humidity | 10 - 90 % RH non-condensing |

| Subject | Specifications | |
|-----------------------|---|---|
| Compressed air | Pressure | Min. 6 bar (90 psi) |
| | Flow | Min. 200/min (53 gpm) |
| | Recommended quality | Class-3, as specified in ISO 8573-1 |
| Water supply | Water pressure | 2 bar (29 psi) - 9.9 bar (144 psi) |
| | Water flow | Min. 800 l/min (211 gpm) |
| | Water outlet | Waste water outlet |
| Exhaust system | Dimensions | Diameter: 80 mm (3.1") |
| | Recommended capacity at 0 mm (0") water gauge | 150 m ³ /h (5297 ft ³ /h) |
| Power supply | Power, nominal load | 3.7 kW |
| | Number of phases | 3 (3L+PE) |
| | Output, main motor | 2.2 kW (2.9 HP) |
| | Voltage/frequency | Nominal load/Max. load |
| | 3 x 200-240 V/50-60 Hz | 15A/31 A |
| | Ampere rating, largest motor | 7.93 A |
| | 3 x 380-415 V/50-60 Hz | 8.5 A/17 A |
| | Ampere rating, largest motor | 4.56 A |
| | 3 x 460-480 V/60 Hz | 8 A/16 A |
| | Ampere rating, largest motor | 3.96 A |

| Subject | Specifications | |
|--|--|--|
| Electrical power supply cables | Voltage/frequency | Local standards can override the recommendations for the main electrical power supply cable. If needed, contact a qualified electrician to verify which option is suitable for the local installation setup. |
| | 3 x 200-240 V/50-60 Hz | <ul style="list-style-type: none"> • Min. fuse: 35 A • Minimum cable size at minimum fuse: 3 x AWG12/2.5 mm²+ PE • Max. fuse: 40 A • Minimum cable size at maximum fuse: 3 x AWG12/2.5 mm²+ PE |
| | 3 x 380-480 V/50-60 Hz | <ul style="list-style-type: none"> • Min. fuse: 20 A • Minimum cable size at minimum fuse: 3 x AWG14/1.5 mm²+ PE • Max. fuse: 40 A • Minimum cable size at maximum fuse: 3 x AWG12/2.5 mm²+ PE |
| | 3 x 460-480 V/60 Hz | <ul style="list-style-type: none"> • Min. fuse: 20 A • Minimum cable size at minimum fuse: 3 x AWG14/1.5 mm²+ PE • Max. fuse: 40 A • Minimum cable size at maximum fuse: 3 x AWG12/2.5 mm²+ PE |
| Residual Current Circuit Breaker (RCCB) | Type B, 30 mA is required. <div style="border: 1px solid blue; border-radius: 10px; padding: 10px; margin-top: 10px;">  <p>Note Always follow local regulations.</p> </div> | |
| Software and electronics | Display | Touch monitor 17" 4:3 Ratio Active Matrix TFT LCD 1280x1024 @ 60 Hz |
| | Controls | The machine is controlled via the touch monitor |

| Subject | Specifications | |
|-----------------------|-------------------------|-------------------|
| Dimensions and weight | Height - without beacon | 192 cm (75.6") |
| | Height - with beacon | 228 cm (89.8") |
| | Width | 210 cm (82.7") |
| | Depth | 132 cm (52.0") |
| | Weight | 800 kg (1763 lbs) |

13.2 Safety Circuit Categories/Performance Level

| Safety Circuit Categories/Performance Level | |
|---|--|
| Emergency stop | EN 60204-1, Stop category 0 EN ISO 13849-1, Category 1 Performance Level (PL) c |
| Main working zone guard | EN 60204-1, Stop category 0 EN ISO 13849-1, Category 3 Performance Level (PL) d |
| Main working zone guard lock | EN 60204-1, Stop category 0 EN ISO 13849-1, Category b Performance Level (PL) a |
| Conveyor working zone guard | EN 60204-1, Stop category 0 EN ISO 13849-1, Category 3 Performance Level (PL) d |
| Conveyor working zone guard lock | EN 60204-1, Stop category 0 EN ISO 13849-1, Category b Performance Level (PL) a |
| Unintended start of fluid | EN 60204-1, Stop category 0 EN ISO 13849-1, Category 1 Performance Level (PL) c |
| Overspeed of grinding disc | EN 60204-1, Stop category 0 EN ISO 13849-1, Category 3 Performance Level (PL) d |

13.3 Noise and vibration levels

| | | |
|--------------------|---|---|
| Noise level | A-weighted sound emission pressure level at workstations | $L_{pA} = 68.7 \text{ dB(A)}$ (measured value) $L_{pC} = \text{N/A dB(C)}$ (measured value) $L_{wA} = \text{N/A dB(A)}$ (measured value) Uncertainty $K = 4 \text{ dB}$ Measurements made in accordance with EN ISO 11202 |
|--------------------|---|---|

Noise level: The figures quoted are emission levels and are not necessarily safe working levels. While there is a correlation between the emission and exposure levels, this cannot be used reliably to determine whether or not further precautions are required. Factors that influence the actual level of exposure of the workforce include characteristics of the work room, the other sources of noise, etc., i.e. the number of machines and other adjacent processes. Also, the permissible exposure level can vary from country to country. This information, however, will enable the user of the machine to make a better evaluation of the hazard and risk.

| | | |
|--------------------|--|---|
| Noise level | Equivalent ultrasound sound pressure level (equivalent level of ultrasound) | $L_{teq,T} = 83.6 \text{ dB}$ (measured value) Uncertainty $K = 2 \text{ dB}$ Measurements made in accordance with EN 61010-1:2010 (chapter 12.5) |
|--------------------|--|---|

DECLARED DUAL-NUMBER NOISE EMISSION VALUES in accordance with EN ISO 4871:2009.

| | |
|------------------------|-----|
| Vibration level | N/A |
|------------------------|-----|

13.4 Safety Related Parts of the Control System (SRP/CS)



WARNING

Safety critical components must be replaced after a maximum lifetime of 20 years. Contact Struers Service.



Note

SRP/CS (safety-related parts of a control system) are parts that have an influence on safe operation of the machine.



Note

Replacement of safety critical components must only be performed by a Struers engineer or a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.). Safety critical components must only be replaced by components with at least the same safety level. Contact Struers Service.

Parts

| Safety related part | Manufacturer/Manufacturer description | Manufacturer catalogue no. | Electrical ref. | Struers catalogue no. |
|--|--|--------------------------------------|---------------------------------|------------------------------|
| Interlock locking device | Schmersal Solenoid interlock | AZM 170SK-02ZRKA | YS1, | 2S00019 |
| Magnetic safety sensor | Schmersal Safety sensors | BNS-120-02z | SS1, | 2SS00130 |
| Frequency inverter | Omron Industrial automation V1000 Frequency inverter | VZA43P0BAA | A4 | 2PU14300 |
| Flexible safety unit | Omron Industrial automation Basic safety unit | G9SX-BC202-RT | KS1 | 2KS10050 |
| Flexible safety unit | Omron Industrial automation Advanced safety unit | G9SX-AD322-T15-RT | KS2, KS5 | 2KS10051 |
| Flexible safety unit | Omron Industrial automation Expansion safety unit | G9SX-EX401-RT | KS3, KS6 | 2KS10052 |
| Safety relay unit | Omron Industrial automation Safety relay | G9SB-3012-A | KS7 | 2KS10006 |
| Installation contactor | ABB Contactor | ESB20-11N-01 | K102, K103, K105, K106 | 2KM20111 |
| Mini motor contactors | Omron Industrial automation Mini motor contactors | J7KNA-12-10-24VD-VS | K8, K104, K100, K101, K107 K108 | 2KM70911 |
| Mini motor contactors | Omron Industrial automation Mini motor contactors | J7KNA-12-01-24VD-VS | K1 | 2KM70912 |
| 2/2-way magnetic valve with exhaust | Stasto Armatures Series 31A | ODE 31A2AR20 + BDV08024CY 24VDC coil | Y36 | 2YM12121 |
| Solenoid valve, 3 port, directly operated, poppet type | SMC PNEUMATICS A/S Series VT307 | VT307-5D1-01F-Q | Y10, Y12 | 2YM10030 |
| Solenoid valve, 5 port rubber seal | SMC Series SY | SY5460-5G-C6-Q | Y20, Y21, Y22 | 2YM15361 |

| Safety related part | Manufacturer/Manufacturer description | Manufacturer catalogue no. | Electrical ref. | Struers catalogue no. |
|---|---------------------------------------|----------------------------|------------------------------|-----------------------|
| Solenoid valve, combined | Invesys V38 Series | V38 valve | Y30, Y31, Y32, Y33, Y34, Y35 | 2YM12311 |
| Solenoid valve, 2 port, directly operated | SMC PNEUMATICS A/S Series VX21/22/23 | VX2A0BA 24DC | Y27, Y28 | 2YM10128 |
| Emergency stop button | Schlegel Latching mushroom head | ES Ø22 type RV | S1, S6 | 2SA10400 |
| Emergency stop contact | Schlegel modular contact, momentary | 5 NC type MTO | S1, S6 | 2SB10071 |
| Module holder | Schlegel Module holder 5 elem. MHR-5 | MHR-5 | S1, S6 | 2SA41603 |
| Safety switch, with separate actuator | Schmersal Safety switch | AZ 17-02ZK | S2, S3 | 2SS00171 |
| Speed monitoring card | Reer Speed monitoring card | SV MR0 | KS4 | 2KS10034 |
| Speed sensor, Y-movement | Sick Inductive proximity sensors | IMB08-02BPSVU2K | HQ2, HQ3 | 2HQ00032 |
| Main guard window | Struers | 15940238 | | 15940238 |
| Conveyor guard | Struers | 15940324 | | 15940324 |

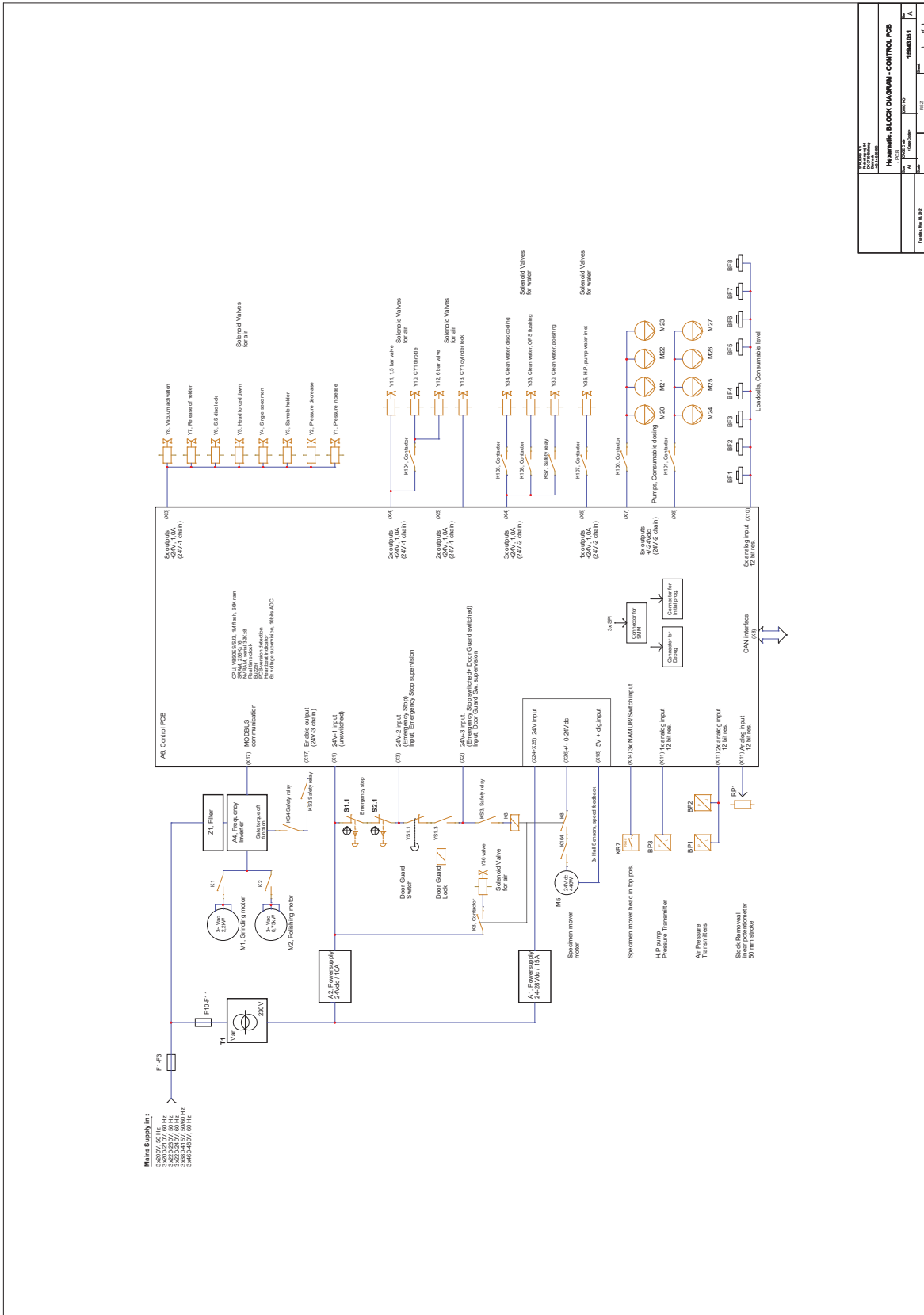
13.5 Diagrams

If you wish to view specific information in detail, see the online version of this manual.

