Instruction Manual

Product	Semi-automatic Bonder
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For	KTH Sweden

Revision Control

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1 Safety Information

The systems are designed to be used for the intended purpose only. If a system is used in any other way it can cause injuries to the operator or damage to the system.

1.1 General

This manual is valid with software version 2.6.02. In the interests of its customers, Paroteq reserves the right to make technical changes and enhancements to improve the functionality of this product without further notice.

In the case of unexpected errors, problems, for suggestions for improvement or criticism contact the Paroteq GmbH.

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1.2 Principle

Notice!

The user must have read and understood this document before carrying out any activity whatsoever with the machine. In case of unclear information, please contact Paroteq or authorized distributors!

1.3 Importance of safety instructions

All safety instructions in this manual must be carried out in order to avoid any injury to persons or damage to property and environment.

1.4 Non-compliance with safety instructions

Non-compliance with the safety instructions, statutory and technical regulations may lead to injuries to persons, damage to property and environment. This manual has been compiled with all necessary care. It is used exclusively for the technical description of the product and the instructions for commissioning. The warranty extends to repair or replacement of defective parts exclusively. Liability for consequential damage and consequential errors is excluded. When installing the device, the applicable standards and regulations must be observed.

1.5 Compliance and Information

In the event of any malfunction or similar technical problems for which a remedy is not described in this document please contact the manufacturer immediately.

2 Introduction

The Paroteq H-System is a semi-automated programmable four axis handling machines for versatile pick & place applications and processes in the field of micro assembly.

The H-System provides the following features:

- Two easy moveable axis (x and y) for fine alignment using micrometer screws
- Up to three programmable and motorized axis (two Z-axis and rotation)
- 3,5” touch screen colour display for controlling and programming the H-System
- Various settings for different components with own setting profiles (Tip positions and rotation, light, zoom, focus, speeds, pick up tool vacuum, tool and chuck heating sequences and dispenser)
- Programmable sequences for different process steps
- Heater with temperature controller
- HD camera for component alignment
- HD camera for process inspection
- Automatic camera toggle during placement
- Beam splitter with LED ring lights and coaxial illumination for top and bottom
- 2x external D-Sub Connectors
- Options:
    - Tool heater with temperature controller
    - Bottom heater with temperature controller
    - UV-light
    - Dispenser or dipping stamp with adhesive pot
    - Height adjustable lower chuck (10mm travel range)
    - Laser pointer
    - Vacuum generator
    - Additional process gas option

2.1 Environmental conditions

To guarantee reliable operation of the machine, we recommend the following conditions:

☐ Do not operate the control system in the following locations:

- Locations subject to direct sunlight.
- Locations subject to temperatures under 15°C or above 50°C
- Locations subject to less than 25% or more than 70% humidity.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to exposure to water, oil, or chemicals.
- Locations subject to shock or vibration.
- Locations without a stable table or installation setup.
- Locations with air draft

☐ Take appropriate and sufficient countermeasures when installing systems in the following locations:

- Locations subject to static electricity or other forms of noise.
- Locations subject to strong electromagnetic fields.
- Locations subject to possible exposure to radioactivity.
- Locations close to power supplies.

2.2 Unpacking

☐ Taking the machine out of the transport box

- Remove the transport box cover
- Unscrew the transport box locking screws
- Lift the machine off the transport box ground

☐ Prepare use of the machine

- It is recommended to wait until the machine has adapted to the room temperature
- Remove the transportation locks described in *11.4 Transportation locks*
- Exchange the tool dummy as described in *6.5 Tool exchange*
- Connect if available to compressed air, vacuum, process gas, monitor, D-Sub peripherals

  Refer to *5.2 Rear side (connections)* for further information of the Connections

  Connect to power

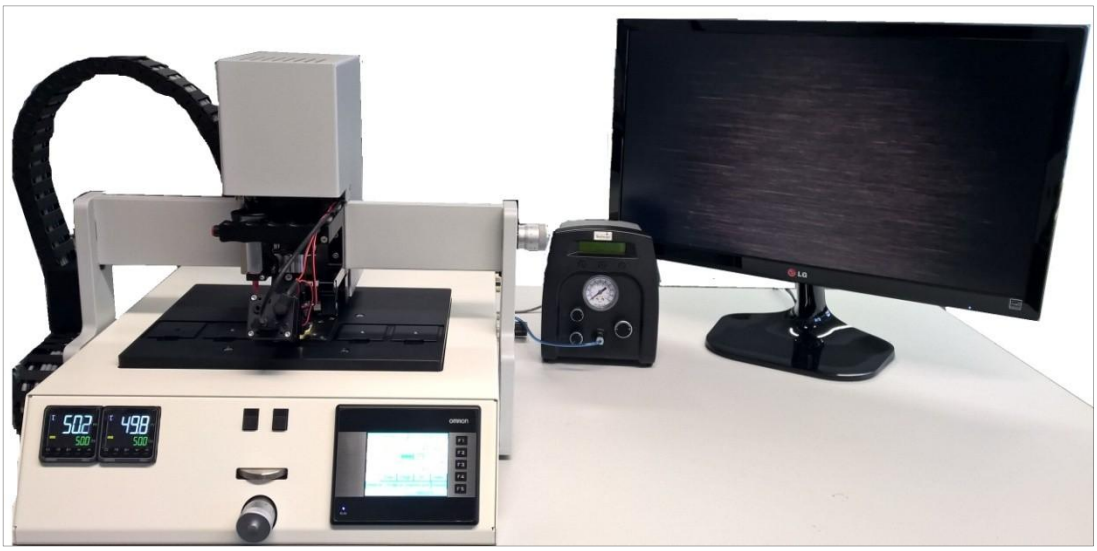
3 Table of Content

4 Technical specifications

Dimensions (W x D x H):	530 mm x 585 mm x 400 mm
Voltage:	230 V, 50 Hz, 1.5 A
Weight:	60 kg
Connections:	Power cable Compressed Air (6 mm pipe); **Pressure: 4.5 bar – 5.0 bar** • ISO 8573-1:2000[1:4:2] or Vacuum (6 mm pipe); **Pressure: -0.6 bar – 0.8 bar** N_2 (6 mm pipe); **Pressure: 4.5 bar – 5.0 bar** HDMI (alignment camera & inspection camera)
Working area:	X: 300 mm Y: 240 mm Z: 60 mm
Optics:	Focus range: 800 µm
Component size (max.):	5 mm x 5 mm
Placement accuracy:	5 µm
Force range:	20cN (min) - 2000cN (max)
Display:	3.5” colour touch screen
Heater:	14×14(240W); 25×25(240W)
Temperature controller:	48 mm x 48 mm white LCD display
Tool specifications:	Diameter: 3mm Length: 16mm

5 Peripherals

5.1 Front Side

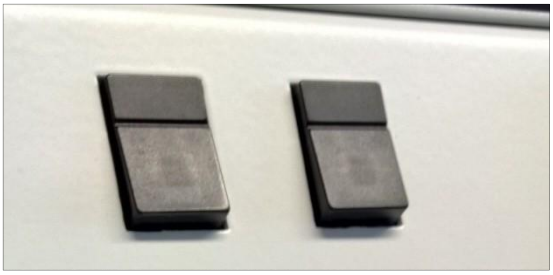


5.1.1 Heater Control Display

- Left controller:
  Bottom heater
- Right controller:
  Top heater

5.1.2 Touch Panel

5.1.3 Tactile buttons



- Left button:
  - / up / counter-clockwise
- Right button:
  + / down / clockwise

5.1.4 Alignment screw and height adjustment

By turning the hand wheel for the height adjustment clockwise, the stage will move up. By turning counter clockwise the stage will move down. The travel range is 10mm.

