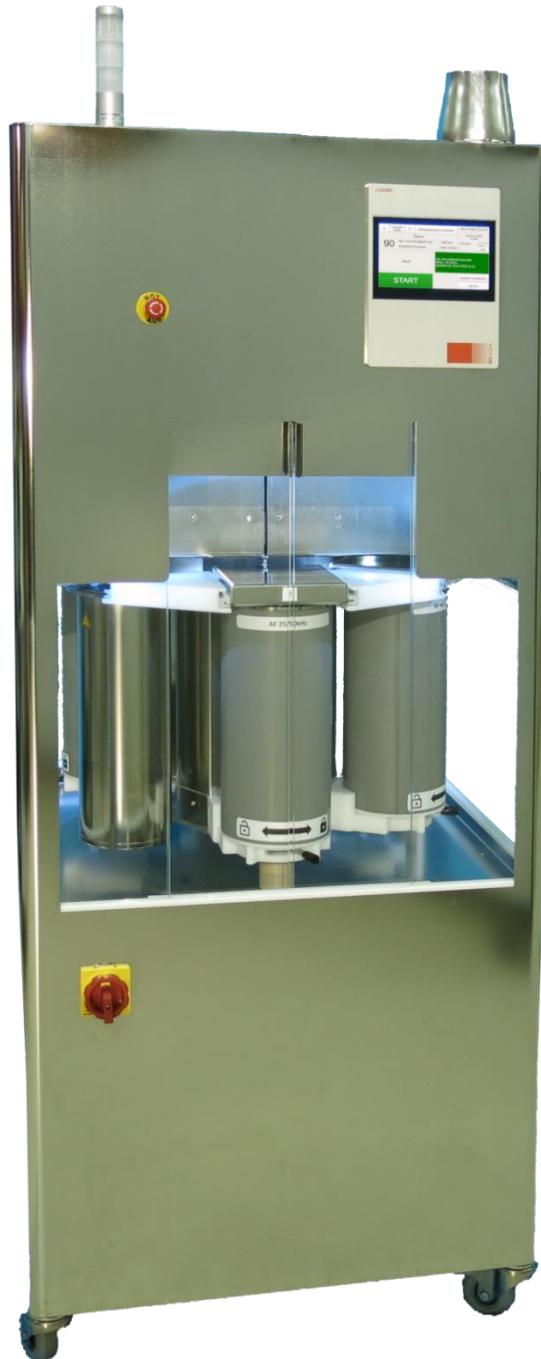


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Release concerns doc:	Project number:	Created or amended and checked:		Checked and approved:	
BA-6028-001_EN	6028	Date:	Abbreviation/Visa	Date:	Abbreviation/Visa
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Baths	
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Degassing	5.7.2 Degassing, page 54
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Create / edit on Windows PC	5.6.3 Edit cleaning cycles on Windows PC, backup, page 50
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# 1 INTRODUCTION

## 1.1 Purpose, scope and application

This operating manual describes the ECOCLEAN P6 cleaning machine and is intended for ECOCLEAN service technicians and technicians trained by ECOCLEAN as well as for users of the ECOCLEAN P6. It provides information on how to operate the machine.

Questions about installation, use and operation can be sent to the e-mail address [info.monschau@ecoclean-group.net](mailto:info.monschau@ecoclean-group.net) of ECOCLEAN GmbH.

We reserve the right to make changes to this document. Copies already issued are not automatically subject to the amendment service.

## 1.2 Terms of use and warranty

ECOCLEAN provides a demonstration cleaning cycle. This only shows a few possibilities in connection with the creation of your own customer-specific cleaning cycles.

As the cleaning quality depends on the cleaning media used, the degree of soiling or the type of items to be cleaned, the cleaning cycles must always be adapted on site and subsequently validated.

The cleaning performance must be checked periodically.

## 1.3 Definitions

### 1.3.1 Terms

#### ***Cleaning cycle***

Program for cleaning small mechanical parts.

#### ***Phase***

Sub-units of a cleaning cycle consist of different phases such as: Ultrasonic cleaning, vacuum cleaning, rinsing or drying.

#### ***Cleaning solution***

Water or water mixed with cleaning chemicals. The chemicals can be alkaline or acidic, or they can be drying aids or other additives.

#### ***Demineralized water***

stands for fully desalinated water. This water must be provided by the customer.

#### ***Bath***

A bath holds the cleaning medium for the cleaning process or is used for rinsing. See 3.1 System overview.

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### **Working Head**

The working head is used to hold the basket containing the items to be cleaned and seals the container during the cleaning process. See 3.1 System overview.

### **Basket**

The items to be cleaned are placed in the basket. The basket is attached to the working head. See 3.1 System overview.

### **Spinning position**

The position of the Z-axis such that the working head rests on the bath and the basket with the items to be cleaned is at the very top inside the bath.

### **Diving position / Immersion position**

The position of the Z-axis such that the working head rests on the bath and the basket with the items to be cleaned is at the very bottom inside the bath.

## **1.3.2 Abbreviations**

CU4000:	Control computer
CM:	Cleaning machine P6
CC:	Cleaning cycle

## **1.3.3 Referenced documents**

Technical specification:	TS-6007-001
Wiring diagram:	ASP-6007-001
Maintenance instructions for cleaning machine P6:	WA-6007-001
Quick guide Software update P6:	BA-6028-002
Operating instructions P6 Suite (PC software):	BA-6028-003
Operating instructions Up/Download:	BA-6028-004
Operating instructions SCADA:	BA-6028-005
Up/download of licenses P6:	BA-6028-006
Quick guide to cleaning machine P6:	BA-6028-007
Licenses used P6:	T-6028-003
Packaging instructions P6:	AA-6007-004

## **1.3.4 Explanation of symbols**

The symbols used in these instructions for use have the following meaning:



This symbol primarily indicates that failure to observe the warning may result in injury to the user or damage to the appliance.

Secondly, the user's attention is drawn to circumstances that must be observed for correct operation.

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This symbol indicates that if the warning is not observed, the user may be injured by electric shock or the appliance may be damaged.



Disposal instructions

## 1.4 Version overview

Version	Remark
P6 UI 1.0.0	
P6 ctrl 1.0.0	
P6 UI 1.1.0 P6 ctrl 1.1.0	New: <ul style="list-style-type: none"> <li>The arrow buttons on the main page for selecting the cleaning cycle can be hidden (6.2.3 Machine settings). This is to prevent unintentional changes to the cleaning cycle selection</li> <li>If the user system is activated, you can set which access level is required for cleaning cycle selection (6.2.3 Machine settings).</li> <li>A description of the cleaning solution can be entered for each turntable position in the cleaning cycle (see 5.4.2.1 CC Parameters for turntable positions). This description also appears in the menu according to 5.3.1 Turntable status (baths), and when filling the baths (5.7 Initialize baths)</li> </ul>
P6 UI 1.2.0 P6 ctrl 1.2.0	New: <ul style="list-style-type: none"> <li>The basket height is specified in the cleaning cycle</li> <li>The up/down movement of the basket during cleaning is no longer specified in predefined distances and speeds (previously e.g. "Short &amp; slow") but can be freely specified (see 5.4.3 Phases of a cleaning cycle)</li> <li>The minimum and maximum filling level of the baths is calculated automatically with the help of the changes mentioned above.</li> <li>Steel baths (ultrasonic baths) and glass baths have different depths. This can be specified in the machine settings, see 6.2.3 Machine settings . The display of the level and volume of the cleaning solution always refers to the bath (bath bottom).</li> </ul> <p>When adjusting the sensor for level measurement, the bath bottom offset is taken into account. However, adjustment should always be carried out in a steel bath, where the bath bottom offset is 0 mm.</p>

Version	Remark
P6 UI 1.3.0 P6 ctrl 1.3.0	<p>New</p> <ul style="list-style-type: none"> <li>• The permanent flow bath is only filled and checked on machine initialization if the selected cleaning cycle uses the permanent flow bath.</li> <li>• When entering a password, the password can be displayed as plain text</li> <li>• Upload/download via web browser (also software update), see 12 Remote access</li> </ul> <p>Amended:</p> <ul style="list-style-type: none"> <li>• User system: The minimum number of characters that can be set by the administrator for a password is 1 (previously: 8, see 5.8.8 Password requirements)</li> <li>• When starting a cleaning cycle, the system waits until all baths have reached their set temperature (see 5.5.4 Temperatures of baths)</li> <li>• Degassing: Default selection of baths for degassing only includes the baths that need to be degassed (defined in the cleaning cycle, see 5.4.2.1 CC Parameters for turntable positions, parameter ID H12.6).</li> <li>• The use of the baths is counted. The regular replacement of the cleaning solution is based on this (see 5.5.1 Replace cleaning solution regularly) and the renewed measurement of the level (see 6.2.4 Turntable parameters). The counter is now only incremented by 1 when the bath is used in the cleaning cycle. Previously, the counter was incremented for each phase of a cleaning cycle</li> <li>• Default value for a new cleaning cycle: Vacuum parameter, "Break to (threshold)" = 850mbar (vacuum parameter ID P14.9, see 5.4.3 Phases of a cleaning cycle)</li> <li>• Minor improvements (e.g. larger symbols etc.)</li> </ul>
P6 UI 1.3.1 P6 ctrl 1.3.1	<p>Bug fixes:</p> <ul style="list-style-type: none"> <li>• Internal error could lead to a crash when replacing SD card or CU4000</li> <li>• When reinitializing after a manually triggered emergency stop, a crash of the axis could follow, depending on the cleaning cycle and where it was within the cycle..</li> </ul>
P6 UI 1.4.0 P6 ctrl 1.4.0	<ul style="list-style-type: none"> <li>• Exhaust fan can be set to run when a cover is open (as in previous versions), or to always run, see 6.2.3 Machine settings</li> <li>• Status output (AUX socket in the rear panel, see 3.1 System overview) can be set to various functions, see 6.2.3 Machine settings</li> <li>• Movements of some valves are counted and maintenance is saved, see 6.3.8 Maintenance (filters, oil, etc.)</li> <li>• Several small changes and improvements</li> </ul>
P6 UI 1.5.0 P6 ctrl 1.5.0	<ul style="list-style-type: none"> <li>• Automatic vacuum valve opening time, see 5.4.3 Phases of a cleaning cycle</li> <li>• Host name can be changed, see 6.2.2 General settings</li> </ul>

Version	Remark
P6 UI 2.0.0 P6 ctrl 2.0.0	<ul style="list-style-type: none"> <li>Support for an oil-free vacuum pump</li> <li>Support for "Liquistop"</li> <li>New in the cleaning cycle <ul style="list-style-type: none"> <li>"Immersion speed" (see 5.4.2 Cleaning cycle header)</li> <li>"Basket loading height" (see 5.4.3 Phases of a cleaning cycle)</li> <li>"Z-Axis (head) is allowed to submerge" (see 5.4.2.1 CC Parameters for turntable positions)</li> </ul> </li> <li>"Move up/down" can now be executed before vacuum cycles. This means that a separate phase does not have to be defined. See 5.5.5 Vacuum.</li> </ul>
P6 ctrl 2.0.1	<p>Bug fix:</p> <ul style="list-style-type: none"> <li>Operating hours of vacuum pump was previously not counted (error was introduced with version P6 ctrl 2.0.0)</li> </ul>
P6 UI 2.1.0 P6 ctrl 2.1.0	<ul style="list-style-type: none"> <li>If the CC (cleaning cycle / job) was not completed successfully, the door remains locked until the abort is confirmed. See 5.2.4.6 Removing items to be cleaned</li> <li>Immersion and emergence speed (Z-axis) in cleaning cycle header and in each phase (see 5.4.2 Cleaning cycle header and 5.4.3 Phases of a cleaning cycle)</li> <li>Improved vacuum valve control</li> <li>Improved UI to initialize baths (5.7 Initialize baths)</li> <li>Support for a conductivity measurement system with a smaller measuring range and better resolution (see 6.3.7.7 Conductivity calibration).</li> <li>Option „Protective gas“ (5.5.9 Protective gas)</li> <li>Support for different hardware components (motor drivers, I/O-system etc.)</li> <li>Support of 50W and 100W ultrasonic generator and baths. All ultrasonic power levels are now specified in watts [W] instead of in percent [%].</li> </ul>
P6 UI 2.2.0 P6 ctrl 2.2.0	<ul style="list-style-type: none"> <li>Power saving mode (see 5.9 Power saving mode)</li> <li>If a liquid level measurement is required, this is carried out automatically as soon as the cleaned items have been removed</li> <li>More information in the status window, e.g. if the vacuum pump or a bath is not ready. Pressing the status attempts to correct the problem (e.g. turn on the vacuum pump, measure liquid levels, etc.)</li> <li>Z-axis motor brake support</li> <li>Correction of possibly incorrectly recognized ultrasonic frequency when inserting an ultrasonic bath</li> <li>Several small changes and improvements</li> </ul>

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## 2 GENERAL INFORMATION

### 2.1 Training

Training is recommended for the use of the P6 cleaning machine.

### 2.2 Intended use

The machine is designed for cleaning small mechanical parts (watch wheels, springs, axles (pivots), etc.) with **aqueous media**.

In particular, the safety instructions for the permitted cleaning media must be followed



**ATTENTION:**

**There is a risk of explosion**

### 2.3 Safety instructions

#### 2.3.1 Cleaning agent

The machine must not be used with flammable or highly flammable solvents. In particular, solvents containing petrol, acetone, alcohol or isopropanol, must not be used.



**ATTENTION:**

**There is a risk of explosion**



**Toxic chemicals** and **elevated temperatures** may be used during the cleaning process.

The instructions for handling the chemicals used **MUST** be observed.



The choice of cleaning agent must be checked for compatibility with the materials of the machine.  
No incompatible cleaning agents may be used.



The cleaning agents used must not release aerosols and/or vapors above the permissible exposure limits in the machine (bath covers are only open for a short time).



When filling the baths with cleaning media outside the machine, safety measures must be taken in accordance with the chemicals used!

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In order to avoid carry-over of cleaning media between the baths, the machine should be spun at the end of a phase. The cleaning cycle must be created accordingly.



If a cleaning process is interrupted and then restarted, carryover cannot be ruled out. Chemical reactions between incompatible cleaning media must be ruled out.

### 2.3.2 General hazards notes



Cleaning items that have undergone a cleaning cycle may be at a dangerously high temperature and touching them may result in burns. Appropriate measures must be taken (gloves, etc.).



To avoid personal injury and damage to property, the warnings and safety instructions given in these operating instructions must be observed.



All live (after a cycle has started), hazardous parts are located behind covers that can only be removed with proper tools and PPE.

**Please note: These covers may only be removed by appropriately trained personnel.**

The national regulations and applicable safety regulations must be observed.

Under no circumstances will the manufacturer accept liability or responsibility for damage resulting from improper installation or use of the machine, software or accessories.

All examples and illustrations in this manual are provided solely to aid understanding of the text. No guarantee can be given for the correctness of the operating procedures shown.

### 2.3.3 Notes on occupational safety

This machine uses electricity, hot water and chemicals to carry out the cleaning process. In accordance with the above guidelines, the design ensures that the user is not exposed to any danger if the machine is operated properly.

The following is a list of certain circumstances that remain hazardous even when used in accordance with the regulations:



The machine must be **installed in** accordance with recognized technical principles. **The connection** of electricity and exhaust air may only be carried out by authorized specialist personnel.



After a cleaning process, the items to be cleaned may be **hot and there is a risk of burns**. Take appropriate protective measures!

After a cleaning process (especially if it is interrupted), the items to be cleaned may be coated with residues of cleaning agent and **there is a risk of poisoning or chemical burns**.



When changing **chemical baths**, take precautions against **splashes** in the eyes and on the skin. Wear **protective goggles** and **gloves**. In addition, the instructions of the chemical supplier must always be observed.

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Remove broken glass with due care, there is a risk of injury!



This machine must not be operated without covers and PPE (protective devices)

Safety-relevant mechanisms such as door monitoring must never be bypassed or disconnected.

## 2.4 Storage, transportation, packaging



Use caution and common sense when **transporting** the machine. Follow the instructions in chap. 4.1 Transportation of the machine .

The shipment must be checked for completeness upon receipt. Any transport damage detected must be reported to the manufacturer immediately.

In the event of temporary storage, we recommend using the original packaging. The storage location must be clean and dry and guarantee an ambient temperature in the range of min. 10°C to max. 40°C.



The machine is on castors. It may only be moved at a maximum of half walking speed. The parking brakes must be applied at the stand position



The machine must be disposed of in accordance with Directive 2002/96/EC of the European Union on waste electrical and electronic equipment! It must be returned to the manufacturer for disposal .

Any chemicals contained must be emptied beforehand and disposed of as chemical waste in accordance with the applicable national/local regulations.

The control unit (CU4000) contains a lithium battery which must be replaced occasionally. This must be handed in at a designated collection point.

## 2.6 Warranty

A warranty claim requires professional installation and commissioning in accordance with the operating instructions valid for the CM P6. The necessary installation, commissioning and maintenance work may only be carried out by competent and factory authorized persons.



Tampering with and modifications to the appliances will invalidate the warranty.

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Water damage to the vacuum pump is excluded from the warranty!



The operator of the CM must ensure through suitable process programming that no water can enter the vacuum pump during the cleaning process. In particular, the waiting time after a vacuum cycle sequence must be long enough so that any cleaning solution foam that is sucked in can flow back into the process chamber.

(See also 5.7.2Degassing



The compatibility of the materials used (see TS) with the cleaning solution must be clarified in advance. The customer is liable for any damage caused by incompatibility.

The working head can be ordered with or without a magnetic coupling.



The working head with magnetic coupling achieves a higher vacuum tightness, which enables a deeper vacuum for drying. This working head is also more durable. It should not be used if there may be suspended magnetic particles in the cleaning solution, as these magnetic impurities can settle on the magnetic coupling and impair its function



Ultrasonic baths have a limited service life. No warranty can be given for cavitation damage (pitting); this is considered normal wear and tear.

## 2.7 Manufacturer

**Ginova Electronics AG**  
**Systems software and electronics**  
**Spärsstrasse 7**  
**CH-2562 Port**  
**SWITZERLAND**  
**Website:** [www.Ginova-electronics.com](http://www.Ginova-electronics.com)  
**E-mail:** [info@Ginova-electronics.com](mailto:info@Ginova-electronics.com)

# 3 DESCRIPTION OF THE MACHINE

## 3.1 System overview

The CM P6 is a computer-controlled machine with 6 cleaning stations. The stations are arranged circularly on a turntable. The first 4 stations can either be equipped with simple glass reaction baths or prepared to accommodate heatable ultrasonic baths. Station 5 is reserved for rinsing with permanent flow (PF) and optional conductivity measurement. The last station is used to dry the items to be cleaned with hot air.

The cleaning cycles are freely programmable. After starting a cleaning cycle, the progress is shown on the graphic display. In the event of faults, error messages are shown in plain text on the display.

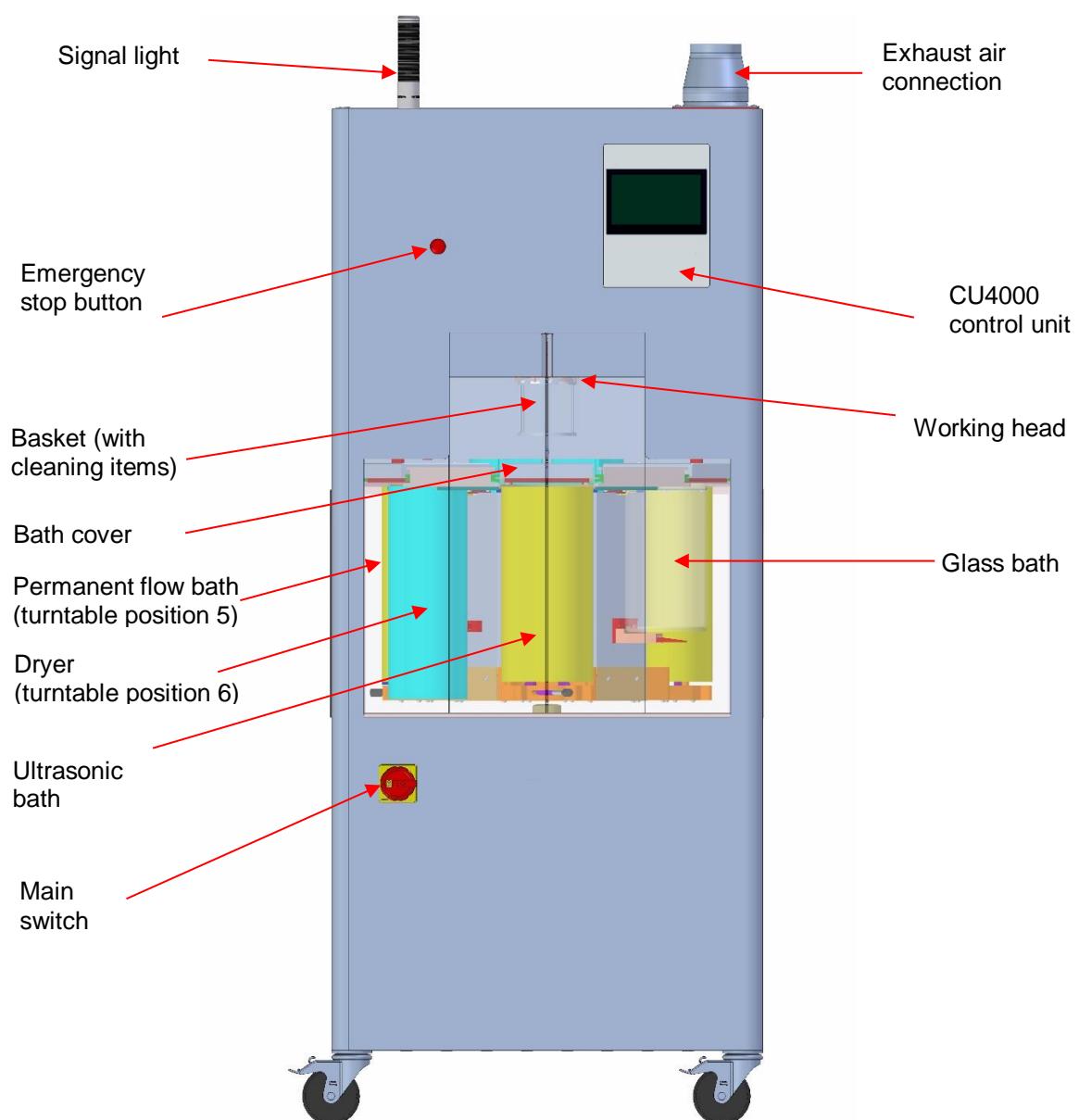
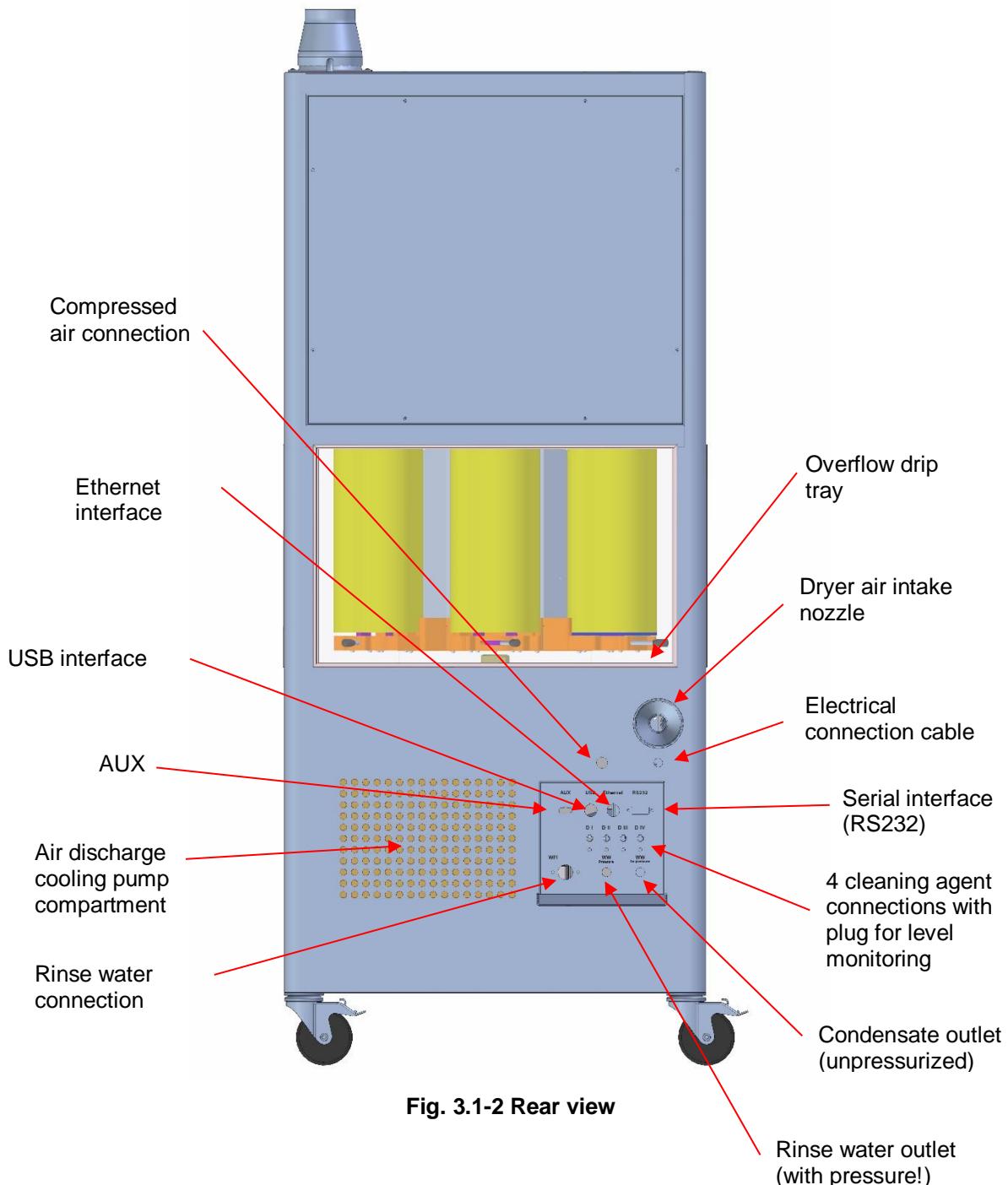


Fig. 3.1-1 Front view



**Fig. 3.1-2 Rear view**

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## 3.2 Assemblies of the system

The CM P6 consists of the following modules, which together enable the cleaning process to be carried out:

- Working head to pick up the basket with the items to be cleaned
- Horizontal turntable with 6 stations
- Up to 4 heatable ultrasonic baths (turntable stations 1 - 4)
- 5 baths (turntable stations) for treatment with cleaning solution
- 1 permanent flow bath (rinse bath)
- Drying station for drying the items to be cleaned (station 6)
- Cover opening system for opening and hermetically sealing the baths
- Vacuum system to support the process
- Monitoring system with sensors for temperature, fill level, etc., for controlling and monitoring the sub-processes (cleaning and drying)
- Electrical system (power controller, contactors, relays, etc.) with I/O system for controlling the system components
- CU4000 control unit with display and integrated touch screen

## 3.3 Application technology

### 3.3.1 Loading and starting a cleaning cycle

The items to be cleaned are filled into the basket. This is attached to the working head using a bayonet lock.

After closing the door, the cleaning cycle can be started. The system locks the door, runs the cleaning cycle and automatically unlocks the door again once the cleaning cycle is complete so that the cleaned items can be removed.



The acceleration, speed and direction of rotation of the spin function must be selected so that the basket cannot come loose from the anchorage.

### 3.3.2 Description of cleaning cycles (see also Chap. 5.4)

Each cleaning cycle can be freely programmed in order to adapt it to the specific reprocessing requirements.

The control system has a cleaning cycle pre-programmed at the factory. This is only intended as an example cycle and can be used to build a working custom cycle.

Cleaning cycles can be created on the control system that are freely programmable according to the requirements of the cleaning process.

A typical cleaning process (cleaning cycle) consists of the following phases:

- Cleaning (ultrasonic / vacuum)
- Post-cleaning

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- Pre-rinsing
- Rinsing
- Drying (with vacuum if necessary)

Typically, one process phase is carried out at each turntable station. A process phase consists of a programmable immersion section and a spin section. See chapter 5.4 Structure of cleaning cycles, page 27.