13.5.1 Diagrams - Hexamatic

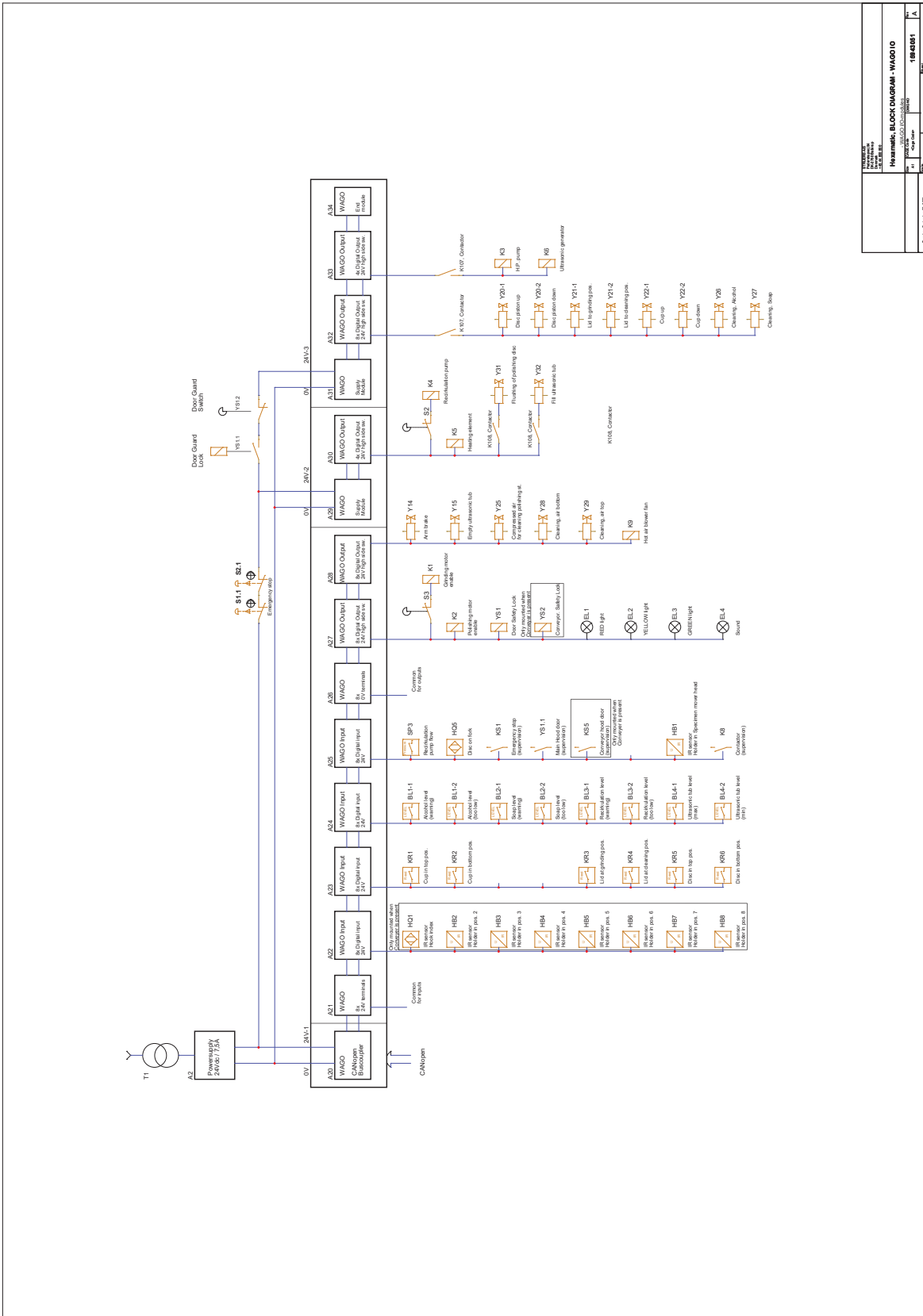
| Title | No. |
|---------------------------|-------------------------------------|
| Block diagram, 4 pages | 15943051 A - Page 1 |
| Circuit diagram, 17 pages | 15943112 A - Page 1 |
| Air diagram | 15941003 A |
| Water diagram | 15941004 A |

15943051 A - Page 2



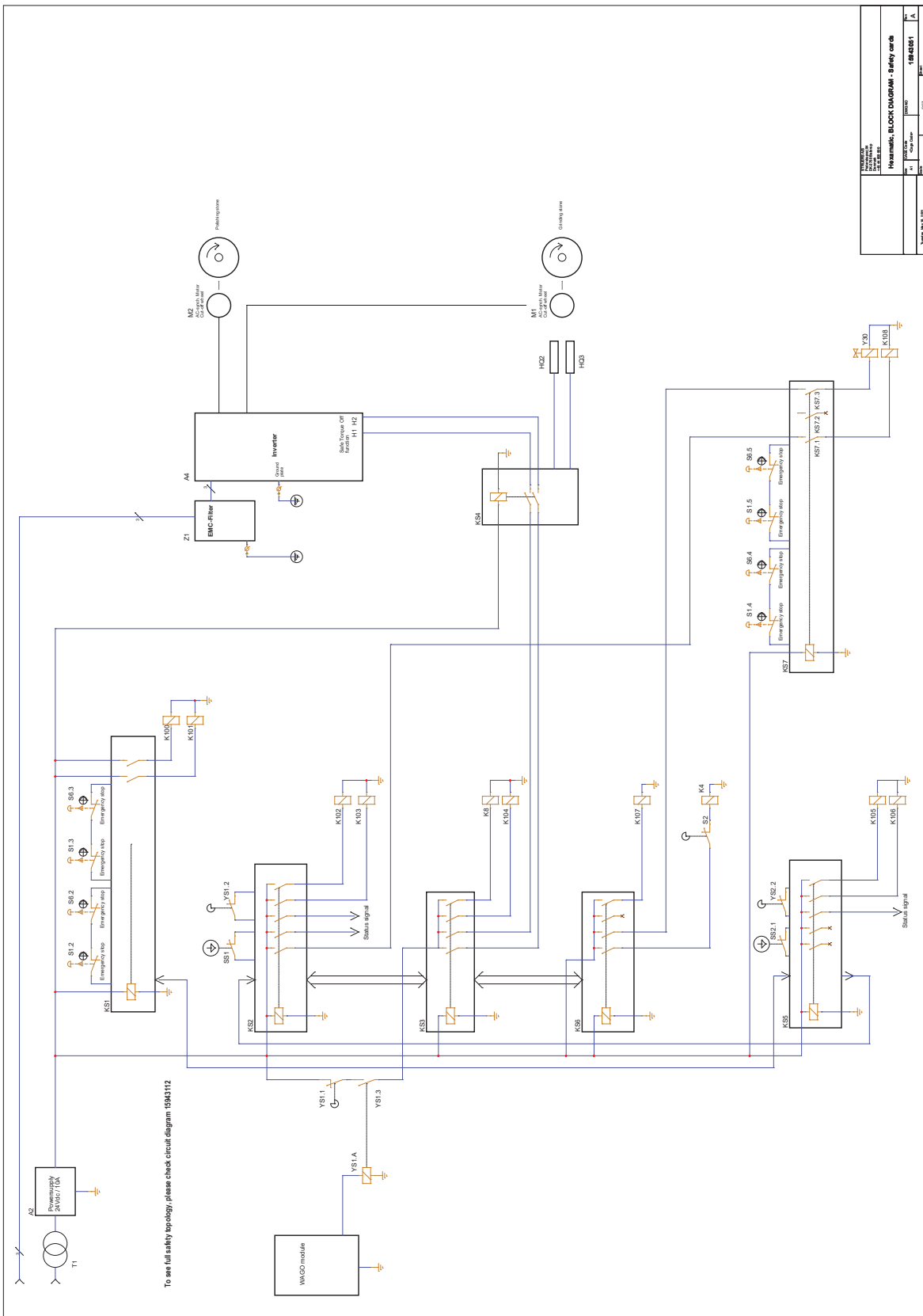
| Hexameric Block Diagram - CONTROL PCB | |
|---------------------------------------|----------|
| Rev. 01 | 15943051 |
| Rev. 02 | 15943051 |
| Rev. 03 | 15943051 |
| Rev. 04 | 15943051 |
| Rev. 05 | 15943051 |
| Rev. 06 | 15943051 |
| Rev. 07 | 15943051 |
| Rev. 08 | 15943051 |
| Rev. 09 | 15943051 |
| Rev. 10 | 15943051 |
| Rev. 11 | 15943051 |
| Rev. 12 | 15943051 |
| Rev. 13 | 15943051 |
| Rev. 14 | 15943051 |
| Rev. 15 | 15943051 |
| Rev. 16 | 15943051 |
| Rev. 17 | 15943051 |
| Rev. 18 | 15943051 |
| Rev. 19 | 15943051 |
| Rev. 20 | 15943051 |

15943051 A - Page 3



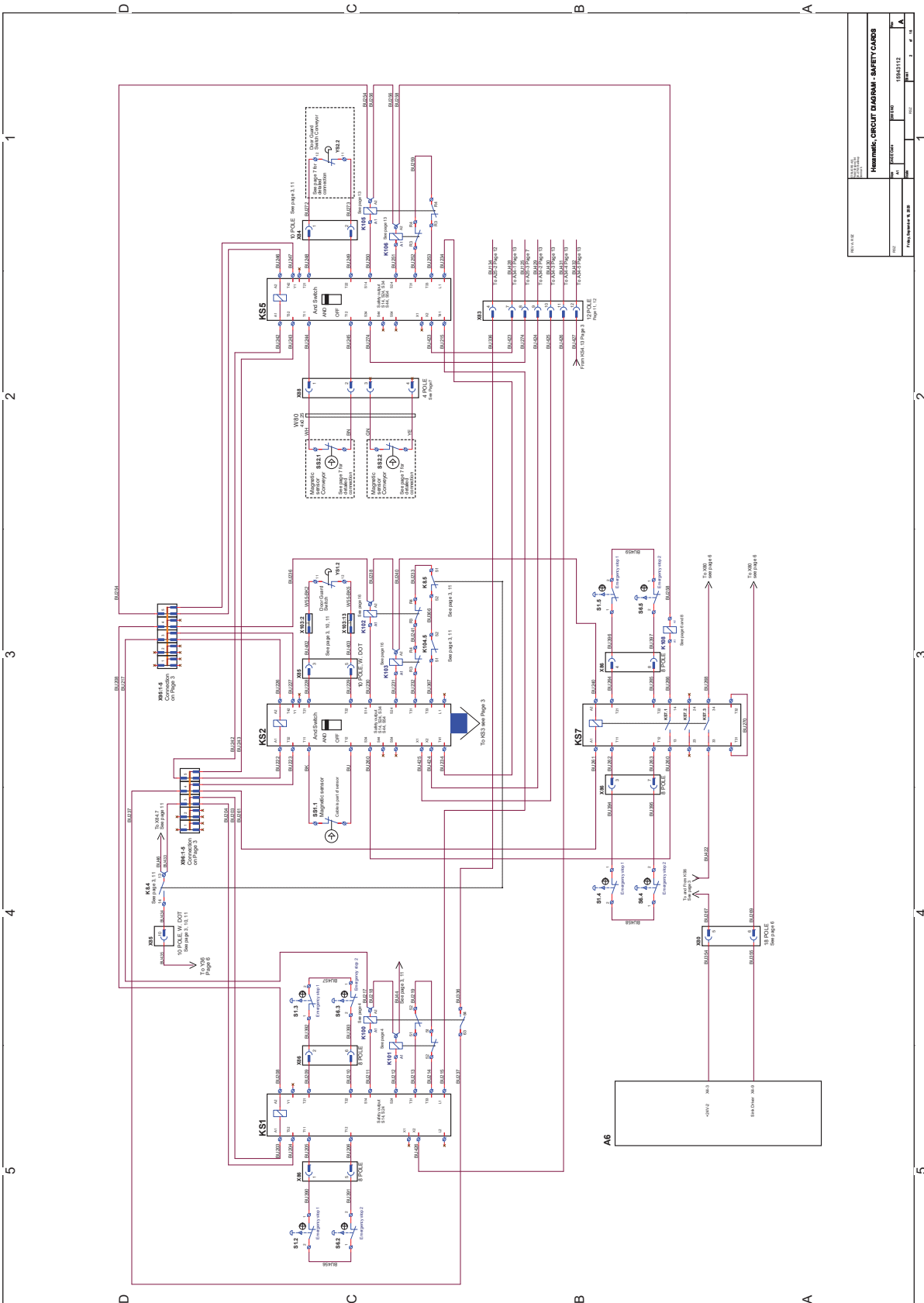
| | |
|--------------|----------------------------------|
| Project Name | Hywamids BLOCK DIAGRAM - WAGO IO |
| Project No. | 15943051 |
| Sheet No. | 1 |
| Sheet Total | 1 |
| Revision | 1 |
| Author | 15943051 |
| Date | 15943051 |
| Scale | 1:1 |

15943051 A - Page 4



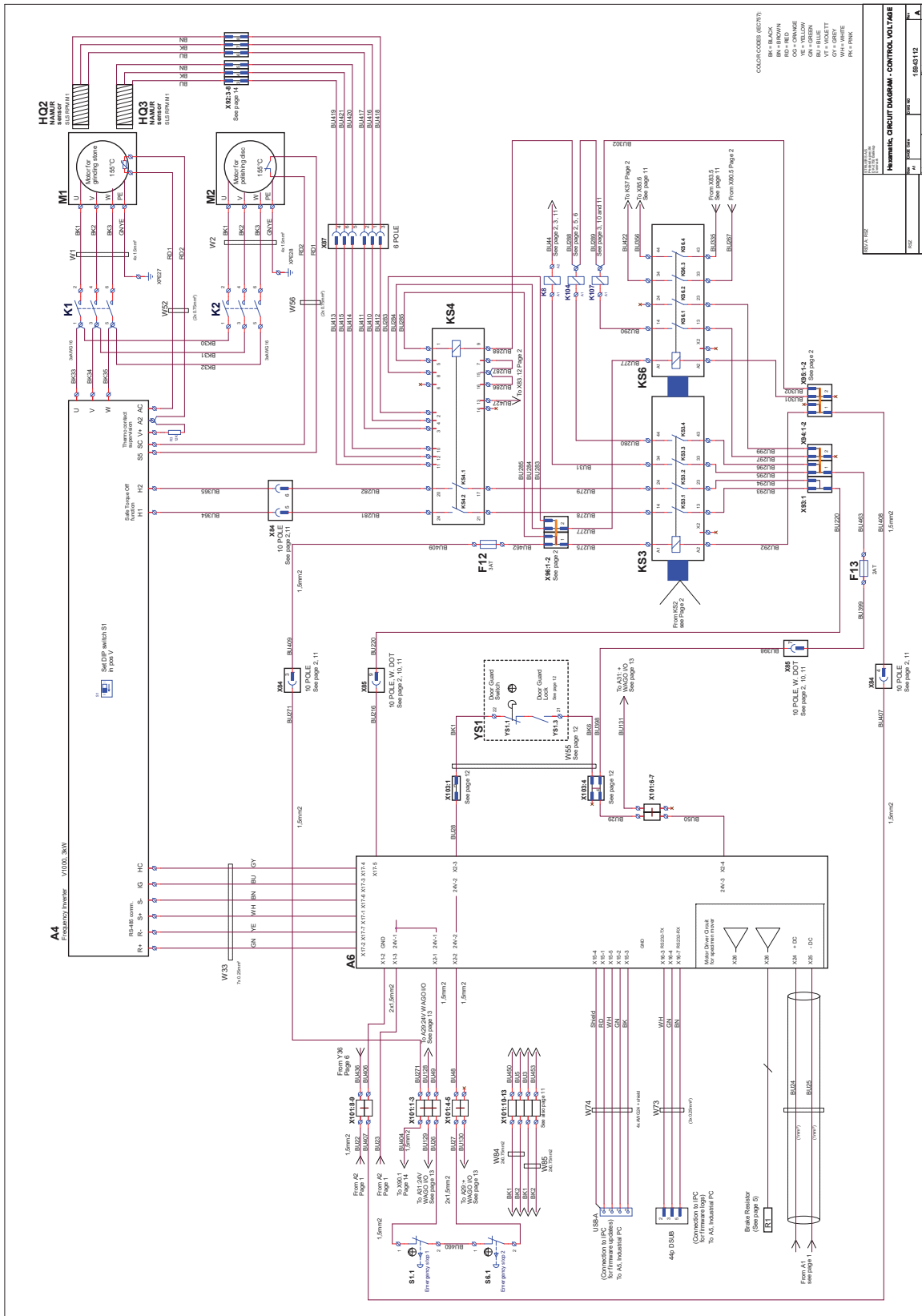
| | | | |
|--------------------------------------|-------------------|--|---------------------|
| Revision 15943051 A 15943051 A | | Title Kawasaki, BLOCK DIAGRAM - Safety code | |
| Date 15/05/2014 | Drawn 15943051 | Date 15/05/2014 | Checked 15943051 |
| Scale 1:1 | | Sheet 1 of 1 | |