5.2 Rear side (connections)

5.2.1 Power cable and switch

Connect the machine to a 230V, 50Hz, 1.5A Power supply with the provided cable.

The IEC connector cable 2m item ID is 112104.

5.2.2 Vacuum and Nitrogen

On the rear side on the H-System you can find the connections for vacuum and nitrogen.

N_2 / Compressed Air (6 mm pipe);

Pressure: 4.5 bar – 5.0 bar (ISO 8573-1:2000[1:4:2])

Vacuum (6 mm pipe);

Pressure: -0.6 bar – 0.8 bar

The PUR 6x1 blue 5m pipe item ID is 112105.

5.2.3 Flow Meter

The flow meter shows the current flow of protection gas (l/min). The flow rate can be adjusted from 2 l/min to 10 l/min by turning the black knob.

5.2.4 D-Sub connectors

These plugs can be used to communicate to other devices. The connection is established by male DE-9 plugs. Power from an external source is allowed to pass through the circuit to operate at a 24 VDC (±10%) load. Power consumption must not exceed 45mA.

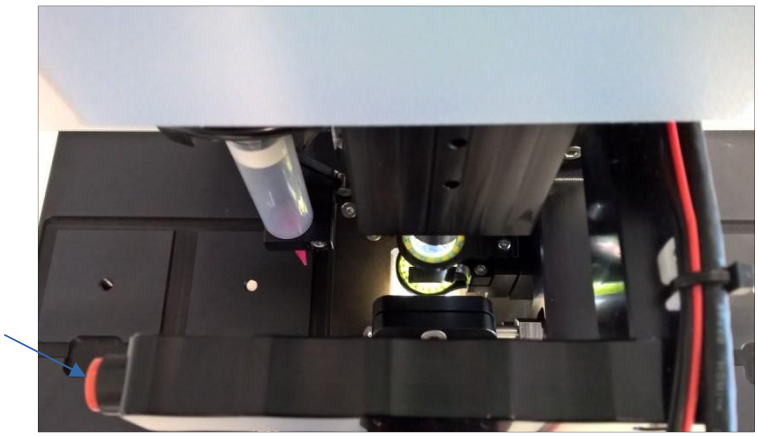
- PIN 1 white +24V
- PIN 2 brown GND
- PIN 3 green Feedback (Open collector)
- PIN 5 yellow GND

5.2.5 Video Connector

To get the images of the alignment camera and the inspection camera, there is an HDMI type A output cable at the back.

6 Mechanical controls

6.1 Handle switch



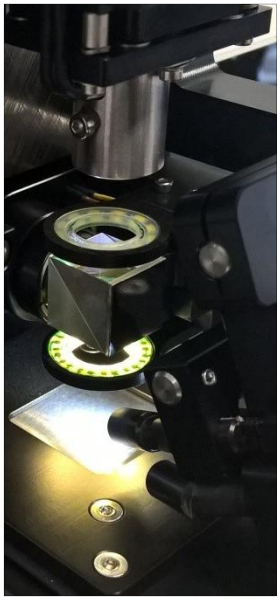
At the gantry handle there is a red switch to unlock the x and y axis for moving the gantry left/right and forwards/backwards. Releasing the handle switch will automatically lock the gantry for fine alignment in x and y using the micrometer screws. For better navigation the coaxial light will be turned on at full power while the red button is pressed.

6.2 Micrometer screws

Micrometer screws for x axis (left) and y axis (right)

The H-System provides two micrometer screws for fine alignment in the x and y axis.

6.3 Beam splitter with illumination



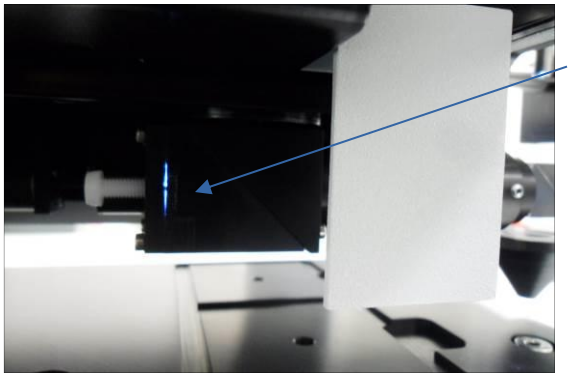
The H-System provides a beam splitter with top and bottom LED illumination for optimal component alignment. The beam splitter automatically drives out when Tip axis is at top position. The brightness level can be set separately for the top/coaxial-light and the bottom-light.

Note: Do not park the optic of the machine above the oven. To avoid damage and instability to the system, the optic should be in this position only for alignment.

Note: Make sure there are no objects preventing the retraction or extension of the beam splitter.

6.4 Coaxial Illumination

The general brightness level of the top/coaxial illumination can be adjusted via the HMI. To set different brightness level for top and bottom turn the polarizer.



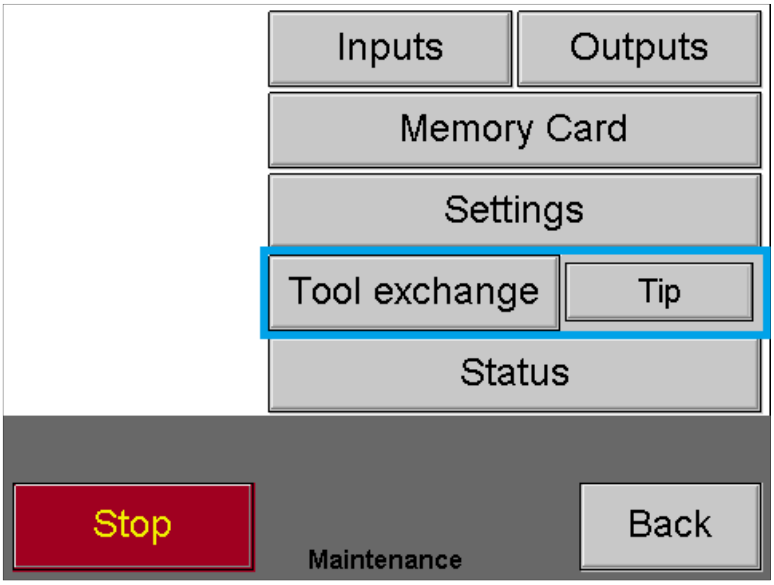
Turn this ring to adjust the illumination level

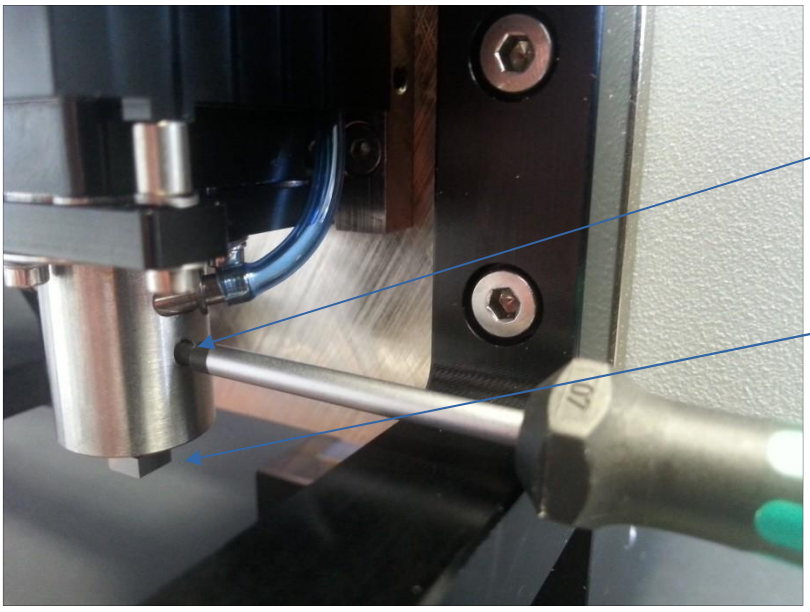
Note: Do not park the optic of the machine above the oven. To avoid damage and instability to the system, the optic should be in this position only for alignment.