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## 4 COMMISSIONING OF THE MACHINE

### 4.1 Transportation of the machine

The machine is supplied in transport packaging. The packaging instructions (see 1.3.3 Referenced documents) describe how the machine should be packed and unpacked.



Risk of injury due to heavy weight! (see technical specification, see 1.3.3 Referenced documents)

### 4.2 Requirements for the environment

The ambient conditions are specified in the technical specification, see 1.3.3 Referenced documents

Select a clean and dry installation site for the machine that is protected from direct sunlight. The surface must be level and have sufficient load-bearing capacity

The installation site must have adequate ventilation. To enable operation in clean rooms with overpressure, the supply and exhaust air can be connected separately to the machine.

### 4.3 Installation of the machine

The machine stands on four swivel castors. These are not height-adjustable and cannot be used to level the machine; the installation site must be level and horizontal. Ensure that there is sufficient space to the side and behind the machine. The rear of the machine should remain accessible for connecting the connections.



The machine may only be installed by qualified personnel in accordance with instructions

### 4.4 Connecting the power supply

Use the supplied connection cable with a standard local plug to connect the machine to the quick disconnect box or circuit breaker panel. Ensure that the circuit breaker is suitable for operating the machine (see technical specification and connection diagram, chapter 1.3.3 Referenced documents).

### 4.5 Connection of the exhaust air system

The machine has a system for expelling the drying air used. This can be connected to a building-side exhaust air system which directs the exhaust air into the open air or, if necessary, into suitable filters.

The dimensions and the exact position of the connection can be found in the technical specification and connection diagram (see chapter 1.3.3 Referenced documents ).

### 4.6 Connection of the supply air system

The machine has a connection for the dryer supply air. This can be used optionally. The dryer air is fed into the machine via a HEPA filter.

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The dimensions and the exact position of the connection can be found in the technical specification and connection diagram (see chapter 1.3.3 Referenced documents).

## 4.7 Connection to rinse water / waste water

The machine is equipped with a permanent flow bath (rinse bath). A water supply (rinsing water) and a waste water connection are required. Information on this can be found in the technical specification (see chapter 1.3.3 Referenced documents, max. water pressure etc.).

## 4.8 Connection to the external compressed air system

The machine requires an external compressed air supply line to drive the valves or scavenge pump used. Connect this to the compressed air connection on the rear of the machine. Information on the compressed air required can be found in the technical specification (see chapter 1.3.3 Referenced documents ).

## 4.9 Switching on for the first time

Switch the machine on by turning the main switch on the front of the appliance.



Before the machine is initialized, all transport securing elements must be removed. See packaging instructions P6 (chapter 1.3.3 Referenced documents)



The direction of rotation of the vacuum pump must be checked (three-phase current), note the direction of the arrow.

Only when the necessary checks have been carried out successfully can the initialization button on the main display of the control unit be touched to initialize the motors.

The baths are then filled and inserted into the machine according to the instructions in the next section.

## 4.10 Filling of the baths



When filling and changing **chemical baths**, take precautions against **splashes** in the eyes and on the skin. **Wear protective goggles** and **gloves**. In addition, the instructions of the chemical supplier must always be observed.



The underside of the baths must always remain absolutely dry as this is where the electrical connections are located.



Before inserting a bath into the CM, check that the bath mount on the turntable with the locking/unlocking lever is dry.

Follow the instructions at 5.7 Initialize baths to move the turntable to the desired position where you can remove a bath for filling. Fill the bath outside the machine with the desired cleaning solution. The quantity

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is calculated<sup>1</sup> automatically and displayed. After inserting the bath, the level of the cleaning solution is measured by the machine and an error message is displayed if necessary.

Repeat the process with the remaining baths used. In the machine settings, you can assign names to the individual turntable stations according to their configuration

Finally, if necessary, insert the drying bath.

---

<sup>1</sup> See 5.5.3 Minimum and maximum fill levels of the cleaning solution

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## 5 OPERATING THE MACHINE

### 5.1 Structure and use of this section

Where reference is made to buttons on the display in these operating instructions, these are printed in ***bold italics*** in the text. In most cases, the further description as "button" is omitted for the sake of simplicity.

Comprehensive information about the structure and programming of Cleaning Cycle (CC) can be found in chapter 5.4 Structure of cleaning cycles.

The following chapters contain detailed information on all topics relating to the operation of the CM P6.

### 5.2 First steps

#### 5.2.1 Power up of the P6

After powering on the CM P6, the following display appears:

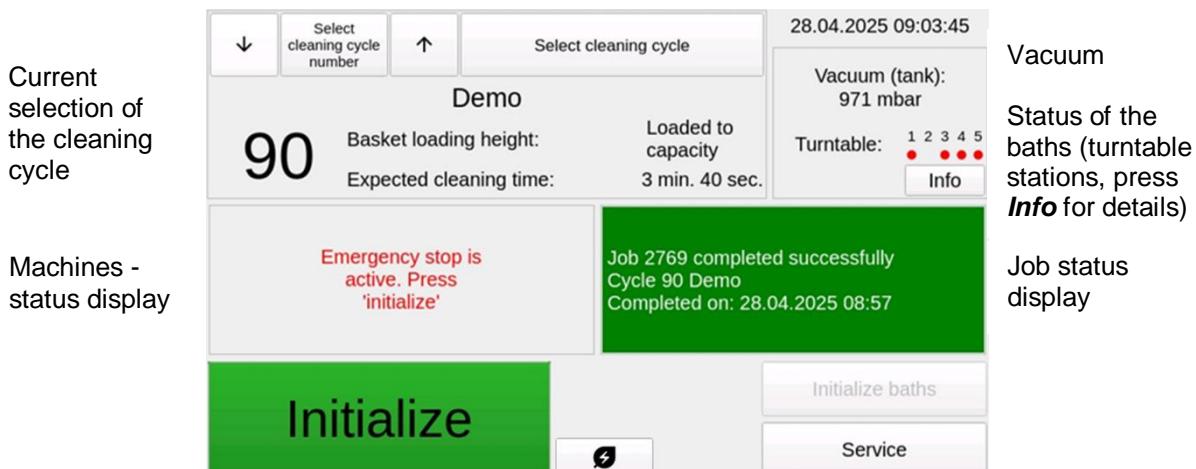


Fig. 5.2-1 Display after power up

To make the system ready for operation, the motor axis and the turntable stations must first be initialized. To do this, the doors must be closed and the green **Initialize** button pressed.

#### 5.2.2 Cleaning cycles

CC are uniquely identified by **numbers**. In addition to the number, the CC are given names which, if chosen correctly, allow them to be assigned to the items to be cleaned.

CC consist of one or more phases. Phases perform partial functions of a cleaning cycle at a turntable station. Examples of such partial functions are ultrasonic and/or vacuum cleaning, immersion cleaning, immersion rinsing or drying.

A predefined CC is available when a CM P6 is delivered. This CC is only intended as an example and can be modified or new CC can be programmed at any time.

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## 5.2.3 Loading

After filling the basket, it is attached to the working head using the bayonet catch. The doors are then closed manually.

## 5.2.4 Starting a cleaning cycle

### 5.2.4.1 Baths (turntable positions)

All baths (turntable positions) that are required in the selected cleaning cycle must be initialized in order to start the cleaning cycle.

A turntable position is considered initialized when a bath with sufficient cleaning solution<sup>2</sup> is inserted. The status (state) of the bath (turntable position) is shown on the right-hand side of the display with green or red dots.

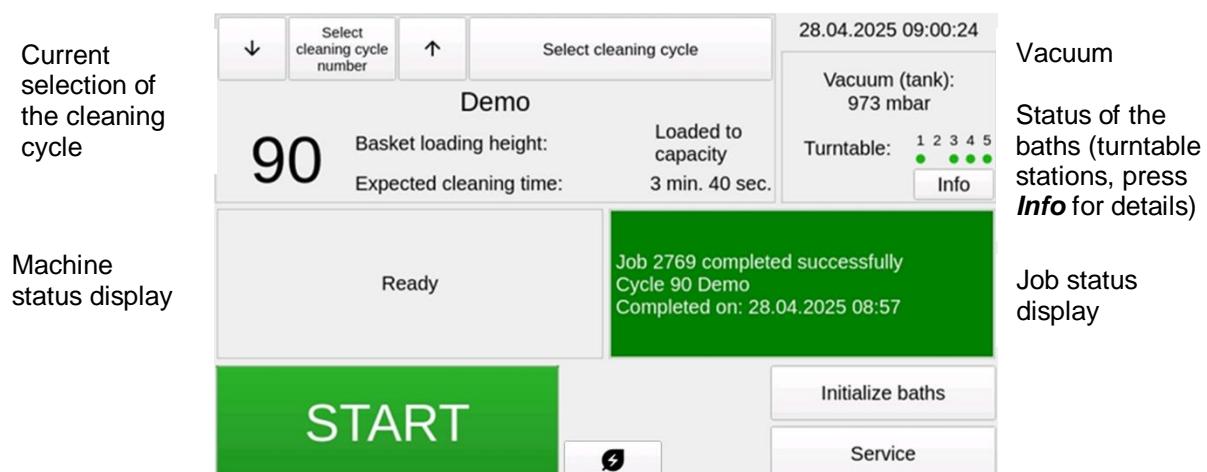


Fig. 5.2-2 Display after initialization

**Initialize baths** is used to fill the baths, replace cleaning solution, replace baths, etc., see 5.7 Initialize baths.

<sup>2</sup> It is also possible to operate a bath without a cleaning solution, e.g. for vacuum drying. In this case, the system checks whether the bath is empty during initialization.

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### 5.2.4.2 Cleaning cycle selection

The current selection from the available CC is displayed in the top left-hand corner. If it does not correspond to the CC to be started, the desired CC must be selected either with the arrow buttons or with the direct selection button in between.

The arrow buttons can be shown or hidden as required. If the user system is activated, you can set whether a user must authenticate themselves to make a selection and what minimum access level is required. For settings, see 6.2.3 Machine settings.



The responsibility for the correct CC selection lies with the operator.

### 5.2.4.3 Cleaning cycle start

Once the correct CC has been selected, the CC is started by pressing the green **START button**. If the machine is not ready, either a corresponding message is displayed, a menu is opened or an attempt is made to initialize the baths (measure fill level, etc.).

After starting a CC, the door is locked and can no longer be opened.

During the entire CC process, the status display shows the current activity of the machine.

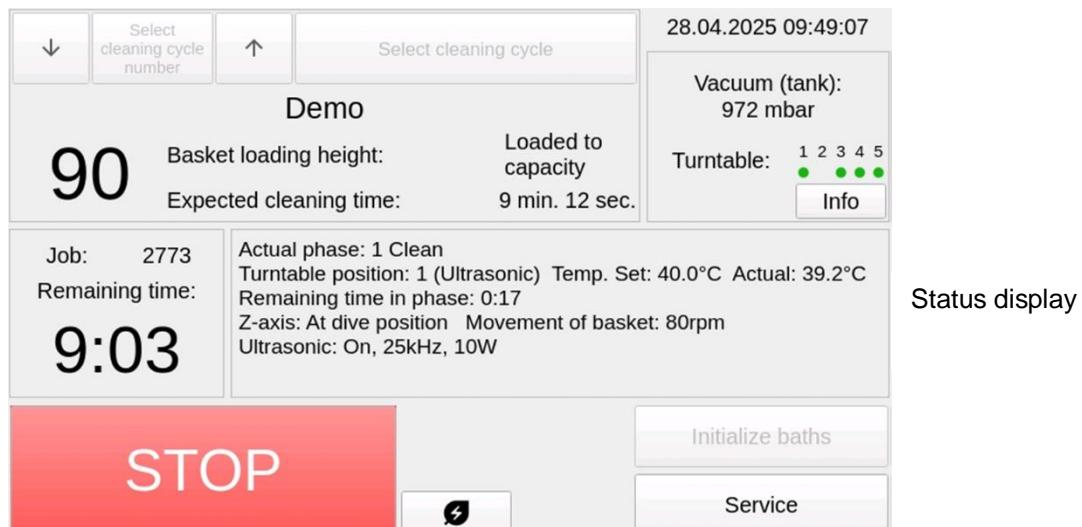


Fig. 5.2-3 Display during execution of a CC

During the cleaning process, the calculated remaining cleaning time is shown in the window to the left of the status display.

### 5.2.4.4 Cleaning cycle status completed

Once the CC has been successfully completed, the job status display shows on a **green** background which CC was successfully completed and when. If the last CC started has not been successfully completed, a corresponding display appears on a **red** background.

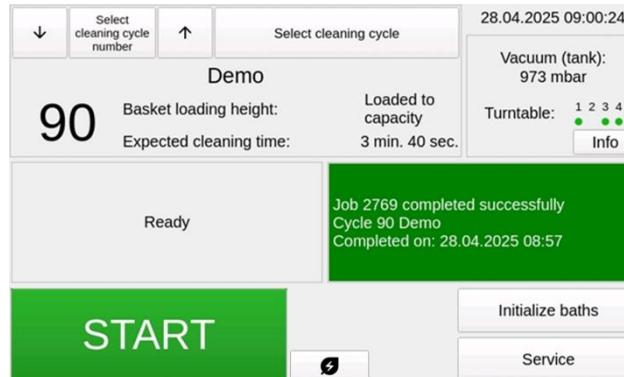
A CC is deemed not to have been successfully completed if it was terminated prematurely for any reason. Prematurely means that not all programmed phases have been completed.

After the CC has ended, the following information is displayed in the status window:

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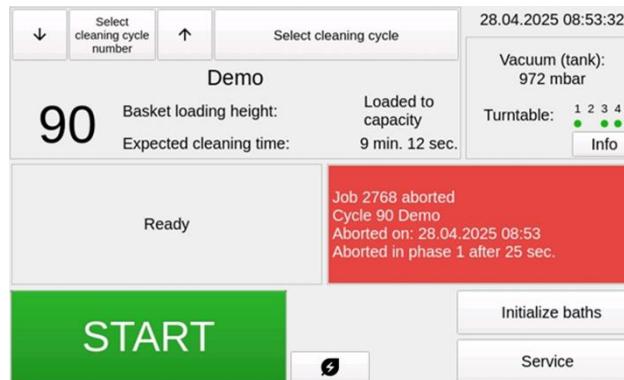
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- Job successfully completed (green background)



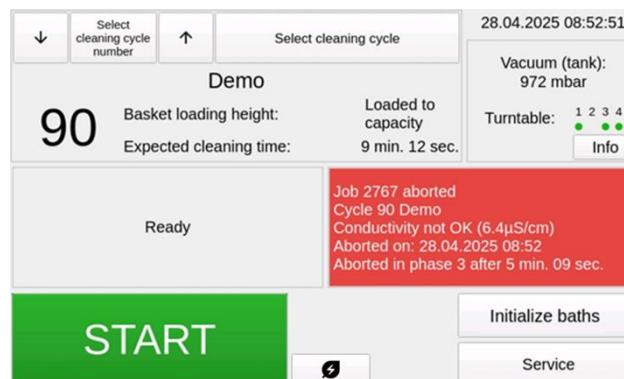
**Fig. 5.2-4 CC successfully completed**

- Job canceled (red background)



**Fig. 5.2-5 CC canceled**

- Job canceled, conductivity too high (red background)



**Fig. 5.2-6 CC aborted, conductivity too high**

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### 5.2.4.5 Cleaning cycle interruption / cancelation

A CC can be interrupted or canceled at any time. To do this, press the **STOP button**. The cleaning process is stopped and the stop menu appears. You can select whether the process is to be definitively canceled or resumed.

### 5.2.4.6 Removing items to be cleaned

If the CC was not completed successfully (due to an error or user cancellation), a window with text on a red background will appear, and the door will remain locked until the abort is confirmed. This is to prevent the removal of cleaning items without noticing that the CC (job) was not successfully completed.



The basket and cleaning items that have been run through a cleaning cycle may be at a dangerously high temperature. Wait until the basket and items have cooled down sufficiently before touching them.

## 5.3 Machine and turntable status

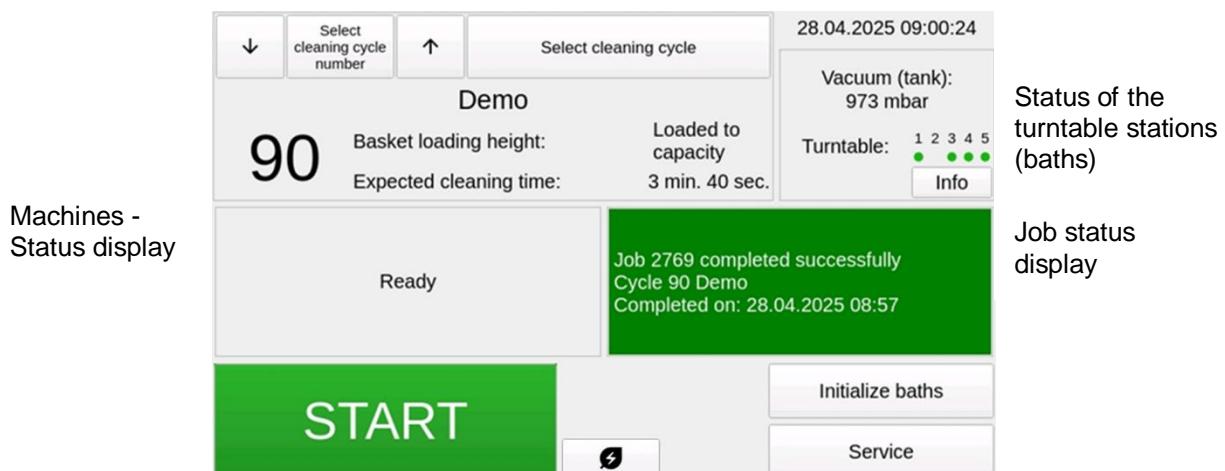


Fig. 5.3-1 Machine and turntable status

#### Machines - Status display:

The machine status is displayed in the window on the left in the center. Information on errors in the CC or turntable stations (baths) that are not ready is also displayed here. By touching the area or pressing **START**, more information is displayed in the event of an error (e.g. a message with the corresponding error in the CC), or a corresponding menu is opened (e.g. initialize baths), or an attempt is made to reinitialize the baths.

#### Status of the turntable stations:

- Green dot: Turntable station (bath) is ready for cleaning (depending on the selected CC)
  - Red dot: The corresponding turntable station (bath) is not ready (e.g. too little cleaning solution in the bath, or the bath is not initialized, etc.).
  - No dot: The turntable station (bath) is not used in the selected CC.
- Info** opens a menu with more information, see 5.3.1 Turntable status (baths)

#### Job status display:

Information on the last job (cleaning process). See also 5.2.4.4 Cleaning cycle status completed

### 5.3.1 Turntable status (baths)

The menu is located under  
Info button in the status window of the turntable stations (main page)



**Fig. 5.3-2 Turntable status menu**

The description of the cleaning solution (parameter H12.1.2, see 5.4.2.1 CC Parameters for turntable positions) is displayed for each turntable station (bath) and the status is described with a pictogram. The status always depends on the selected CC (e.g. a bath can be used with liquid or empty).

#### Colors and flashing:

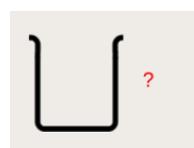
In principle, the current status is always displayed.

Black means "all right".

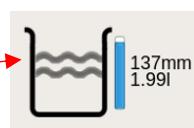
Red means that something is wrong.

Flashing red indicates what should be but is not (e.g. a flashing red water symbol means that the bath is empty but should contain cleaning solution)

#### Symbols:

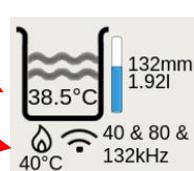


Unknown, bath is not initialized  
(Baths are initialized when the machine is initialized, or when CC is started, or can be initialized manually individually in the *Initialize baths* menu (see 5.7 Initialize baths ))



The bath contains  
cleaning solution

The amount of cleaning solution  
in millimeters and liters. The  
vertical bar shows the range  
between the minimum and  
maximum filling quantity<sup>3</sup>

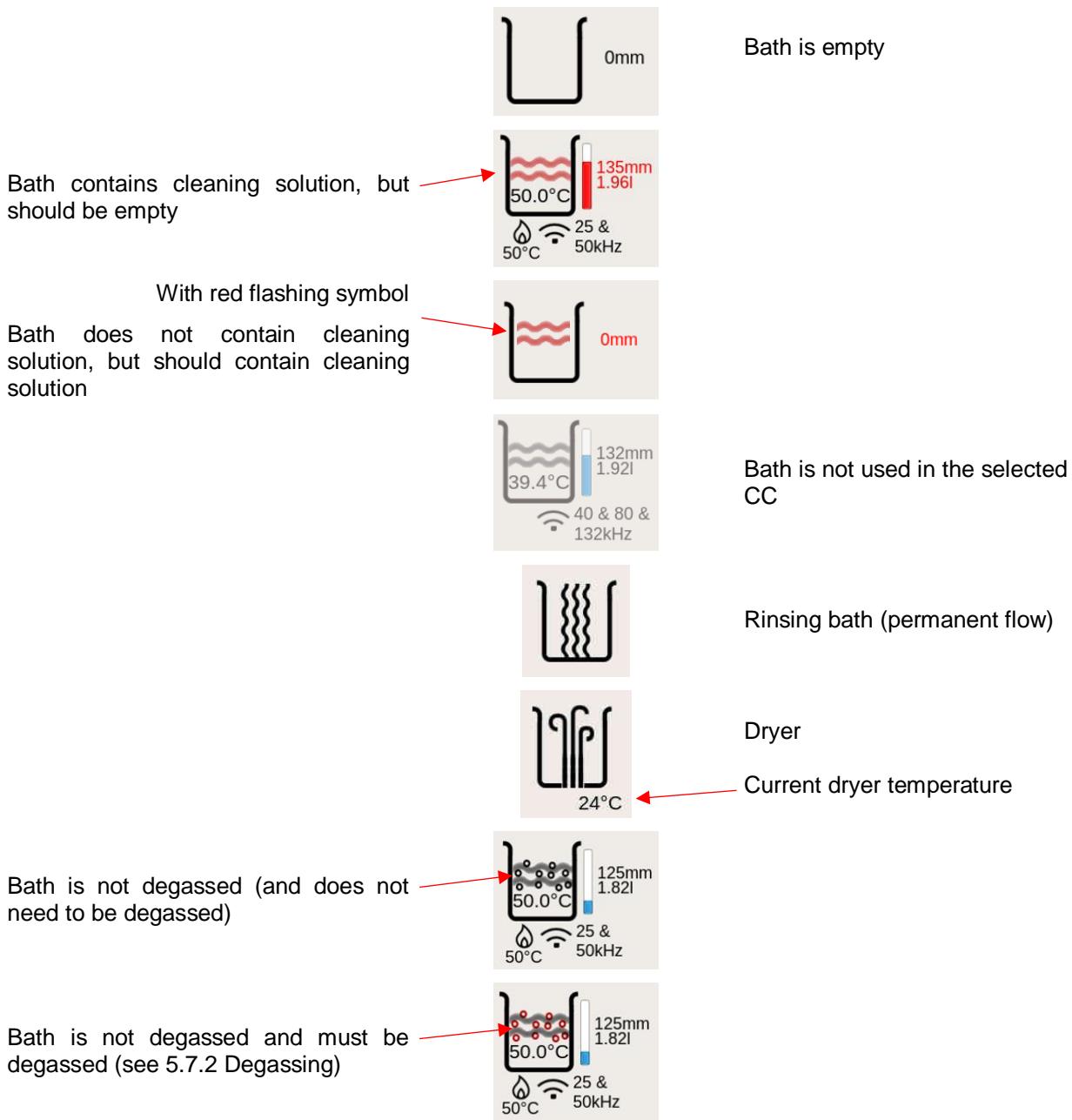


Current temperature  
(Example: 38.5°C)

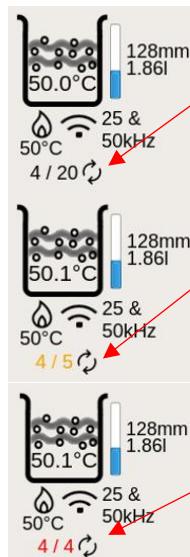
Bath heating running, set  
temperature 40°C

Inserted bath has ultrasonic

<sup>3</sup> See 5.5.3 Minimum and maximum fill levels of the cleaning solution



Use of the bath



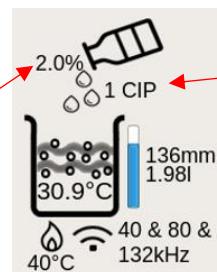
4/20 ↗ Used 4 times, cleaning solution must be replaced after 20 uses

4/5 ↗ Used 4 times, cleaning solution must be replaced after 5 uses. The warning limit has already been exceeded

4/4 ↗ used 4 times, cleaning solution must be replaced after 4 uses (in the example, the cleaning solution must be replaced now)

Cleaning agent  
(Autofill, dosing unit)

Quantity  
(concentration) of  
cleaning agent



Number and name of the cleaning agent



Incorrect cleaning agent in the bath.

## 5.4 Structure of cleaning cycles

### 5.4.1 Fundamentals

The CM P6 can manage a maximum of **10,000 different CC**. They are uniquely identified with a number between 0 and 9999, i.e. no two CC can have the same number. A name can be assigned to each CC. The same name can be assigned to different CC.

Each CC can consist of a maximum of **40 phases**, which are processed one after the other. Names can be programmed into the phases to differentiate between them. Phases consist of a dip phase and a spin phase during which context-specific functions can be activated.

The total phase time is made up of the two programmed partial phase times. The total CC duration is the sum of all phase times.

The creation and modification of CC on the CU4000 is described at 5.6 Operation and programming of cleaning cycles.

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## 5.4.2 Cleaning cycle header

A CC has a header with the following data:

ID	Designation	Value range	Description
H1	Cleaning cycle number	0 .. 9999	
H2	Name	max. 48 characters	
H3	Min. access level for starting	0 (free) .. 4	Only appears if the user system is activated. 0 (free) means that the CC can be started without a user authenticating itself. See 5.8 User system and access authorization.
H4	Min. access level for editing	1 .. 4	Only appears if the user system is activated. Users with a lower access level only have access to the CC and cannot make any changes. See 5.8 User system and access authorization.
H5	Basket height (including bracket)	1 .. 100mm	Including the bracket. The basket height affects the required fill level, see 5.5.3 Minimum and maximum fill levels of the cleaning solution
H6	Basket loading height	0 (unspecified / loaded to capacity) ... 100mm	Measured from below. The specification of the loading height allows a lower minimum filling level, see 5.5.3 Minimum and maximum fill levels of the cleaning solution
H7	Basket displacement	0 .. 1000ml <sup>4</sup>	If unknown, leave at 0.  Includes the basket with cleaning items, but only up to the height specified under "Basket loading height" (ID H6)!  A higher displacement of the basket (with the cleaning items) allows for a lower minimum fill level, see 5.5.3 Minimum and maximum fill levels of the cleaning solution
H8	Basket rot. acceleration in diving position	1 .. 1000rpm/s	
H9	Immersion speed	1 .. 140mm	
H10	Emergence speed	1 .. 140mm	
H11	Barcode / QR Code		
H11.1	Barcodes / QR codes to start cleaning cycle	max. 1024 characters	See 5.5.2 Scan barcodes / QR codes
H11.2	Scan and save any barcodes / QR codes on start	No / Yes	See 5.5.2 Scan barcodes / QR codes

<sup>4</sup> The displacement can be easily determined, for example, by immersing the basket in a measuring cup filled with water (only the lower part of the basket up to the "Basket Load Height", ID H6!).  
CAUTION: Make sure that no air remains trapped inside the basket.

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### 5.4.2.1 CC Parameters for turntable positions

Some parameters of the CC are defined for each turntable position. The turntable position to be used is then selected for each phase.

The following parameters exist individually for each turntable position, except for the permanent flow bath and the dryer.