15943112 A - Page 2

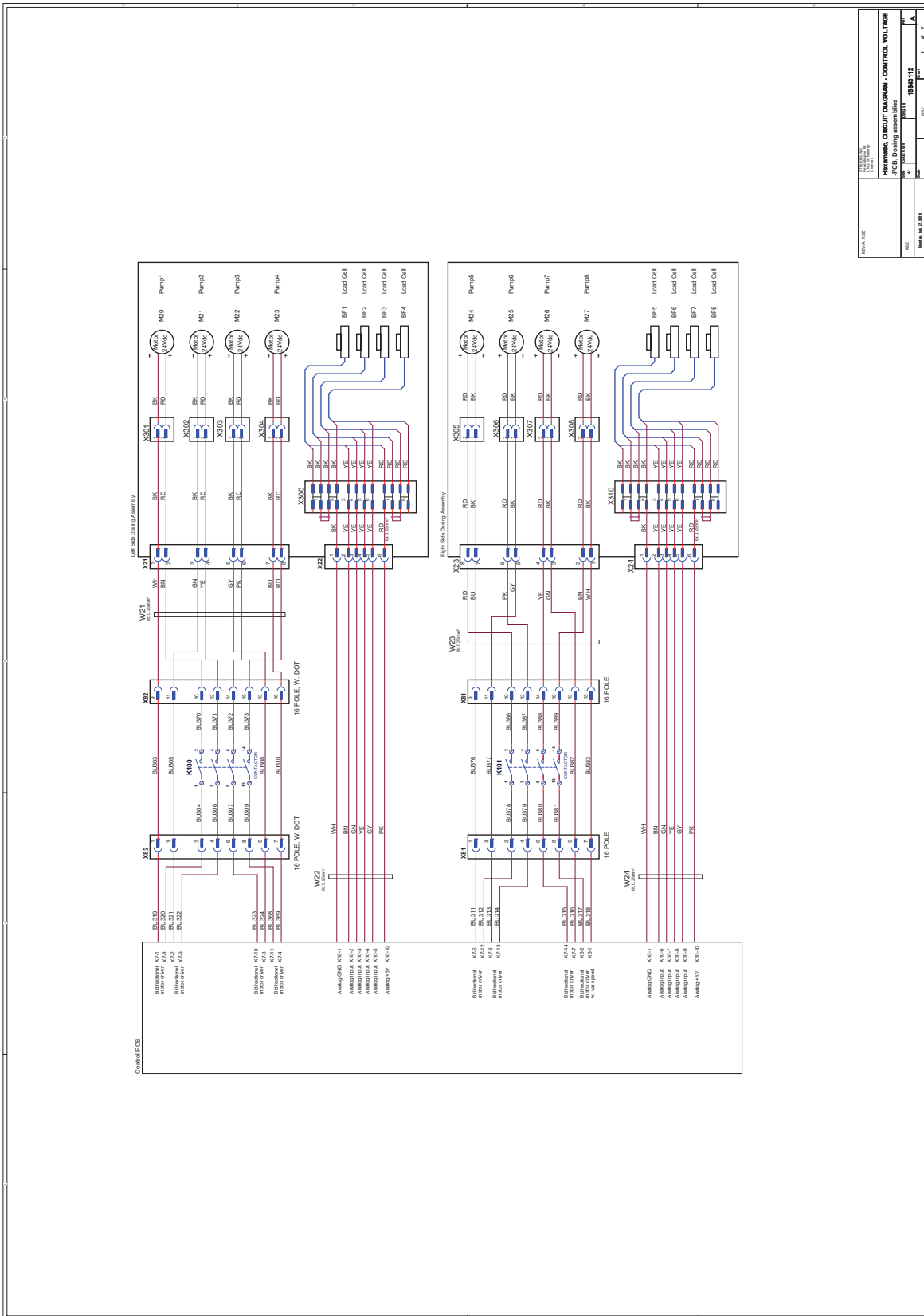


| HEMATIC CIRCUIT DIAGRAM - SAFETY CIRCUIS | | | |
|--|----------|------------|---------|
| Page | 24 | Page Count | 108/108 |
| File Name | 15943112 | Rev | A |
| Project | 15943112 | Sheet | 2 of 11 |

15943112 A - Page 3

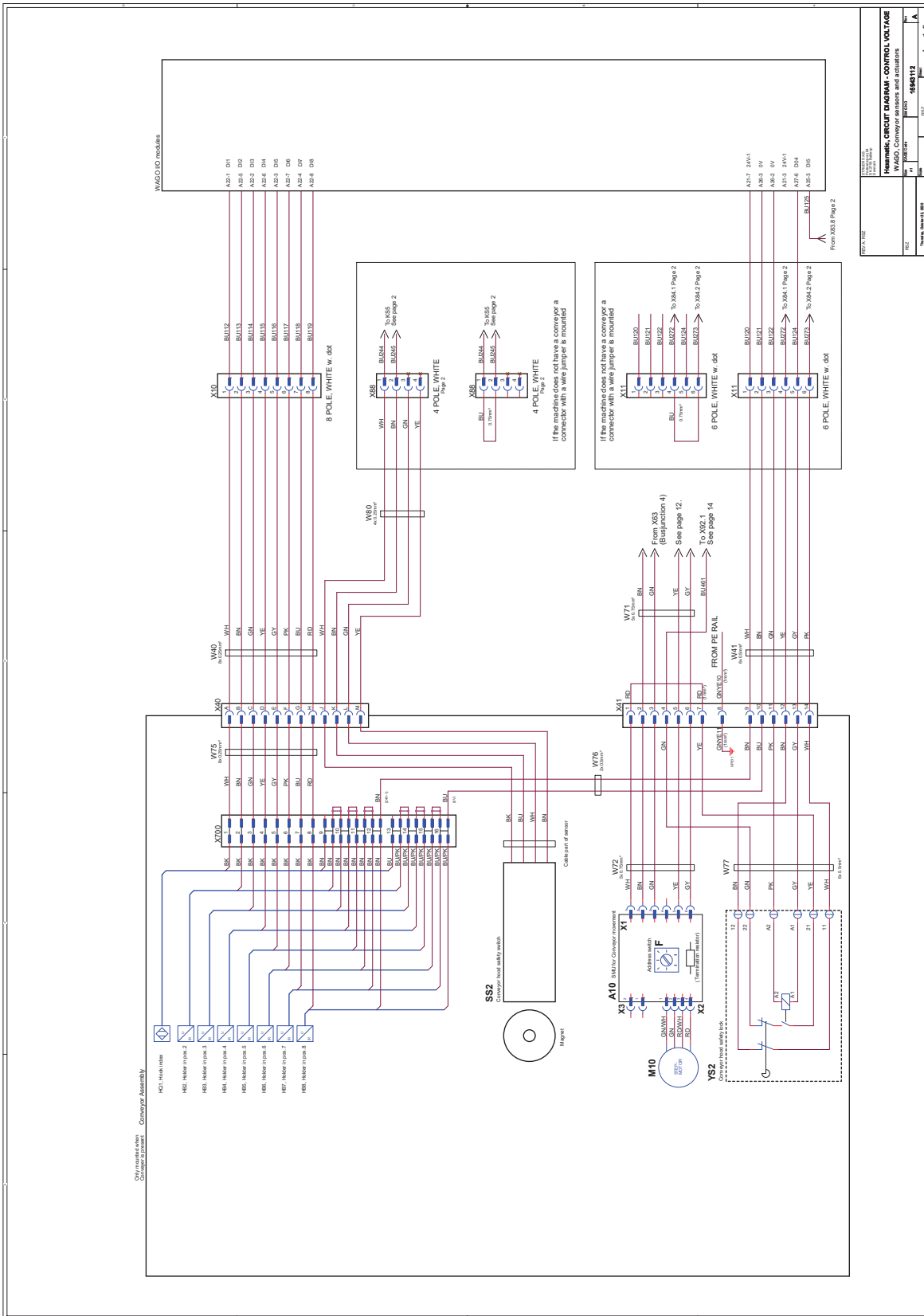


15943112 A - Page 4

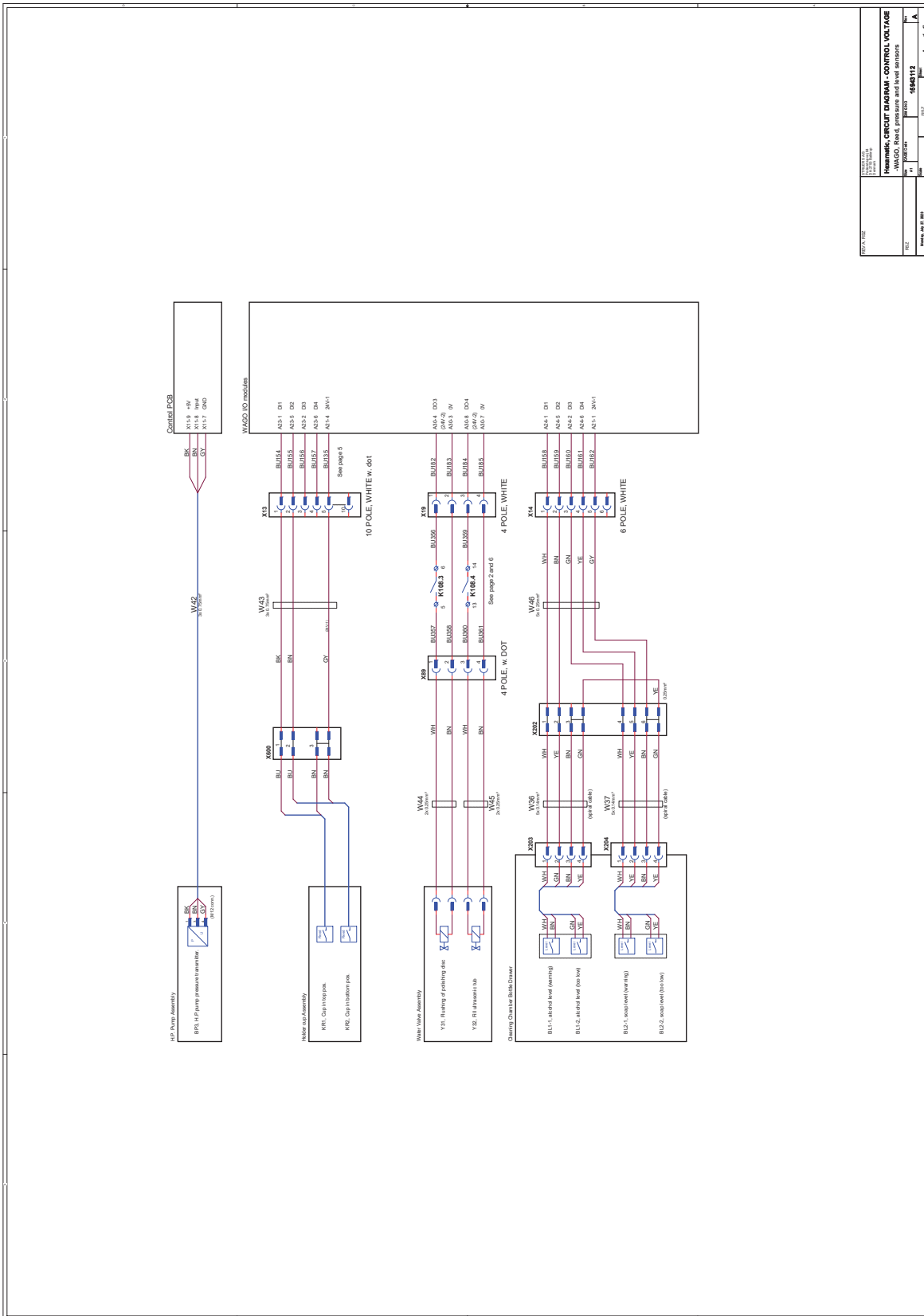


| | | | |
|---|--|------------|--|
| HEXAMATIC | | 15943112 A | |
| HEMATIC CIRCUIT DIAGRAM - CONTROL VOLTAGE | | 15943112 A | |
| REV. 01 | | 15943112 A | |
| REV. 02 | | 15943112 A | |
| REV. 03 | | 15943112 A | |
| REV. 04 | | 15943112 A | |
| REV. 05 | | 15943112 A | |
| REV. 06 | | 15943112 A | |
| REV. 07 | | 15943112 A | |
| REV. 08 | | 15943112 A | |
| REV. 09 | | 15943112 A | |
| REV. 10 | | 15943112 A | |
| REV. 11 | | 15943112 A | |
| REV. 12 | | 15943112 A | |
| REV. 13 | | 15943112 A | |
| REV. 14 | | 15943112 A | |
| REV. 15 | | 15943112 A | |
| REV. 16 | | 15943112 A | |
| REV. 17 | | 15943112 A | |
| REV. 18 | | 15943112 A | |
| REV. 19 | | 15943112 A | |
| REV. 20 | | 15943112 A | |