6.5 Tool exchange

To exchange the tool, press “**Tool exchange**”. Then follow the instructions in the pictures below.

Open this screen by navigating 'Home' → 'Maintenance'.





To exchange the tool you have to loosen

the hexagon screw

in the shaft with a 0,9mm hexagon screw driver. Then you can carefully take out

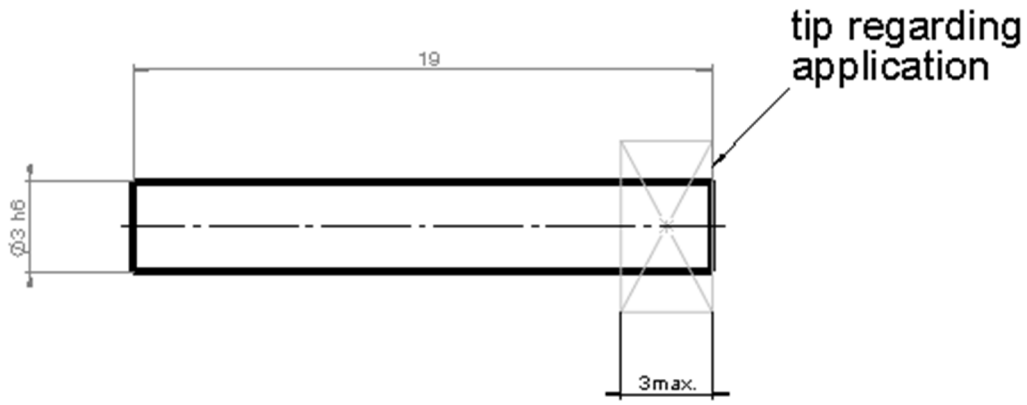
the tool

and exchange it and fix it in reverse order.

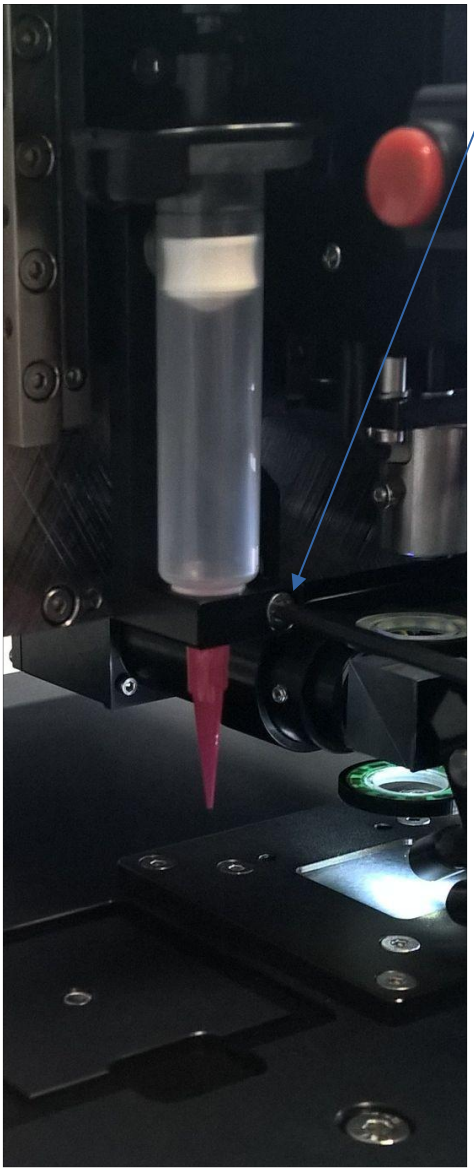
The tool for the dipper is mounted with the same screw.

To help holding the tool in the tool chuck the Tip vacuum can be activated.

6.6 Tool specifications



6.7 Cartridge exchange



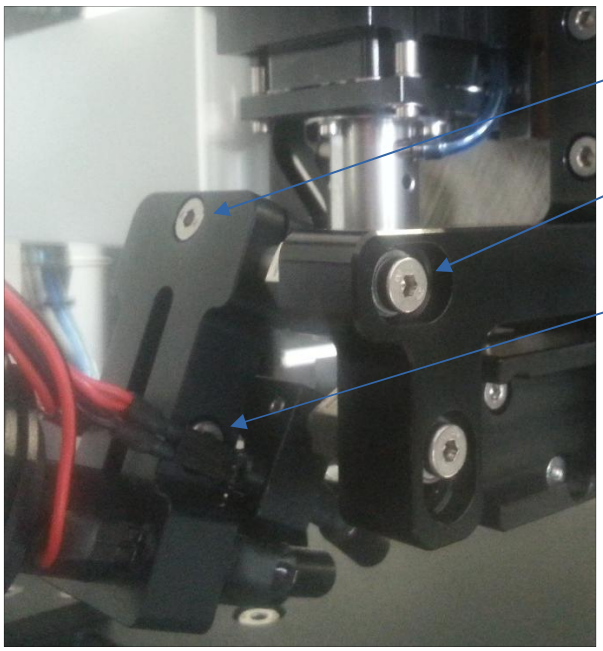
To exchange the cartridge you have to loosen

the hexagon screw

of the cartridge holder with a 2,5mm hexagon screw driver. Then you can carefully take out the cartridge and change it and fix it in reverse order.

6.8 Inspection Camera

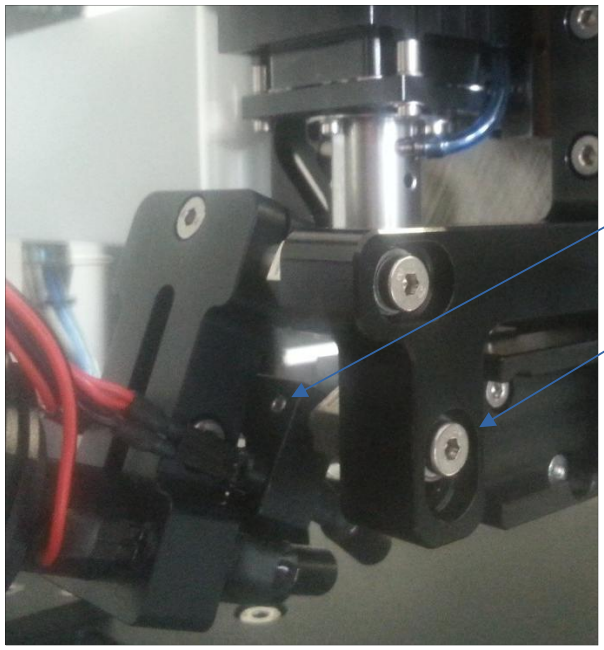
There are three different screws to adjust the inspection camera.