ID	Designation	Value range	Description
H12.1	Cleaning solution		
H12.1.1	Cleaning solution	Bath with liquid / Bath empty	An empty bath can be used, for example, for vacuum drying, see 5.5.5 Vacuum
H12.1.2	Description	max. 196 characters	This description is shown in 5.3.1 Turntable status (baths) and in 5.7 Initialize baths
H12.2	Temperature	not heated, 30 ... 75°C	For baths without a heater, only "not heated" can be set. Entering a temperature lower than 30°C = "not heated"
H12.3	Replace cleaning solution		
H12.3.1	Replace cleaning solution after usages	0 (replacement not required) / > 0	See 5.5.1 Replace cleaning solution regularly
H12.3.2	Replace cleaning solution after usages, warning	0 (no warning) / > 0	See 5.5.1 Replace cleaning solution regularly
H12.4	Cleaning agent		
H12.4.1	Cleaning agent	No cleaning agent, Cleaning agent 1 ... 4	See 6.2.6 Cleaning agent
H12.4.2	Concentration	0.0% (determined by the user) ... 100.0%	
H12.4.3	Change of cleaning agent and / or dosage	No change allowed Can change cleaning agent and dosage Can change dosage only	
H12.5	Z-Axis (head) is allowed to submerge	Yes / No	The filling level of the cleaning solution is limited so that the Z-axis is not immersed in the cleaning solution. Mechanical adjustments may also be necessary for this to work properly
H12.6	Degas required	Yes / No	Only relevant if the bath is used with vacuum or ultrasonic.

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Parameter H12.6 „Degas required“:

High bath temperatures and foaming cleaning agents can lead to increased water absorption of the vacuum system during vacuum cycles!

 It is important that foaming cleaning solution is degassed!

**The manufacturer accepts no liability for water damage to the vacuum pump.**

#### 5.4.2.2 Spinning

At the end of a phase, the basket is spun to free the items to be cleaned from the cleaning solution and thus minimize carryover. To do this, the basket with the items to be cleaned is pulled out of the cleaning solution and rotated. The spin cycle is skipped if the phase was carried out in an empty bath or in the dryer, or if the subsequent phase is carried out in the same bath. The following settings can be programmed:

ID	Designation	Value range
H13.1	Time	0 .. 59min 59s
H13.2	Rotation	Left, Right, Left / Right
H13.3	Rotation speed	80 .. 3000rpm
H13.4	Acceleration	1 ... 1000rpm/s

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ID	Designation	Value range
H13.5	Time rotation	0 .. 3600.0 seconds
H13.6	Time in idle	0 .. 3600.0 seconds

### 5.4.3 Phases of a cleaning cycle

During a phase, the basket with the items to be cleaned is immersed in the cleaning solution or dried (dryer at turntable position 6, or vacuum drying in an empty bath). The following settings can be programmed for a phase:

ID	Designation	Value range	Description
P1	Phase name	max. 48 characters	
P2	Turntable position	1 .. 6	By definition, turntable position (turntable station) 1 is always the first ultrasonic station and turntable station 6 is always the drying station. The permanent flow bath is located at position 5.
P3	Time	0 .. 59min 59s	The phase lasts according to the time set here, but at least until all vacuum cycles have been completed (Parameter ID P14.1, vacuum, "Number of cycles").
P4	Immersion speed	0 (According to general setting) ... 140mm	„According to general setting“ = As set in CC-Header, H9 and H10
P5	Emergence speed	0 (According to general setting) ... 140mm	
P6	Rotate basket	No movement, Left, Right, Left / Right	
P7	Rotation speed	In cleaning solution: 80 <sup>5</sup> ... 400rpm In air: 80 ... 3000rpm	
P8	Time rotation	0.0 (Permanent) ... 3600.0 seconds	
P9	Time in idle	0.1 .. 3600.0 seconds	
P10.1	Up/down movement	Off, Submerged, Emerge	“Emerge” moves the Z-axis from the immersion position up to the spinning position. Must be “Off” if vacuum is used.
P10.2	Up/down movement: Distance (submerged)	1 .. 100 mm	Only if P10.1 “Move up/down” = “Submerged”. This value affects the minimum fill level, see 5.5.3 Minimum and maximum fill levels of the cleaning solution
P10.3	Up/down movement: Speed	1 .. 140 mm/s	

<sup>5</sup> Depending on the hardware installed, the minimum rotation speed can also be lower (e.g. 20rpm).

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ID	Designation	Value range	Description
P11	Dryer: Temperature	Off, 30°C ... 130°C	Only for turntable station 6. Enter a temperature lower than 30°C = Off The maximum value is typically 130 °C, but it can be individually adjusted by ECOCLEAN.
P12	Dryer: Fan speed	10% ... 100%	Only for turntable station 6

## Ultrasonic

Only possible if available and at the selected turntable position.

ID	Designation	Value range	Description
P13.1	Frequency	Off / Selection of available frequencies	Frequencies according to the installed ultrasonic generators
P13.2	Power	5W .. 50W / 10W .. 100W	Range according to the installed ultrasonic generators
P13.3	On delay	0 .. 3600 seconds	
P13.4	Time active	0 (Permanent) ... 3600 seconds	
P13.5	Time inactive	0 .. 3600 seconds	

## Vacuum

Only possible if available and at the selected turntable position.

For more information see 5.5.5 Vacuum.

ID	Designation	Value range	Description
P14.1	Number of cycles	0 (Off) ... 100	See 5.5.5 Vacuum The phase lasts according to the time set with Parameter ID P3 "Time", but at least until all vacuum cycles have been completed
P14.2	On delay	0 .. 3600 seconds	
P14.3	Min tank pressure before vacuum	0 .. 950mbar	
P14.4	Active until pressure less than (vacuum valve open)	0 .. 950mbar	Only adjustable (and only relevant) if "Cleaning solution = bath empty" (5.4.2.1 CC Parameters for turntable positions)
P14.5	Suction time (vacuum valve open)	0.00 (Automatic) ... 3.00 seconds / 0.00 ... 3600.00 seconds	Lower max. value if parameter ID H12.1.1 "Cleaning solution = bath with liquid", higher if "Cleaning solution = bath empty" (5.4.2.1 CC Parameters for turntable positions). The resolution for entering these times is 0.01 seconds and the minimum achievable time is approx. 0.03 seconds
P14.6	Suction time adjustment (vacuum valve open)	-1.00 .. 1.00 seconds	Only if P14.5 Suction time = Automatic

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ID	Designation	Value range	Description
P14.7	Max. pressure in bath (vacuum check)	0 .. 950mbar	
P14.8	Holding time (vacuum on) (vacuum valve closed)	0.00 .. 6.00 seconds / 0.00 ... 3600.00 seconds	Lower max. value if parameter ID H12.1.1 "Cleaning solution = bath with liquid", higher if "Cleaning solution = bath empty" (5.4.2.1 CC Parameters for turntable positions).
P14.9	Break vacuum up to (threshold)	0 .. 950mbar	
P14.10	Use protective gas	Yes / No	Only if protective gas is available. For more information see 5.5.9 Protective gas
P14.11	Waiting time phase end	0 .. 3600 seconds	

## Conductivity

Only if the conductivity measurement and permanent flow bath is installed, and turntable position 5 is selected.

For more information see 5.5.8 Conductivity measurement in permanent flow bath.

ID	Designation	Value range	Description
P15.1	Rinse until conductivity at or below	0 (No conductivity measurement) ... <measuring range> µS/cm	0 = No conductivity measurement. In this case, rinsing takes place according to the phase duration (time, parameter ID P3). If > 0µS/cm, the phase duration (time, parameter ID P3) serves as a timeout (CC is canceled if the conductivity has not been reached after the entered duration).  The maximum value as well as the number of decimal places (i.e., precision) depend on the conductivity measurement system. For more information, see 6.3.7.7 Conductivity calibration

## Flood bath with protective gas

Only if installed. For more information see 5.5.9 Protective gas.

ID	Bezeichnung	Wertebereich
P16.1	Flood bath with protective gas	Off, During phase, Before phase, at spinning position, Before phase, at dive position
P16.2	Time	1 .. 60 seconds

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## 5.5 Cleaning procedure

Cleaning is carried out according to the selected CC. See 5.2.4.2 Cleaning cycle selection and 5.4 Structure of cleaning cycles

### 5.5.1 Replace cleaning solution regularly

In the CC, you can define for each turntable position after how many uses the cleaning solution should be replaced (parameter ID H12.3.1). It can be defined that a warning is issued if the cleaning solution needs to be replaced "soon" (parameter ID H12.3.2). The parameters can be found at 5.4.2.1 CC Parameters for turntable positions

As soon as the number of uses is exceeded, the CC cannot be started. The cleaning solution must be replaced, see 5.7 Initialize baths

The number of uses is displayed in the turntable status, see 5.3.1 Turntable status (baths) and 5.3 Machine and turntable status

### 5.5.2 Scan barcodes / QR codes

Barcodes / QR codes require a valid license code, see 6.2.2 General settings.

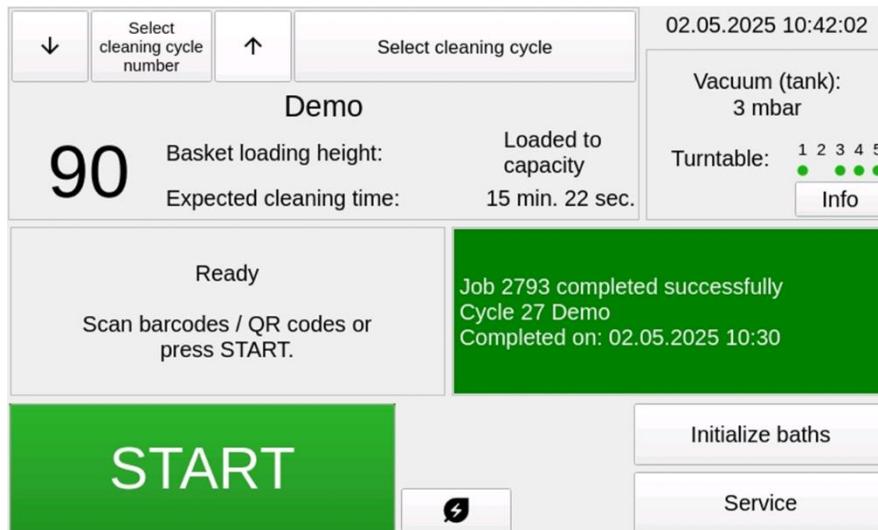
The following use of barcodes / QR codes is supported:

1. *Barcodes / QR codes to start cleaning cycle* (parameter in the CC, parameter ID H11.1, see 5.4.2 Cleaning cycle header)  
The listed barcodes / QR codes must be scanned before starting the CC. The CC can only be started once all codes have been scanned.
2. *Scan and save any barcodes / QR codes on start* (parameter in the CC, parameter ID H11.2 = "Yes", see 5.4.2 Cleaning cycle header)  
Any barcodes / QR codes can be scanned before starting the CC. All scanned codes are saved. The codes and all relevant information about a job (cleaning cycle) are recorded in SCADA<sup>6</sup>.
3. Combination of 1. and 2.

The CC can be started by pressing **START** or scanning a barcode / QR code.

---

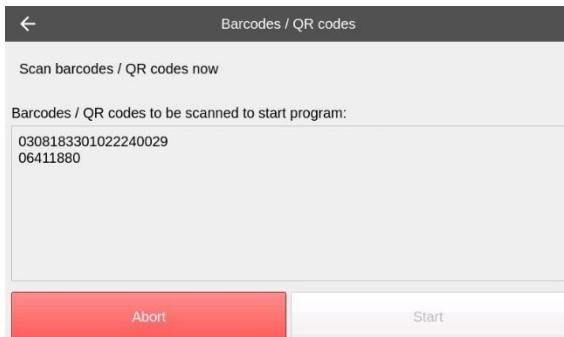
<sup>6</sup> SCADA see 1.3.3 Referenced documents



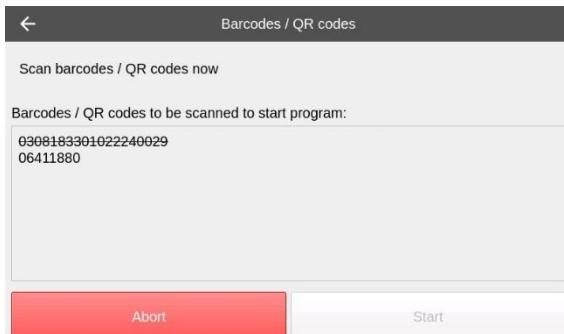
**Fig. 5.5-1 Machine ready, CC selected with barcodes.  
Status "Scan barcodes or press START"**

As soon as **START** is pressed or a barcode / QR code is scanned, the following screen appears:

**Barcodes / QR codes to start cleaning cycle  
(parameter ID H11.1) contains codes**

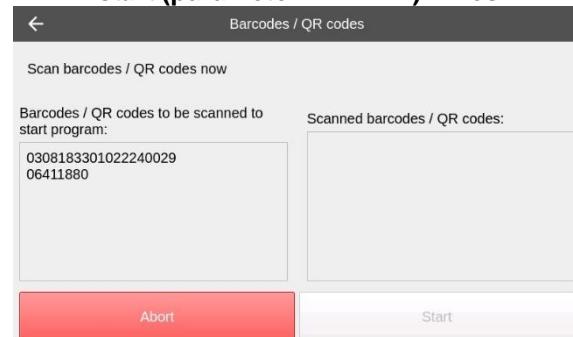


No codes scanned yet, the list of codes must be scanned (in any order), no other codes may be scanned.

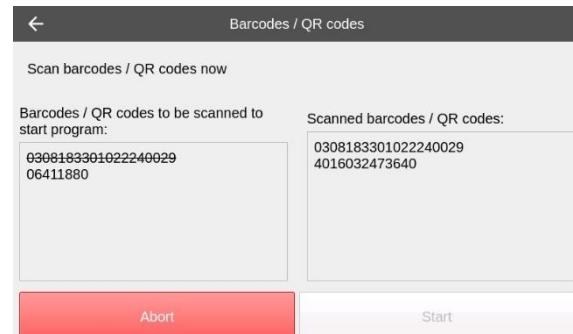


The first code has been scanned. Codes that have already been scanned are crossed out

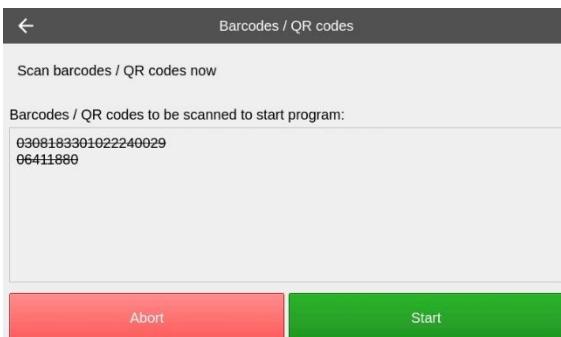
**Barcodes / QR codes to start cleaning cycle  
(parameter ID H11.1) contains codes, and  
Scan and save any barcodes / QR codes on start (parameter ID H11.2) = Yes**



No codes scanned yet, the list (left) of codes must be scanned, any other codes can be scanned.



The first code from the list on the left and another (arbitrary) code (in the list in the right) were scanned

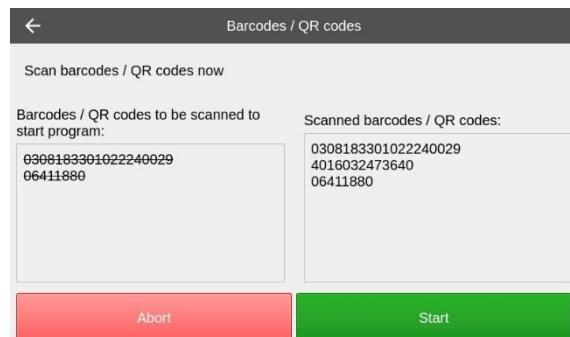


As soon as all the required codes have been scanned, the **START** button is released.

If a code is scanned that is not required (i.e. is not in the list), a message appears and the CC start is aborted. The scanning process must be started again from the beginning.

If *Barcodes / QR codes to start cleaning cycle* (parameter ID H11.1) does not contain any codes, and *Scan and save any barcodes / QR codes on start* (parameter ID H11.2) = Yes, only the right-hand part (the right-hand column) of the screen appears.

Supported barcode scanners are listed in the *technical specification*, see 1.3.3 Referenced documents.



As soon as all the required codes have been scanned, the **START** button is released.

Further codes can be scanned.

### 5.5.3 Minimum and maximum fill levels of the cleaning solution

The minimum and maximum fill levels - or rather, the fill quantity - of the cleaning solution are calculated automatically for each bath. The values are given in millimeters from the bottom of the bath (from which the volume in liters is derived). The following factors influence the required fill level (the parameters mentioned below are part of the CC, either under 5.4.2 Cleaning cycle header or 5.4.3 Phases of a cleaning cycle):

**Maximum fill level:**

The maximum fill level is calculated such that the basket does not touch<sup>7</sup> the cleaning solution when the Z-axis is in the spinning position. The basket height is used for this (parameter ID H5 "Basket height").

**Minimum fill level:**

The minimum fill level is calculated so that the basket does not emerge from the cleaning solution during cleaning (Z-axis in immersion position). The calculation proceeds as follows:

1. "Basket height" (parameter ID H5) and "Basket loading height" (parameter ID H6)

These values are used to calculate a fill level such that the cleaning items are covered with cleaning solution. If "Basket loading height" = "loaded to capacity" (or if the value is not specified), the upper edge of the basket is assumed.

2. "Up/down movement" (parameter ID P10.1)

If "Up/down movement" = "Submerged", the minimum fill level is increased. To keep the cleaning items covered with cleaning solution, the previously calculated fill level is increased by "Up/down movement: Distance (submerged)" (parameter ID P10.2)<sup>8</sup>.

3. "Basket displacement" (parameter ID H7)<sup>9</sup>

<sup>7</sup> Plus safety margin

<sup>8</sup> "Up/down movement" = "Submerged" is taken into account for all phases; the relevant value is the largest value of "Up/down movement: Distance (submerged)" at the respective turntable position

<sup>9</sup> Often, "Basket displacement" can remain at 0 ml. In that case, the minimum fill level will be slightly too high (on the safe side). "Basket displacement" can be used to increase the range between the minimum and maximum fill levels.

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The displacement of the basket with the cleaning goods will cause the level of the cleaning solution to rise when immersed. Therefore, the minimum fill level is reduced by the height corresponding to this displacement.

#### 4. Heated bath (“Temperature”, parameter ID H12.2)

If the bath is heated (“Temperature”, parameter ID H12.2), then a minimum fill level is never allowed to fall below a set value. Typically, this level is around 122 mm but can be individually adjusted by ECOCLEAN.

There should be some distance between the minimum and maximum fill levels to allow for tolerances when filling the bath (see 5.7 Initialize baths). To reduce the minimum fill level, the following adjustments may help:

- Lower the “Basket loading height”
- Reduce “Up/down movement: Distance (submerged)”
- Specify the “Basket displacement”
- Use a taller or shorter basket (change “Basket height”, parameter ID H5): A taller basket with a defined “Basket loading height” reduces the minimum fill level but also reduces the maximum fill level.

#### **Permanent Flow rinse**

In the permanent flow bath (rinse), the water level is mechanically defined. However, the above calculations still apply, except that displacement is ignored (in permanent flow bath, the water level does not rise due to displacement). During filling or initialization of the permanent flow bath, the water level is measured. It must be within the minimum and maximum fill levels, otherwise an error is triggered.

#### **Empty bath**

If a bath is used empty, e.g., for vacuum drying (“Cleaning solution” = “Bath empty”, parameter ID H12.1.1), it is verified that the bath is indeed empty.

### **5.5.4 Temperatures of baths**

The temperatures of heated baths, and baths used in the CC are checked at the start of cleaning. If the temperature of a bath is outside the defined limits, a window appears in which the target and current temperatures are displayed. The CC starts automatically as soon as all temperatures are within the limits. Target temperature according to the selected CC (temperature: see 5.4.2.1 CC Parameters for turntable positions). For temperature tolerance, see 6.2.3 Machine settings.

Before each phase, the temperature of the container being used is checked again, and if necessary, it is waited until the temperature is back within the defined limits.

During a phase, the limits are **not** considered. However, temperatures are monitored at all times:

- **Under temperature:** When a cold basket with cleaning items is immersed, the temperature will drop. The CM checks that after the drop, the temperature rises again. If the temperature does not rise or rises too slowly, an emergency stop is triggered, and machine error 10003 appears.
- **Over temperature:** If, for any reason, the temperature is too high, an emergency stop is triggered, and machine error 10005 appears. The over-temperature limit is set at the target temperature + 5% + 2°C<sup>10</sup>.
- **Interruptions or short circuits of the temperature sensors:** The CM detects short circuits or interruptions in the temperature sensors and triggers the corresponding machine error and emergency stop.

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<sup>10</sup> It could also be individually adjusted by ECOCLEAN

## 5.5.5 Vacuum

Vacuum cycles can only be active during the "immersion phase". In a phase with activated vacuum cycles, up/down movements can only be programmed before the start of the vacuum cycles (set switch-on delay, vacuum parameter ID P14.2).

The vacuum process must be set so that no water enters the vacuum system! The vacuum valve must remain open for as short a time as possible to limit water absorption. High bath temperatures and foaming cleaning agents can lead to increased water absorption.



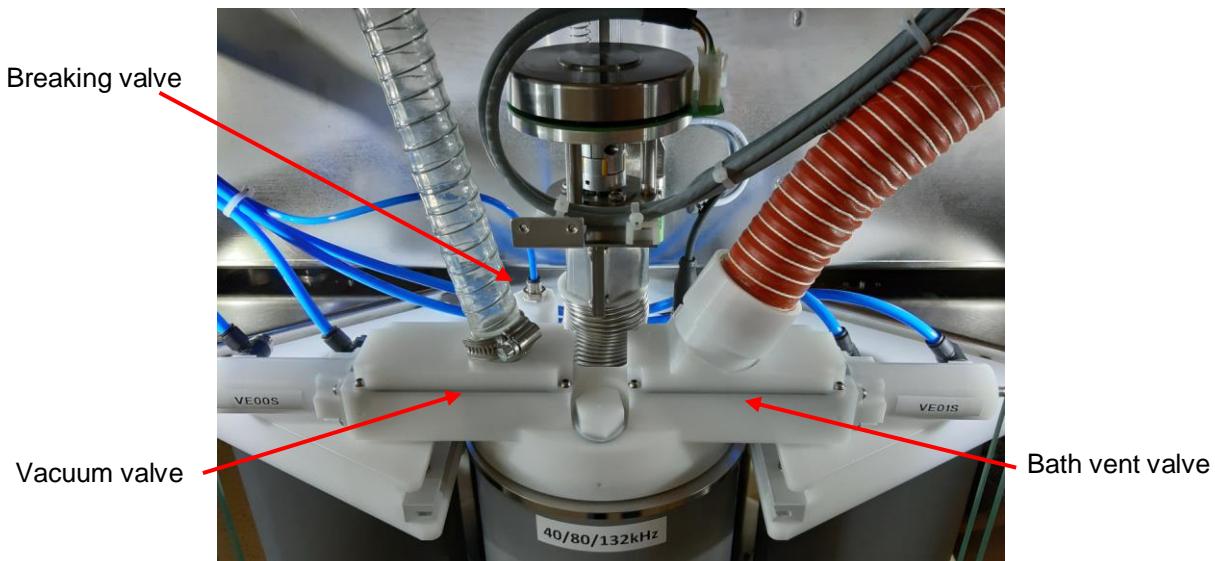
It is important that foaming cleaning solution is degassed (see parameter 7.5 at 5.4.2.1 CC Parameters for turntable positions, and 5.7.2 Degassing).

**The manufacturer accepts no liability for water damage to the vacuum pump.**

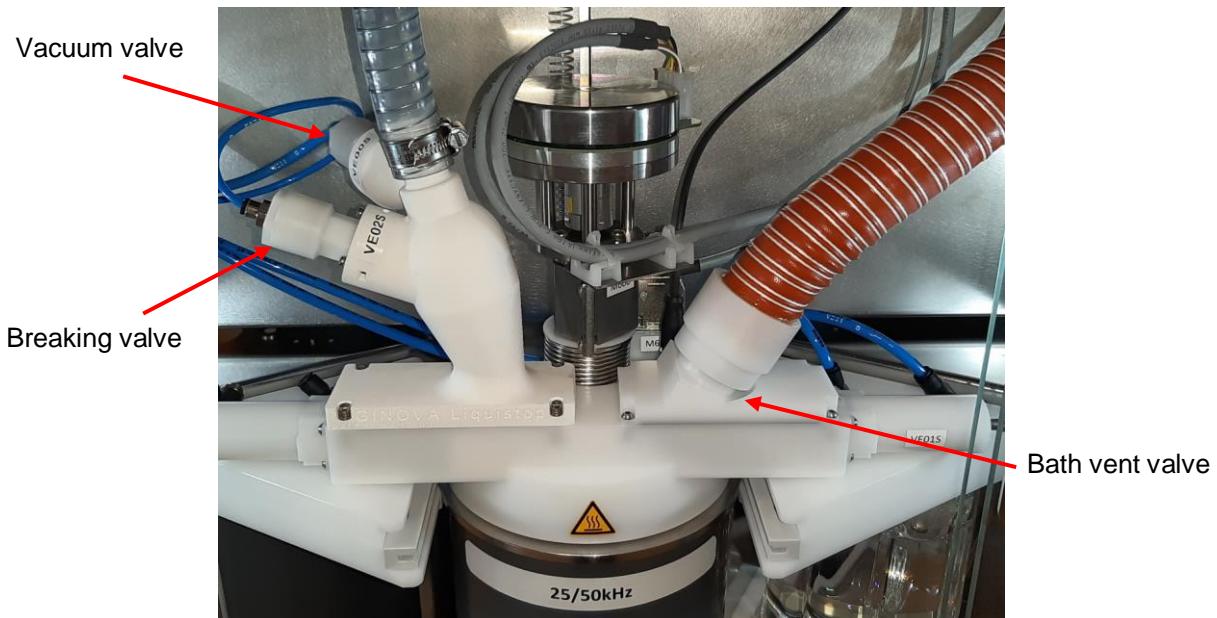


After a cleaning process with vacuum cycles, the CM must remain switched on so that the moisture in the tank and in the oil of the vacuum pump can evaporate or be worked out. The vacuum pump switches off automatically after a certain run-on time. Failure to observe this can result in damage to the vacuum pump.

The bath is placed under vacuum or the vacuum is broken using various valves in the working head. The valves are described below:



**Fig. 5.5-2 Vacuum valves, without Liquistop**



**Fig. 5.5-3 Vacuum valves, with Liquistop**

When starting a CC with vacuum, the ambient pressure is measured with the pressure sensor in the working head (sensor that also measures the pressure in the bath). It must be at least 15 mbar higher than specified with the "Break to (threshold)" parameter (vacuum parameter ID P14.9) in all phases with vacuum. If this is not the case, error 11031 appears.

At the start of a vacuum cycle, the system checks again and error 11030 appears if the difference is less than 5 mbar.

All vacuum cycles programmed in the CC are carried out, even if the phase time entered (parameter ID P3) is shorter.

A programmed vacuum cycle runs as follows (all IDs refer to the vacuum parameters P14.x, see 5.4.3 Phases of a cleaning cycle).