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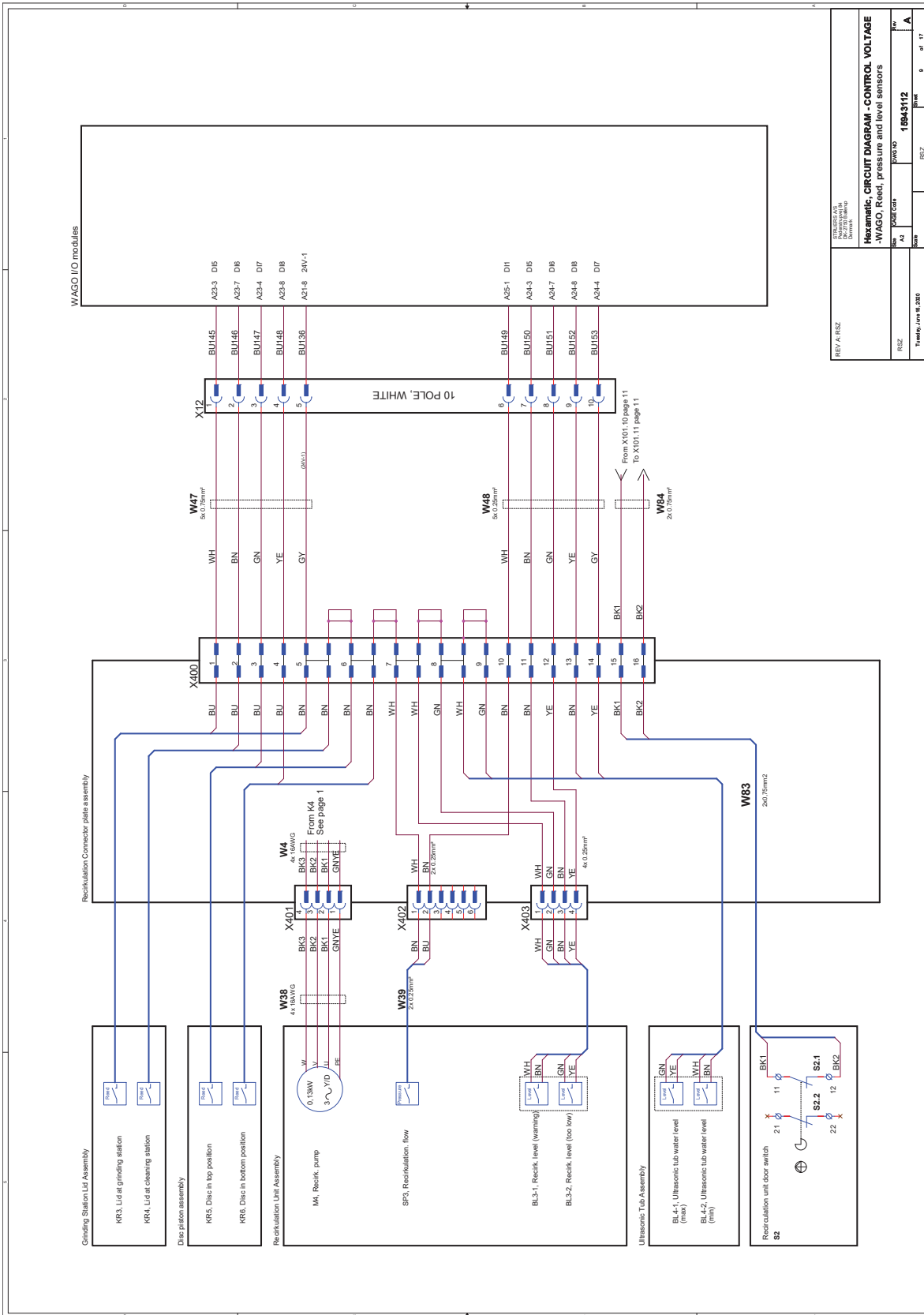


15943112 A - Page 8



| | | | |
|----------|----------|---|---|
| REV. 002 | 15943112 | 1 | 0 |
| REV. 001 | 15943112 | 1 | 0 |
| REV. 000 | 15943112 | 1 | 0 |
| REV. 000 | 15943112 | 1 | 0 |

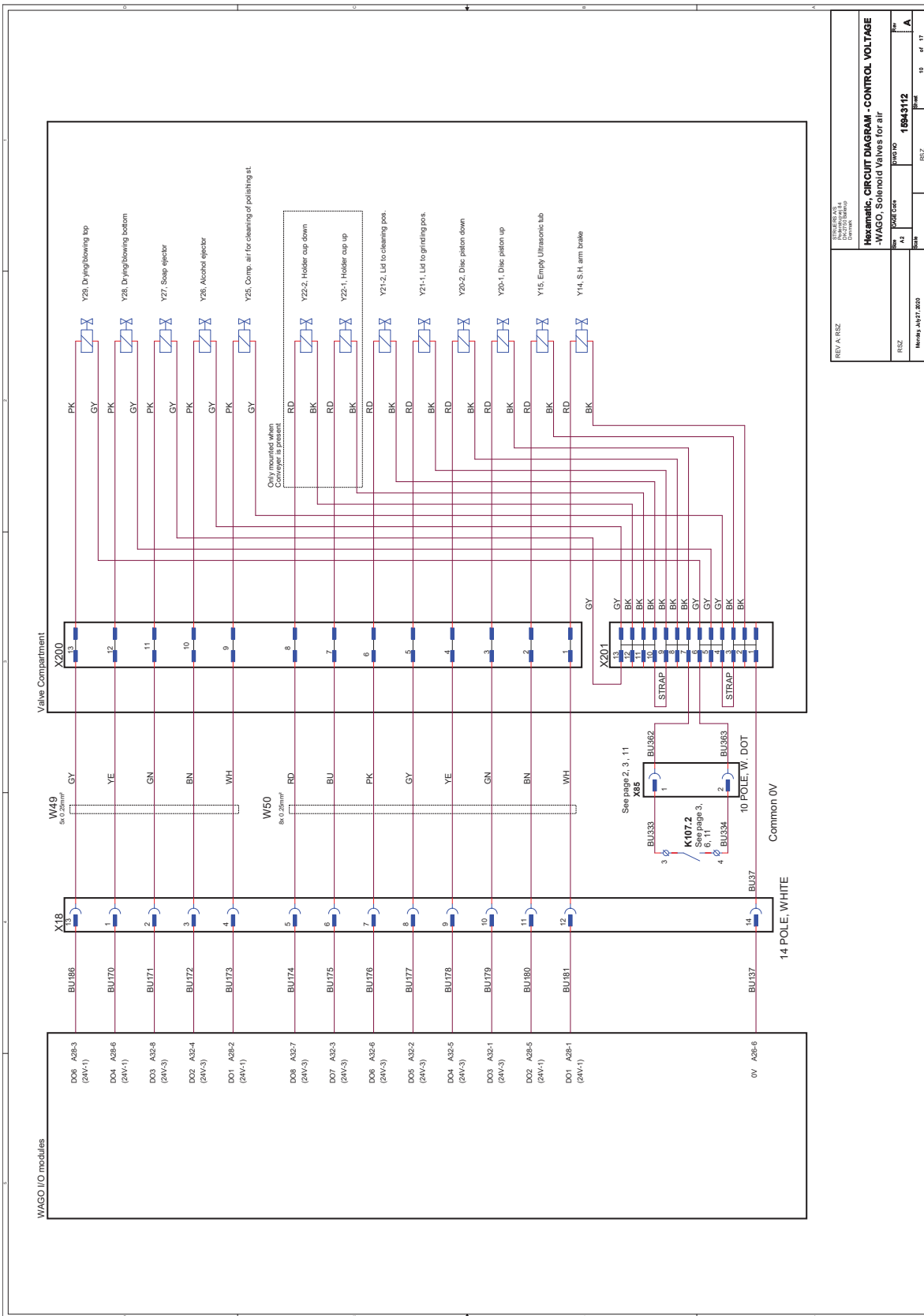
15943112 A - Page 9



| | | | | |
|------------------|---------------------|------------------|---------------------|--------|
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| DATE: 06.08.2020 | DESIGN NO: 15943112 | REV: A | REV: A | REV: A |
| DATE: 06.08.2020 | DESIGN NO: 15943112 | REV: A | REV: A | REV: A |
| DATE: 06.08.2020 | DESIGN NO: 15943112 | REV: A | REV: A | REV: A |

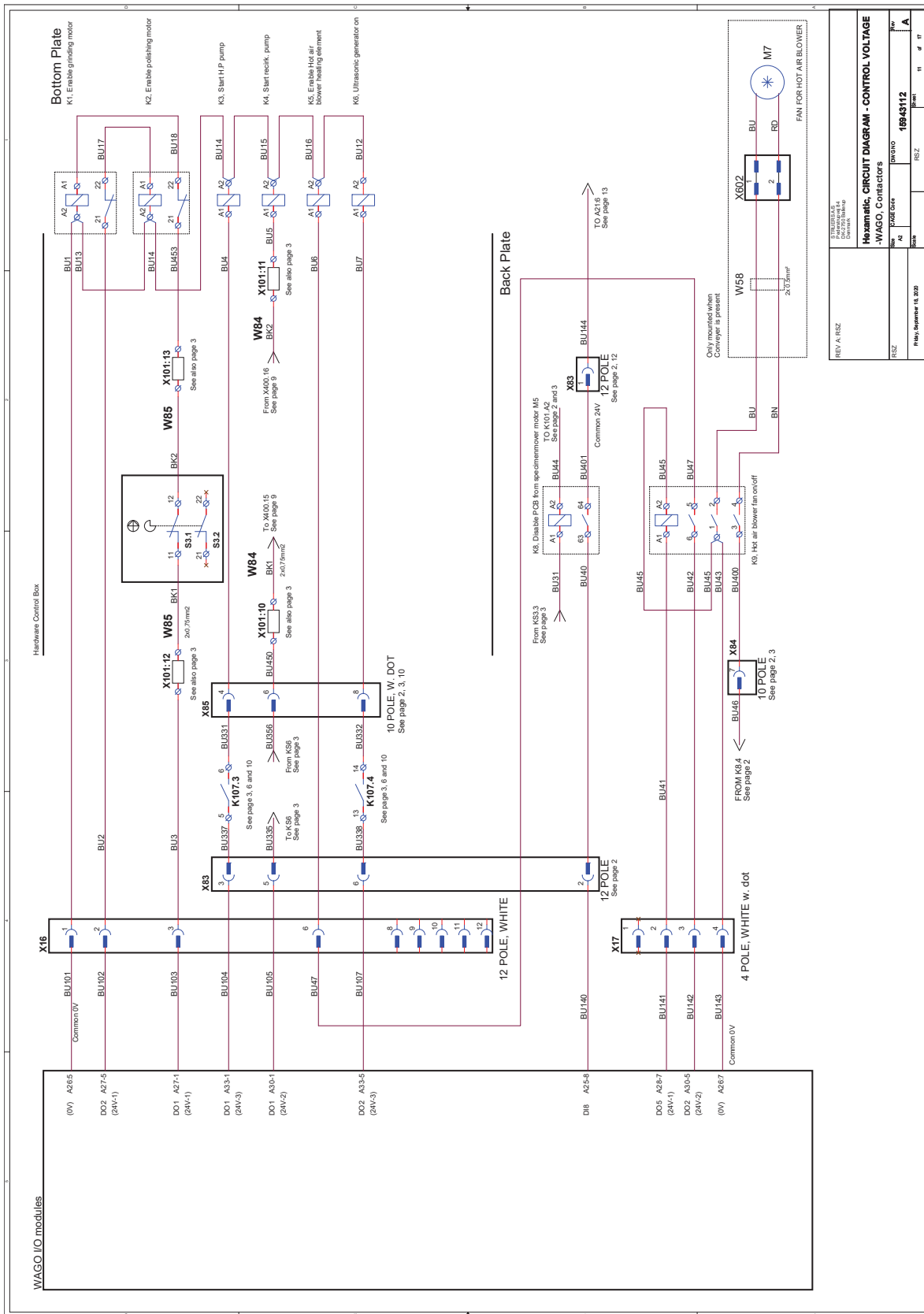
Hexameric, CIRCUIT DIAGRAM - CONTROL VOLTAGE
 -WAGO, Reed, pressure and level sensors

15943112 A - Page 10

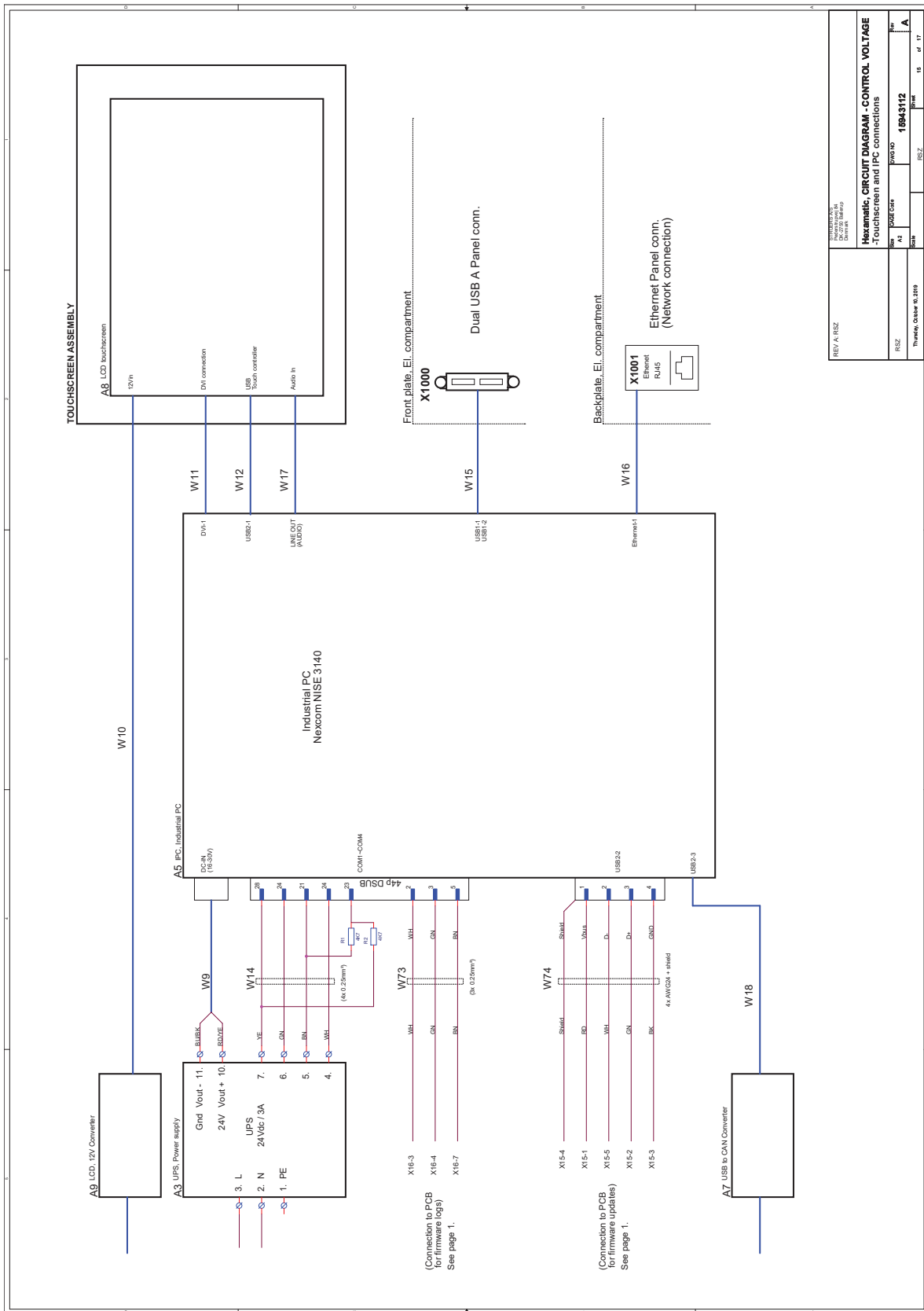


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|-----------|-----------|-----------|-----------|-----------|-----------|
| REV A R5Z | REV A R5Z | REV A R5Z | REV A R5Z | REV A R5Z | REV A R5Z |
| DATE | DATE | DATE | DATE | DATE | DATE |
| BY | BY | BY | BY | BY | BY |
| 15943112 | 15943112 | 15943112 | 15943112 | 15943112 | 15943112 |
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| 17 | 17 | 17 | 17 | 17 | 17 |