Adjust only one position at a time by loosening the relevant screw, while the others are tight.

6.9 UV – light

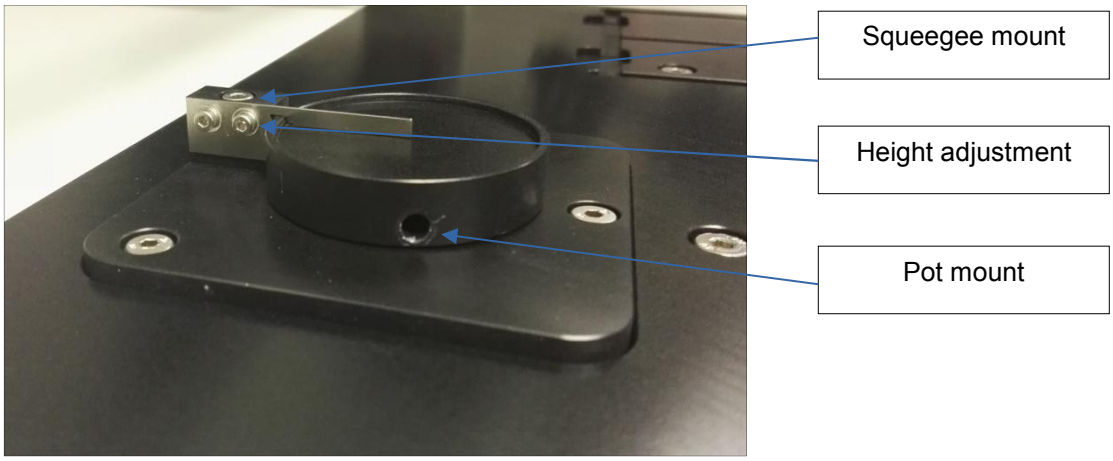
There are two different screws to adjust the UV-light.



Adjust only one position at a time by loosening the relevant screw, while the others are tight.

6.10 Epoxy pot

There are four different screws for adjusting and cleaning the dispenser.



To change the target thickness of the adhesive, loosen both screws for height adjustment and tighten them again while the squeegee is hold at the correct height.

To completely clean the whole epoxy pot, the mounting screws for the squeegee and the pot can be taken off. Remove the squeegee first, then the pot.

7 Operating with the machine

The machine provides a touch screen display for programming and controlling the device. There are a setup and a sequence mode. In the setup mode, the machine allows the operator to configure all parameters for the bonding process steps. For each component and its functions an own set of parameters (positions, focus, zoom, light, rotation, vacuum, etc.) can be configured for a repeatable process. In the sequence mode for each step (e.g. pick up/place substrate, pick up component, place bonded components) the operator can choose one of the configured setups to automatically get all the settings assigned.

7.1 Starting up the machine

When switching on the power of the machine, please wait until the display is finished with loading and the 'Log in' screen appears.

7.2 Stop and Back

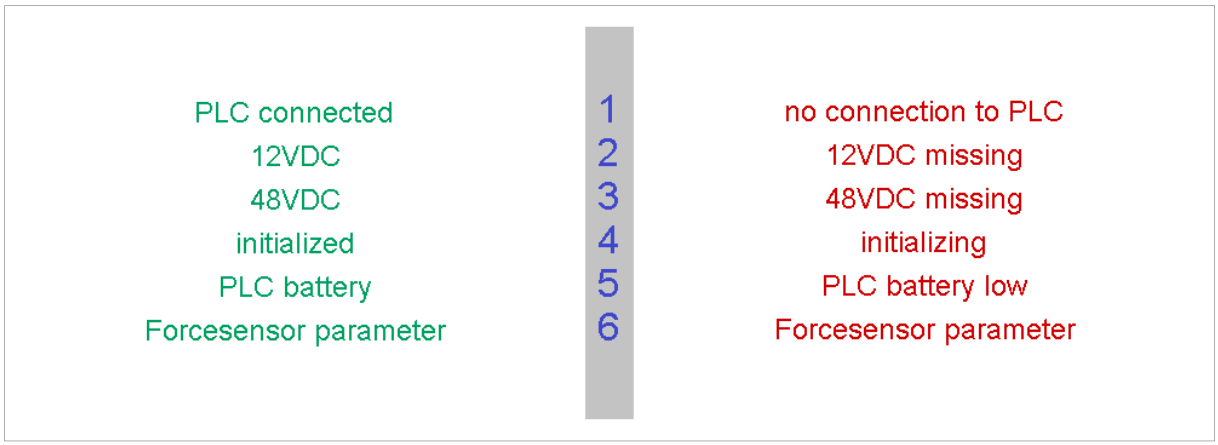
In most screens is this pair of buttons at the bottom of the screen.

When the 'Stop' button has been pressed the system will halt all actions as fast as possible. If then, the user presses the 'Confirm' button in the newly appeared pop-up screen, the machine will be referenced.

Parameter	Description / Possible Values	Data entry
Stop	Halts every action and process, then starts initializing when continue is pressed	Button
Back	Navigates to the preceding screen	Button

7.3 Load Screen

While booting the system, this screen will show status notifications.



1) no connection to PLC: If this warning appears switch off the system and contact your local dealer.

2) 12VDC: If this warning appears switch off the system and contact your local dealer.

3) 48VDC: If this warning appears switch off the system and contact your local dealer.

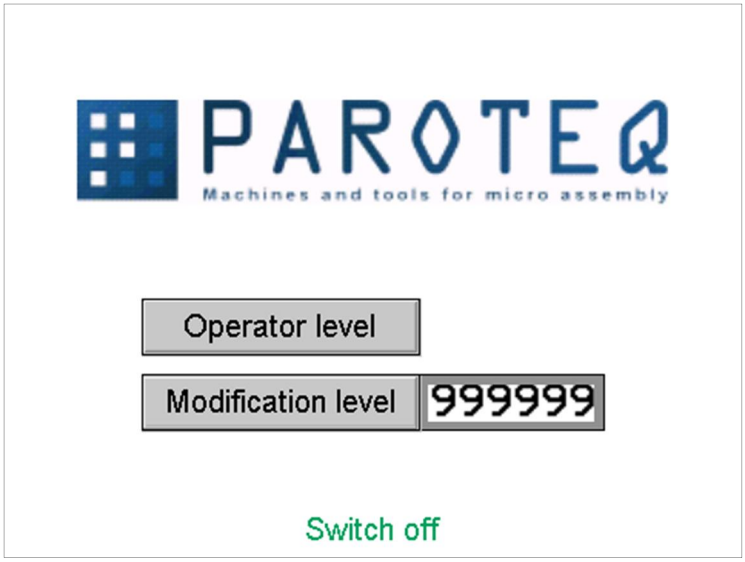
4) initializing: If this warning appears, wait for the reference run to be finished.

5) PLC battery low: If this warning appears switch off the system and contact your local dealer.

6) Force sensor parameter: If this warning appears, wait for the automatic setup to be finished.

If this screen is open for more than 30 seconds a skip button appears. This allows access for service personnel in the case of wrong settings or other malfunctions.