Step	Description
1	<u>At the start of the phase, the vacuum cycle is delayed in accordance with the on delay (ID P14.2).</u>
2	<u>Position of the valves:</u>  Vacuum valve closed Break vacuum valve open Bath vent valve closed
3	Pressure in the <u>vacuum system is checked</u> . The system waits until the pressure is lower than "Min tank pressure before vacuum" (ID P14.3) (timeout: 60 seconds, after which machine error 10015 appears).
4	<u>Place the cleaning bath under vacuum:</u>  The vacuum valve is opened. This places the cleaning bath under vacuum.  A distinction is made between baths with liquid and empty baths:  Bath with liquid: <ul style="list-style-type: none"> <li>• The vacuum valve is closed as soon as the "Suction time" (ID P14.5) has expired.  If "Suction time" (ID P14.5) = "Automatic", the valve opening time is automatically controlled for optimum cleaning performance. It is possible that too much liquid is sucked into the vacuum tank when the cleaning solution is foaming. In this case, the valve can be closed earlier with a negative value for "Suction time adjustment" (ID P14.6).</li> </ul> Bath empty: <ul style="list-style-type: none"> <li>• The vacuum valve remains open until the vacuum in the bath has fallen below the value of "Active until pressure below" (ID P14.4). If the vacuum in the bath does not decrease by at least 2 mbar within approx. 5 seconds, the system will not wait any longer.</li> <li>• Once the set vacuum has been reached, the vacuum valve remains open until "Suction time" (ID P14.5) has elapsed. The vacuum valve is then closed.</li> </ul>
5	<u>Hold time:</u> Wait during "Hold time (vacuum active)" (ID P14.8)
6	The <u>pressure in bath</u> must be lower than "Max. pressure in bath (vacuum check)" (vacuum parameter ID P14.7), otherwise error 11034 appears
7	<u>Breaking the vacuum:</u>  The break valve is opened. The system waits until the pressure in the bath is greater than "Break vacuum up to (threshold)" (ID P14.9).  If "Use protective gas" (ID P14.10) is enabled, protective gas is introduced into the bath instead of air.
8	If " <u>Waiting time phase end</u> " (ID P14.11) > 0:  The last vacuum cycle is completed before step 7.  The venting valve of the vacuum tank is opened and as soon as the pressure in the vacuum tank is at least 50 mbar higher than in the bath, the vacuum valve is opened.  This breaks the vacuum in the bath, whereby air first flows from the vacuum tank into the bath and then any liquid in the hose can flow back into the bath during the waiting time.  This process takes according to "Waiting time end of phase" (ID P14.11)  The vacuum valve is closed.

Is repeated according to "Number of cycles" (ID P14.1)

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9	The break valve is opened. Wait until the bath pressure is within 10 mbar of the previously measured ambient pressure. The bath vent valve is then opened.  The break valve is closed.
---	--

## 5.5.6 Ultrasonic

It is known that ultrasonic error no. 6 "Frequency not found" can occur. The following settings can help to prevent this error:

- Up/down movement of the basket (parameter ID P10, see 5.4.3 Phases of a cleaning cycle): Select as little movement as possible (preferably no movement at all, more movement increases the probability of error).
- Reduce ultrasonic power (parameter ID P13.2, see 5.4.3 Phases of a cleaning cycle)

## 5.5.7 Permanent Flow Bath

The permanent flow bath (rinse bath) is installed at turntable position 5.



The permanent flow bath must be filled before cleaning begins. This is done automatically when the machine is initialized. On bath initialization (5.7 Initialize baths), the permanent flow bath can also be filled.

For use with conductivity measurement, see 5.5.8 Conductivity measurement in permanent flow bath.

If conductivity measurement is not installed or not activated (conductivity parameter ID P15.1 = No conductivity measurement, (see 5.4.3 Phases of a cleaning cycle), permanent flow rinse takes place during the phase duration (parameter ID P3).

The permanent flow rinse process runs as follows:

- If no water is detected in permanent flow bath overflow<sup>11</sup>, the water valve is opened and the scavenge pump is switched off. After 10 seconds, water must be detected in permanent flow bath overflow, otherwise machine error 10010 appears and the water valve is closed. This is for safety reasons in case the level sensor is not working properly. However, the reason could also be a lack of water pressure or a start of rinsing with an empty permanent flow bath.
- If water is detected in permanent flow bath overflow, the scavenge pump is switched on and the water valve is closed. After 10 seconds at the latest, water must no longer be detected in permanent flow bath overflow, otherwise machine error 10009 appears. This is used to check the rinsing process, as this status may indicate a defective scavenge pump or other issues.

If no rinse process is active, the permanent flow bath overflow is constantly monitored. As soon as water is detected, the scavenge pump switches on until the water is no longer present.

## 5.5.8 Conductivity measurement in permanent flow bath

The CM measures the conductivity in the outgoing rinsing water after the permanent flow bath. The conductivity measuring device is an option.

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<sup>11</sup> The level switch is located in the overflow of the permanent flow bath. Depending on the installed hardware, the input may or may not be available in Manual Code (6.3.5 Manual code).

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If conductivity measurement is activated in the CC ("Rinse until conductivity is at or below", conductivity parameter ID P15.1, see 5.4.3 Phases of a cleaning cycle), rinsing takes place until the conductivity reaches or falls below the programmed limit value:

- The conductivity is only measured after the scavenge pump has been switched on for a minimum total time since the start of rinsing (6.2.3 Machine settings, parameter "Min. rinse time before conductivity is measured"). This ensures that water from the rinse tank has reached the conductivity sensor (the conductivity sensor is positioned in the return flow of the rinse water).
- The conductivity is then measured continuously and the rinsing process or phase is ended as soon as the conductivity set in the CC "Rinse until conductivity is at or below" (conductivity parameter ID P15.1) is reached or undershot.
- The programmed phase time serves as a timeout: The CC is aborted with the message "Conductivity not OK" if, after the programmed phase time, the conductivity is still above "Rinse until conductivity is at or below" (conductivity parameter ID P15.1).

## 5.5.9 Protective gas

The CM can be equipped with protective gas (optional).

By using protective gas (e.g., argon), oxidation of metallic parts can be prevented. Protective gas can be used in the following ways:

- Flood bath with protective gas:

Using the parameter "Flood bath with protective gas" (ID P16.1, see 5.4.3 Phases of a cleaning cycle), the bath can be flooded with protective gas.

To initiate flooding, the bath vent valve and the break vacuum valve are opened, allowing the protective gas to flow into the bath. The exhaust fan is turned off. This process continues for the duration specified by parameter ID P16.2 "Time." After that, the bath vent valve and the break vacuum valve are closed, preventing the gas from escaping the bath (for the designation of the valves, see 5.5.5 Vacuum)

Flooding can occur either at the beginning of a phase (with the basket in the spinning or dive position), or during the phase itself (while cleaning is in progress). In the latter case, however, vacuum cycles (see 5.5.4 Vacuum) cannot be performed simultaneously. Therefore, flooding is stopped before the first vacuum cycle begins. If the flooding duration exceeds the phase time including spinning, flooding is stopped at the end of the spinning process

- Vacuum cycles with protective gas:

When breaking the vacuum, protective gas can be used instead of air (Parameter ID P14.10, see 5.4.3 Phases of a cleaning cycle). In this case, the bath is filled with protective gas instead of air. See also 5.5.5 Vacuum.

## 5.6 Operation and programming of cleaning cycles

CC can be freely programmed on the CM P6. In principle, the CU4000 can be programmed while a CC is being executed. The CC are loaded into a buffer before execution. Therefore, changes made during the execution of a CC are not taken into account until the next start.

It is possible program CC on the CU4000 or in the *P6 Suite* PC application. Chapter 5.4 Structure of cleaning cycles describes the structure of the CC.

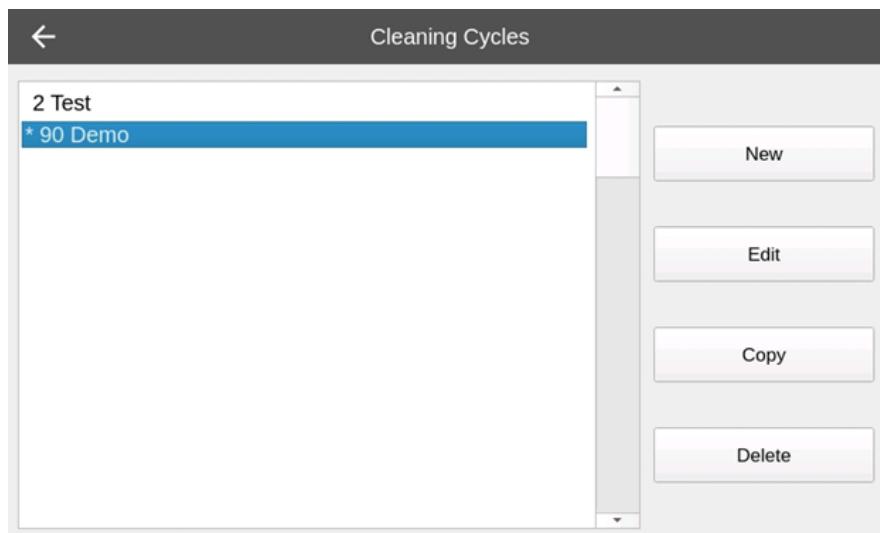
### 5.6.1 Backup of cleaning cycles

CC can be copied from the CU4000 to the PC using the *P6 Suite* PC application. This allows CC to be archived on the PC, see 10 Backup.

## 5.6.2 Edit cleaning cycles on CU4000 (control unit)

Select **Edit cleaning cycles** via the service menu. The following display then appears:

The menu can be found under  
Service → *Edit cleaning cycles*



**Fig. 5.6-1 Edit cleaning cycles menu**

The functions shown on this display page are explained in detail in the following chapters.

### 5.6.2.1 Management of the CC

The CM P6 manages a maximum number of 10,000 CC. CCs are uniquely identified with a number. All programmed CCs can be started on the front page<sup>12</sup> with **START**.

The CC currently selected on the front page is automatically selected and also marked with an asterisk (\*).

A new CC can be created with the **new cleaning cycle**.

**Edit cleaning cycle** to edit the selected CC, see 5.6.2 Edit cleaning cycles on CU4000 (control unit)

**Copy cleaning cycle** copies the selected CC

**Delete cleaning cycle** deletes the selected CC.

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<sup>12</sup> This refers to the display that is shown on a CU4000 after switching on the CM P6.

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### 5.6.2.2 Programming of CC

Select one of the CCs shown and **Edit cleaning cycle** to select it for editing.

#### Editing the CC header

The following figure shows the display for editing the CC.

The menu is located under  
Service → Edit cleaning cycles → [Select CC] → Edit cleaning cycle

Cleaning cycle	
Cleaning cycle number	90
Name	Demo
Signature of last change	
Min. access level for starting	Free
Min. access level for editing	2
Basket height (incl. bracket)	75 mm

**Fig. 5.6-2 Edit cleaning cycle menu, CC header and phases**

**Signature of last change** shows the signature of the last change to the CC. This button does not appear if the user system is deactivated. See 5.8 User system and access authorization.

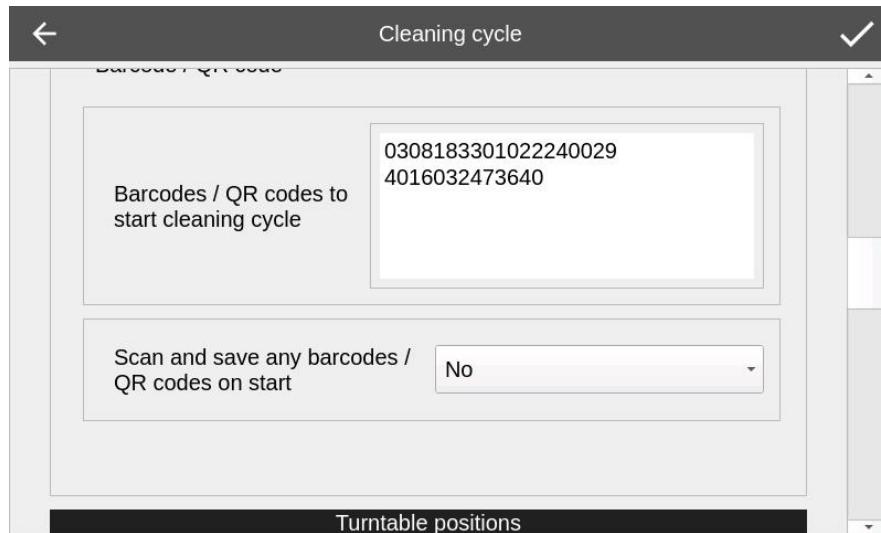
#### Barcode / QR Code

The barcode / QR code parameters can be set a little further down in the screen (only appears if the barcode license is valid).

Cleaning cycle	
Emergence speed Can be overridden in each phase. All phases use this speed.	140 mm/s
<b>Barcode / QR code</b>	
Barcode / QR code	_____
<b>Turntable positions</b>	
Turntable 1 (Ultrasonic)	_____
Turntable 2 (Ultrasonic)	_____
Turntable 3 (Simple liquid)	_____

**Fig. 5.6-3 Edit cleaning cycle menu, barcode / QR code**

Touch▶ or the "Barcode / QR Code" text to open the input box:

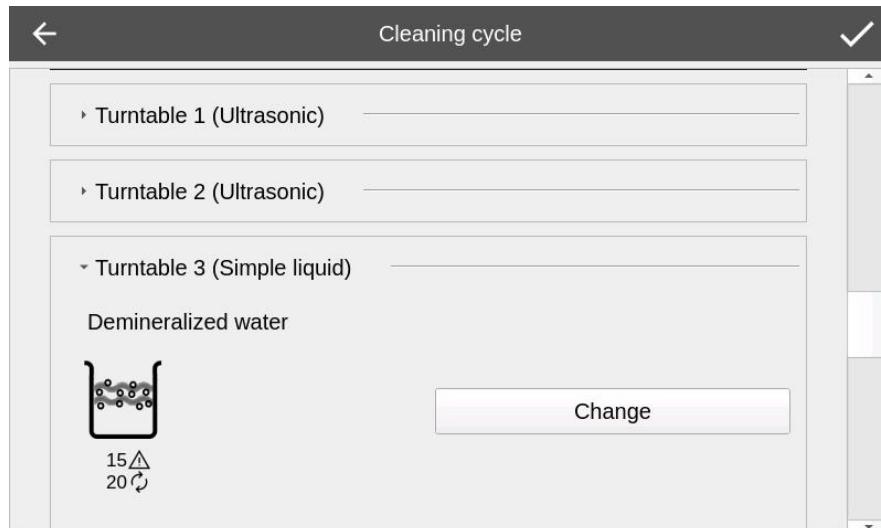


**Fig. 5.6-4 Edit cleaning cycle menu, barcode / QR code expanded**

"Barcodes (QR codes) to start" can either be entered using the keypad or scanned with the barcode scanner (focus must be in the input field, touch the field). Individual codes are separated from each other by a line break. For a description of the functionality, see 5.5.2 Scan barcodes / QR codes

### **Turtable positions**

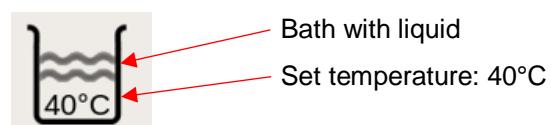
The parameters for the turntable positions are displayed further down in the screen (see 5.4.2.1 CC Parameters for turntable positions)

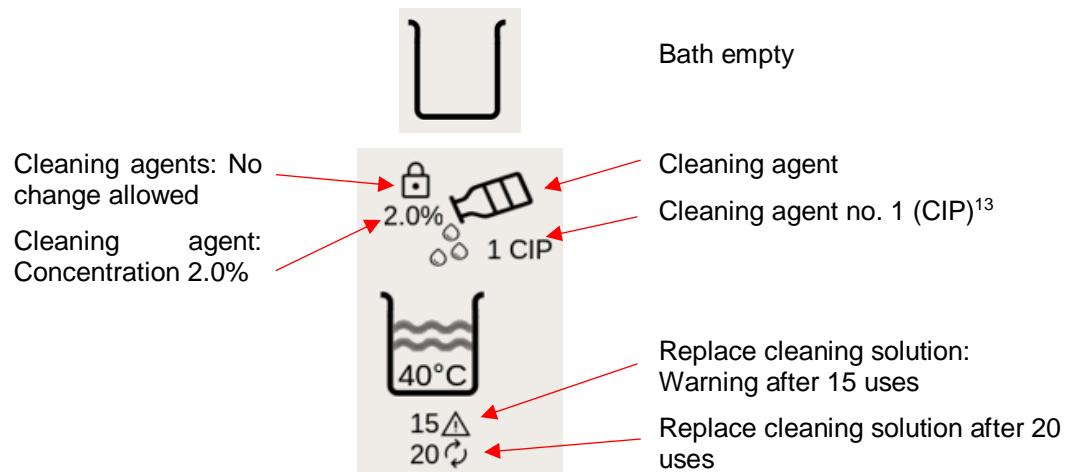


**Fig. 5.6-5 Edit cleaning cycle menu, turntable positions,  
Turntable position 3 opened**

The symbol in the left-hand area shows an overview of the set parameters, similar to the turntable status (5.3.1 Turntable status (baths)). However, the required (set) parameters are displayed here and not the current status

Symbols:





The parameters can be set with **Change**:

The menu is located under  
Service → Edit cleaning cycles → [Select CC] → Edit cleaning cycle → [Select turntable position] →  
**Change**

Turntable position 3 (Simple liquid)

Bath with/without cleaning solution

Cleaning solution Bath with cleaning solution

Description Demineralized water

Temperature

Temperature bath at turntable position 3 (Simple liquid) not heated

Replace cleaning solution

Replace cleaning solution after 65

**Fig. 5.6-6 CC parameters for turntable position**

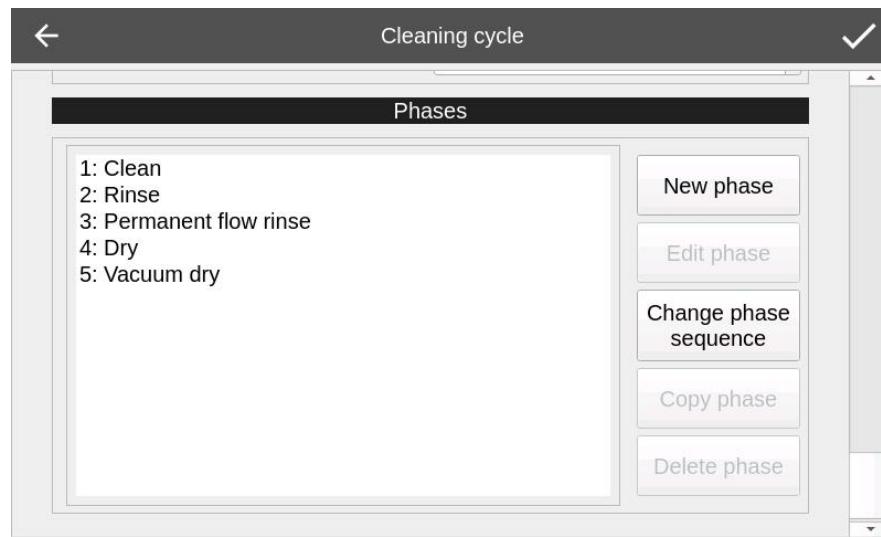
### Phases

All phases are listed further down in the screen.

<sup>13</sup> Name see 6.2.6Cleaning agent

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**Fig. 5.6-7 Edit cleaning cycle menu, phases (example)**

**New phase** adds a new phase.

**Change order of phases** to change the order, see below.

All other functions relate to the phase selected in the list.

### Edit phases

The menu is located under  
Service → *Edit cleaning cycles* → [Select CC] → *Edit cleaning cycle* → [Select phase] → *Edit phase*

Phase name	Clean
Turntable position	1 (Ultrasonic)
<ul style="list-style-type: none"> <li>Bath with cleaning solution</li> <li>Demineralized water</li> <li>Temperature: 30°C</li> </ul> <small>(defined for each turntable position, not for phase)</small>	
Time	0 min. to 5 sec.
Immersion speed	According to general setting

**Fig. 5.6-8 Edit phase menu**

The most important parameters of the selected turntable position (bath with liquid or empty, description, temperature) are displayed in this area. The parameters have already been mentioned above. To change them, you can either close this window and edit the parameters of the corresponding turntable position in the higher-level menu, or directly via **Change**. ATTENTION: The parameters affect all phases that use the corresponding turntable position!

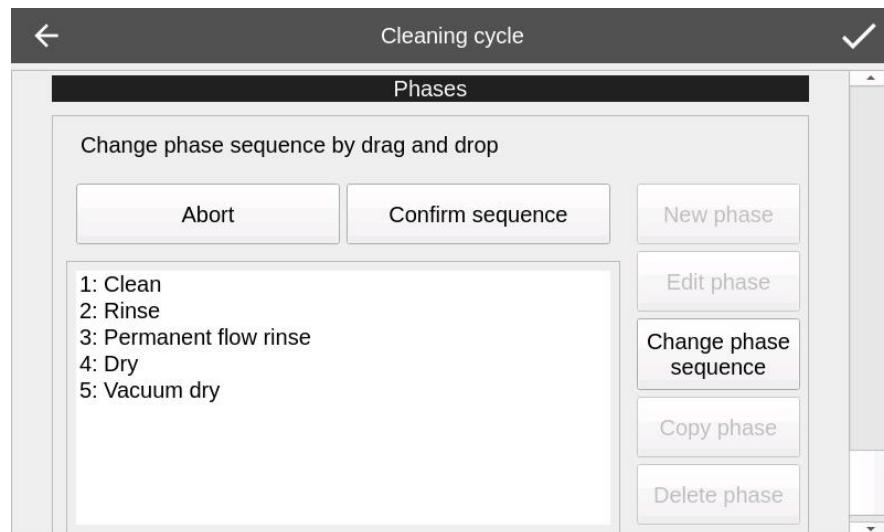
All parameters are described at 5.4 Structure of cleaning cycles.

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### **Change the order of the phases**

If **Change sequence of phases** is selected, the following functions appear:



**Fig. 5.6-9 Change the order of the phases**

Phases can be dragged and dropped into the desired order. Select and hold a phase with your finger and drag the phase to the desired position. The phase numbers are retained and thus show the original sequence until the sequence is confirmed (with **Confirm sequence** or **OK** at the bottom of the screen, whereby **OK** confirms the changes to the CC and closes the window).

### **5.6.3 Edit cleaning cycles on Windows PC, backup**

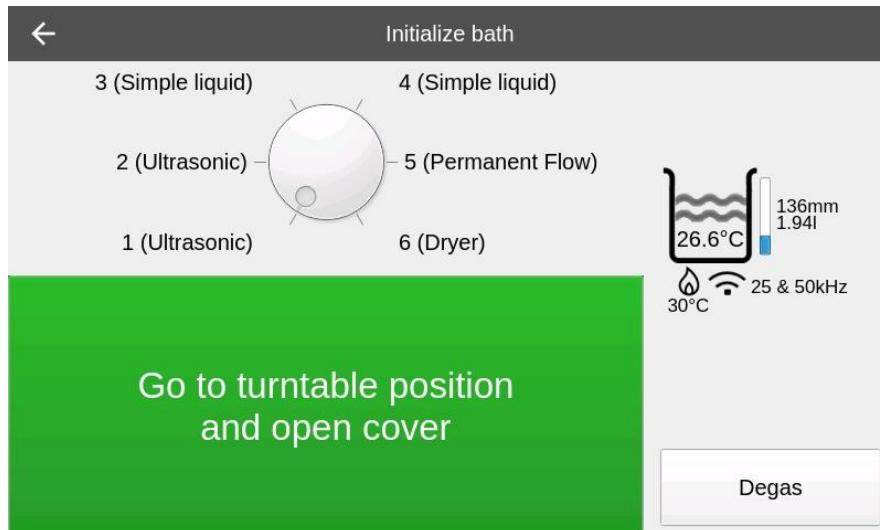
Cleaning cycles can be exchanged between the CU4000 and a PC, and can be created and edited on a Windows PC. Cleaning cycles can also be archived on a PC or server (backup).  
See operating instructions *P6 Suite* (PC software), chapter 1.3.3 Referenced documents.

## **5.7 Initialize baths**

The turntable stations are equipped with cleaning baths that must be maintained manually (emptied, cleaned and filled). The baths must be removed from the turntable for maintenance and replacement of the cleaning solution. The **Initialize baths** menu is used for this purpose.

The doors must be closed for all movements.

The menu can be found under  
*Initialize baths*



**Fig. 5.7-1 Initialize baths menu**

The icon on the right-hand side of the screen shows the current status of the selected turntable position (depending on the selected CC), see 5.3.1 Turntable status (baths).

The desired turntable position can be selected, **Go to turntable position and open cover** executes the action.

The cleaning bath can be removed from the turntable for maintenance. To do this, it is lifted slightly from its position and removed towards the front:



Baths must be **unlocked before removal!**

#### **Ultrasonic & Permanent Flow**

Move the lever on the bottom of the station to the left stop to unlock.

When locking **and** unlocking the turntable, use the countergrip to prevent radial forces from acting on the turntable. This will help avoid damage to the turntable's suspension!



#### **Glass baths**

To remove, push the lever upwards, pull the bottom of the bath slightly forwards and remove it upwards.

To insert bath, place it against the unlocking mechanism and press lightly backwards until the locking mechanism audibly snaps into place.



"Click"

#### **Dryer**



The dryer is locked with a pin on the back of the bath. Remove the pin to remove the dryer bath.



Before inserting a cleaning bath, its underside and the base with lever must be dry.



At turntable positions that require the cleaning bath to be locked, care must be taken to ensure that the connector plugs of the bath mount do not come into contact with liquid, **risk of short circuit!** Dry off any drops on the bath mount.



If a cleaning bath is no longer being used, make sure that the underside of the cover is dry after closing it and that no drops can come loose when turning the turntable.



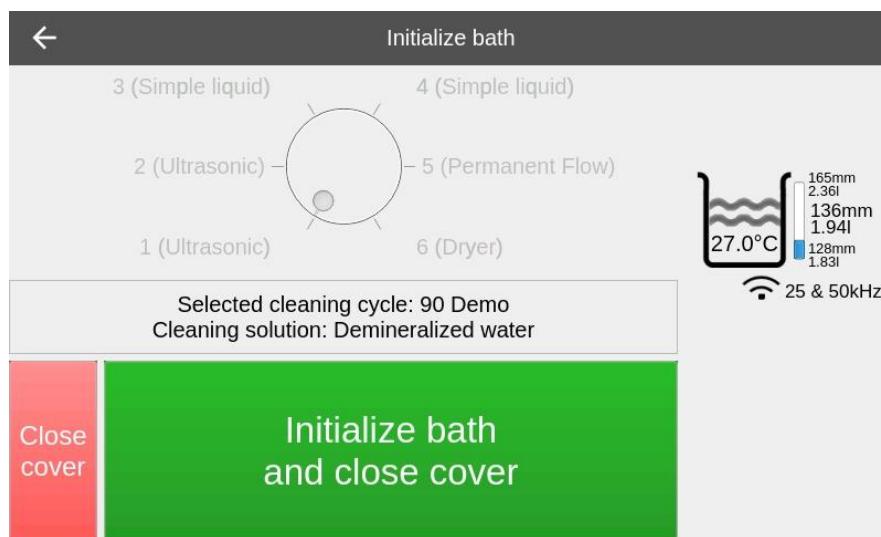
When removing the permanent flow bath, a drop of water may remain on the mount. Dry this off with a cloth.



When filling the baths with cleaning media outside the machine, safety measures must be taken in accordance with the chemicals used!

Once the cleaning bath has been serviced, it is reinserted.

The menu can be found under  
*Initialize baths*



**Fig. 5.7-2 Initialize bath menu with open cover**

When the cover is open, the maximum and minimum fill level or fill quantity<sup>14</sup> of the cleaning solution is also displayed in the bath status (symbol on the right-hand side of the screen). Whether the bath is used with liquid or empty is defined in the selected CC (parameter H12.1.1). Furthermore, the description of the cleaning solution (parameter H12.1.2, see 5.4.2.1 CC Parameters for turntable positions) is displayed above the green button.

If Autofill and / or dosing unit are installed, you can access the Autofill menu via **Autofill / dosing unit**, see 5.7.1 Autofill.

**Initialize bath and close cover** initializes the bath (turntable station, e.g. measures the level of the cleaning solution, starts the bath heating or fills the permanent flow bath, depending on the turntable position and the selected CC). The cover is then closed.

<sup>14</sup> See 5.5.3 Minimum and maximum fill levels of the cleaning solution

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The turntable stations are checked periodically during operation (e.g. level of the cleaning solution). The intervals for this check can be parameterized (6.2.4 Turntable parameters).

**Degassing** opens the menu for degassing the baths. When the menu is closed, the menu for degassing is opened automatically if not all baths have been degassed (see 5.7.2 Degassing).