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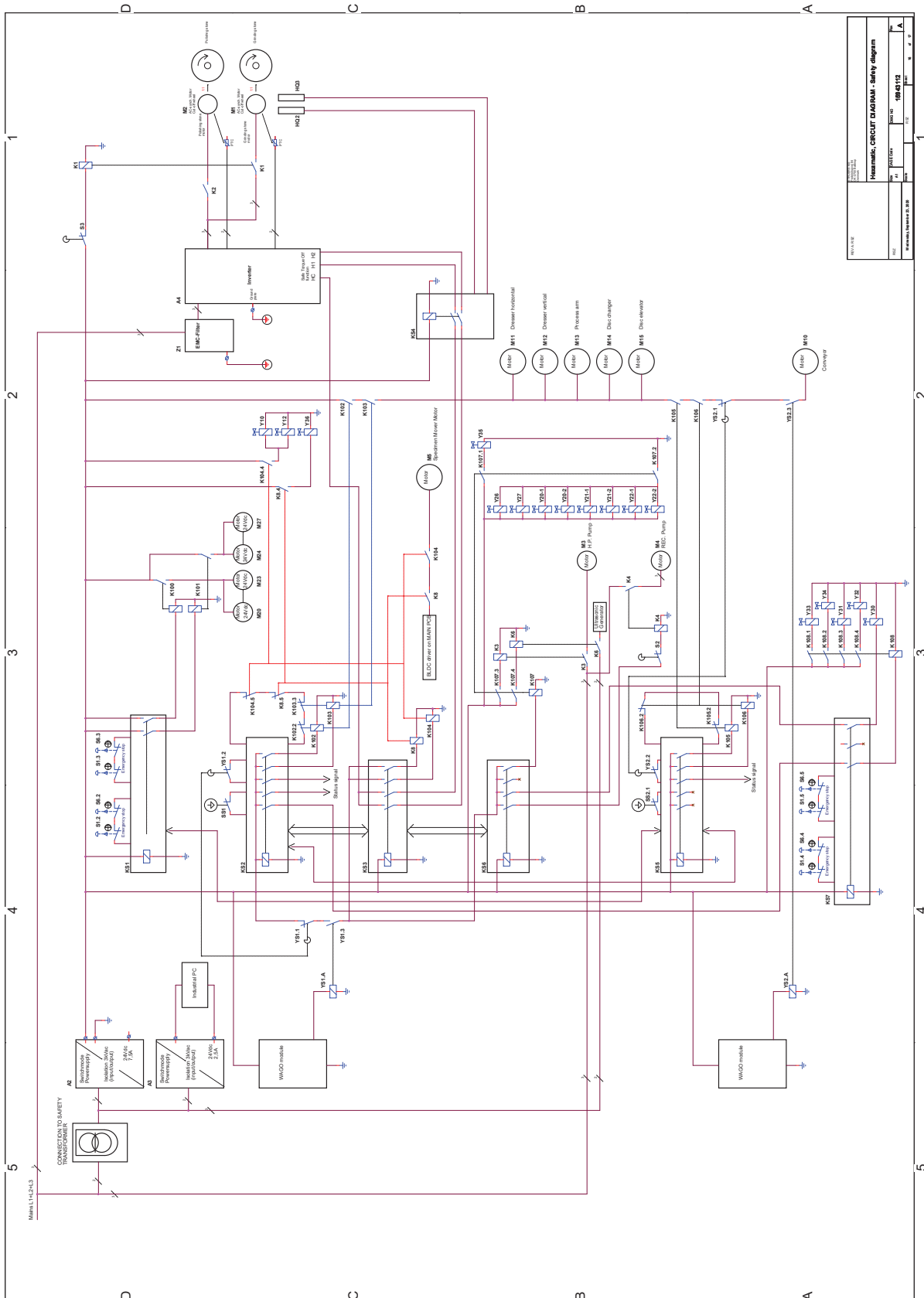


15943112 A - Page 15

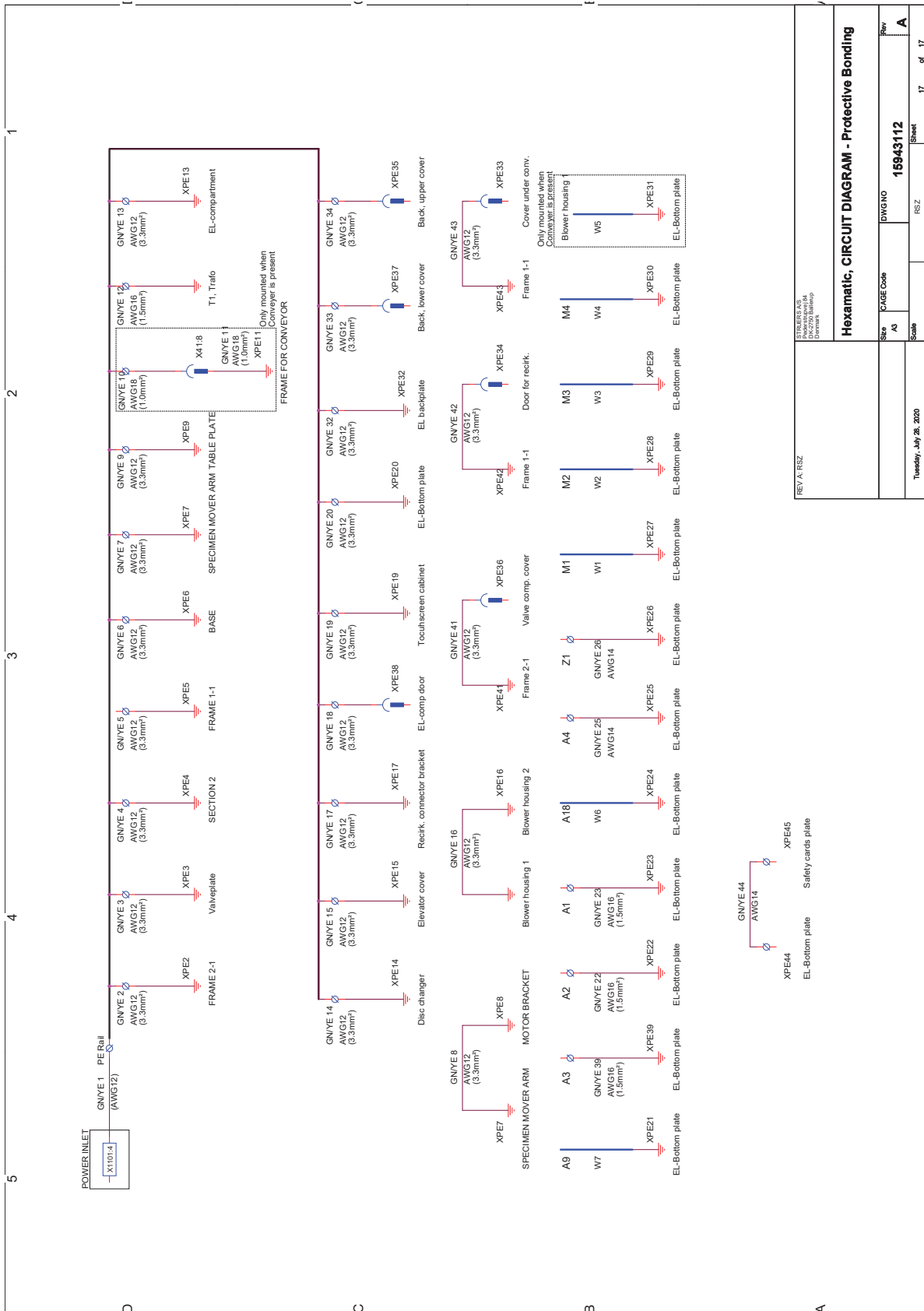


| | | | | |
|--|------------|----------|------------|----------|
| REV. A RSZ | DATE | BY | CHK | APP |
| RSZ | 04/08/2019 | RSZ | RSZ | RSZ |
| Hexameric, CIRCUIT DIAGRAM - CONTROL VOLTAGE -Touchscreen and IPC connections | | | | |
| Doc No | 15943112 | Rev | A | 15 of 17 |
| Doc | RSZ | Doc Date | 04/08/2019 | Doc Rev |

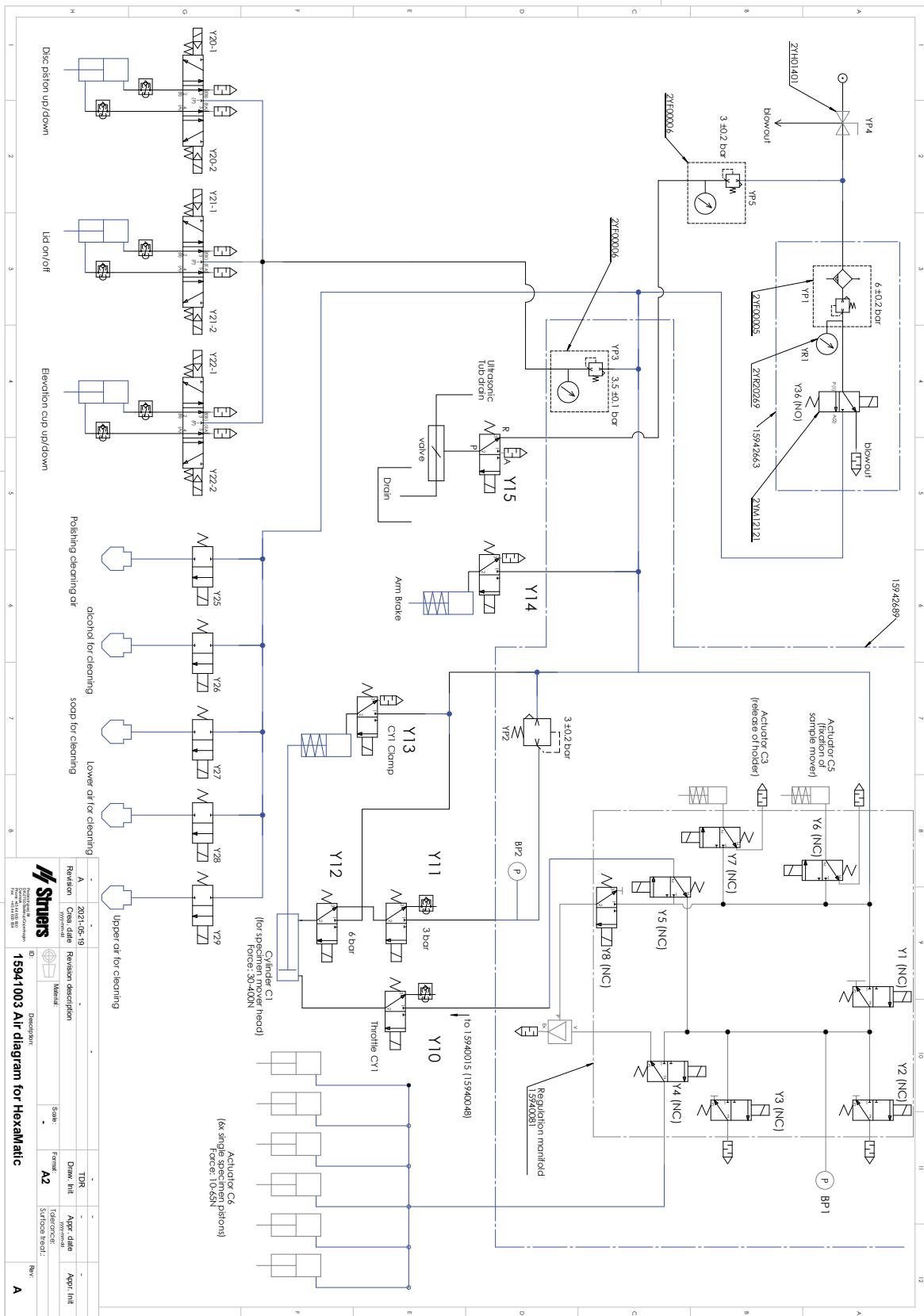
15943112 A - Page 16



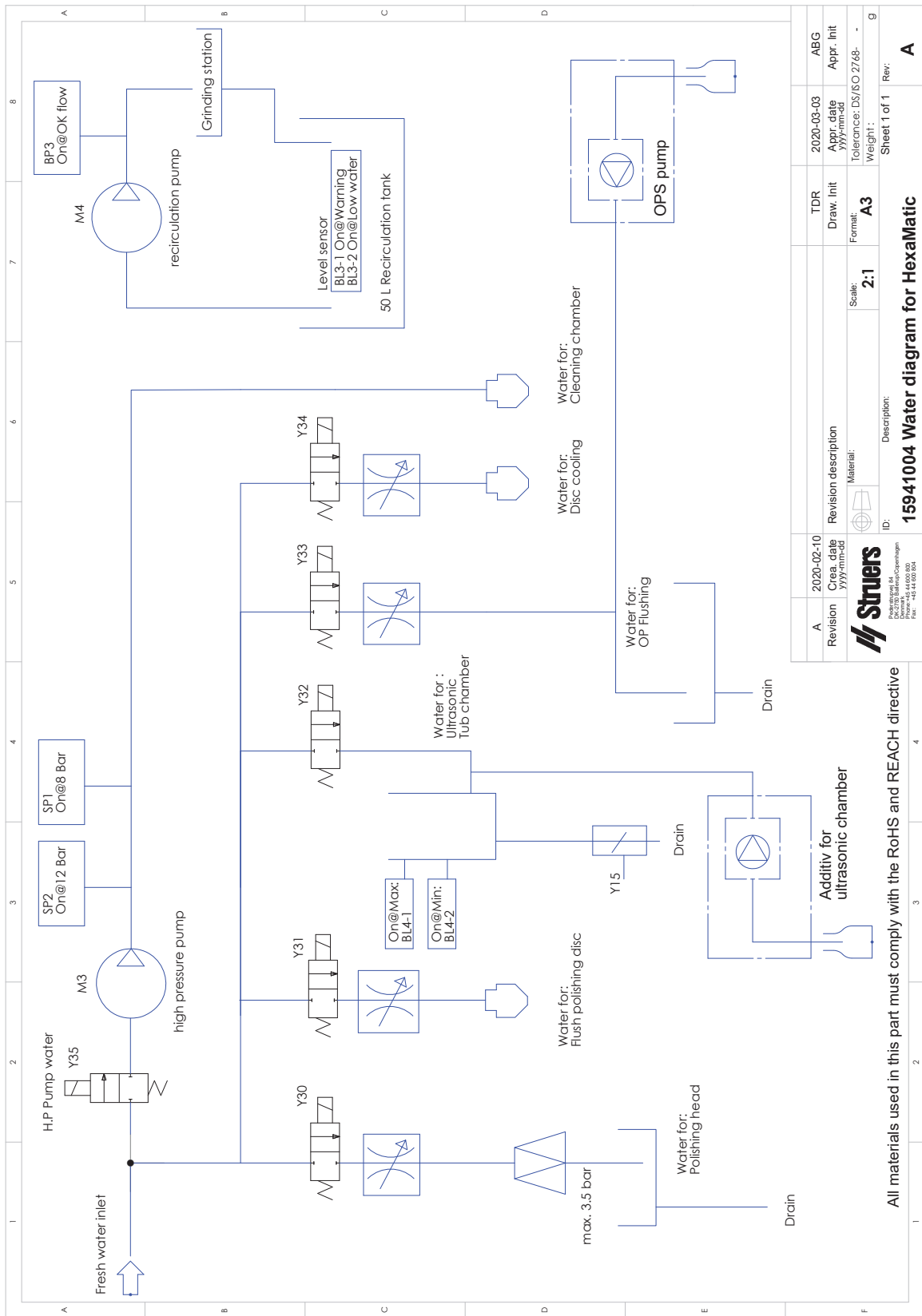
15943112 A - Page 17



15941003 A



15941004 A



| | | | |
|---|---------------|---------------------|-------------------------|
| A | 2020-02-10 | 2020-03-03 | ABG |
| Revision | Creation date | TDR | Appr. date |
| | yy/mm-dd | Draw. Init | yy/mm-dd |
| | | Format: | Tolerance: DS/ISO 2768- |
| | | Scale: | Weight: |
| | | 2:1 | A3 |
| Description: | | Sheet 1 of 1 Rev: A | |
| 15941004 Water diagram for HexaMatic | | | |



All materials used in this part must comply with the RoHS and REACH directive

13.6 Legal and regulatory information

FCC notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

14 Pre-installation checklist

14.1 Installation requirements

- Forklift truck
- Electrical power supply cables, 4-lead or 5-lead, three phases and one earth connection
- External short circuit protection
- Residual current circuit breaker
- Compressed air supply

Accessories and consumables

Required accessories and consumables that have been ordered separately.