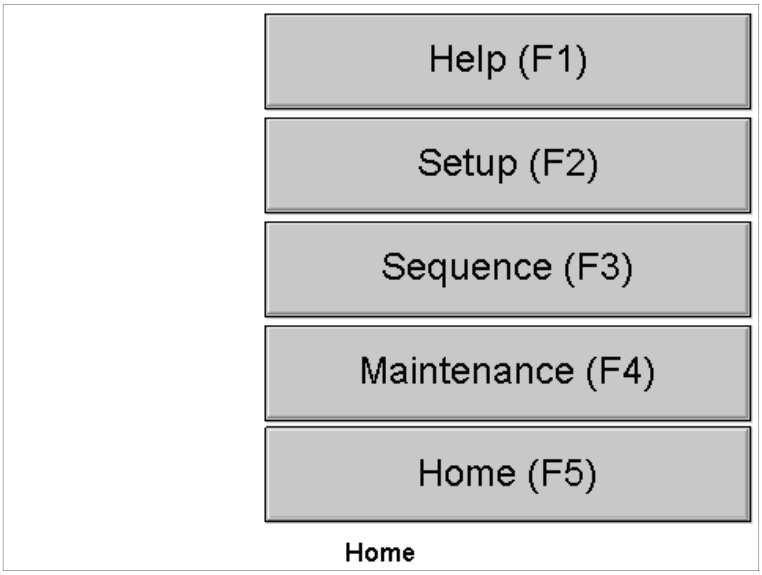
7.4 Access level



After booting the system you will encounter the 'Log in Screen'. There you can enter a password to get a higher access level. For an overview of unlocked functions see the table below. Logging into the 'Operator level' requires no password.

Access level	Operator level	Setup level	Service level 1	Service level 2
Start sequence				
Set up sequence				
Calibrate sensors				
Set up motors				
Set up cameras				

7.5 Home screen



Home

After booting the machine shows the home screen on the display. From this screen the *Help screen, Setup mode, Sequence mode* and *Maintenance screen* can be opened.

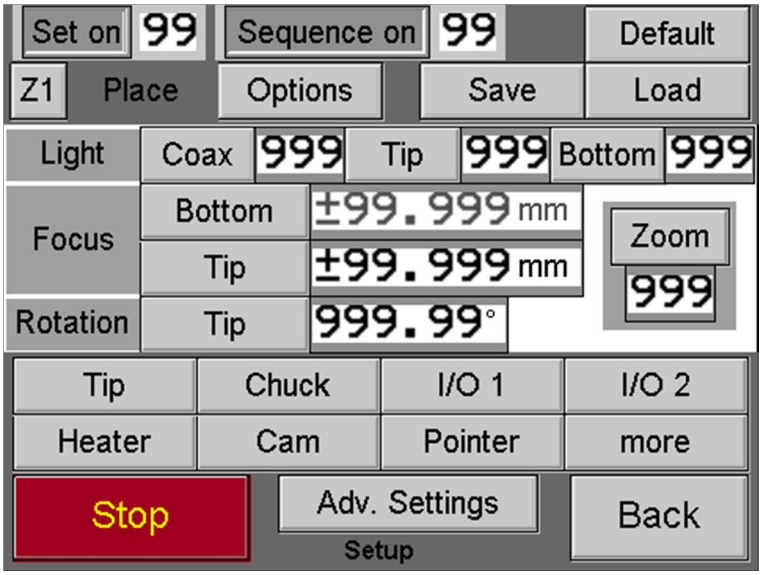
- ☐ Help (F1)
  - shows contacts for service
- ☐ Setup (F2)
  - screen for setting up sequences
- ☐ Sequence (F3)
  - screen for using predefined sequences
- ☐ Maintenance (F4)
  - shows options to change machine parameters
- ☐ Home (F5)
  - shows screen for log in

With the hardware switches on the right of the display (F1 – F5), the operator can directly open the Help (F1), Setup screen (F2), the Sequence screen (F3), the Maintenance screen (F4) or get back to the Home screen (F5).

7.6 Setup

Open this screen by navigating 'Home' → 'Setup'. Opening this screen will apply the parameters of the current sequence. This includes moving the tip and changing the heater standby temperature.

In the Setup mode the operator can activate, deactivate and set up the sequences for the Sequence mode, but also control the machine independently from the Sequence mode.



There are four different types of sequences: 'Pick', 'Place', 'Dispense' and 'Bond'. Switch between them by changing the current set up options. This and other settings are changed by accessing 'Options'. For further instructions on 'Options' and 'Advanced Settings' refer to *7.6.2 Setup Options* and *7.6.3 Advanced Settings*.

Note that either coax light or tip light can be turned on, not both at the same time.

There are 25 sets [0..24]. For every set there are 10 sequences [1..10]. Set 0 is for maintenance.

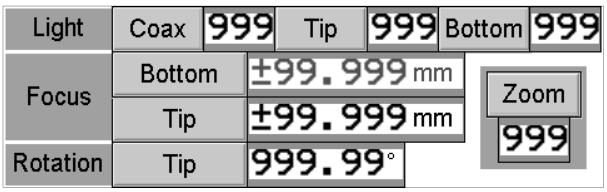
Whenever the 'Setup' screen is opened the current sequence will be loaded. To open another sequence change the set and sequence number accordingly, then press 'Load'. To create a new sequence press 'Default' to load in standard values or load another sequence as a preset.

Changes will only be permanent if 'Save' is pressed. Make sure to **save changes** before loading another sequence or opening another screen. Test sequences in the Sequence mode.

Sets and sequences can be activated and deactivated by pressing the corresponding button 'Set on/off' or 'Sequence on/off'. Those changes also have to be saved. Deactivated Sets cannot be loaded in Sequence mode. Deactivated sequences cannot be started in the Sequence mode.

In this action bar functions can be accessed, which will not be saved. They are for active use, to test functions or do a process manually. Click 'more' to open a pop-up with further options.

Leaving the set up will deactivate all functions available in the Action-bar, except the vacuum options.



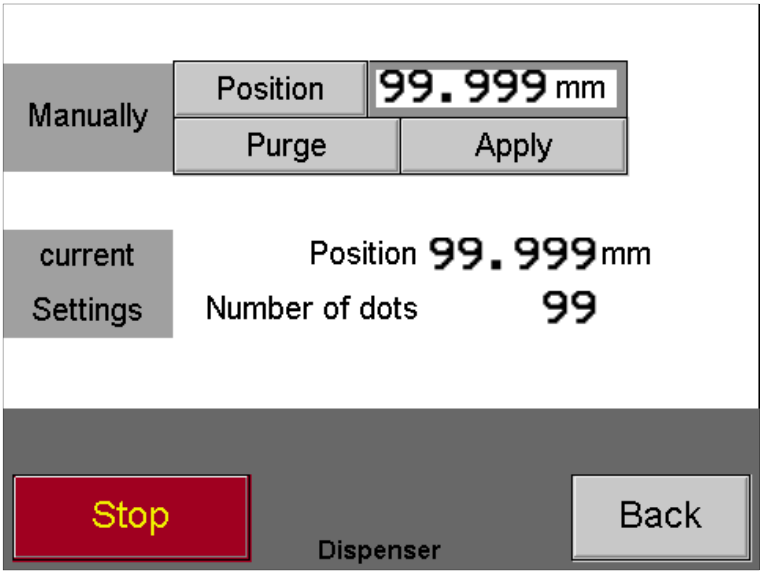
This is the main set up area. To adjust these values concentrate on the image of the camera. First select the according button, and then adjust the value. Do this by entering the value or by using the tactile buttons. This part of set up is finished, when top and bottom are in focus and clearly visible. At first get a clear bottom image, then the top image. **Tool and component must be in focus** for reliable operation, when position mode is not used.