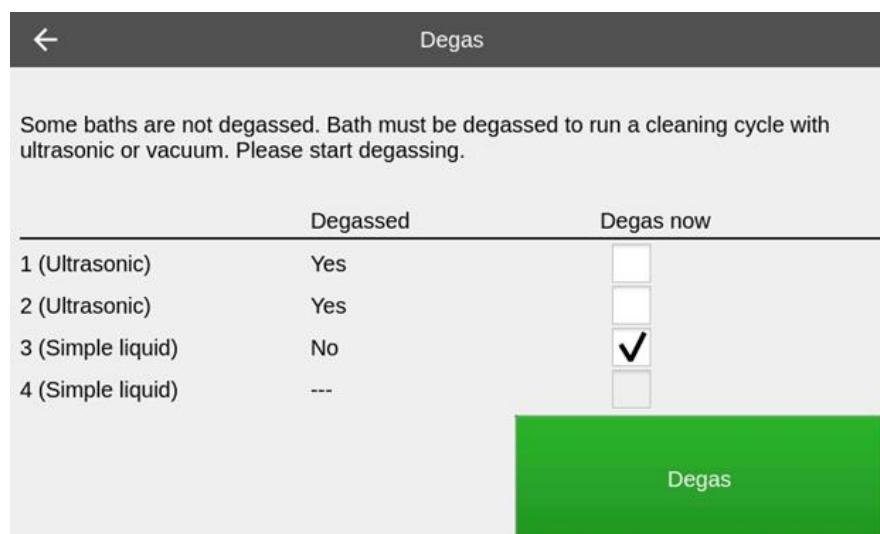
## 5.7.1 Autofill

The Autofill menu allows you to empty (**Empty bath**) or replace (Empty and refill, **Replace cleaning solution**) the cleaning solution in autofill baths. The selection of cleaning agent and dosage are both defined and unchangeable according to the selected CC or can be changed (see 5.4.2.1 CC Parameters for turntable positions).

## 5.7.2 Degassing

Baths filled with a cleaning solution that are used with a vacuum must be degassed. Degassing reduces the amount of gas (air) dissolved in the cleaning solution. As a result, the cleaning solution foams significantly less under vacuum.

The menu can be found under  
*Initialize baths* → *Degassing*



**Fig. 5.7-3 Degassing**

Baths for which the level of the cleaning solution is adequate can be selected for degassing. The baths are degassed one after the other using the parameters specified in the machine settings (see 6.2.3 Machine settings).

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The CC specifies whether a bath must be degassed or not (5.4.2.1 CC Parameters for turntable positions).



High bath temperatures and foaming cleaning agents can lead to increased water absorption of the vacuum system during vacuum cycles!

It is important that foaming cleaning solution is degassed!

**The manufacturer accepts no liability for water damage to the vacuum pump.**

## 5.8 User system and access authorization

The user system only allows access to certain functions for authorized users. Furthermore, certain changes (e.g. changes to cleaning cycles, machine settings, etc.) can be traced back to a user.

The access security concept is based on the standard set out in 21 CFR Part 11.

### 5.8.1 Activate / deactivate user system

The user system can be activated or deactivated by the administrator, see 6.2.5.1 Activate / deactivate user system, functions for administrator.

### 5.8.2 Administrator

After delivery of a CU4000, only the administrator is registered as a user. The default password is "-" (hyphen).

To set up a user hierarchy, a responsible person must be designated as the administrator. This person first changes the administrator's default password and then grants access authorizations to the designated users (see 6.2.5 Users).

The administrator is not a valid user for data changes or data handling (e.g. CCs or machine settings) and for the most part is not granted access to these functions (see also 5.8.3 Access authorization / access level).

### 5.8.3 Access authorization / access level

Certain actions require a certain access level of the user (e.g. to change or start a CC or to change settings).

Access level	Description
Admin	Access level of the administrator (the administrator can manage users and make user settings)
0 (Free)	Free, data or actions with this level do not require a registered user ('0' is not an available access level for a user)
1	Lowest level, lowest level of a user
2	
3	
4	Highest level, highest level of a user
Service	Access level, e.g. for a service technician

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## 5.8.4 Register new user

For operation, see 6.2.5 Users.

New users can be registered or users deleted either by the administrator alone or by a user with a higher access level (e.g. a user with access level 4 can register and delete users of level 1, 2 or 3). The administrator can set what should apply. This setting can be found in the *Users* menu, see 6.2.5 Users

The default setting is "Administrator only".

When a new user is registered, they are assigned an access level. A logged-in user can register a new user according to the following table:

Access level of the logged-in user <sup>15</sup>	Available access levels for new users
Admin	1 .. 4 and Service
1	Not available (users with access level 1 cannot register a new user)
2	1
3	1, 2
4	1, 2, 3
Service	Not available (users with access level 'Service' cannot register new users)

In principle, the new user always receives a lower access level than the logged-in user. The logged-in user becomes the sponsor of the new user.

The same authorizations also apply to deleting a user, i.e. a user with access level 4 can delete users with access levels between 1 and 3 (unless only the administrator can create and delete users).



It is strongly recommended that you manage access authorizations precisely.

If unauthorized persons gain access to certain functions, major damage (loss of data or damage to the machine) can occur.

## 5.8.5 Log in / Sign / Authenticate

For certain actions, a user must log in or authenticate themselves (e.g. when selecting a **service** on the main page). A prompt always appears in the form of a list of users who have the necessary access level for the corresponding action. Once the user has been selected from the list, the password must be entered.

When signing data (e.g. when changing CC, machine settings, adjusting measuring channels, etc.), the logged-in user is prompted to enter the password again.

When starting a CC for which the "Min. access level to start" is > 0, the authorized users are listed. The CC is started by selecting and entering the password.

## 5.8.6 Forgotten password

When prompted to enter the password, there is a "Forgot password" button. Only the administrator's password can be reset. To do this, send the data displayed via Forgot password to your point of sale. A

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<sup>15</sup> '0' is not an available access level for a user and is therefore not listed.

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code is calculated from the details, which can then be used to set a new password. The code is only valid once, so a new code is required after each reset.



To avoid this, we strongly recommend that you keep the administrator password in a safe place!

Passwords of other users (not administrators) cannot be reset. A user with a higher access level (or the administrator) can delete the user and create a new user.

### 5.8.7 Password change interval

This interval forces users to change their password at given intervals. This setting can be found in the *User* menu (only accessible by the administrator), see 6.2.5 Users. A password can be changed via *Change password*, see 6.2.5 Users. If a user's last password change was longer ago than the interval, the user will be prompted to change the password when logging in (logging in only takes place after the password has been changed).

The default setting is 90 days.

### 5.8.8 Password requirements

The administrator can define the password requirements for users in the *Users* menu, see 6.2.5 Users.

The following settings are possible:

Requirement	Description	Standard setting
Number of characters (minimum)	The minimum number of characters in the password	8
Capital letters	The password must contain at least one capital letter	No
Numbers (0 .. 9) or symbols	The password must contain at least one number or a symbol ("Numbers (0 .. 9) or symbols" and "Numbers (0 .. 9) and symbols" are mutually exclusive)	Yes
Numbers (0 .. 9) and symbols	The password must contain at least one number and at least one symbol ("Numbers (0 .. 9) or symbols" and "Numbers (0 .. 9) and symbols" are mutually exclusive)	No



If the password requirements are changed and a user's password no longer meets the requirements, the user will be prompted to change the password the next time they log in (see 5.8.5 Log in / Sign / Authenticate).

### 5.8.9 User information

The following user information is saved and can be displayed (see 6.2.5 Users)

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Name: Demo  
ID: 6732fe3850a8cf66  
Created on: 12.11.2024 08:05:28  
Last password change: 12.11.2024 08:05:28  
Access level: 4  
Version: 2  
Sponsor:  
Name: Administrator  
ID: 6458b30344c1f083

**Fig. 5.8-1 User information**

Field	Description
Name	The assigned user name  A user name can only occur once in the system. If a user has been deleted, a new user with the same name can be registered again
ID	The user ID is generated automatically when the user registers. This ID is unique and is not repeated. If a user has been deleted, a new user with the same name can be registered again, but the ID will be different.
Created on	Date and time when the user registers
Last password change	Date and time of the last password change
Access level	Access level of the user
Version	Version of the user system
Sponsor	Information of the sponsor. The sponsor is the person (user) who registered this user.  The name and ID have already been described above.

## 5.8.10 Signature information

Some settings and parameters are signed (e.g. CCs or machine settings). The signature shows when the change was made and by which user.

Name: Demo  
User ID: 6732fe3850a8cf66  
Signature ID: 680f381e1b4071a3  
Signed: 28.04.2025 10:11:10  
Version: 1

**Fig. 5.8-2 Signature information**

Field	Description
Name	Name of the user who signed the data  Note: A user can be deleted and then a new user with the same name can be created! The user ID, on the other hand, is unique.

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User ID	The ID of the user who signed the data, see 5.8.5 Log in / Sign / Authenticate  Note: A user can be deleted and then a new user with the same name can be created, but the user ID is unique.
Signature ID	A unique ID of the signature.  A new ID is generated when the data is signed again.
Signed on	Date and time when creating the signature
Version	Version of the signature system when creating the signature

## 5.8.11 Access level for functions and menus

The following table lists all functions with the associated access level.

Access level 0: "Free", access also for unidentified users, i.e. no users need to authenticate themselves (level 0 is not a valid level for registered users)

**X:** Access possible

**R** (read-only): The access level only grants access, but does not allow any changes.

**W** (write): Full access (changes also possible)

**R/W:** Access authorization is programmable (e.g. the access options for programming CC are adjustable)

ID	Function	Access level of the user						
		0 (free)	1	2	3	4	Service	Admin
<b>1</b>	<b>Basic functions</b>							
1.1	Select CC <sup>16</sup>	(X)	(X)	(X)	(X)	(X)		
1.2.1	Starting a CC with start level = Free (0) <sup>17</sup>	X						
1.2.2	Starting a CC with start level = 1		X	X	X	X		
1.2.3	Starting a CC with start level = 2			X	X	X		
1.2.4	Starting a CC with start level = 3				X	X		
1.2.5	Starting a CC with start level = 4					X		
1.3	Initialize baths, degas, autofill			X	X	X	X	X
<b>2</b>	<b>Service functions</b>							
2	Menu Service		X	X	X	X	X	X
2.1	Edit cleaning cycles <sup>18</sup>			R/W	R/W	R/W	R	R
<b>3</b>	<b>Settings</b>							
3.1	General settings		R	R	R	W	W	W
3.1.1	Time / Date		R	R	R	R	R	W

<sup>16</sup> Adjustable in the machine settings, see 6.2.3 Machine settings

<sup>17</sup> Can be set in the CC, see 5.4.2 Cleaning cycle header, "Min. access level to start"

<sup>18</sup> Can be set individually in each CC, see 5.4.2 Cleaning cycle header, "Min. access permission level for changing"

ID	Function	Access level of the user						
		0 (free)	1	2	3	4	Service	Admin
3.2	Machine settings		R	R	R	W	W	R
3.3	Turntable parameters		R	R	R	W	W	R
3.4	Job number		R	R	R	W	W	R
<b>4</b>	<b>Tests, calibration &amp; maintenance</b>							
4	Tests, calibration & maintenance menu			X	X	X	X	X
4.1	Axis movement					X	X	
4.2	Manual code					X	X	
4.3	Ultrasonic test					X	X	
4.4	Calibration / Adjustment					X	X	
4.5	Oil and filter change							
4.5.1	Change HEPA filter			R	R	W	W	R
4.5.2	Oil change vacuum pump *1)			R	R	W	W	R
4.5.3	Change air filter vacuum pump *1)			R	R	W	W	R
4.5.4	Change oil separator vacuum pump *1)			R	R	W	W	R
4.5.5	Clean silencer vacuum pump *1)			R	R	W	W	R

**Tab. 5.8-1 Access levels and functions**

\*1) Not available with oil-free vacuum pump

### 5.8.12 Example of a user hierarchy

The following user hierarchy would be useful on the CM.



The following information is only an example!

Access level	Range of functions
Admin	Administrator
4	Service / Maintenance These users have access to all functions (e.g. calibration and adjustment functions, settings, expert mode) All CC can be used and changed
3	Create and change CC Users who can create and change CC No access to settings, calibration and adjustment functions etc.

Access level	Range of functions
	<p><b>!</b> "Min. access level for changing" (5.4.2 Cleaning cycle header) of the CC should be set to level 3 so that users at a lower level cannot change these CCs!</p> <p>However, this does not mean that users with a lower level cannot also create CCs!</p>
2	<p>Supervisor:  Start cleaning cycles, replace turntable baths / cleaning solution</p> <p>Users at this level cannot make any machine settings etc. The "Initialize baths" menu (5.7 Initialize baths) is accessible (used to remove baths and replace cleaning solution).</p> <p><b>!</b> The "Min. access level for changing" (5.4.2 Cleaning cycle header) of the CC should be set to a higher level (e.g. level 3) so that users on level 2 cannot change (if desired)!</p> <p>"Min. access level to start" should be set to level 1 so that level 1 users can start the CC.</p>
1	<p>Start cleaning cycles</p> <p>These users can only start cleaning cycles. The cleaning solution of the baths cannot be replaced either (the "Initialize baths" menu (5.7 Initialize baths) is locked).</p> <p>Furthermore, these users cannot change any cleaning cycles or make any settings</p> <p><b>!</b> "Min. access level to start" should be set to level 1 so that level 1 users can start the CC.</p>
Service	A user with the 'Service' level can be created for service technicians, for example. These users have access to calibration and adjustment functions, but cannot change cleaning cycles

## 5.9 Power saving mode

The machine can be set to power saving mode manually (via the power saving mode function on the main page) or automatically (e.g. daily at 19:00, see 6.2.3 Machine settings).

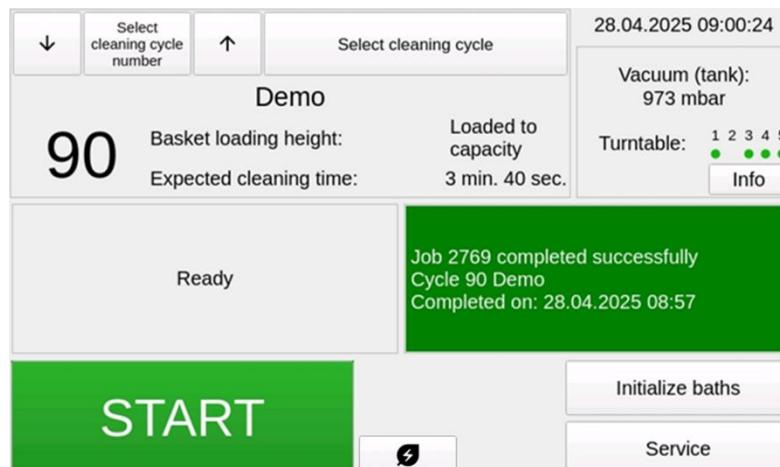
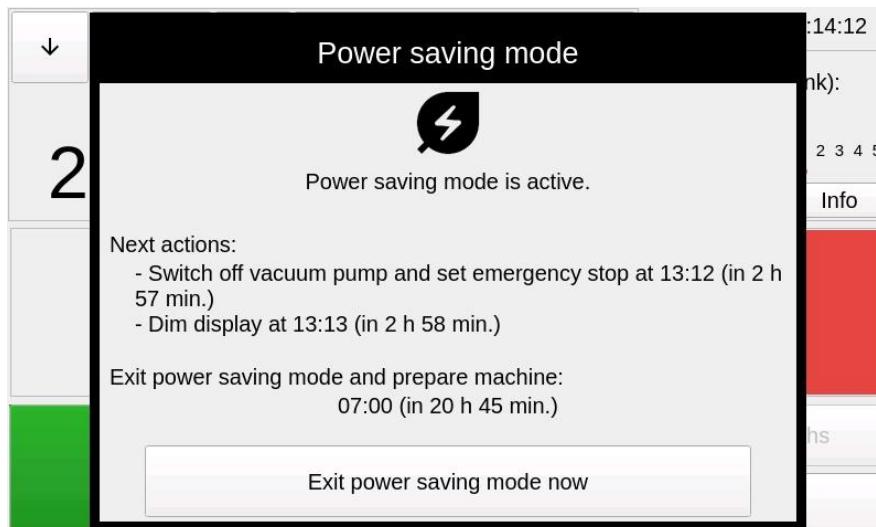


Fig. 5.9-1 *Power saving mode* on the main page

The following happens in power saving mode:

- Bath heaters are switched off
- Motors are unpowered<sup>19</sup>
- Machine lighting is switched off<sup>20</sup>
- As soon as the vacuum pump switches off (run-on time, see 5.5.5 Vacuum), the machine is put into emergency stop
- Display is dimmed or switched off (see 6.2.3 Machine settings)



**Fig. 5.9-2 Main page when power saving mode is active**

When exiting power saving mode, the machine is initialized again. This means that the baths are also heated up again to the temperatures defined in the selected cleaning cycle. Power saving mode can be exited manually or automatically (e.g. daily at 7:00, see 6.2.3 Machine settings).

<sup>19</sup> Only if the installed motor drivers support deactivation of the motors

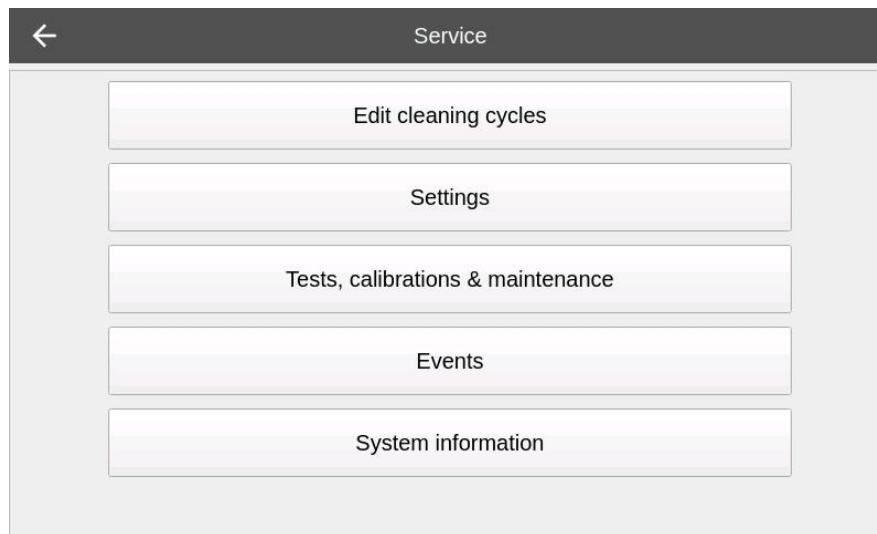
<sup>20</sup> Only if the electrical system of the machine supports switching off

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## 6 SERVICE

The menu can be found under  
Service



**Fig. 5.9-1 Service menu**

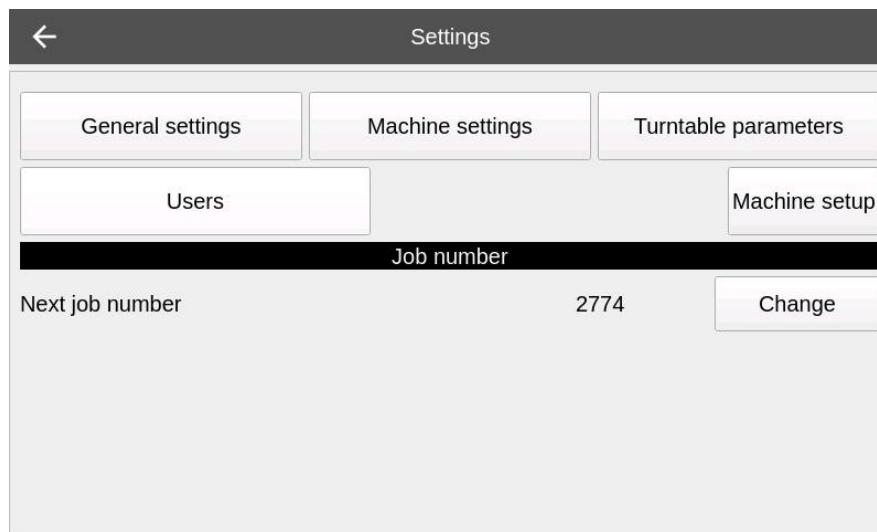
### 6.1 Edit cleaning cycles

See 5.6 Operation and programming of cleaning cycles, page 44.

### 6.2 Settings

Fig. 6.2-1 shows the settings display. The individual functions and submenus are described below.

The menu can be found under  
Service → Settings



**Fig. 6.2-1 Menu settings**

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## 6.2.1 Job number

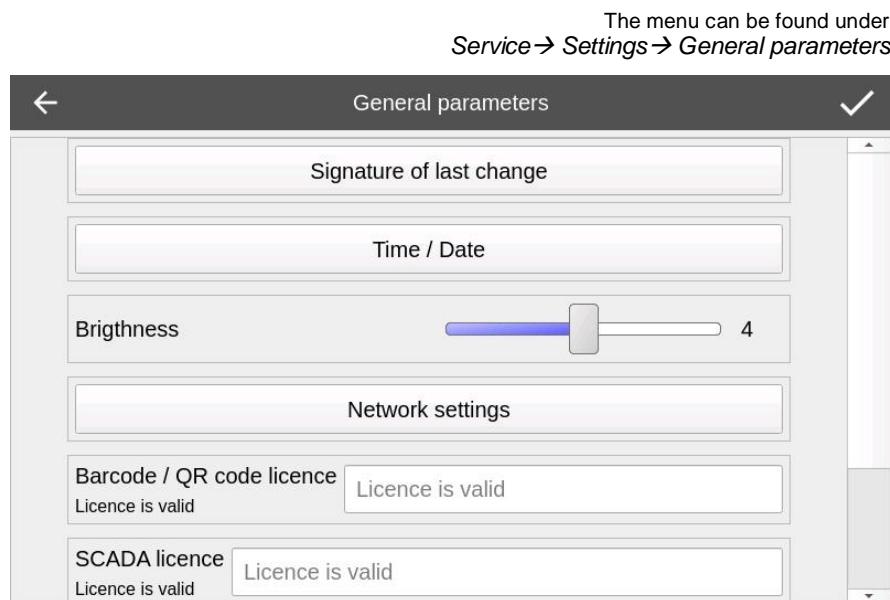
A job number is assigned for each run or start of a CC. The next job number can be changed here.

## 6.2.2 General settings

Fig. 6.2-2 shows the display of the general settings

If the user system is activated, the parameters can only be changed if the logged-in user has a certain access level, see 5.8.11 Access level for functions and menus

The individual functions and submenus are described below.



**Fig. 6.2-2 General parameters**

### Signature of the last change

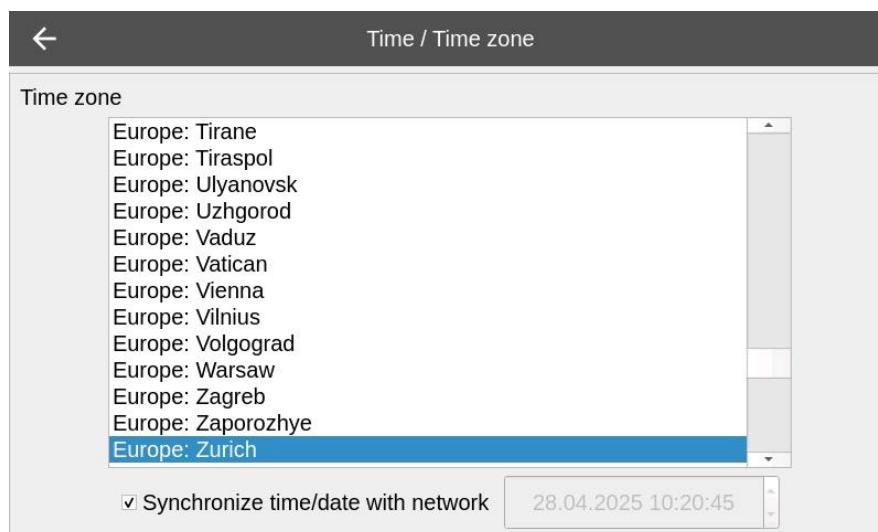
(Only if the user system is activated, see 5.8 User system and access authorization)

Changes to the general parameters are signed. The signature is displayed here (for more information on a signature, see 5.8 User system and access authorization)

### Date / Time

The system time and time zone can be set here.

The menu is located under  
Service → Settings → General settings → Date / time



**Fig. 6.2-3 Setting the time and time zone**

The time and date (system time) can either be synchronized with the network (NTP) or set manually (if set manually, synchronization with the network must be deactivated). Changes require a password to be entered. If the user system is activated (see 5.8 User system and access authorization), the time and date can only be changed by the administrator (password is requested). If the user system is not activated, the time and date can be changed with the password *timeChange543*.

The time zone can be changed without entering a password.

### Brightness

The brightness of the display is adjusted using the slider

### Network settings

The IP address, netmask and hostname can be configured here

### Barcode / QR Code License

The barcode / QR code option is activated with a valid license code. Instead of entering the license code here, a license file can also be sent directly to the CU4000 via the PC application *P6 Suite*, see Up/Download of licenses P6, 1.3.3 Referenced documents.



It is recommended that you write down the purchased license codes and keep them in a safe place. The license code is based on the serial number of the CU4000.

### SCADA license

SCADA option see SCADA operating instructions, 1.3.3 Referenced documents. The SCADA option is activated with a valid license code. Instead of entering the license code here, a license file can also be sent directly to the CU4000 via the PC application *P6 Suite*, see Up/Download of licenses P6, 1.3.3 Referenced documents.



It is recommended that you write down the purchased license codes and keep them in a safe place. The license code is based on the serial number of the CU4000.

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### SCADA activated (Yes / No)

SCADA function is generally activated or deactivated. If SCADA is activated, every job (CC run) is recorded. See SCADA operating instructions; 1.3.3 Referenced documents.

### Language

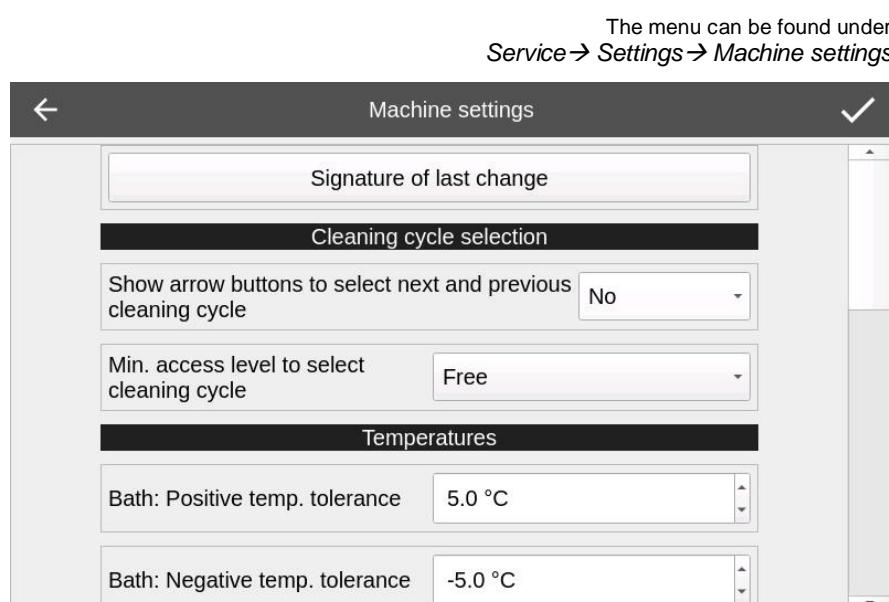
The desired dialog language is selected with Language. The keypad is adapted accordingly.

## 6.2.3 Machine settings

Fig. 6.2-4 shows the display of the machine settings.

If the user system is activated, the parameters can only be changed if the logged-in user has a certain access level, see 5.8.11 Access level for functions and menus.

The individual functions and submenus are described below.



**Fig. 6.2-4 Machine settings**

### Signature of the last change

(Only if the user system is activated, see 5.8 User system and access authorization)

Changes to the machine settings are signed. The signature is displayed here (for more information on a signature, see 5.8 User system and access authorization).

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## Cleaning cycle selection

### Show arrow buttons to select next and previous cleaning cycle

The arrow buttons on the main page for program selection can be shown or hidden. Hiding the buttons is intended to prevent unintentional changes to the program selection.

### Min. access level to select cleaning cycle

If not "Free", a user must authenticate (enter password) to select a CC. The level selected indicates the minimum access level required by the user. After selecting the CC (on the main page), the user has 5 seconds to change the selection before the password must be entered again. This allows the user to scroll through the available programs using the arrow buttons.

## Temperatures

### Temperature tolerance

The temperature tolerance of heated turntable baths can be specified. See also 5.5.4 Temperatures of baths.