The use of Struers consumables is recommended.

- Grinding stones, Diamond grinding disc, Preparation discs
- Specimen holder

For information about the available range, see:

- [The Hexamatic](https://www.struers.com) (<https://www.struers.com>)
- [The Struers Consumables Catalogue](http://www.struers.com/Library) (<http://www.struers.com/Library>)

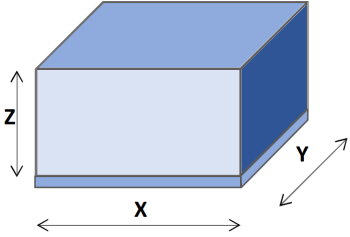
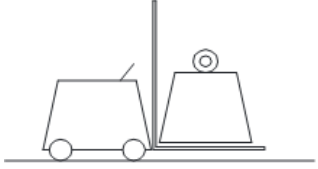
Recommended accessories

- Additive for recirculation unit (option)

- Exhaust system (option)

14.2 Packaging specifications

Machine

| | | |
|-----------|---|---|
| X: | 218 cm (85.5") |  |
| Y: | 124 cm (49") | |
| Z: | 226 cm (89") | |
| Weight | Up to 1050 kg (2315 lbs). The weight is stated on the crate. The weight depends on the configuration of the machine. |  |

14.3 Location

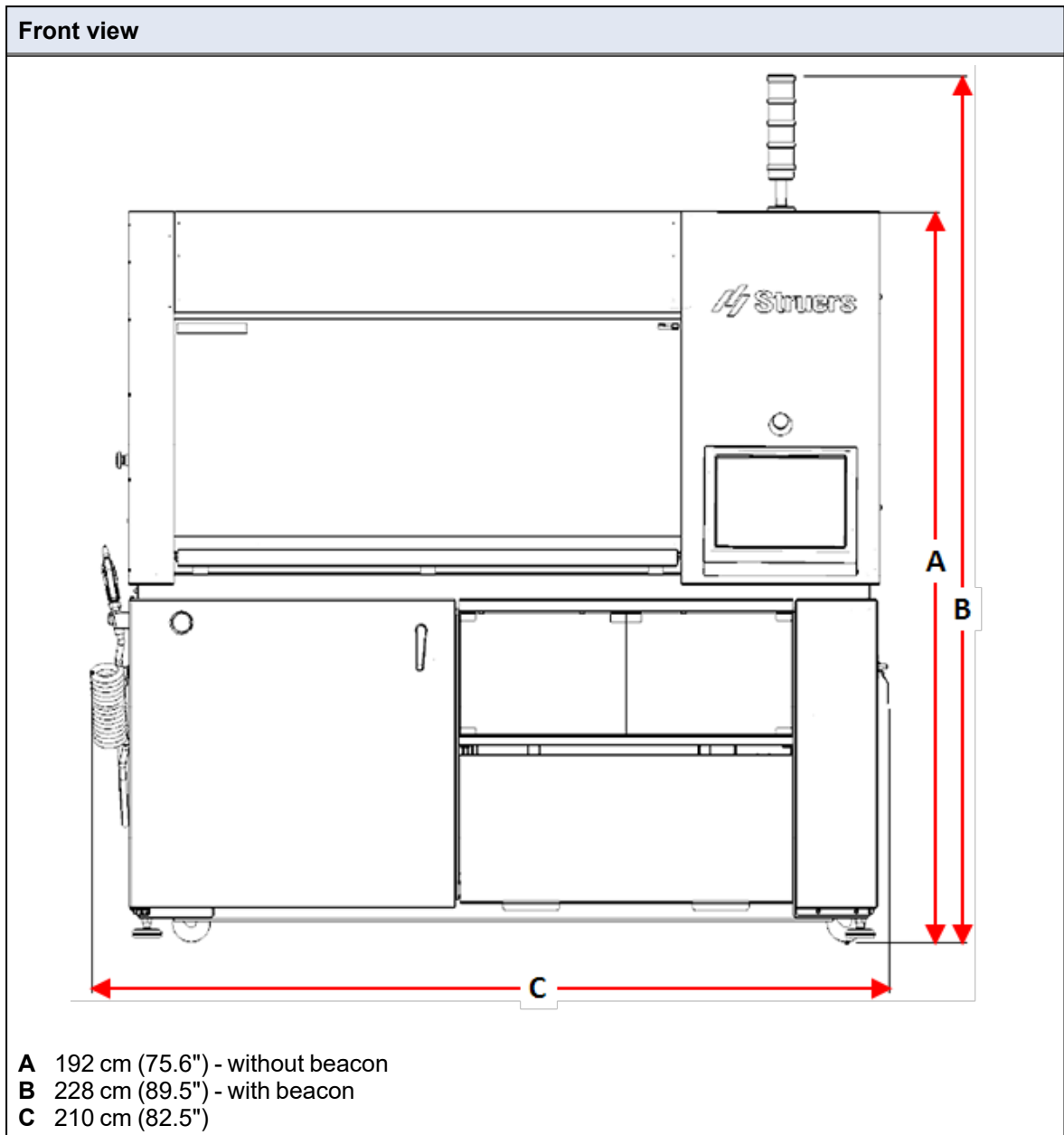
| Distance from the floor to the following units | |
|--|--|
| Emergency stop | 107 cm/42.1" |
| Front panel | 130 cm/51.2" |
| Display | 141 cm/55.5" |
| Cover handle (open/closed) | Open: 137 cm/53.9" Closed: 106 cm/41.7" |

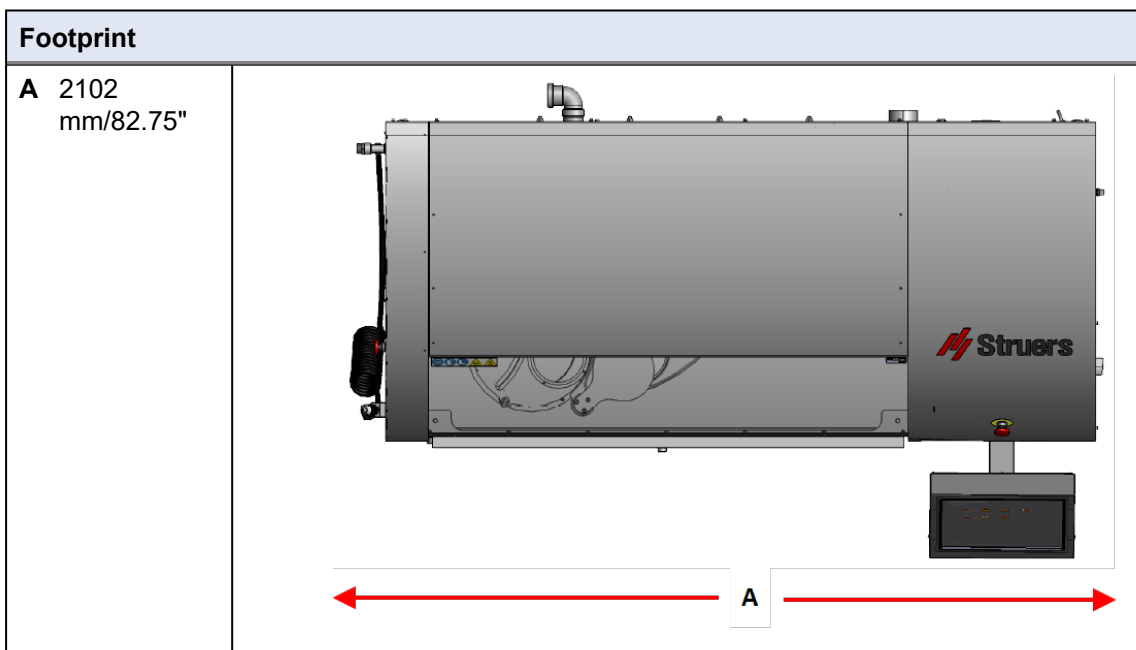
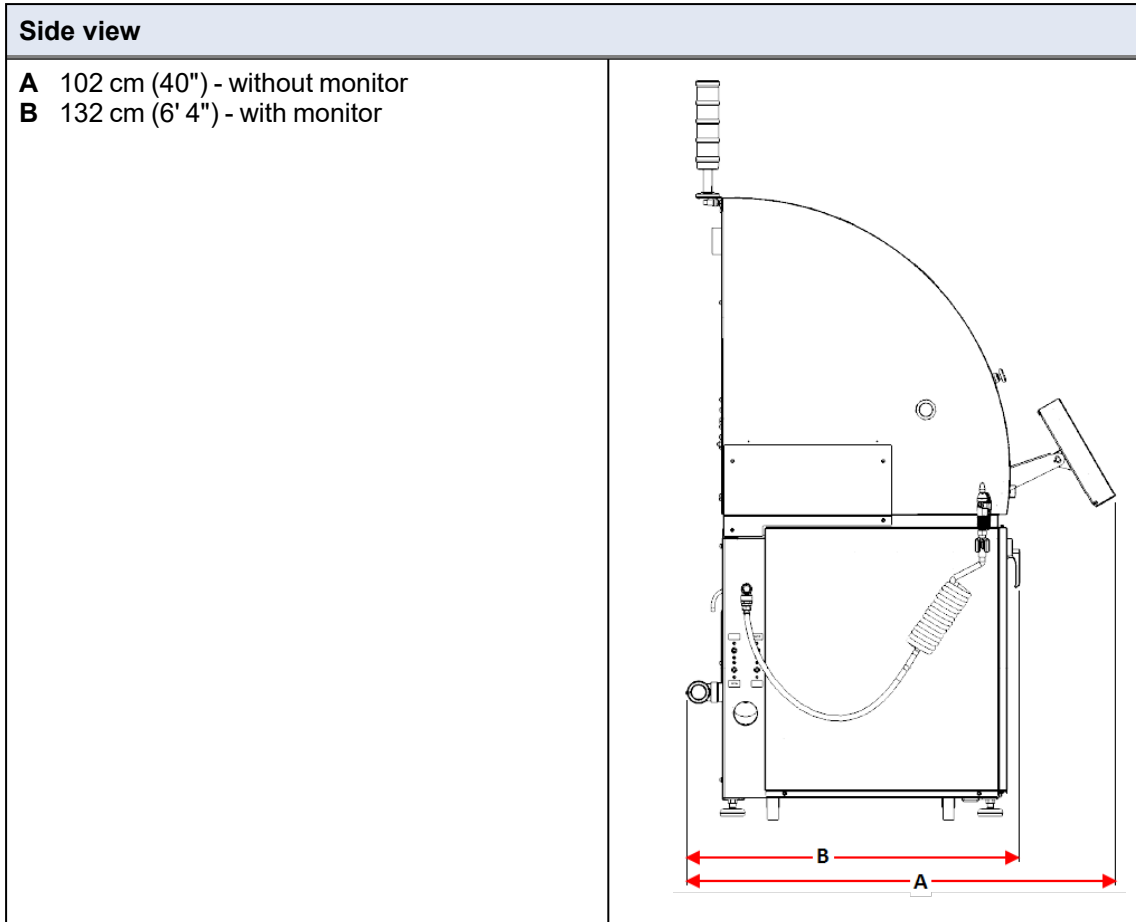
Illumination

Make sure that the machine is adequately lit up. A minimum of 300 Lumen is recommended to illuminate the controls and other work areas.

| Ambient conditions | | |
|-----------------------|-------------------------|---------------------------|
| Operating environment | Surrounding temperature | 5-40°C/40-105°F |
| | Humidity | 35-85 % RH non-condensing |

14.4 Dimensions





14.5 Recommended space

Space in front of the machine

- Make sure that there is enough room in front of the machine. 100 cm/40"

Space at the sides of the machine

- Recommended space at the sides of the machine. 100 cm/40"

Space at the rear of the machine

- The machine can be placed against a wall.
- Make sure that there is enough room behind the machine for access to the compressed air connection.

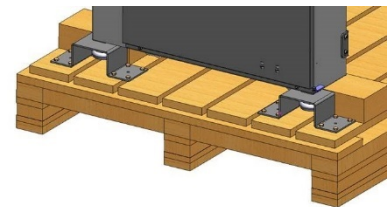
14.6 Unpacking



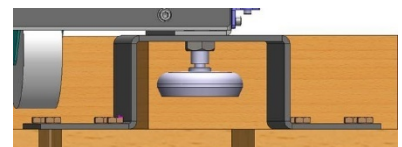
Note

Struers recommends that all original packaging and fittings are kept for future use.

1. Open and remove the sides and the top of the packing box.
2. Unscrew the transport brackets that secure the machine to the pallet.



3. Lift the machine from the ground using a forklift to access the adjustable feet.
4. If needed, turn the adjustable feet so that they move up towards the machine.



14.7 Transport and storage

If, at any time after the installation, you have to move the unit or place it in storage, there is a number of guidelines we recommend that you follow.

- Package the unit securely before transportation.
Insufficient packaging could cause damage to the unit and will void the warranty. Contact Struers Service.

- Struers recommends that all original packaging and fittings are kept for future use.

14.7.1 Storage



Note

Struers recommends that all original packaging and fittings are kept for future use.

- Disconnect the unit from the electrical power supply.
- Remove any accessories.
- Clean and dry the unit before storage.
- Place the machine and accessories in their original packaging.

14.7.2 Transport



Note

Struers recommends that all original packaging and fittings are kept for future use.

To transport the machine safely, follow these instructions.

1. Make sure that the following items are available:

- Transport brackets (x 4)
- Transport crossbar (x 1)
- The original pallet

2. If needed, disconnect the following:

- Power supply



ELECTRICAL HAZARD

Disconnecting the unit from the electrical power supply must only be done by a qualified technician.