A height difference of ~1.7mm is covered by the focus depth of the camera. Bigger differences can only be bridged by a movable table. Bigger differences can only be bridged by a movable table.

Parameter	Description / Possible Values	Data entry
Set on/off	▪ Changes, if the current Set can be loaded in the sequence screen	Toggle button
Set	▪ Loads up 25 [0..24] different sets of sequences ▪ Set 0 is for maintenance	Numeric keypad
Sequence on/off	▪ Forbids or allows the use of this sequence in the sequence screen	Toggle button
Sequence	▪ Changes between the 10 [1..10] sequence in the current Set.	Numeric keypad
Save	▪ Writes set up parameter to current sequence	Button
Load	▪ Applies parameter of current sequence to Setup	Button
Default	▪ Applies default parameter to Setup	Button
Pick'n'Place axis	▪ Changes between available axes for main operation (Tip is standard)	Toggle button
Options	▪ Changes to Setup Options screen	Button
Light Coaxial	▪ 0 % - 100 % ▪ Coaxial illumination	Numeric keypad Front switches (+ / -)
Light Tip	▪ 0 % - 100 % ▪ Top illumination	Numeric keypad Front switches (+ / -)
Light Bottom	▪ 0 % - 100 % ▪ Bottom illumination	Numeric keypad Front switches (+ / -)
Focus Bottom	▪ The focus position of the camera ▪ Configured correctly when bottom image is in focus	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Focus Tip	▪ The upper position of the Pick'n'Place axis ▪ Configured correctly when tool image is in focus ▪ Can be used to freely move the Pick'n'Place axis	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Zoom	▪ 0 % - 100 % ▪ Zooming the alignment camera	Numeric keypad Front switches (+ / -)
Rotation	▪ Middle position: 180° ▪ Travel range: 0° to 360° ▪ Resolution: 0,03° ▪ Adjusting angle of the tool	Numeric keypad Front switches (+ / -)

Vacuum Tip	▪ Turns the vacuum or additional vacuum of the pickup tool on/off	Toggle button
Vacuum Chuck	▪ Turns the vacuum for the lower chuck on/off	Toggle button
Vacuum I/O	▪ Turns the vacuum for Input/Output on/off	Toggle button
Vacuum I/O 2 (optional)	▪ Turns the vacuum for Input/Output 2 on/off	Toggle button
Heater	▪ Starts/stops the heater program	Toggle button
Camera	▪ Switches between inspection image and alignment image	Toggle button
Laser pointer	▪ Turns the laser pointer on/off	Toggle button
More	▪ Shows further options	Toggle button
Dipper	▪ Starts/stops dipping process	Toggle button
Epoxy pot	▪ Rotates epoxy pot	Toggle button
UV-light	▪ Turns the UV-light on/off	Toggle button
Dispenser	▪ Changes to Dispenser screen	Button
External	▪ Turns the external connection on/off	Toggle button
Advanced Settings	▪ Changes Screen, refer to *7.6.3 Advanced Settings* for more information	Menu navigation

7.6.1 Dispenser screen



Open this screen by navigating 'Home' → 'Setup' → 'more' → 'Dispenser'

The dispenser axis can be used freely in this screen. The current position can also be copied to the current setup as the bottom position.

Make sure to save changes by pressing 'Save' in the *Setup screen*.

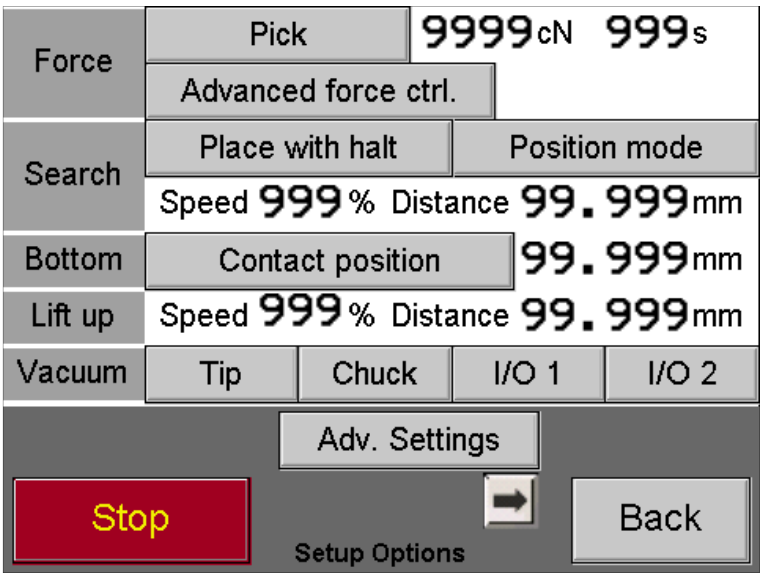
Parameter	Description / Possible Values	Data entry
Position	▪ Current position of the Dispenser axis	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Purge	▪ Activates the external dispenser	Button
Apply	▪ Copies the position to the current settings	Button
Current Settings Position	▪ Displays the bottom position for the Dispenser axis in the current setup	Numeric keypad
Number of dots	▪ Number of purges in the current sequence	Numeric keypad

7.6.2 Setup Options

Open this screen by navigating 'Home' → 'Setup' → 'Options'. Beside other settings, it can be configured which state the vacuums will have after contact with the component. Changes have to be saved in the *Setup screen*.

7.6.2.1 Pick'n'Place

This screen will open first and has options for picking and placing components.



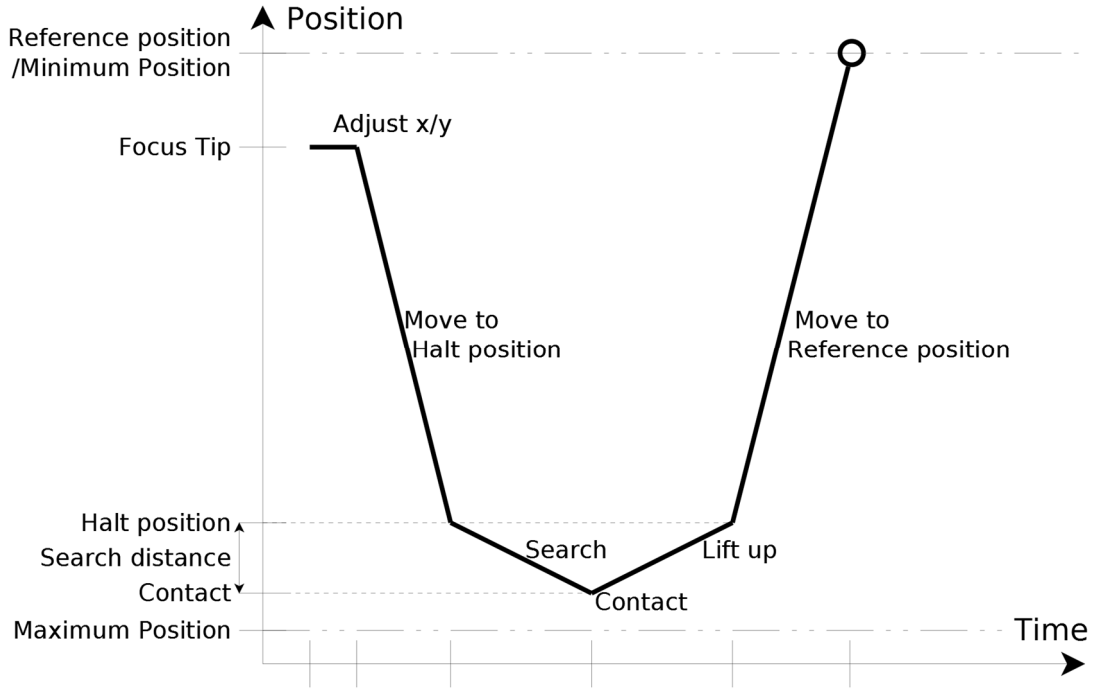
The parameters in this screen can change the handling of the component in many ways. For an overview of what parameter changes what, look at the following diagrams.