The temperature to be controlled for individual turntable baths is specified in the CC, see 5.4.2.1 CC Parameters for turntable positions.

## Baths

### Steel bath: Diameter

The diameter is required to calculate the filling volume in steel baths.

### Glass bath: Diameter

The diameter is required to calculate the filling volume in glass baths..

### Glass bath: Offset bath base

The base of the glass baths may not be at the same depth as the steel baths. The offset can be determined by measuring the base of an empty bath in the calibration menu (see 6.3.7.5 Liquid level (cleaning solution qty) measurement calibration)

## Ultrasonic

### Ultrasonic generator

A maximum of 2 ultrasonic generators can be installed in the machine, each with a frequency range and a certain power (50W or 100W). The frequencies and the power of the installed generators must be specified here. Each ultrasonic generator can be routed to any ultrasonic bath.

### Degas parameters

These parameters are required for degassing the baths, see 5.7.2 Degassing. These are the following parameters:

Parameters	Description
<b>Degassing</b>	
Vacuum valve open	It is degassed under vacuum. This value shows how long the vacuum valve is opened.
Keep vacuum below [mbar]	During degassing, the bath is placed under vacuum. The vacuum valve is always opened briefly when the pressure in the bath rises above the value set here.
Break vacuum by (relative) [mbar]	Before the vacuum valve is opened again, it breaks the vacuum (opens break vacuum valve) until the pressure in the bath rises by this value.
Wait time after vacuum [sec]	This is the same purpose and function as described for parameter ID P14.11 „Waiting time phase end“ (see 5.4.3 Phases of a cleaning cycle).
<b>Degassing with 40 / 80 / 132 kHz ultrasonic</b> (these settings are used when degassing an ultrasonic bath of this type)	
Ultrasonic frequency	40kHz, 80kHz or 132kHz, the ultrasonic frequency to be used during degassing
Power [W]	The ultrasonic power to be used during degassing
Time	The duration of degassing
<b>Degassing with 25 / 50kHz ultrasonic</b> (these settings are used when degassing an ultrasonic bath of this type)	
Ultrasonic frequency	25kHz or 50kHz, the ultrasonic frequency to be used during degassing
Power [W]	The ultrasonic power to be used during degassing
Time	The duration of degassing
<b>Degassing without ultrasonic</b> (these settings are used if the ultrasonic parameters do not apply, e.g. no ultrasonic bath inserted at respective turntable position)	
Time	The duration of degassing
<b>Spinning after degassing</b>	
Spinning time	Time of spinning after degassing. During degassing, the z-axis is moved downwards, so the cleaning basket mount gets wet.
Spinning: Rotation speed	The speed of the basket for spinning

### Power saving mode

See 5.9 Power saving mode.

#### Activate power saving mode

Define the days of the week and time of day when power saving mode is automatically activated.

#### Exit power saving mode

Define the days of the week and time of day when power saving mode is automatically exited.

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#### Display brightness during power saving mode

The brightness of the display during active power saving mode

#### Switch off the vacuum pump only in power saving mode

If this option is active, the vacuum pump is never switched off outside of power saving mode if the selected cleaning cycle uses vacuum. This prevents the pre-run time of the vacuum pump from delaying the start of the cleaning cycle.

#### Other

##### Exhaust fan

- On with open cover: Fan runs when a cover is open
- Always on: The fan runs continuously

##### Status output (AUX)

The status output is a relay changeover contact that can be connected via the AUX socket in the rear panel (see 3.1 System overview)

The output can be set if:

- On when dryer fan is running
- On when exhaust fan is running
- On if cleaning cycle is running

##### Configuration

Configuration changes to the machine can be made in this field. For example, machine components can be retrofitted. The configuration can be adjusted accordingly here. The required information is supplied with such a component where necessary.

### **6.2.4 Turntable parameters**

Fig. 6.2-5 shows the turntable parameters. Each of the six stations can be selected and parameterized.

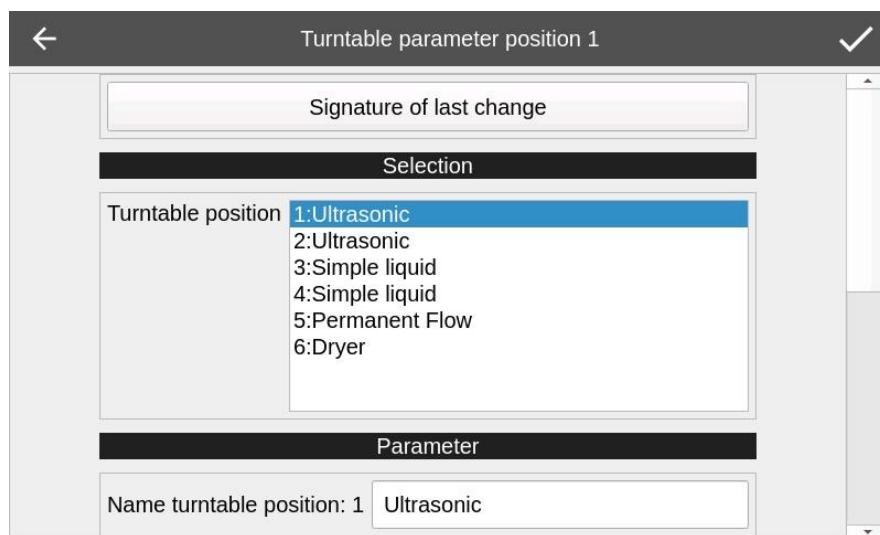
If the user system is activated, the parameters can only be changed if the logged-in user has a certain access level, see 5.8.11 Access level for functions and menus.

The individual functions are described below.

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The menu can be found under  
Service → Settings → Turntable parameters



**Fig. 6.2-5 Turntable parameters**

After selecting a turntable position from the list, the parameters are displayed below.

#### **Signature of the last change**

(Only if the user system is activated, see 5.8 User system and access authorization)

Changes to the turntable parameters are signed. The signature is displayed here (for more information on a signature, see 5.8 User system and access authorization)

#### **Parameters**

##### **Name turntable position**

This function can be used to assign a freely selectable name to each turntable position.

##### **Heating available**

(May or may not be show, depending on the installed hardware, if not shown, it is determined automatically)

Yes, if this turntable position (bath) can be heated. In this case, a target temperature can be specified for this turntable position in the CC, see 5.4.2.1 CC Parameters for turntable positions

##### **Ultrasonic bath**

(May or may not be show, depending on the installed hardware, if not shown, it is determined automatically)

Yes, if an ultrasonic bath can be inserted at this turntable position. In this case, the ultrasonic parameters can be set in the CC at this turntable position.

#### **Cleaning solution level measurement**

##### **Measure liquid level every ... [minutes]**

##### **Measure liquid measurement after number of bath usages**

##### **Measure liquid measurement after number of vacuum cycles**

The level (quantity) of the liquid level (cleaning solution) in the bath is measured when a CC is started if the last measurement was either taken for longer than the set time, if the bath has already been used several times (according to the parameter) or if more vacuum cycles have been carried out in the bath.

#### **Level low (above minimum), warning**

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The minimum and maximum level of the cleaning solution is determined using the CC. The existing parameter is a fixed distance as a warning threshold above the minimum level. A warning appears if the current level in the bath falls below this warning threshold.

## Permanent flow bath

If the permanent flow bath is installed (see 6.2.3 Machine settings), turntable position 5 allows editing only the name.

## 6.2.5 Users

This menu provides functions for managing users. For information on the user system, see 5.8 User system and access authorization.

### 6.2.5.1 Activate / deactivate user system, functions for administrator

The user system can generally be activated or deactivated. When opening the *User* menu with the user system deactivated, the menu looks as follows:

The menu is located under  
Service → Settings → Users



**Fig. 6.2-6 User menu with deactivated user system**

When activating the user system, the administrator must enter the password. The user system is then activated and the *User* menu looks like this:

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The menu is located under  
Service → Settings → Users

The screenshot shows a mobile-style application interface titled "User". At the top, it displays the user's name, ID, creation date, last password change, access level, and version. Below this, there are four main buttons: "Change password", "Information about user", "Register new user", and "Delete user".

**Fig. 6.2-7 User menu with activated user system**

The administrator can deactivate the user system again and has access to settings (these options do not appear for all other users)

The menu is located under  
Service → Settings → Users

The screenshot shows the "Settings" section of the application. It includes a checkbox for "User system active" which is checked. Below this, there are dropdown menus for "Register new user / delete user by:" (set to "Administrator only") and "Password change interval" (set to "No password change"). Under "Password requirements", there is a dropdown for "Number of characters (minimum)" set to "1", and three checkboxes for "Capital letters (A ... Z)", "Numbers (0 .. 9) or symbols", and "Numbers (0 .. 9) and symbols".

**Fig. 6.2-8 Settings for administrator only**

Further options (for administrator only):

#### Register new user / delete user by:

New users can only be registered or users deleted by the administrator or by a user with a higher access level (e.g. a user with access level 4 can register and delete users of level 1, 2 or 3). The administrator can set what applies here. See 5.8.4 Register new user.

#### Password change interval

This interval forces the user to change the password at given intervals. If an interval of 0 days is entered, no password change is required. See 5.8.7 Password change interval.

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### Password requirements

The password requirements can be defined. See 5.8.8 Password requirements.

### 6.2.5.2 Functions for all users

The menu is located under  
Service → Settings → Users



**Fig. 6.2-9 User menu**

#### Change password

To change the password of the logged-in user

#### Information about user

Only users with a lower access level can be selected

#### Register new user

Authorization to create new users is described at 5.8.4 Register new user. This function appears if the logged-in user is allowed to register new users.

The logged-in user becomes the sponsor of the new user (see 5.8.9 User information). A new user can only receive an access level that is lower than that of the sponsor. See 5.8 User system and access authorization.

#### Delete user

Who can delete users is described at 5.8.4 Register new user. This function appears if the registered user is allowed to delete other users.

### 6.2.6 Cleaning agent

This function only appears if dosing units (dosing pumps and flow meters) are installed.

The basic parameters (including a name) of the cleaning agents connected to the machine can be entered here.

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## 6.2.7 Machine setup

The machine setup contains basic settings and definitions. These settings are not normally changed. Access to the machine setup is password-protected and only intended for the manufacturer.

## 6.3 Tests, calibrations & maintenance

Test functions, calibrations and some maintenance functions can be carried out here.

The menu can be found under  
Service → Tests, calibrations & maintenance

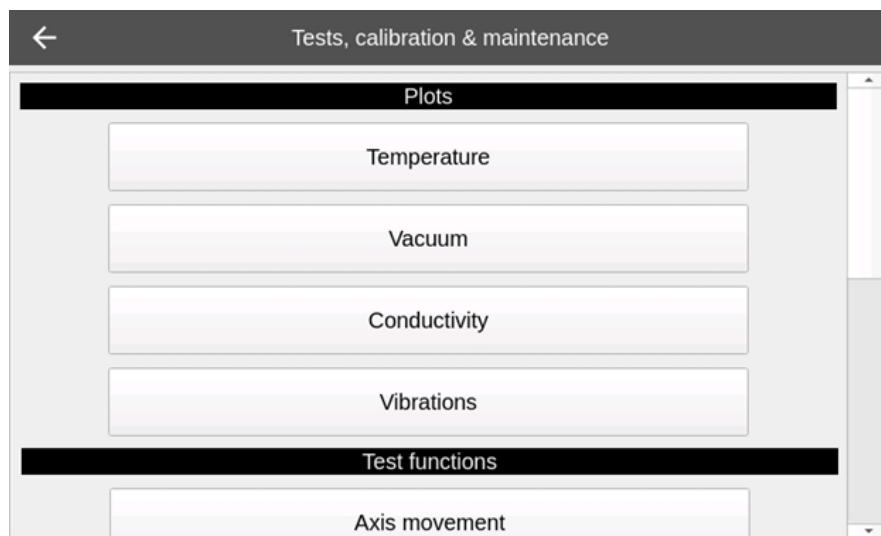
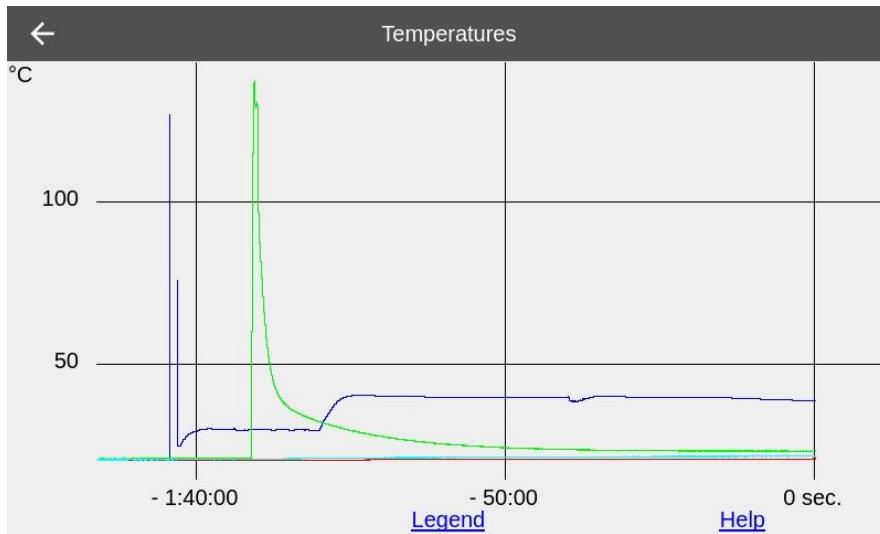


Fig. 6.3-1 Test, calibrations & maintenance

### 6.3.1 Temperature plot

The history of the last 10 hours is recorded for all activated temperature channels. To display this temperature plot, press **Temperature plot**. The display then appears as shown below

The menu can be found under  
Service → Tests, calibrations & maintenance → Temperature plot



**Fig. 6.3-2 Temperature profile**

**Legend** shows the color of the temperature channels, and individual channels can be shown or hidden.

**Help** displays a help text for operation

Zoom:

Draw a rectangle around the area to be zoomed in with one finger

Move section / change zoom:

Move the image section with two fingers, pinch for zoom

Previous view (step by step):

Swipe right with three fingers (swipe left again with three fingers for reverse effect)

Default view (entire graphic visible):

Press and hold the display

## 6.3.2 Vacuum plot

The course of the vacuum is displayed. The sampling rate is 10ms.

Two pressure sensors are installed: One sensor is connected to the vacuum tank (sensor labeled "Tank"), and another is installed in the working head and measures the pressure in the bath (sensor labeled "Bath")

## 6.3.3 Conductivity plot

The conductivity curve is recorded. It should be noted that the sensor is not located directly in the permanent flow bath, but slightly downstream of it. This means that the rinsing water reaches the sensor with a delay. See also 5.5.8 Conductivity measurement in permanent flow bath.

## 6.3.4 Axis movement

This menu allows you to move the axes. If the axes are jammed for any reason, they can be moved freely.

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The axes can be moved freely. Collisions are possible and must be prevented manually!

The menu can be found under  
Service → Tests, calibrations & maintenance → Axis movement

**Please note:**

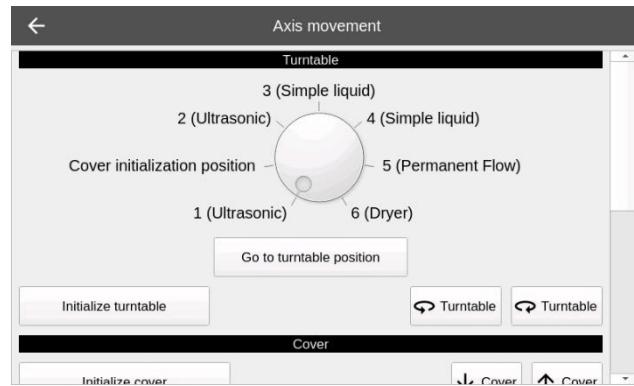
The arrow buttons move the corresponding axes. As long as the button is pressed, the axis moves; releasing it stops it. The initialization of the axis position is lost.



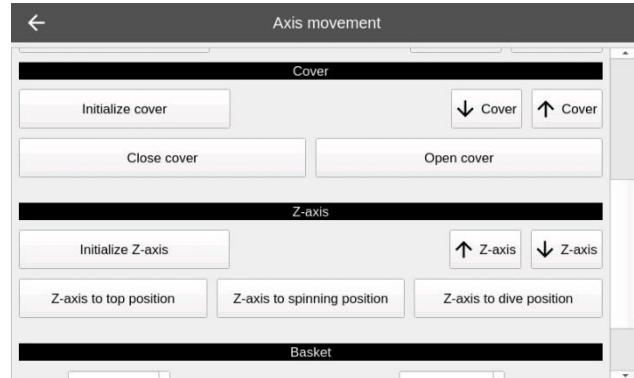
The axes can be moved to the mechanical stop using the arrow keys!



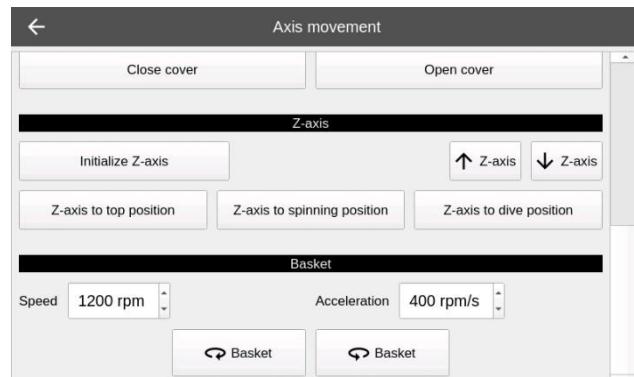
Collisions are possible and must be prevented manually!



**Fig. 6.3-3 Axis movement: Turntable**



**Fig. 6.3-4 Axis movement: Cover and Z-axis**



**Fig. 6.3-5 Axis movement: Z-axis and basket**

### 6.3.5 Manual code

The manual code allows the digital inputs and outputs to be checked.



With the manual code, the outputs can be switched on and off without restriction. This makes it possible to create dangerous conditions that can lead to **the destruction of the machine** or its surroundings. In particular, this can result in **fire, flooding or injury to a person**.

The menu can be found under  
Service → Tests, calibrations & maintenance → Manual Code

Manual Code	
Inputs	Outputs
PX02 PX03 Bath 5 PE feedback ● 1000 *emergency stop 1001 Door is open 1002 Door locked ● 1003 Dryer module ready 1004 Dryer airflow ● 1005 Door safety relay ● 1006 Air pressure ok 1007 1100 1101 Basket motor error 1102 Basket speed deviation 1103 1104 1105 1106 1107	● 1000 Emcy stop power 1001 Status output signal 1002 Exhaust fan 1003 Dryer heater 1004 SignalLight green ● 1005 SignalLight yellow 1006 SignalLight red 1007 US generator selection 1100 Vacuum pump relay 1101 Vacuum pump cooling fan 1102 Lock door 1103 Basket enable ● 1104 Basket direction 1105 Dryer module on 1106 Open water valve 1107 Onn Tank exhaust valve

**Fig. 6.3-6 Display of inputs and outputs in the manual code**



change the font size (and therefore the line height) of the inputs and outputs.

### Inputs

The inputs are listed on the left-hand side of the display. Each name is preceded by the assigned output number of the I/O system<sup>21</sup>. This means that the inputs can be clearly assigned to the hardware. Numbers without names show inputs that are not assigned and therefore not used.

To the left of the number, the current status of the input is displayed with a green dot. No dot means no voltage at the input. A green dot means 24V at the input.

#### For I/O system “PU3000” only

If a PU3000 is installed, input and output 007 are reserved for the shutdown display. If **Shutdown PUs** is pressed, the PU3000 is set to shutdown mode. **Reset PUs** returns the PU3000 to the normal state. In shutdown mode, all outputs are switched off, regardless of whether they have been switched on logically (by software).

### Outputs

The same display philosophy applies to the outputs on the right-hand side of the display. Here, an individual output is also selected either by pressing the desired line or using the single arrow buttons. **Modify** acts on this output.



Setting the outputs can result in damage to the machine! For example, heaters can be switched on and cause overheating!

<sup>21</sup> Type may vary depending on the installed hardware

**Modify** changes the status of the selected output. This is displayed to the left of the number. The following table shows the meaning of the dot display:

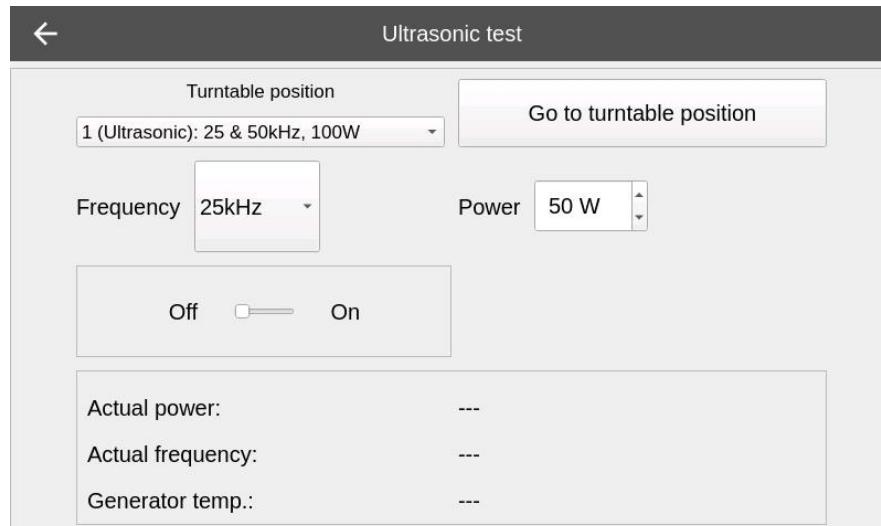
Display	Meaning
No point	Output switched off, no current flows
green dot 	Output switched on, current flows
yellow dot 	Output switched on, no current is flowing (no load or load interrupted) <sup>22</sup>
red dot 	Output switched off, current flows <sup>23</sup>

**Tab. 6.3-1 Display of the manual code**

### 6.3.6 Ultrasonic test

This function allows the ultrasonic generators to be switched on for test purposes.

The menu can be found under  
*Service → Tests, calibrations & maintenance → Ultrasonic test*



**Fig. 6.3-7 Ultrasonic test**



The generators must only be operated with a bath containing sufficient liquid!

<sup>22</sup> This state exists only if a PU3000 is installed as IO box. This state does not exist for other IO box hardware

<sup>23</sup> This state exists only if a PU3000 is installed as IO box. This state does not exist for other IO box hardware

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## 6.3.7 Calibrations

In the service menu via **Tests, calibrations and maintenance** → **Calibrations**, you can access the submenu for adjusting the analog measuring channels (e.g. level measurement, temperature measurement, etc.).



Calibration and adjustment of the analog measuring channels may only be carried out by qualified and trained personnel.

Calibration must be carried out in accordance with the maintenance instructions (see 1.3.3 Referenced documents)



Cleaning baths must be **unlocked before removal!** See unlocking at 5.7 Initialize baths

The menu can be found under  
Service → Tests, calibrations & maintenance → Calibrations

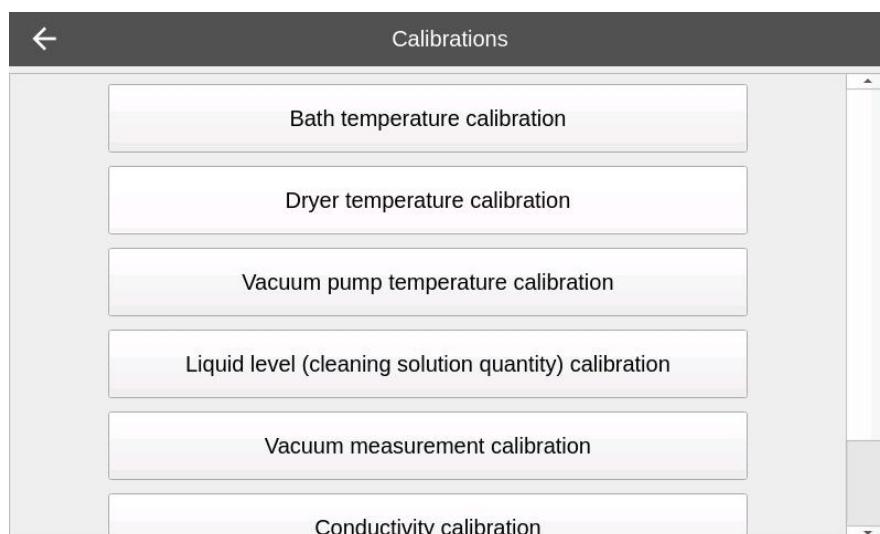


Fig. 6.3-8 Calibration / adjustment

### 6.3.7.1 General notes on temperature calibrations

The utilized **measuring range of the temperature channels is between 0°C and +150°C**. This means that temperature values outside these limits are interpreted and displayed as overflow or underflow at all other display locations. An overflow is displayed as +++°C and an underflow as ---°C.



If a temperature sensor is unplugged in this "Temperatures" maintenance menu, +++ must be displayed. This is the only way to ensure that a temperature sensor breakage is detected.



If a temperature sensor is unplugged during normal operation, a machine error is triggered as soon as the measured value leaves the temperature range of 0°C to +160°C.

### 6.3.7.2 Bath temperature calibration

**Bath temperature calibration** displays the currently measured temperatures and allows the channel to be adjusted.

The screenshot shows a mobile application interface for 'Bath temperature calibration'. At the top, there's a back arrow and the title 'Bath temperature calibration'. Below that, a dropdown menu for 'Turntable position' is set to '1 (Ultrasonic)' with a 'Go to turntable position' button next to it. Underneath, there's a 'Heater' section with a 'Set temp.: 40.0 °C' input field, a 'Temperature plot' button, and an 'On/Off' switch. The switch is currently off. Below the heater section, the 'Actual temperature' is listed as '38.7 °C' with a unit selector between °C and cnts. To the right, it says 'Adjusted (date unknown)'. At the bottom, there's a large 'Adjust' button.

**Fig. 6.3-9 Bath temperature calibration**

**Go to turntable position** moves the turntable to the corresponding position and opens the cover.

**Heater on/off** allows the bath heating to be switched on and off in controlled mode.



The liquid level in the bath is not checked. If the liquid level is too low, this could result in overheating and damage to the machine or the bath!

#### Adjust

To carry out the adjustment, either calibration resistors<sup>24</sup> (PT100 simulation) or a temperature reference (e.g. heat up the liquid in the turntable bath and measure with a reference thermometer) are required. Two reference points (low and high temperature) are always required for calibration.

#### 6.3.7.2.1 Adjustment with PT100 simulation

Remove the bath and insert the corresponding PT100 simulations into the plug on the bath mount as prompted on the display.

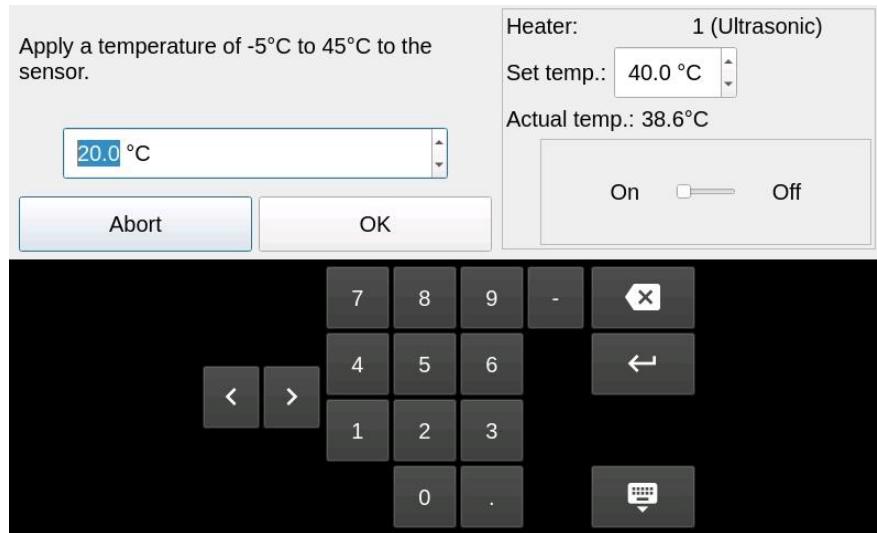
The adjustment can be canceled at any time. In the event of an abort or error, the existing adjustment is retained and is not lost.