- Compressed air supply
 - Water supply
 - Recirculation unit See the manual supplied with the specific equipment.
 - Disconnect the monitor. This must be done by StruersService.
 - Conveyor
 - Accessories
3. Clean and dry the unit.


Requirements

- Make sure that the floor of the working area and the transportation corridor is designed to carry the following weight:

| Weight | |
|---------|-------------------|
| Machine | 800 kg (1763 lbs) |

- The weight of the specimen holders and consumables used.
- Make sure that the following facilities are available:
 - Power supply
 - Water supply
 - Compressed air supply
 - Water drain

Moving the machine



Note
The machine must be installed by Struers technicians or by an authorized service technician trained by Struers for this specific task.

See [Lifting ▶ 174](#).

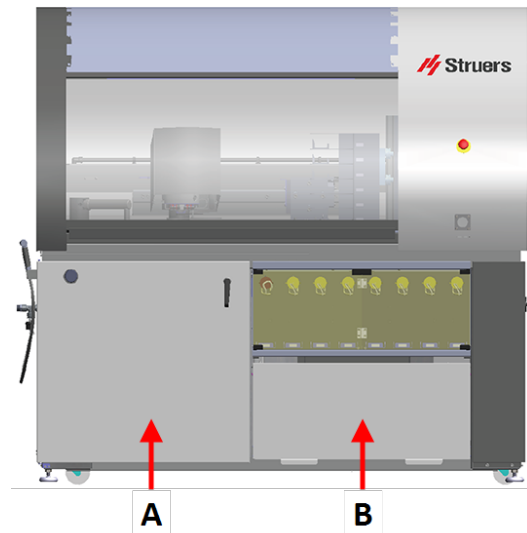
14.7.3 Lifting

| Weight | |
|---------|-------------------|
| Machine | 800 kg (1763 lbs) |

Moving the machine

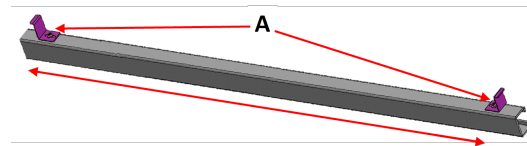
To move the machine, use a fork-lift truck and a crossbar.

1. Open the door on the left and the storage cover on the right.



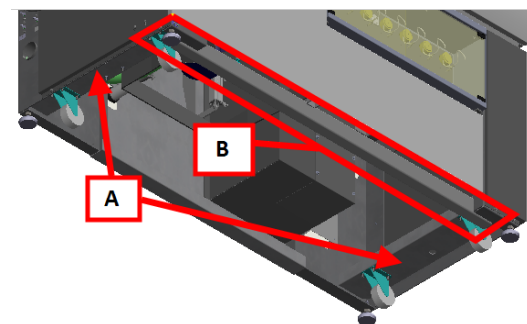
- A Door
- B Cover

2. Make sure that the transportation crossbar supplied with the machine is secured in position before you start lifting.
3. Loosen the brackets on the transportation crossbar to allow movement.
4. Adjust the brackets.
5. Towards the front of the machine, press and hold the crossbar against the bottom of the U-beams.
6. Slide the brackets of the transport crossbar over the edges of the U-beams and tighten the bolts.



- A Bolt

The graphic shows the machine seen from below.



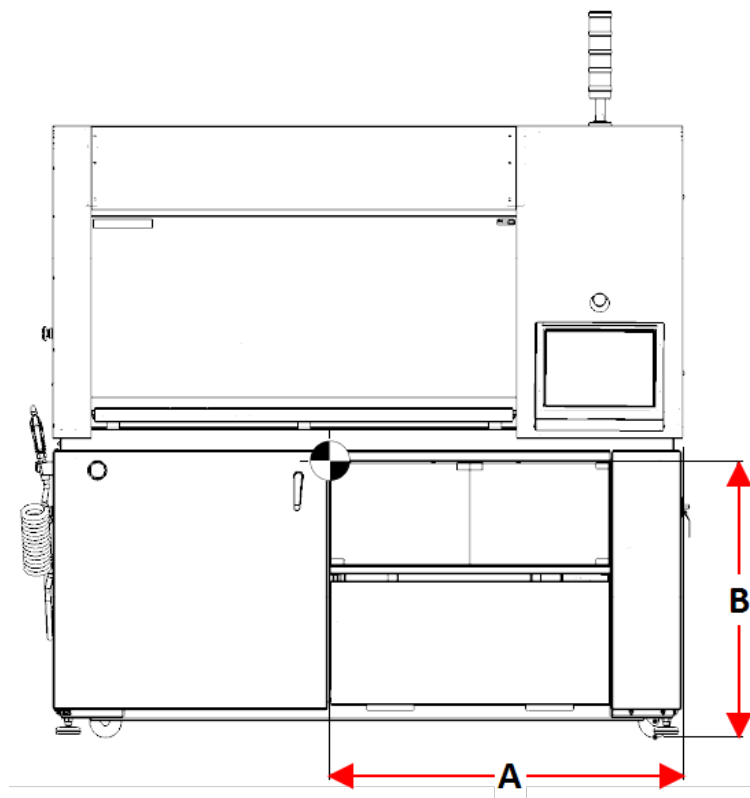
- A U-beams
- B Transportation crossbar

7. Position the forklift as close to the center line of gravity as possible.
See the following graphics showing the center of gravity.

Center of gravity

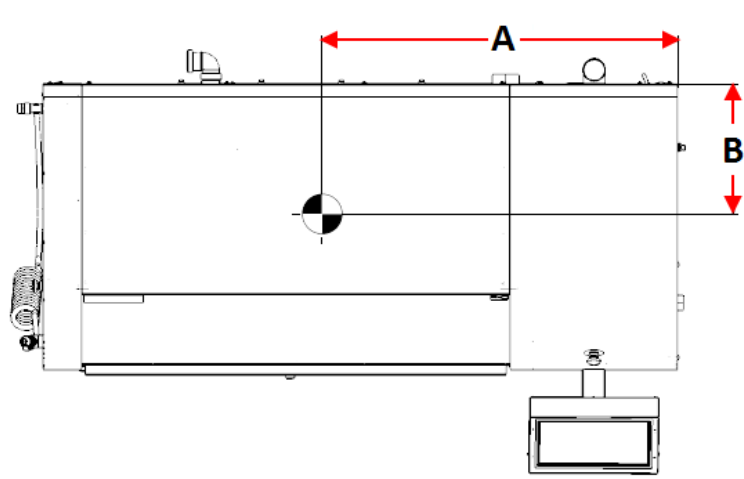
Front view

- A 111 cm (43.5")
- B 87 cm (34")



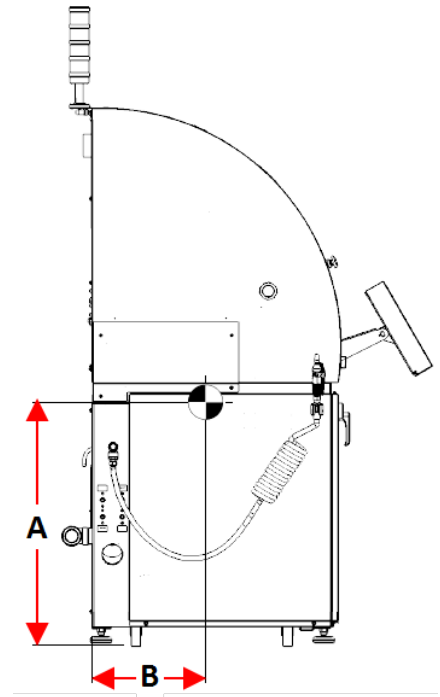
Top view

- A 111 cm (43.5")
- B 41 cm (16")

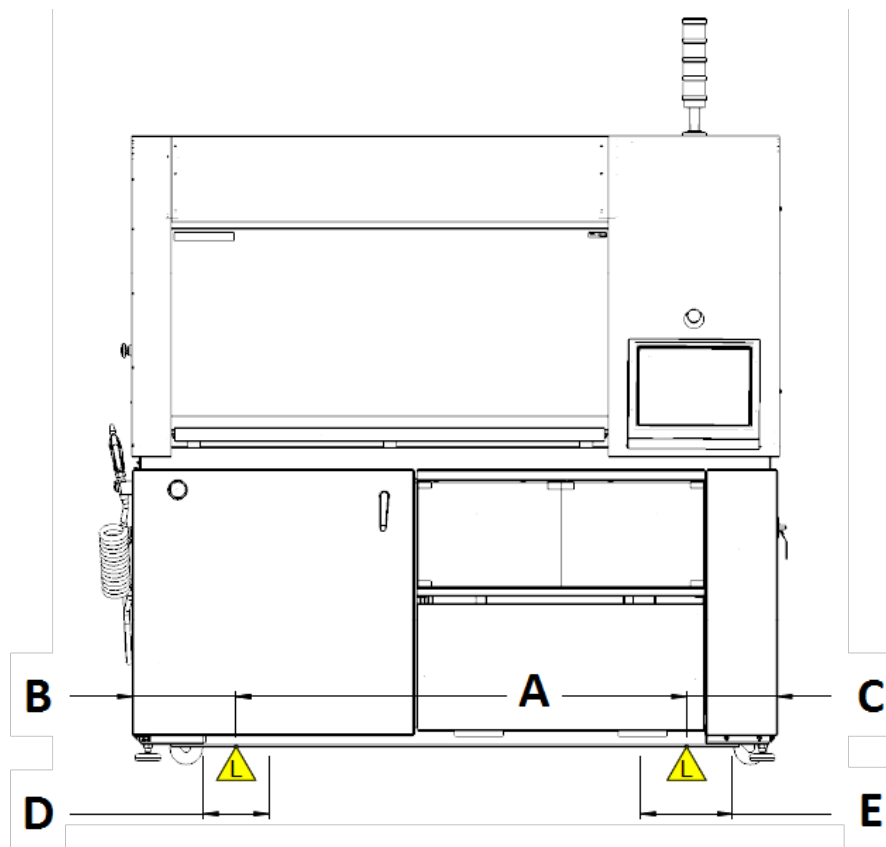


Side view

- A** 87 cm (34")
- B** 41 cm (16")



Lifting points - for lifting straps



- A** 138 cm (54")
- B** Best position - 32 cm (12.5")
- C** Best position - 28 cm (11")
- D** Area for best lifting position - 20 cm (8")
- E** Area for best lifting position - 28 cm (11")

Lifting the machine with a fork lift

1. Place the forks so that the center of gravity is placed between the forks. Lift the machine from the front.
2. See the following methods of placing the machine.
 - Pushing the machine into position
 - Lifting the machine directly into position

Pushing the machine into position

1. If you cannot place the machine directly in its location, turn the adjustable feet upwards to stand the machine on its wheels.
2. Remove the crossbar and store it for future use. The wheels of the machine cannot swivel when the crossbar is mounted.
3. Move the machine as close to its position as possible.
4. Lower the machine so that the wheels touch the floor.


Note

Place the machine on a plane and horizontal floor.


CAUTION

The machine must not operate when it is resting on its wheels.

5. Push the machine into the correct position.


CAUTION

Make sure that the machine is level.

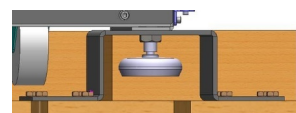
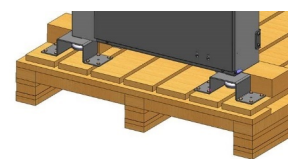
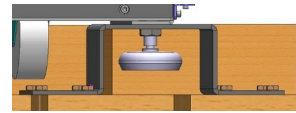
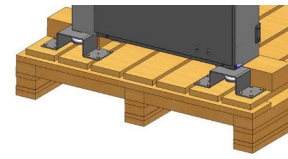
6. Turn the adjustable feet until the machine rests on the feet, and make sure that the machine is level.
7. Remove the crossbar and store it for future use.

Lifting the machine into position

1. If you can place the machine directly in its location, turn the adjustable feet downwards to stand the machine on its feet.
2. Remove the crossbar and store it for future use.
3. Lift the machine into the correct position.
4. Lower the machine so that the feet touch the floor.


Note

Place the machine on a plane and horizontal floor.



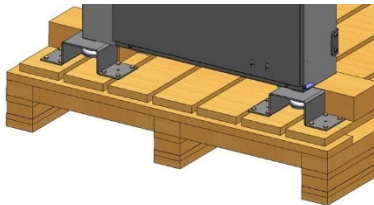
14.7.4 Preparing for transport and storage



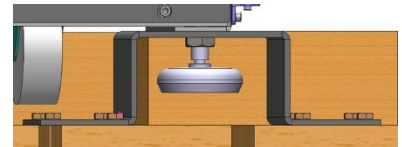
Note

Struers recommends that all original packaging and fittings are kept for future use.

1. Make sure that packaging (screws and plywood) is available for building a crate to cover the machine.
2. Position the machine on the blocks on the original pallet.
The blocks lift the wheels from the pallet.
3. Use the transport brackets to secure the machine to the pallet.



Machine placed on blocks. The feet are close to the chassis.



Close-up. Wheel and foot are clear of the pallet.

4. Place the machine and accessories in their original packaging.
5. Build a crate around the machine.

14.8 Power supply



ELECTRICAL HAZARD

The machine must be earthed (grounded).

Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine.

Incorrect voltage can damage the electrical circuit.



ELECTRICAL HAZARD

For electrical installations with Residual Current Circuit Breakers

For Hexamatic a residual current circuit breaker Type B, 30 mA is required (EN 50178/5.2.11.1).

For electrical installations without Residual Current Circuit Breakers

The equipment must be protected by an insulation transformer (double-wound

Contact a qualified electrician to verify the solution.

Always follow local regulations.

**ELECTRICAL HAZARD**

Disconnect the electrical power supply before installing electrical equipment. Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine. Incorrect voltage can damage the electrical circuit.

**WARNING**

In case of fire, alert bystanders, the fire brigade and cut power. Use a powder fire extinguisher. Do not use water.

Recommended power supply cable specifications

Local standards can override the recommendations for the main electrical power supply cable. If needed, contact a qualified electrician to verify which option is suitable for the local installation setup.

| Voltage/frequency: 3 x 200-240 V/50-60 Hz | |
|---|---|
| Min. fuse: 35 A | Minimum cable size at minimum fuse: 3 x AWG12/2.5 mm ² + PE |
| Max. fuse: 40 A | Minimum cable size at maximum fuse: 3 x AWG12/2.5 mm ² + PE |

| Voltage/frequency: 3 x 380-480 V/50-60 Hz | |
|---|---|
| Min. fuse: 20 A | Minimum cable size at minimum fuse: 3 x AWG14/1.5 mm ² + PE |
| Max. fuse: 40 A | Minimum cable size at maximum fuse: 3 x AWG12/2.5 mm ² + PE |

Electrical data

The other end of the cable can be fitted with an approved plug or hard-wired into the power supply according to the electrical specifications and local regulations.

| Voltage/frequency: 3 x 200-240 V/50-60 Hz | |
|---|-------------------|
| Power consumption | 200-240 V: 3.6 kW |
| Output, main motor | 200-240 V: 2.2 kW |
| Max. load | 200-240 V: 31 A |

| Voltage/frequency: 3 x 380-480 V/50-60 Hz | |
|---|----------------------------|
| Power consumption | 380-480 V/50-60 Hz: 3.5 kW |
| Output, main motor | 380-480 V/50-60 Hz: 2.2 kW |
| Max. load | 380-480 V/50-60 Hz: 17 A |

| Voltage/frequency: 3 x 360-480V/60 Hz | |
|---------------------------------------|------------------------|
| Power consumption | 360-480V/60 Hz: 3.8 kW |
| Output, main motor | 360-480V/60 Hz: 2.2 kW |
| Max. load | 360-480V/60 Hz: 16 A |

Procedure

For specifications see the section Technical data.