Make sure to save changes by pressing 'Save' in the *Setup screen*.

Parameter	Description / Possible Values	Data entry
Force on / off	▪ Toggles, whether the contact is driven to with the force sensor	Toggle button
Force	▪ Pressure the tool will apply	Numeric keypad
Force time (to the left of 'Force')	▪ Time how long the Bond force acts ▪ Is zero when 'Heating process' is on ▪ No effect if is zero or 'Force' is turned off	Numeric keypad
Advanced force control	▪ Turns correction of the acting force on/off	Toggle button
Search with halt	▪ Sets manual halt before contact is searched	Toggle button
Position mode	▪ Disables the automatic determination of the contact position and enables manual manipulation	Toggle button
Search Speed	▪ 10 % - 100 % ▪ percentage of the maximum search speed	Numeric keypad
Search Distance	▪ 0.200 mm – 2.000 mm ▪ The distance upwards from Contact position at which Search starts	Numeric keypad
Contact position	▪ Navigates to Positions screen, refer to *7.6.3.1 Positions* for more information	Menu navigation

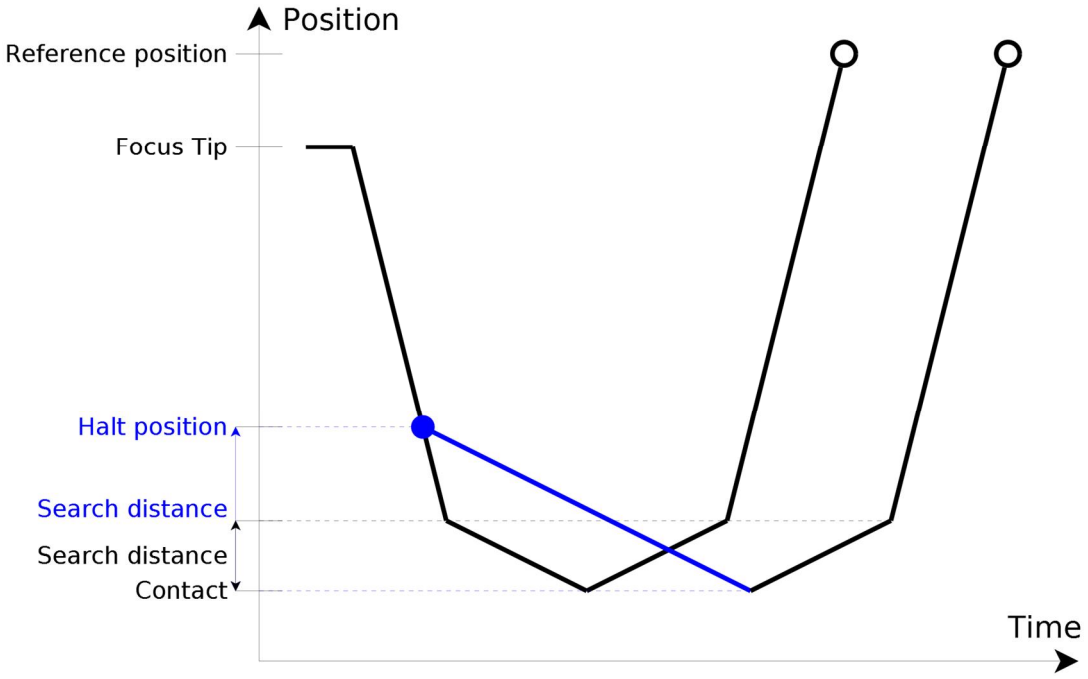
Contact position	▪ Position where contact will be made ▪ **This value must not be smaller than 40.000mm**	Numeric keypad
Lift up Speed	▪ 10 % - 500 % ▪ percentage of the maximum search speed	Numeric keypad
Lift up Distance	▪ 0.200 mm – 2.000 mm ▪ The distance upwards from Contact position Pick'n'Place axis will be lifted	Numeric keypad
Vacuum Tip	▪ State which the vacuum at the tool will be switched to	Toggle button
Vacuum Chuck	▪ State which the vacuum at the assembly place will be switched to	Toggle button
Vacuum I/O1	▪ State which the vacuum will be switched to	Toggle button
Vacuum I/O2	▪ State which the vacuum will be switched to	Toggle button
Advanced Settings	▪ Changes Screen, refer to *7.6.3 Advanced Settings* for more information	Menu navigation
Navigation arrow	▪ Changes Setup Options Screen for more Options	Menu navigation

Parameter diagrams



Search distance set up

Positive values only.

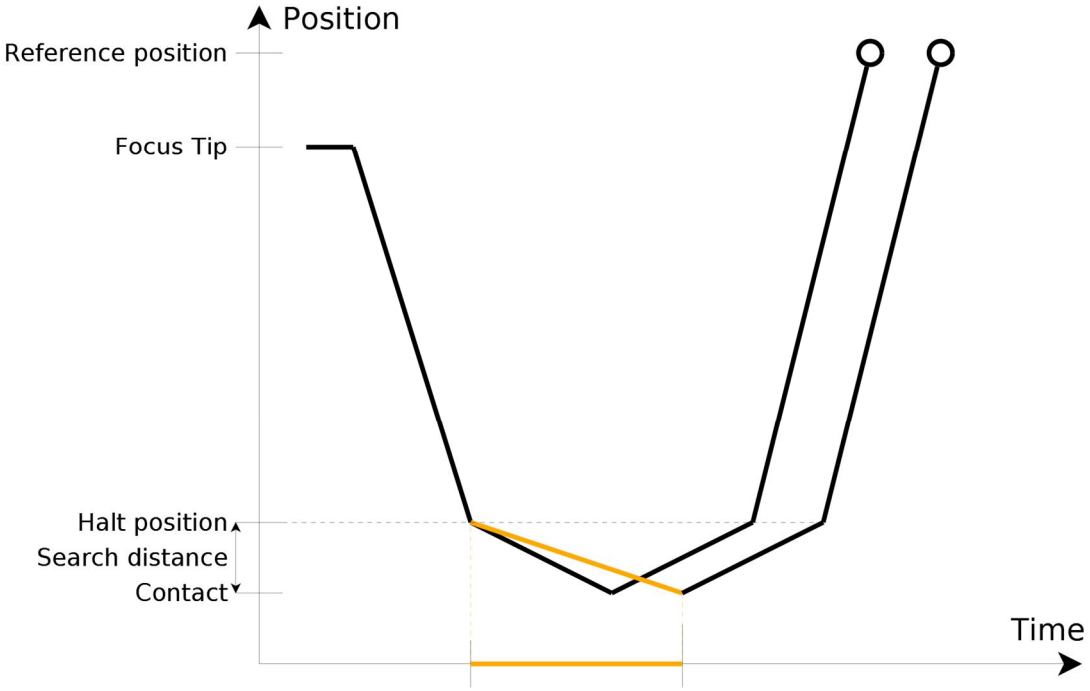


Pick/Place with halt set up

Only on/off operator.