#### 6.3.7.2.2 Adjustment with temp reference

For adjustment with "Temperature reference", the temperature sensor must be exposed to two reference temperatures (low and high temperature).

<sup>24</sup> Calibration resistors ECOCLEAN article 30180, adapter for plugging into the heated turntable stations: ECOCLEAN article 30346

After starting the adjustment with "Temperature reference", the following display appears:



**Fig. 6.3-10 Adjustment with temperature reference**

The temperature sensor must be exposed to a temperature within the displayed range.

The bath heating can be operated in the right-hand area. The measured temperature is displayed on the right under *Current temp.* (ATTENTION: This is the temperature measured by the CU4000, which is to be adjusted. Accordingly, the display may deviate from the reference temperature).

As soon as the temperature is stable, the reference temperature must be entered via the keypad.

A prompt then appears again to expose the temperature sensor to a higher temperature.

As soon as the temperature is stable, the reference temperature must be entered via the keypad.

The adjustment is completed.

The adjustment can be canceled at any time. In the event of an abort or error, the existing adjustment is retained and is not lost.

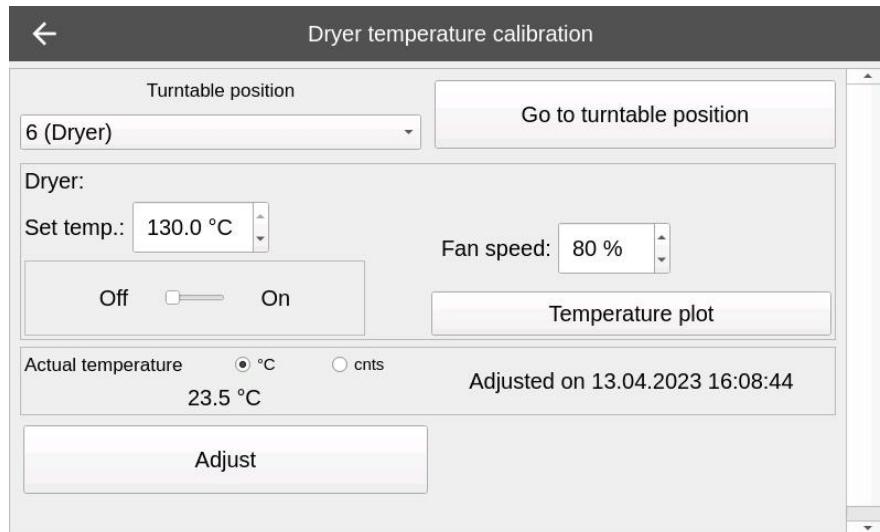


When adjusting the temperature measurement of cleaning baths (e.g. ultrasonic baths), the CU4000 hardware and the temperature sensor are adjusted together. Replacing or swapping cleaning baths inevitably results in the temperature sensor being replaced. A check and possibly an adjustment of the corresponding temperature channel must be carried out!



After adjustment, the measurement output of the temperature sensors must be checked by immersing them in a heat source with a precisely known temperature within the working temperature range. The measured output is compared with the known setpoint value. The difference must be within the specified accuracy of the measuring channel.

### 6.3.7.3 Dryer temperature calibration



**Fig. 6.3-11 Dryer temperature calibration**

The temperature measurement of the dryer can be adjusted in a similar way to the calibration/adjustment of the turntable bath temperatures (see 6.3.7.2 Bath temperature calibration). For calibration, the sensor can also simply be dismantled and adjusted with an oil bath.

**Go to turntable position** moves the turntable to the dryer position and the cover is opened. The working head (z-axis) can then be moved downwards ( $\uparrow \downarrow Z\text{-axis}$ ).

The dryer can only be switched on after the turntable has been moved to the dryer position and the working head has been lowered onto the bath.

#### Adjust

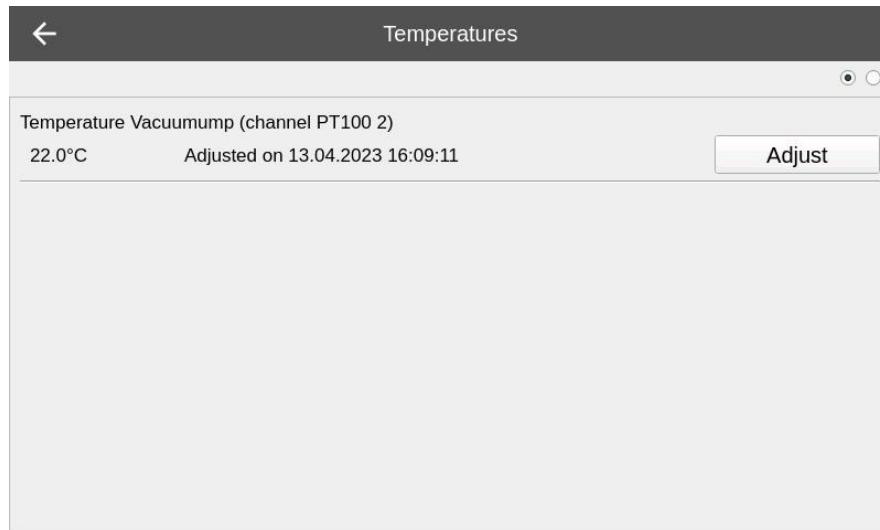
To carry out the adjustment, either calibration resistors<sup>25</sup> (PT100 simulation) or a temperature reference (e.g. constant dryer temperature) are required. The process is carried out via the display and is identical to adjusting the temperature of the turntable baths, see 6.3.7.2 Bath temperature calibration.

Calibration resistors are plugged into the rear of the CU4000, PT100 channel 1.

### 6.3.7.4 Vacuum pump temperature calibration

Only available if vacuum is installed.

<sup>25</sup> ECOCLEAN article 30180



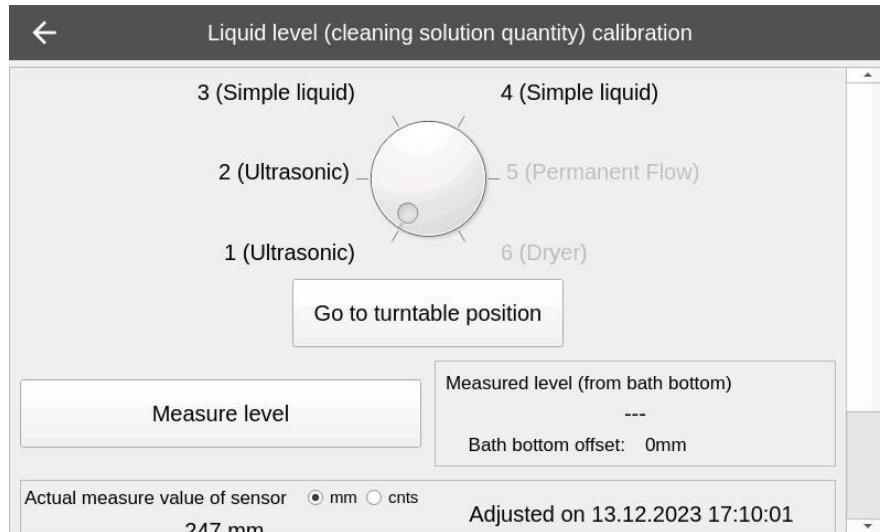
**Fig. 6.3-12 Vacuum pump temperature calibration**

### **Adjust**

To carry out the adjustment, either calibration resistors<sup>26</sup> (PT100 simulation) or a temperature reference are required. The display guides you through the process, which is identical to adjusting the temperature of the turntable baths, see 6.3.7.2 Bath temperature calibration.

The calibration resistors are plugged into the rear of the CU4000, PT100 channel 2.

### **6.3.7.5 Liquid level (cleaning solution qty) measurement calibration**



**Fig. 6.3-13 Liquid level (cleaning solution qty) measurement calibration**

**Go to turntable position** moves the turntable to the selected position and the cover is opened.

**Measure liquid level** can be performed after **moving to turntable position** to measure the liquid level (cleaning solution quantity). After measuring the liquid level, the measured value is displayed in the **Measured level** window on the right (relative to the bottom of the bath).

<sup>26</sup> ECOCLEAN article 30180

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*Current measured value Sensor* shows the current measured value, in mm or in counts.

### **Adjust**

This function adjusts the sensor for measuring the level of the cleaning solution.

Adjustment is carried out by specifying two reference heights in bath. This can either be a defined liquid level or mechanical dummies, e.g. foam blocks. The set bath base offset (see 6.2.3 Machine settings) is taken into account.

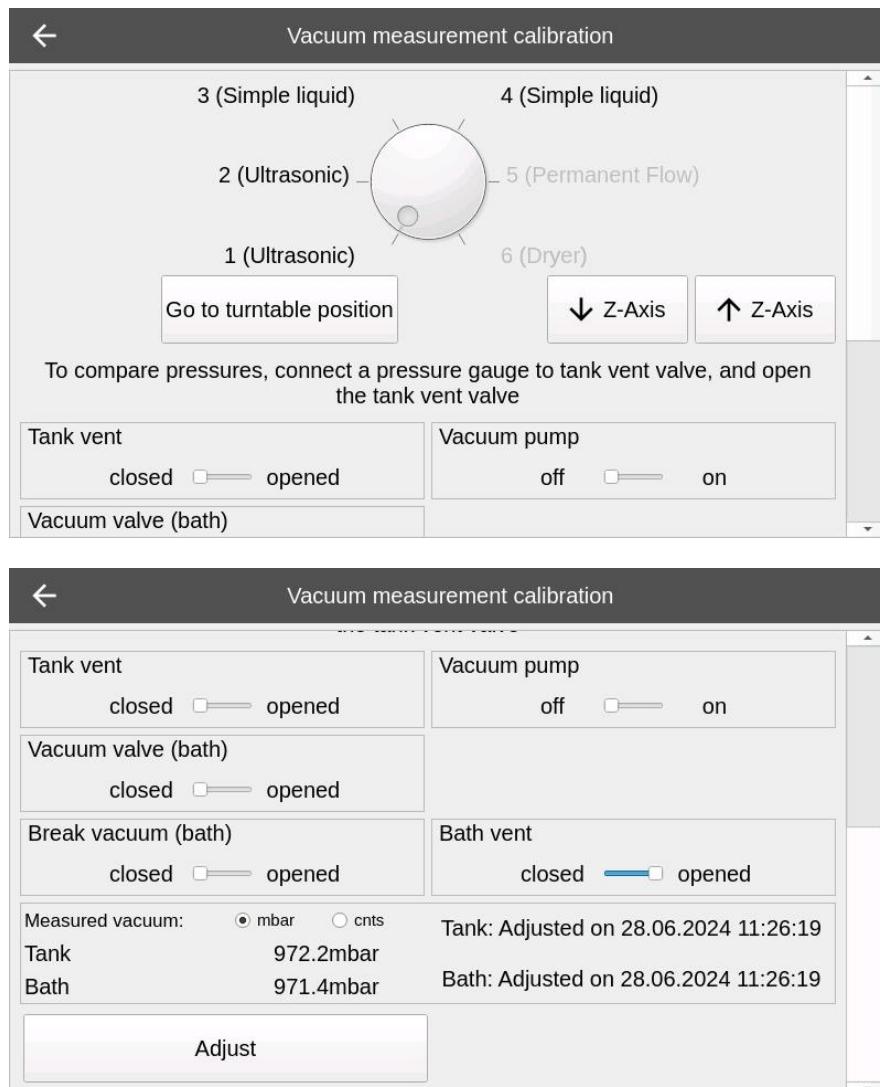
The adjustment procedure is as follows:

- The adjustment is made at the selected turntable position. It is recommended to use a steel bath (ultrasonic bath) as the manufacturing tolerances are smaller.
- Cover is opened and the door is unlocked
- Insert a (low) reference level (dummy or liquid level) in the indicated area (from the bottom of the bath). It is recommended to use the bottom of the bath (0 mm) directly.
- Close the door, then the height is measured (sensor)
- The door is unlocked and a higher reference level is inserted in the displayed area (from the bottom of the bath) (dummy or liquid level)
- Close the door, then the height is measured (sensor)
- The adjustment process is completed

The adjustment can be canceled at any time. In the event of an abort or error, the existing adjustment is retained and is not lost.

### 6.3.7.6 Vacuum measurement calibration

Only available if vacuum is installed.



**Fig. 6.3-14 Vacuum measurement calibration (upper and lower display area)**

A pressure gauge is used as a reference measurement. This gauge is connected to the tank vent. After opening the tank vent, the gauge receives the vacuum system pressure. The pressure on the pressure gauge and the current measured value in the window on the display should match.



If the tank vent is closed, the connected pressure gauge is no longer connected to the vacuum system and the vacuum display on the CU4000 will no longer correspond to the pressure gauge.

The pressure in the vacuum system can be varied by switching on the vacuum pump or opening the vent. The vacuum valve in the working head ("Vacuum valve (bath)") and possibly also the bath venting valve ("Bath vent valve") are used for venting.

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When the vacuum pump is switched on and the vent is open, the air flow in the vacuum system creates a different pressure at the tank vent (pressure gauge) and at the pressure sensor of the CM, and the measured values are therefore not identical.

It must also be ensured that the connection to the tank vent is tight, otherwise a pressure difference will occur.

### Tank and bath pressure sensors

The CM is equipped with two pressure sensors: one sensor is located on the vacuum tank (sensor labeled "Tank") and one in the working head to measure the pressure in the bath (sensor labeled "Bath").

**Go to turntable position** moves the turntable to the selected position and the cover is opened (if the turntable is in a different position, the vacuum in the bath is broken first (vacuum valves), the Z-axis is moved upwards and the cover is closed)

**↑ /↓ Z-axis** moves the Z-axis to the top position or to the immersion position (only when the cover is open). By switching the valves, the vacuum can reach the bath pressure sensor so that it can be calibrated and adjusted.



If the Z-axis is in the immersion position when the vacuum pump is switched on with the vacuum valve (bath) closed, care must be taken to ensure that there is no cleaning solution in the bath, as this can lead to foaming and large quantities of cleaning solution can be sucked in.

### Adjust

This function adjusts the sensors for measuring the pressure in the vacuum system. You can select whether the tank or bath or both sensors are to be adjusted.

The CU4000 guides you through the adjustment process, which is carried out as follows:

- If the bath sensor is to be adjusted:
  - Select a turntable position at which the bath can be placed under vacuum so that the vacuum reaches the sensor (ATTENTION: Use an empty bath or a bath with pure water to avoid foaming!) The turntable moves to the selected position, the cover is opened and the Z-axis is moved to the immersion position.
- A pressure gauge (absolute pressure) is connected to the tank vent. This pressure gauge is used as a reference for the adjustment.
- The vacuum system is vented by the vacuum valve, which places the bath under vacuum during a cleaning process, and, if necessary, by the bath venting valve.
- As soon as the pressure in the vacuum system is stable (ambient pressure), enter the pressure shown on the pressure gauge (keypad on the display).
- The vacuum pump is switched on. As soon as the pressure in the vacuum system is stable (vacuum), enter the pressure shown on the pressure gauge (keypad on the display).

The adjustment can be canceled at any time. In the event of an abort or error, the existing adjustment is retained and is not lost.

### 6.3.7.7 Conductivity calibration

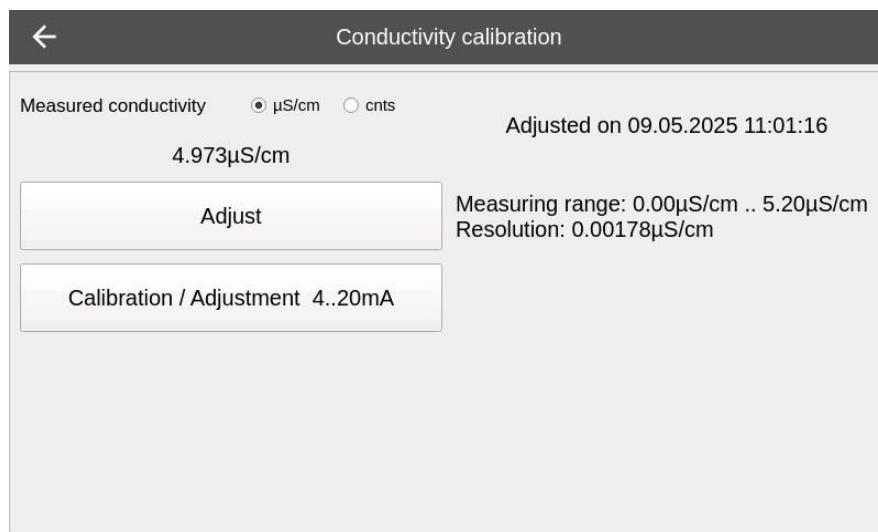
Only available if conductivity measurement is installed.

The measurement range and precision (number of decimal places) of the displayed conductivity depend on the conductivity measurement system. The measurement range typically lies between 0.0 and

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20.0  $\mu\text{S}/\text{cm}$ , or between 0.00 and 5.00  $\mu\text{S}/\text{cm}$ , but other ranges are also possible. It is important to note that the conductivity sensor used may not be able to measure down to 0.01  $\mu\text{S}/\text{cm}$ , but typically  $\geq 0.05 \mu\text{S}/\text{cm}$  (refer to the datasheet).



**Fig. 6.3-15 Conductivity calibration**

The conductivity is measured continuously and displayed in the window under *Measured conductivity*. In this menu, one more decimal place than usual is displayed.

To the right of **Adjust** the measurement range and resolution of the measurement system are shown. The number of decimal places is determined by this resolution

### **Adjust**

This function adjusts the sensor for conductivity measurement.

The CU4000 guides you through the adjustment process, which is carried out as follows:

- The conductivity sensor is removed from the mount and immersed in a liquid with low or high conductivity. The conductivity value is entered using the keypad.
- After confirmation and measurement, the conductivity sensor is immersed in a liquid with a known higher or lower conductivity. The conductivity value is entered via the keypad.
- After confirmation and measurement, the adjustment is completed.

The adjustment can be canceled at any time. In the event of an abort or error, the existing adjustment is retained and is not lost.

### **Calibration/Adjustment 4-20mA**

The conductivity sensor supplies a 4-20mA signal. The 4-20mA measured value is also required for the conductivity. A conductivity measurement is only valid if the current is between 4mA and 20mA<sup>27</sup>. High precision is not required as the 4-20mA value is only used to check the validity, the conductivity value is measured and calculated using the calibration described above.

<sup>27</sup> The 4-20mA current output of the conductivity sensor (measured value) may go below 4mA ("low conductivity") even if the current conductivity is outside the upper range. Therefore, the conductivity is only considered "valid" if the current is between 4mA and 20mA.

### 6.3.7.8 4..20mA channel calibration

**4-20mA channel calibration** displays the current measured values of the 4-20mA channels in mA and allows individual channels to be calibrated. 4-20mA channels are used for the identification of turntable baths. Other channels (e.g. level measurement, vacuum measurement, conductivity measurement) are adjusted in mA and the value can be read, but the adjustments are not used (except for the conductivity measurement), but are only used for troubleshooting (sensor values can also be read directly in 4-20mA values). In this respect, these channels do not need to be checked or adjusted (apart from the conductivity measurement, which can be accessed directly at 6.3.7.7Conductivity calibration

A reference current source is required to adjust the 4-20mA channels.

### 6.3.8 Maintenance (filters, oil, etc.)

The menu can be found under  
Service → Tests, calibrations & maintenance → Maintenance (filters, oil, etc.)

Maintenance			
Service			
Dryer: Filter	Last service 10.05.2022 11:28 at 6 h 38 min.	Remaining 50 h 23 min.	Serviced / inspected
Vacuum pump			
Oil	02.05.2024 09:04 at 543 h 00 min.	275 h 29 min.	Serviced / inspected
Air filter	02.05.2024 09:04 at 543 h 00 min.	-24 h -30 min.	Serviced / inspected
Oil separator	02.05.2024 09:04 at 543 h 00 min.	1775 h 29 min.	Serviced / inspected
Silencer	09.12.2021 11:07 at 7 h 03 min.	239 h 31 min.	Serviced / inspected
	12.02.2024 12:24		

**Fig. 6.3-16 Maintenance**

#### Service

Certain components are serviced regularly. The last maintenance and the remaining time or cycles until the next maintenance are displayed. A completed maintenance can be confirmed with "Serviced". The time remaining until the next maintenance can then also be entered.

A message appears as soon as the remaining time or cycles of the individual components require the next maintenance.

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Concerns the following components:

- Dryer filter
- Vacuum pump (not if an oil-free vacuum pump is installed)
  - Oil
  - Air filter
  - Oil separator
  - Silencer
- Vacuum valve
- Break vacuum valve
- Bath vent valve

(For valve designations, see 5.5.5 Vacuum)

### **Operation counters**

The operating hours and counters of the components are displayed. The operating hours and counters can only be changed with a password. The password is not public.

## **6.4 Events**

**Events** opens a window in which past events are listed. The events are divided into messages, errors that have occurred and CCs that have been carried out (for more information, see 9 Machine status and events).

The menu can be found under  
Service → Events

Events					
← Filter / Search		Event type	Event num	Description	Time / Date
Search	Search	13643	Changes	13024	Machine settings changed. 28.04.2025 10:11:10
Filter		13641	Process	14005	Job 2773 (cleaning cycle 90 Demo) aborted 28.04.2025 09:49:59
Changes		13639	Process	14003	Job 2773 (cleaning cycle 90 Demo) started 28.04.2025 09:48:58
Fatal errors					Job 2772
Machine errors					
Messages					
Other errors					
Process					
Warnings					

**Fig. 6.4-1 Events**

With **Filter / Search**, the Filter / Search window can be shown or hidden as required.

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With a long tap on an event (press and hold your finger on a line), the event appears in a new window:



**Fig. 6.4-2 Event details**

## 6.5 System information

**System Information** opens a window with information about the software and hardware.

The menu can be found under  
Service → System Information

System information	
ECOCLEAN	GUI SW version P6 UI 2.1.0
	Qt version 5.14.2
	Logic SW version P6 ctrl 2.1.0
	PU/AD controller MSPCU4000Main 1.00
	Copyright © 2022 Ginova Electronics AG
Licenses	Serialnumber 30411.01004
	Hostname P6
	IP address 192.168.1.3, 192.168.1.37
	Operation counter 258 h 41 min.
	Version vibration sensor Accelerometer 1.0.0
	Version US/DAC 1 US Interface 1.00
	Version US/DAC 2 US Interface 1.00
	Last job 2793
	Jobs total 2793

**Fig. 6.5-1 System information**

The system information includes the serial number of the CU4000 and the software versions of the various software units involved.

**Licenses** shows the licenses and copyrights of the software used.

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## 7 MAINTENANCE AND SERVICING

Maintenance and servicing must be carried out in accordance with the maintenance instructions, see 1.3.3  
Referenced documents.

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## 8 TROUBLESHOOTING

### 8.1 Error messages

Causes and remedies can be found for some error messages, see 9.1 Errors, warnings, messages Chapter 8.1.

### 8.2 Jammed motor axes

If the motor axes become jammed (e.g. cover) and it is no longer possible to initialize the machine, each motor axis can be moved manually via the Axis movement menu. See 6.3.4 Axis movement.

# 9 MACHINE STATUS AND EVENTS

## 9.1 Errors, warnings, messages

The CM P6 recognizes various exceptional situations that trigger messages, errors and warnings.

Errors and warnings are given a unique event number, which are listed in the following sections. Errors and warnings are recorded as *events* (see 6.4 Events) and displayed as a message when they occur, see the following figure:



**Fig. 9.1-1 Example of a warning (with event number)**

### 9.1.1 Messages

Simple messages are not listed in these operating instructions. Simple messages are also not assigned an event number, but are recorded as *events* under 'Messages' (see 6.4 Events).

### 9.1.2 Machine error

The CM P6 monitors various machine functions and triggers a machine fault if a malfunction is detected.

Most machine faults trigger an emergency stop, which interrupts the power supply to the motors and heaters. The CM P6 must be reinitialized by pressing **START**.

The following table lists the machine errors. 1%, 2% etc. denote runtime-dependent content (e.g. motor specification, turntable position specification, measured value etc.). Values in angle brackets "<>" also denote runtime-dependent values, whereby the type of content is specified more precisely.

Event number	Text	Possible cause and remedy
10001	Bath at turntable position 1% is not locked!	The bath was unlocked during the cleaning process.
10002	Dryer fan could not be started or stopped (communication error)!	
10003	Heater of bath 1% does not heat or heats too slowly!	
10004	The temperature of bath 1% rises too quickly!	There may be no liquid in the bath.
10005	Overtemperature of bath 1%! Current temperature: %2°C	
10006	No suitable control parameters for dryer, temperature 1°C, fan speed 2%!	Contact manufacturer
10007	Temperature channel 1% is interrupted!	

Event number	Text	Possible cause and remedy
10008	Short circuit temperature channel 1%!	
10009	Timeout of permanent flow scavenge pump!	During the rinsing process (permanent flow), the scavenge pump cannot suck out the water or the level switch in the overflow of the permanent flow bath is defective.
10010	Timeout of water valve (permanent flow)! Check water connection.	During the rinsing process (permanent flow), the water level does not rise or only rises very slowly, or the level switch in the overflow of the permanent flow bath is defective. Check the machine's water connection.
10011	Error while filling permanent flow bath: Overflow level reached! Maybe the level switch in permanent flow bath does not work.	The overflow level is detected when filling the permanent flow bath. Maybe the level switch in the permanent flow bath is not working correctly.
10012	Permanent flow bath is not locked!	
10013	Ultrasonic generator 1% could not be switched on!	
10014	Ultrasonic generator 1% could not be switched off!	
10015	Vacuum not attained. Reached value: %1mbar	See 5.5.5 Vacuum
10016	Z-axis must be at dive position to turn on vacuum!	
10017	Overtemperature of vacuum pump (1%°C)!	
10018	Communication with PAX failed! Error code: 1%	
10019	Internal error: Communication with PU/AD controller failed!	
10020	Internal error: PU/AD controller watchdog error (%1ms)!	
10021	PU/AD controller: PU service is not running!	
10022	Air flow in the dryer already detected before the dryer fan is switched on!	
10023	No dryer airflow!	
10024	Error of the dryer module!	
10025	Error of the ultrasonic generator 2%, error code %1<optional: <i>error description</i> >! Selected frequency: %3kHz. Turntable position: %4	See 5.5.6 Ultrasonic
10026	Failed to start ultrasonic!	
10027	Failed to start dryer!	
10028	PU output <PU, Block, Bit> (<Name>) on error!	
10029	PU output <PU, Block, Bit> (<Name>) off error!	
10030	PU is in shutdown!	

Event number	Text	Possible cause and remedy
10031	Internal error (1%)!	
10032	Communication with motor %1 failed!	
10034	Position error of motor 1%!	Check mushroom button emergency stop, check that all bath covers are fully closed, initialize machine, switch off machine beforehand if necessary
10035	Motor 1% has not reached end position!	
10036	Motor 1% is not initialized.	
10037	Error of basket motor driver!	
10038	Z-axis is not at the top!	
10039	The Z-axis cannot be moved upwards while the bath is under vacuum!	
10040	Cover is not open!	
10041	Basket motor could not be started or stopped (communication error)!	
10042	Door is not locked!	
10043	Error while filling permanent flow bath: Water valve timeout. Check water connection. Filling rate: %1mm/s (required: minimum %2mm/s)	The water level does not rise while the permanent flow bath is being filled. Check the machine's water connection.
10044	Machine parameters are not signed (general settings, machine settings, turntable parameter). Open settings, check parameters and confirm to sign.	Open parameters for editing, check and confirm, see 6.2 Settings
10045	Error during degassing: The pressure in the bath continues to drop! The vacuum valve may not be closing!	
10046	Error: Door is not locked!	The door should be locked, but it was detected that the door is not (or no longer) locked.
10047	Dryer heater could not be switched on!	
10048	Speed deviation of the basket motor! Basket may be blocked. If the problem persists reduce acceleration and/or speed.	The speed and acceleration of the basket motor is defined in the CC, see 5.4 Structure of cleaning cycles.  Bearing damage at most.
10049	Error (1) of motor %1! Error code: %2	
10050	Motor 1%: Monitoring error (possibly heartbeat)!	
10051	Error (2) of motor 1%!	
10052	Motor driver of motor 1% could not be configured!	
10053	Error when breaking vacuum: Timeout!	
10054	Following error of motor %1! The axis may be jammed.	