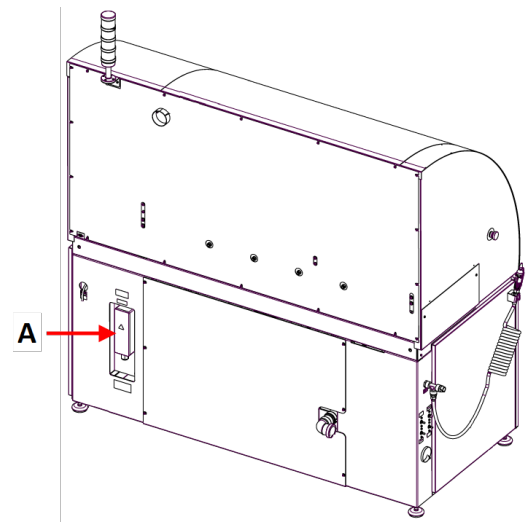
The machine is delivered without a power supply cable.

To install the electrical power supply, the following is needed:

- Electrical power supply cable, 4-lead, three phases and one earth connection

1. Connect the cable to the electrical connection box.

| | |
|----|----------------|
| PE | Earth (ground) |
| L1 | Phase |
| L2 | Phase |
| L3 | Phase |



A Electrical connection box

| EU cable | |
|----------------|---------------|
| L1 | Brown |
| L2 | Black |
| L3 | Black or Grey |
| Earth (ground) | Yellow/Green |
| Neutral | Blue |

| UL cable | |
|----------------|-------------------------|
| L1 | Black |
| L2 | Red |
| L3 | Orange/Turquoise |
| Earth (ground) | Green (or Yellow/Green) |
| Neutral | White |

The other end of the cable can be fitted with an approved plug or hard-wired into the power supply according to the electrical specifications and local regulations.

External short circuit protection

The machine must always be protected with external fuses. See the electrical table for details on the fuse size required.

Residual Current Circuit Breaker (RCCB)



Note

Local standards can override the recommendations for the main electrical power supply cable. If needed, contact a qualified electrician to verify which option is suitable for the local installation setup.

| Requirements for electrical installations | |
|--|--|
| With Residual Current Circuit Breakers (RCCB) | Type B, 30 mA (EN 50178/5.2.11.1) |
| Without Residual Current Circuit Breaker | The equipment must be protected by an insulation transformer (double-wound transformer). |

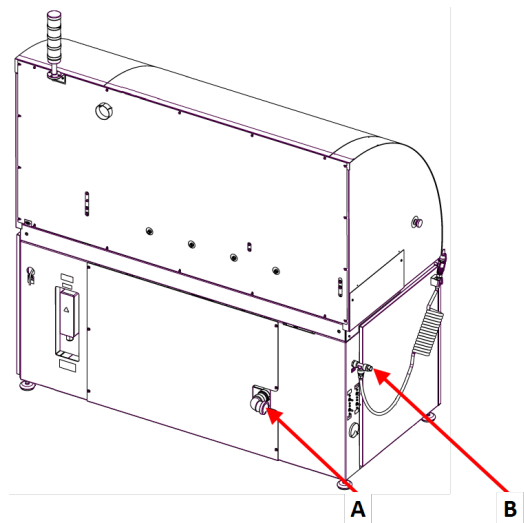
14.9 Safety specifications

| Safety Circuit Categories/Performance Level | |
|---|--|
| Emergency stop | EN 60204-1, Stop category 0 EN ISO 13849-1, Category 1 Performance Level (PL) c |
| Main working zone guard | EN 60204-1, Stop category 0 EN ISO 13849-1, Category 3 Performance Level (PL) d |
| Main working zone guard lock | EN 60204-1, Stop category 0 EN ISO 13849-1, Category b Performance Level (PL) a |
| Conveyor working zone guard | EN 60204-1, Stop category 0 EN ISO 13849-1, Category 3 Performance Level (PL) d |
| Conveyor working zone guard lock | EN 60204-1, Stop category 0 EN ISO 13849-1, Category b Performance Level (PL) a |

| Safety Circuit Categories/Performance Level | |
|---|--|
| Unintended start of fluid | EN 60204-1, Stop category 0 EN ISO 13849-1, Category 1 Performance Level (PL) c |
| Overspeed of grinding disc | EN 60204-1, Stop category 0 EN ISO 13849-1, Category 3 Performance Level (PL) d |

14.10 Water supply

- A Water outlet
- B Water inlet



Water inlet



Note

New water pipe installations:

Leave the water to run for a few minutes to flush any debris from the pipe before connecting the machine to the water supply.

The machine is supplied with a standard hose to connect the machine to the water supply.

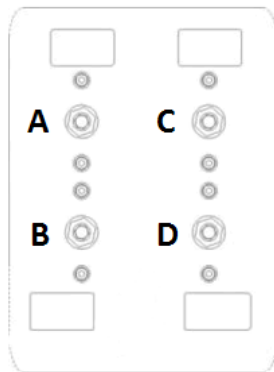
| Water supply - Specifications | |
|-------------------------------|---|
| Water pressure | 2 - 9.9 bar (29 - 143 psi) |
| Water flow | Min. 800 l/h (211.5 gph) |
| Hose supplied | Diameter: 3/4". Length: 1.5 m (59"). With standard connector and 90° bend. |
| Tube connection | 3/4" British Standard pipe thread. |

Connecting to the waste water outlet

1. The machine is delivered with a water outlet hose.

2. Connect the water outlet hose to the water outlet on the back of the machine.
3. Make sure that the hose slopes downward towards the waste water drain throughout its entire length. If needed, shorten the hose.

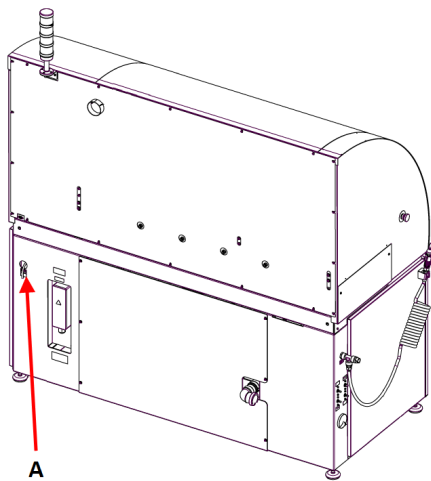
Water flow regulators



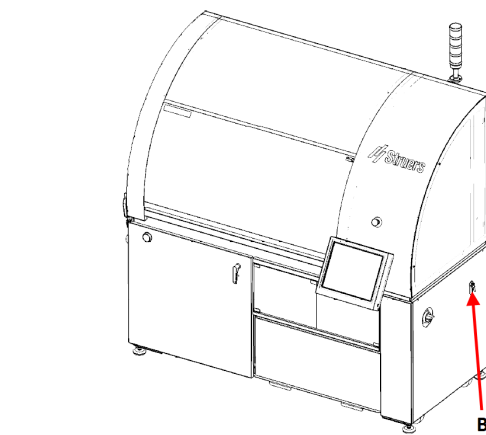
- A** Water inlet for disc cooling
- B** Flushing water for polishing disc
- C** Ultrasonic water
- D** OP flush water

14.11 Compressed air

| Specifications | |
|--------------------------|---|
| Pressure | Min. 6 bar (90 psi) |
| Air consumption, approx. | Min. 200 l/min (53 gpm) at atmospheric pressure |
| Air quality | Class-3, as specified in ISO 8573-1 |



A Compressed air inlet



B Air inlet valve

Procedure

1. Connect the compressed air hose to the compressed air inlet on the machine.
2. Connect the air hose to the compressed air supply.
3. Secure the connections with hose clamps.

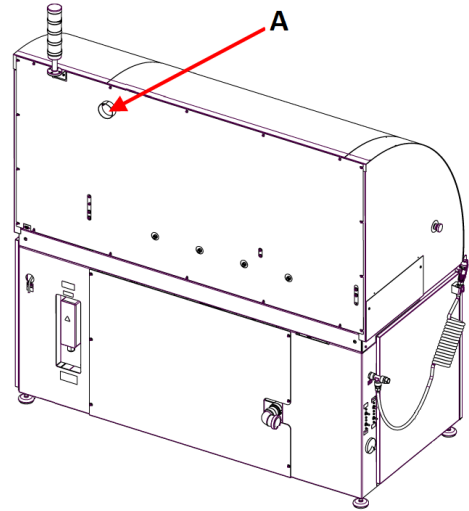
14.12 Exhaust (option)

Specifications

Minimum capacity: 150 m³/h (5297 ft³/h) at 0 mm (0") water gauge.

An exhaust system is required when working with alcohol-based suspensions or lubricants.

A Exhaust



Struers recommends that the machine is connected to an exhaust system.

1. Connect a 52 mm pipe to the exhaust outlet on the machine.
2. Connect the other end of the pipe to the exhaust system.

14.13 Recirculation unit

To ensure optimal cooling, mount a recirculation unit on the machine.



ELECTRICAL HAZARD

Make sure that the electrical power supply voltage corresponds to the voltage stated on the type plate of the pump.

Incorrect voltage can damage the electrical circuit.

The Struers recirculation unit includes

- a recirculation pump
- a recirculation tank
- a filter bag
- a disposable tank liner
- a GEKA coupling for connection to the machine hose

Consumables

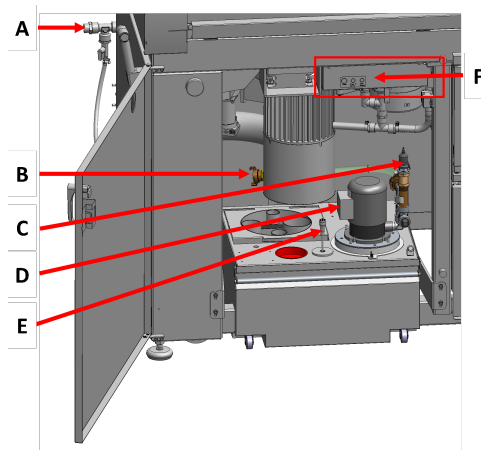
- Struers recommends adding a Struers anti-corrosion additive to the cooling water.
- The use of Struers consumables is recommended.

Other products may contain aggressive solvents, which dissolve e.g. rubber seals. The warranty may not cover damaged machine parts (e.g. seals and tubes), where the damage can be directly related to the use of consumables not supplied by Struers.

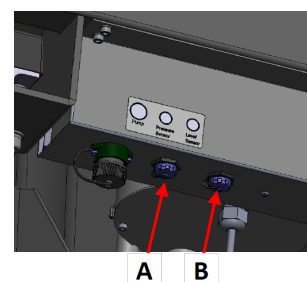
Connecting the unit to the machine

1. Connect the water inlet hose to the quick coupling on the recirculation pump.

- A** Water inlet hose - to machine
- B** Recirculation pump
- C** Quick coupling - on pump
- D** Pressure sensor
- E** Level sensor
- F** Connectors



2. Insert the water outlet hose from the machine into the large hole of the filter unit. If needed, shorten the hose.
3. Connect the cable from the recirculation pump to the electrical power socket of the recirculation unit inside the compartment.
4. Connect the pressure sensor and the level sensor.
5. Make sure that the direction of the flow is as stated with an arrow on the pump. If the direction is incorrect, switch two of the phases:
 - EU cable: switch two of the phases.
 - UL cable: switch phases L1 and L2.



6. Push the unit into place in the compartment under the machine.

15 Manufacturer

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 Pederstrupvej 84
 DK-2750 Ballerup, Denmark
 Telephone: +45 44 600 800
 Fax: +45 44 600 801
 www.struers.com

Responsibility of the manufacturer

The following restrictions should be observed, as violation of the restrictions may cause cancellation of Struers legal obligations.

The manufacturer assumes no responsibility for errors in the text and/or illustrations in this manual. The information in this manual is subject to change without notice. The manual may mention accessories or parts not included in the supplied version of the equipment.

The manufacturer is to be considered responsible for effects on safety, reliability, and performance of the equipment only if the equipment is used, serviced, and maintained in accordance with the instructions for use.

Struers ApS
Pederstrupvej 84
DK-2750 Ballerup, Denmark

Declaration of Conformity

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| Model / Модел / Model / Model / Modell / Μοντέλο / Modelo / Mudel / Malli / Modèle / Model / Modell / Modello / Modelis / Modelis / Model / Model / Modelo / Modelul / Model / Model / Modell / モデル / 모델 / Modell / Модель / Model / 型号 | N/A |
| Function / Функция / Funkce / Funktion / Funktion / Λειτουργία / Función / Functio / Toiminto / Fonction / Funkcija / Funkció / Funzione / Funkcja / Functie / Funkcja / Função / Functia / Funkcia / Funkcija / Funktion / 機能 / 기능 / Funksjon / Назначение / Fonksiyon / 功能 | Plane grinding and polishing machine without conveyor |
| Туре / Тип / Тур / Type / Тур / Түр / Τύπος / Tipo / Túyp / Тууپی / Type / Tip / Tipus / Tipo / Tipas / Tips / Type / Typ / Tipo / Tipul / Тур / Тр / Тур / 種類 / 유형 / Type / Тип / Tür / 类型 | 06406229, 06406246, 06406254 |
| Serial no. / Серийн номер / Výrobní číslo / Seriennummer / Seriennummer / Σειριακός αριθμός / N.º de serie / Seerianumber / Sarjanro / No de série / Serijski broj / Sorozatszám / N. seriale / Serijos Nr. / Sērijas Nr. / Serienr. / Numer seryjny / N.º de série / Nr. serie / Výrobné č. / Serijska št. / Seriennummer / シリアル番号 / 일련번호 / Serienr. / Серийный номер / Serí no. / 序列号 | |

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| 2006/42/EC | EN ISO 12100:2010, EN ISO 13849-1:2015, EN ISO 13849-2:2012, EN ISO 13850:2015, EN ISO 13857:2008, EN ISO 16089:2015, EN 60204-1:2018 |
| 2011/65/EU | EN IEC 63000:2018 |
| 2014/30/EU | EN 61000-3-2:2006, EN 61000-3-2-A1:2009, EN 61000-3-2-A2:2009, EN 61000-3-2:2014, EN 61000-3-3:2008, EN 61000-3-3:2013, EN 61000-6-2:2005/Corr.:2005, EN 61000-6-4:2007, EN 61000-6-4-A1:2011 |
| 1907/2006/EU | |
| Additional standards | NFPA 79, FCC 47 CFR Part 15 Subpart B |

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