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Event number	Text	Possible cause and remedy
10055	The doser could not be stopped!	
10056	Communication error with turntable hardware, turntable position %1!	
10057	Error reading from the I/O system! %1 Module type: %2	
10058	Error writing to the I/O system! %1 Module type: %2	
10059	I/O system watchdog (heartbeat) error!	
10060	I/O system error (unknown)!	
10061	Vacuum in the bath is not building up!	
10062	Incorrect ultrasonic frequency! Ultrasonic generator %1 outputs %2kHz, but %3kHz is required.	
10063	Incorrect ultrasonic power! Ultrasonic generator %1 outputs %2W, but %3W is required.	The power of the installed ultrasonic generator may not match the power specified in the machine settings, see 6.2.3 Machine settings.
10064	Cover is neither open nor closed!	
10065	The valve in the DualDry (hot air – vacuum dryer) is not open!	
10066	The valve in the DualDry (hot air – vacuum dryer) is not closing!	

### 9.1.3 Other errors

These types of errors are generic errors (not machine errors), possibly as a result of operator error, but not necessarily.

These faults do not usually trigger an emergency stop.

The following table lists the errors. 1%, 2% etc. denote runtime-dependent content (e.g. motor specification, turntable position specification, measured value etc.). Values in angle brackets "<>" also denote runtime-dependent values, whereby the type of content is specified more precisely.

Event number	Text	Possible cause and remedy
11001	Bath at turntable position %1 is not locked!	The bath was unlocked during the cleaning process.
11002	No compressed air.	Check compressed air supply
11005	Invalid machine setup!	See 10.3.2 Different versions between SD card and control unit (CU4000)
11006	Invalid machine parameters!	See 10.3.2 Different versions between SD card and control unit (CU4000)

Event number	Text	Possible cause and remedy
11007	Some temperature channels are not calibrated!	
11008	Liquid level (cleaning solution quantity) measurement is not calibrated!	
11009	Some channels for bath detection are not calibrated (4..20mA channels)!	
11010	Conductivity measurement is not calibrated!	
11011	Pressure measurement (vacuum) is not calibrated!	
11012	One or more dosers are not calibrated!	
11013	Some analog channels are not calibrated!	
11014	Measurement of conductivity at turntable position %1 failed!	
11018	No enough vacuum in tank. Measured: %1mbar	
11019	Test of earthing connection of bath at turntable position %1 failed!	
11020	Communication with US/DAC controller failed!	
11021	Low disk space! Cleaning cycle cannot be started. Please read out SCADA jobs to free up space.	
11022	Failed to load cleaning cycle!	
11023	Error in cleaning cycle!	This is a fallback message, in case of no exact error description could be found
11024	Checksum of the cleaning cycle is incorrect! Data may be faulty. Please verify the cleaning cycle.	Open the CC for editing, check the CC and confirm (see 5.6.2 Edit cleaning cycles on CU4000 (control unit)). The checksum will be recalculated.
11025	Conductivity sensor position is not at the top!	
11026	Cover at unknown position is open.	In 6.3.4 Axis movement, move the turntable to the position of the open cover and close the cover. If all covers are closed, the motors can also be initialized individually.
11027	SCADA data could not be saved!	
11028	No SD card. Saving and deleting cleaning cycles is blocked.	Switch off the machine, insert the SD card and switch the machine on again
11029	Failed to resolve cleaning cycle storage conflict. Saving and deleting cleaning cycles is blocked.	
11030	Vacuum should be broken up to 1%mbar. Current ambient pressure is 2%mbar. Cleaning cycle is aborted.	
11031	Vacuum should be broken up to 1%mbar (phase 3%). Current ambient pressure is %2mbar. Cleaning cycle is not started.	

Event number	Text	Possible cause and remedy
11032	Vibrations are too high (acceleration phase)! Movement stopped.	
11033	Vibrations are too high (constant speed)! Movement stopped.	
11034	Vacuum has not dropped below 1% mbar (measured: 2% mbar)!	In a vacuum cycle, the pressure must fall below a certain level, see 5.5.5 Vacuum.
11035	Internal error: CYC_START_SIG	
11036	<i>This error occurs if the bath is not ready for the selected cleaning cycle at the specified turntable position. A detailed description is generated.</i>	
11037	Communication with vibration sensor failed!	
11038	Cleaning cycle has a different version and cannot be started.	Open CC for editing, check parameters. The CC is then saved with the new version.
11039	The machine is in 'exhibition mode'. Bath heaters, vacuum and permanent flow cannot be used.	Exhibition mode can be switched on and off at 6.2.3 Machine settings .
11040	Automatic vacuum: Resulting valve opening time is too short!	Error in connection with vacuum parameter P14.5 "Suction time" = "Automatic", see 5.4.3 Phases of a cleaning cycle
11041	Automatic vacuum: Vacuum valve timeout!	
11042	Automatic vacuum: Pressure determination failed!	
11043	Automatic vacuum: Timeout!	Pressure differences that are too small (low value of P14.9 "Break vacuum up to (threshold)") or ice formation in the vacuum valve could be the cause.
11044	No protective gas (pressure too low).	

## 9.1.4 Warnings

Warnings are usually caused by operating errors.

The following table lists the warnings. 1%, 2 % etc. denote runtime-dependent content (e.g. motor specification, turntable position specification, measured value etc.). Values in angle brackets "<>" also denote runtime-dependent values, whereby the type of content is specified more precisely.

Event number	Text	Possible cause and remedy
12001	Bath at turntable position <turntable position and name> is not locked!	
12002	No compressed air.	Check compressed air supply
12003	Cannot lock door!	

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Event number	Text	Possible cause and remedy
12011	Heater of the bath at turntable position <turntable position and name> is incorrectly set!	Normally, turntable stations (baths) are initialized automatically before a CC is started. Initialize manually in 5.7 Initialize baths
12012	Conductivity in bath <turntable position and name> too high! Measured: 3 % $\mu$ S Limit value: 4% $\mu$ S	
12013	Cannot reset emergency stop. Check that the emergency stop switch is released.	The emergency stop switch is the red mushroom button on the front of the machine. The emergency stop switch is reset by turning it.
12014	SCADA licence is not valid! Enter licence code in settings, or deactivate SCADA.	SCADA is activated, but the license code is not valid. Deactivate SCADA or enter a valid license code, see 6.2.2 General settings.
12015	Machine cannot be reinitialized after power save mode because the door is open.	

## 9.2 Events: Changes

Some changes to parameters, CCs etc. are recorded. No message is displayed when these events occur.

The following table lists the possible changes. 1%, 2% etc. denote runtime-dependent content (e.g. motor specification, turntable position specification, measured value etc.). Values in angle brackets "<>" also denote runtime-dependent values, whereby the type of content is specified more precisely.

Event number	Text	More information
13001	Cleaning cycle <CC number> <CC name> created	
13002	Cleaning cycle <CC number> <CC name> changed	
13003	Cleaning cycle <CC file name> deleted	
13004	Cleaning cycle <CC file name> replaced (remote)	
13005	Cleaning cycle <CC file name> saved (remote)	
13006	Cleaning cycle <CC file name> deleted (remote)	
13009	Dryer air filter replaced. Operation time dryer fan: 1%h 2% min. Next change at 3%h 4% min	
13010	Vacuum pump oil changed. Operation time vacuum pump: %1h %2 min. Next change due at %3 h %4 min.	
13011	Vacuum pump air filter replaced or cleaned. Operation time vacuum pump: %1h %2min. Next change or cleaning due at %3h %4min.	
13012	Air release element of vacuum pump changed. Operating hours: 1% hr. 2% min. Next change at 3% hr. 4% min.	

Event number	Text	More information
13013	Vacuum pump air silencer replaced or cleaned. Operation time vacuum pump: %1h %2min. Next replacement or cleaning due at %3h %4min.	
13014	General parameters copied from the SD card to the machine	See 10.3.2 Different versions between SD card and control unit (CU4000)
13015	General parameters copied from the machine to the SD card	See 10.3.2 Different versions between SD card and control unit (CU4000)
13016	Machine setup copied from the SD card to the machine	See 10.3.2 Different versions between SD card and control unit (CU4000)
13017	Machine setup copied from the machine to the SD card	See 10.3.2 Different versions between SD card and control unit (CU4000)
13018	Cleaning cycles were copied from the SD card to the machine	See 10.3.2 Different versions between SD card and control unit (CU4000)
13019	Cleaning cycles were copied from the machine to the SD card	See 10.3.2 Different versions between SD card and control unit (CU4000)
13020	Cleaning cycle conflict (SD card - machine): Cleaning cycles from SD card are used	See 10.3.2 Different versions between SD card and control unit (CU4000)
13021	Cleaning cycle conflict (SD card - machine): Cleaning cycles from machine are used	See 10.3.2 Different versions between SD card and control unit (CU4000)
13023	General parameters updated.	Occurs when general parameters are updated, e.g. via the SD card
13024	Machine settings changed.	
13025	General parameters changed.	
13026	Parameters of turntable <turntable position and name> changed.	
13027	Time zone changed from <name time zone> to <name time zone>	
13028	Clock time changed from <date / time> to <date / time>	
13029	Machine setup saved (remote)	The machine setup (see 6.2.7 Machine setup ) was changed via Up/Download (file upload via web browser)
13030	General parameters saved (remote)	The general settings, machine settings and turntable parameters (see 6.2.2 General settings, 6.2.3 Machine settings, 6.2.4 Turntable parameters) were changed via Up/Download (file upload via web browser)
13031	License 1% was set (remote)	A license was set via Up/Download (file upload via web browser).
13032	User 1% saved (remote)	

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Event number	Text	More information
13033	User 1% overwritten (remote)	
13034	User 1% deleted (remote)	
13035	User settings saved (remote)	
13036	User settings deleted (remote)	
13037	Job number for next job change from %1 to %2.	The job number has been changed in the Settings menu, see 6.2.1 Job number
13038	Dryer fan operating hours changed from %1h 2%min to %3h %4min	
13039	Dryer heater operating hours changed from %1h 2%min to %3h %4min	
13040	Vacuum pump operating hours changed from %1h 2%min to %3h %4min	
13041	Scavenge pump operating hours changed from %1h 2%min to %3h %4min	
13042	Cleaning agent settings changed.	
13043	Time/date synchronization via network activated	
13044	Time/date synchronization via network deactivated	
13045	Vacuum valve counter set from %1 to %2	
13046	Break vacuum valve counter set from %1 to %2	
13047	Bath vent valve counter set from %1 to 2%	
13048	Water valve counter set from %1 to %2	
13049	Permanent flow in valve counter set from 1% to 2%	
13050	Permanent flow out valve counter set from 1% to 2%	
13051	Vacuum valve inspected. Counter: %1. Next inspection due at counter %2	
13052	Break vacuum valve inspected. Counter: %1. Next inspection due at counter %2	
13053	Bath vent valve inspected. Counter: %1. Next inspection due at counter %2	

### 9.3 Events: Process

The following events belong to the "Process" group and are also recorded.

The following table lists the possible process events. 1%, 2% etc. denote runtime-dependent content (e.g. motor specification, turntable position specification, measured value etc.). Values in angle brackets "<>" also denote runtime-dependent values, whereby the type of content is specified more precisely.

Event number	Text	More information
14001	Power on	
14002	Power off	
14003	Job< Job number> (cleaning cycle <CC number> <CC name>) started	

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Event number	Text	More information
14004	Job <Job number> (cleaning cycle <CC number> <CC name>) completed successfully	
14005	Job <Job number> (cleaning cycle <CC number> <CC name>) aborted	
14006	Job <Job number> (cleaning cycle <CC number> <CC name>) failed	
14007	Released memory: Removed %1 SCADA jobs.	
14008	Job <Job number> (cleaning cycle <CC number> <CC name>): Cancellation confirmed	After a job was aborted (user abort or failed), the door remains locked until cancellation is confirmed (on the user interface). See 5.2.4.6 Removing items to be cleaned

## 9.4 Events: Fatal Errors

"Fatal errors are errors that cannot be reset. These errors are usually basic problems and can help to find the problem.

The following table lists the possible events. 1%, 2% etc. denote runtime-dependent content (e.g. motor specification, turntable position specification, measured value etc.). Values in angle brackets "<>" also denote runtime-dependent values, whereby the type of content is specified more precisely.

Event number	Text	More information
15000	Startup error (logic).	
15001	Application %1 has produced an error and was restarted. Log: %2	
15002	No I/O system detected!	
15003	Error opening BUS - UART.	
15004	Failed to set up dosers.	
15005	Turntable hardware at position %1 not found!	
15006	Failed to connect to I/O-system! %1	

## 9.5 Signal light

A red/yellow/green signal light is mounted on the roof of the machine. It shows the current machine status.

Condition	RED	YELLOW	GREEN
Not initialized, emergency stop	on		
During the initialization process			on
During the cleaning process			on
Cleaning process stopped		on	
Cleaning process is canceled		on	
Cleaning cycle complete, ready for new job. Last job was successfully completed			flashes
Cleaning cycle completed, ready for new job. Last job was <u>not</u> completed successfully		flashes	

## 9.6 Emergency stop

### 9.6.1 Emergency - stop circles and effect

The emergency stop function is used to shut down the CM immediately and safely in the event of danger. It differs from the normal interruption of a cleaning cycle which is described in 5.2.4.5.

There are two emergency stop circuits:

#### 1 - Security door

Opening the safety door (2 channel) causes the following components to be switched off

- Z-axis
- Cover motor
- Basket motor
- Bath heaters
- Ultrasonic
- Dryer heating

#### 2 - Emergency stop switch

An emergency stop can be triggered by pressing the emergency stop switch. The CU4000 can also trigger an emergency stop, e.g. if a machine fault occurs. An emergency stop causes the components listed under "1 - Safety door" to be switched off and also affects the following additional components:

- Dryer - fan (power cut-off)
- Vacuum pump
- All pneumatic valves (valves go to standard position, as when the machine is switched off, e.g. water valves closed)
- Turntable motor (current cut-off)

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#### Note on the turntable motor

The power of the turntable motor is low and has therefore been classified as not relevant to safety. The turntable motor therefore remains energized when the door is opened.

## **9.6.2 Resetting the emergency stop status**

An emergency stop status is reset as follows.

- Resetting the emergency stop button
- Closing the security door
- Press the **Initialize** button on the display of the CU4000

After resetting the emergency stop status, the CM performs an initialization and is then ready for operation again.

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# 10 BACKUP

## 10.1 Generally

A backup is used to save data, for example to restore the machine status when replacing a defective control unit (CU4000).

## 10.2 Up/Download

Data can be downloaded with a PC via a web browser and sent back to the CU4000 from there (procedure: see 12 Remote access). This concerns the following data:

- Cleaning cycles
- Machine setup
- Settings (general settings, machine settings, turntable parameters), licenses
- Users
- Software (applications)

The following data cannot be uploaded:

- Job number
- Operating hours counter (e.g. vacuum pump, dryer, scavenge pump)
- Parts with a limited service life (oil change, filter change, etc.) or their "remaining time"
- Events (see 6.4 Events)
- Calibrations

## 10.3 SD card

### 10.3.1 Generally

Essential data is stored on the control unit (CU4000) and on the SD card. Essential data are

- Software (application)
- Cleaning cycles
- Machine setup
- Settings (general settings, machine settings, turntable parameters) and licenses
- Users
- Job number, operating hours counter (e.g. vacuum pump, dryer, scavenge pump) and parts with a limited service life (oil change, filter change, etc.) or their "remaining time".

Essential data cannot be changed without a functioning SD card. This means that different versions between the SD card and the control unit (CU4000) are largely avoided.

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### 10.3.2 Different versions between SD card and control unit (CU4000)

The following rules apply if the data on the SD card does not match the data on the control unit (CU4000, local file system):

- Software

The software files on the SD card are used and copied to the CU4000 (software update or software downgrade).

- Cleaning cycles

Cleaning cycles are copied from the SD card to the CU4000 and vice versa, provided there are no conflicts with identical CC numbers. If conflicts exist (e.g. non-identical CCs with the same CC number exist on the SD card and on the CU4000), the user can select whether the CCs on the SD card or the CU4000 should be used.



Cleaning cycles are overwritten!

- Machine setup

The machine setup of the SD card is used as long as the MAC (Message Authentication Code) of the machine setup is valid (the machine setup on the CU4000 is replaced). If the MAC is not valid, the machine setup of the CU4000 (local file system) is used.

- Settings (general settings, machine settings, turntable parameters) and licenses

The files on the SD card are used (settings on the CU4000 are replaced).

- Users

The user and user settings on the CU4000 are replaced with those on the SD card, but only after the administrator of the CU4000 has confirmed the replacement by entering the password. This prompt appears automatically, unless the administrator password is still the default password. In this case, the users are replaced automatically.

- Job number, operating hours counter (e.g. vacuum pump, dryer, scavenge pump) and parts with a limited service life

The data from the CU4000 is used, unless the files were created with a different CU4000 (different serial number), in which case the data from the SD card is used. This means that when a CU4000 is replaced, the operating hours counter and the next change of parts with a limited service life (oil change, filter change, etc.) are also transferred. At the same time, inserting a backup SD card will not reset the operating hours counter to the old values.

### 10.3.3 Replacement control unit (replacement of a defective CU4000 control unit)

When installing a replacement control unit (CU4000), it is sufficient to insert the SD card of the replacement control unit into the replacement control unit. The "essential data" mentioned above is then automatically transferred.

The following data is not transferred and will be lost if the control unit is replaced:

- SCADA data not transmitted (jobs)

SCADA data (jobs) are saved on the CU4000 (not on the SD card) and loaded onto a PC, provided there is a connection to the SCADA PC application. Accordingly, SCADA data that has not been transferred is lost if the CU4000 is replaced.

- Job number

- Events (see 6.4 Events)

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- Calibrations (a replacement controller (CU4000) may be calibrated, but some calibrations are specific to the built-in sensors!)
- Date, time, time zone setting

The following points must be observed when replacing the control unit:

- As the SCADA license is based on the serial number of the CU4000, a license file cannot be used on another CU4000. A new license file or a new license code is required.
- The machine must be calibrated and possibly readjusted, see 6.3.7 Calibrations
- Check the job number (to reset, see 6.2.1 Job number)
- Check the operating hours and next filter or oil change (reset see 6.3.8 Maintenance (filters, oil, etc.))

### 10.3.4 Defective SD card

As all essential data is also stored on the control unit (CU4000), a defective SD card does not result in any data loss. A defective (or missing) SD card is detected when starting up and an error message is displayed. Switch the machine off again and insert a new SD card. The essential data is copied from the CU4000 to the SD card again when the machine is started up.

To back up the SD card, the contents of the SD card can be copied using a PC. The data can also be conveniently downloaded to a PC via the *P6 Suite* and archived in this way, see 10.2 Up/Download



Only remove or insert the SD card when it is switched off.

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## 11 SOFTWARE UPDATE

A software update of the CU4000 (machine control unit) can be carried out with a PC via any web browser, see quick guide software update P6, chapter 1.3.3 Referenced documents.

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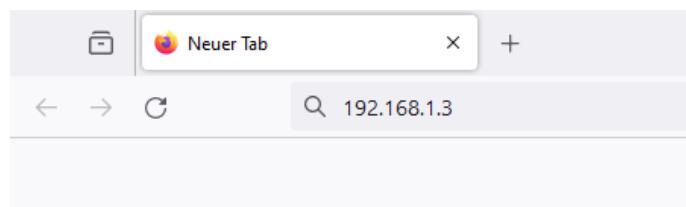
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## 12 REMOTE ACCESS

The machine can be accessed from a PC using any web browser (e.g. Firefox, Microsoft Edge, Google Chrome, etc.).

### Connect

The machine must be in the same network as the PC (connection of the machine via Ethernet). Open any web browser on the PC (e.g. Firefox, Microsoft Edge, Google Chrome etc.) and enter the IP address (e.g. <http://192.0.2.1>) or the host name of the machine (e.g. <http://IndexLine>, or <http://IndexLine.local>) in the browser. The IP address and host name of the machine can be seen in the system information (6.5 System information), and can be changed in the general settings (6.2.2 General settings).



**Fig.10.3-1 Enter IP address or host name in the browser**

### HTTP vs HTTPS:

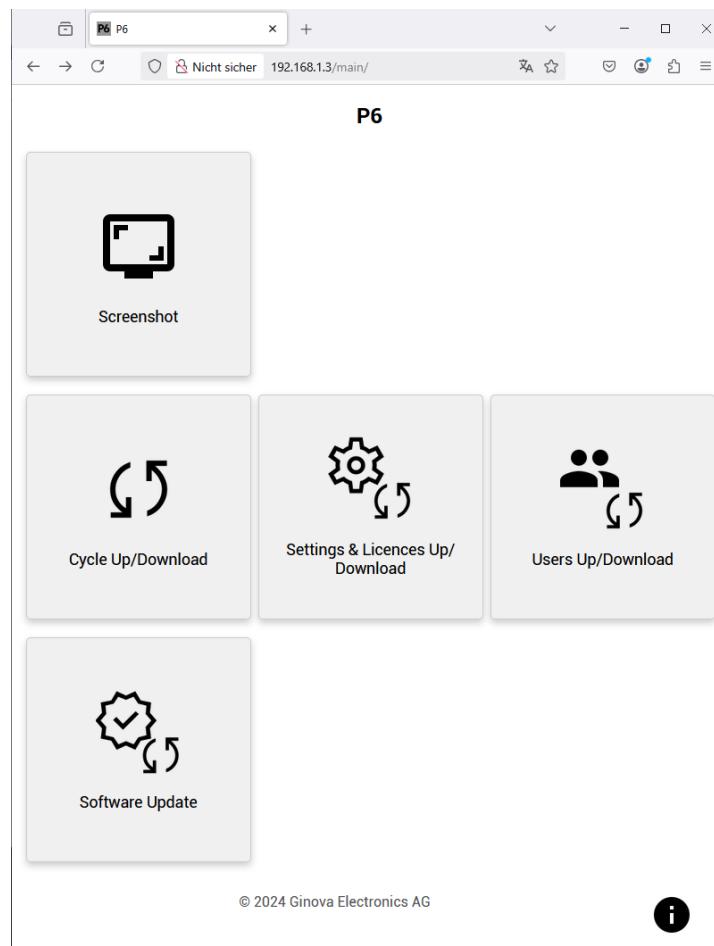
Communication takes place via HTTP. It is normally sufficient to simply enter the IP address (e.g. 192.0.2.1). If the browser displays https (e.g. <https://192.0.2.1> or <https://IndexLine>), you must switch to http (without "s", e.g. <http://192.0.2.1> or <http://IndexLine>, or maybe <http://IndexLine.local>).

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### Function overview

As soon as a connection has been established, an overview of the available functions appears:



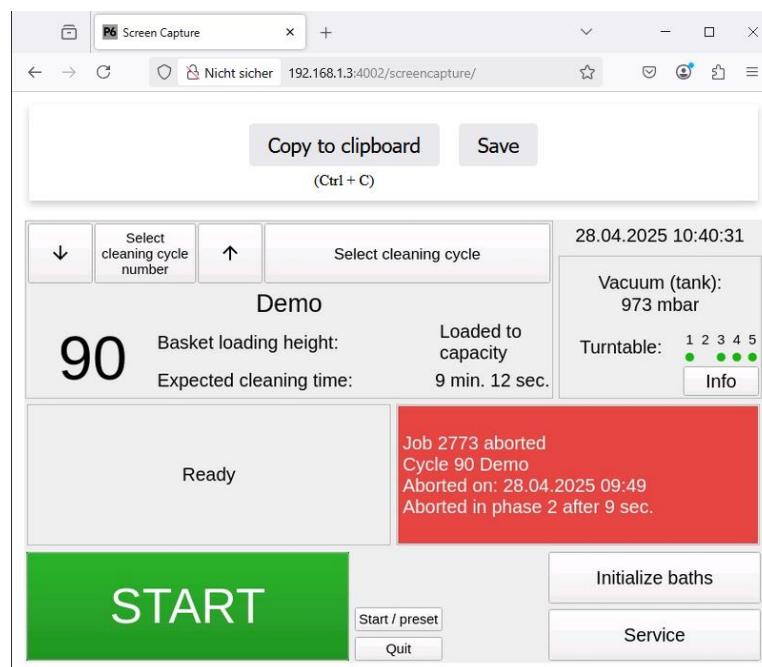
**Fig. 10.3-2 Overview of the available functions**

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## Screenshot

The display of the CU is shown in the browser. Images can be saved.



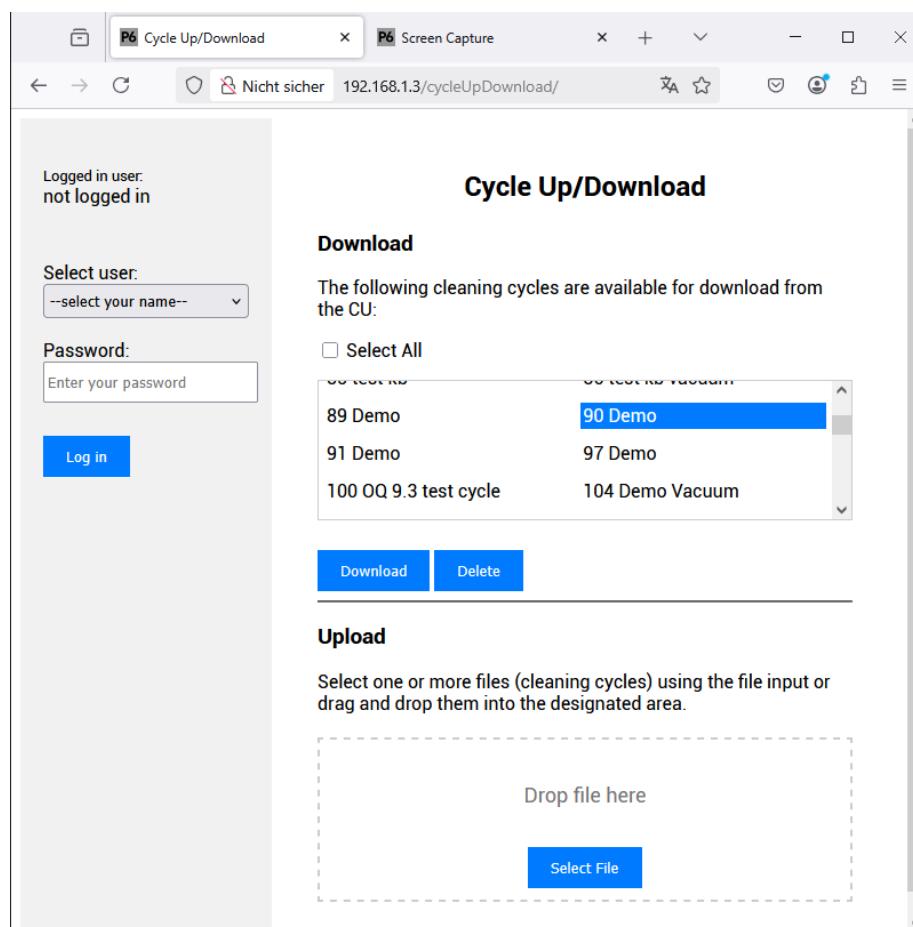
**Fig. 10.3-3 Screenshot in the browser**

## Up/Download

Various data (cleaning cycles, settings & licenses, users) can be downloaded from the machine to the PC and also uploaded from the PC to the machine. For more information, see the Up/Download operating instructions, chapter 1.3.3 Referenced documents.

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**Fig. 10.3-4 Upload/download in the web browser (example: cleaning cycles)**

#### Software update

A software update of the machine by uploading the required files as described above. For more information, see the P6 software update quick guide, chapter 1.3.3 Referenced documents.

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## 13 LICENSES AND COPYRIGHTS

The application of the CU4000 (machine control) uses the following software under the specified licenses:

Application	Software used	Licenses
P6 UI	Qt Toolkit  The Qt version used is displayed in "System Information" on the CU4000.	<a href="#">GNU Lesser General Public License, Version 3</a> (LGPL version 3) <sup>28</sup>

Further license information and copyrights can be found in the document 'Licenses used P6', see chapter 1.3.3 Referenced documents.

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<sup>28</sup> <https://doc.qt.io/qbs/attribution.html#gnu-lesser-general-public-license-version-3>