Search speed set up

In percent of Force sensor maximum speed

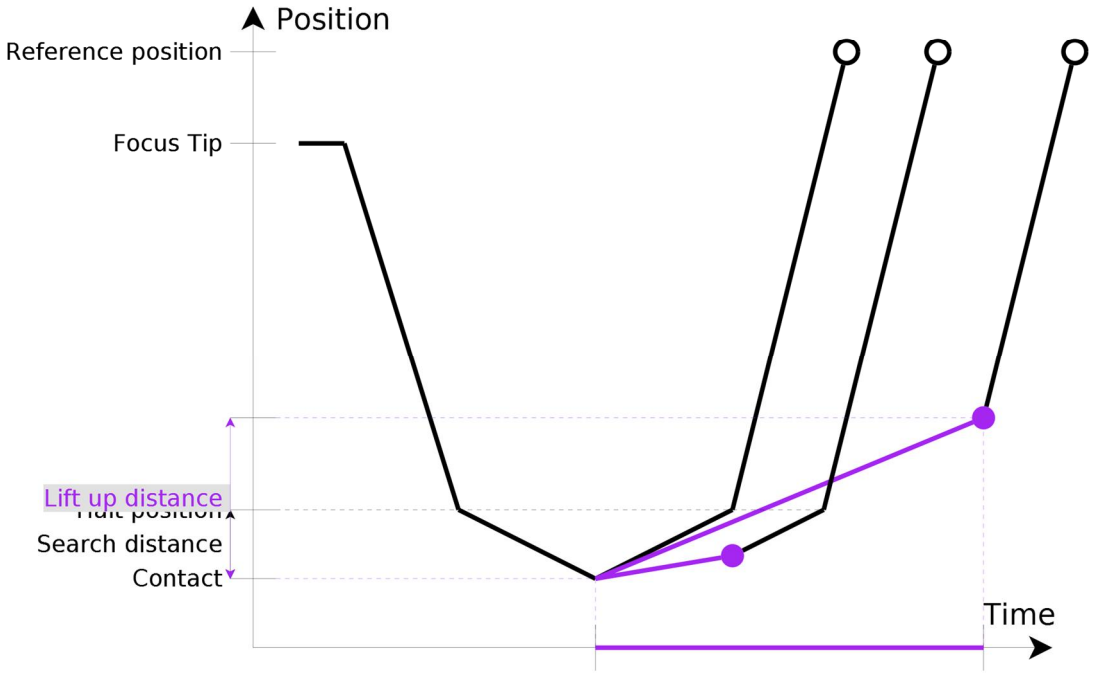


A slow lift up over longer distances can be used to lift components from a gel pack.

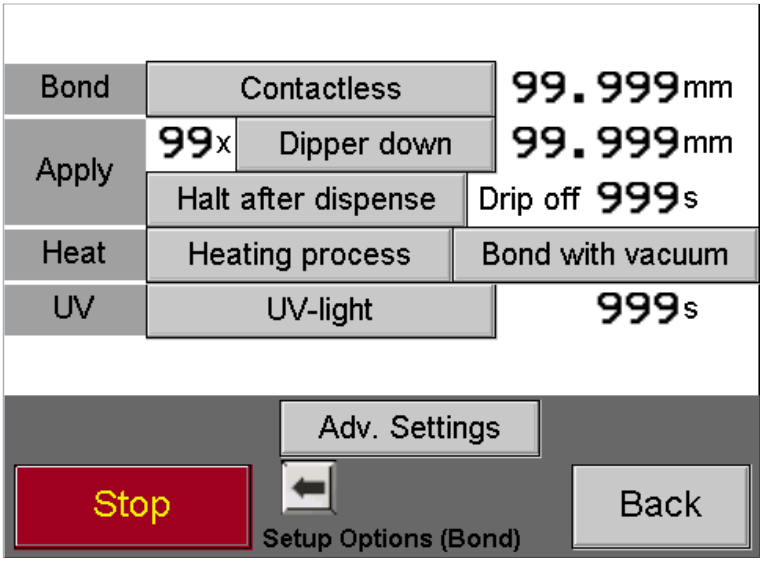
A slow lift up over shorter distances can be used with high pressure bond forces.

Lift up speed and distance set up

Speed in percent of Force sensor maximum speed



7.6.2.2 Bond



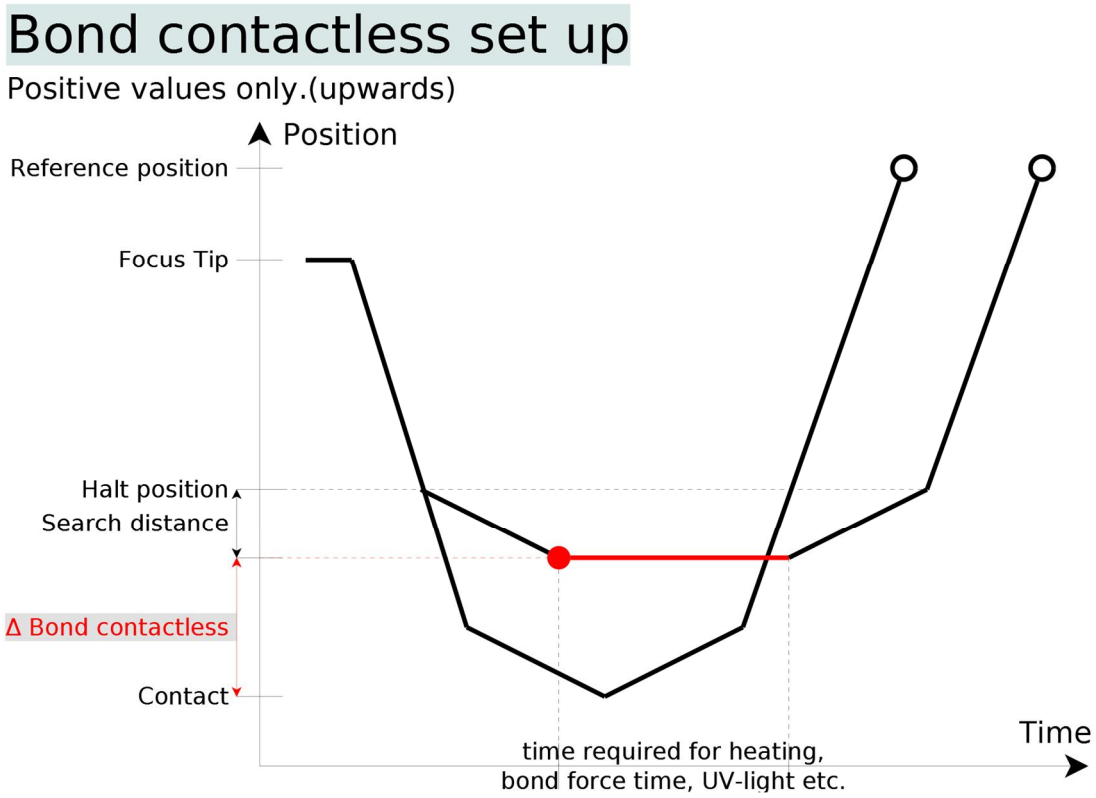
This screen will open as the second screen for options when another than 'Pick' is chosen as the current operation.

When placing a component there are several options, for example heating, dispensing, dipping or bonding with pressure.

Make sure to save changes by pressing 'Save' in the *Setup screen*.

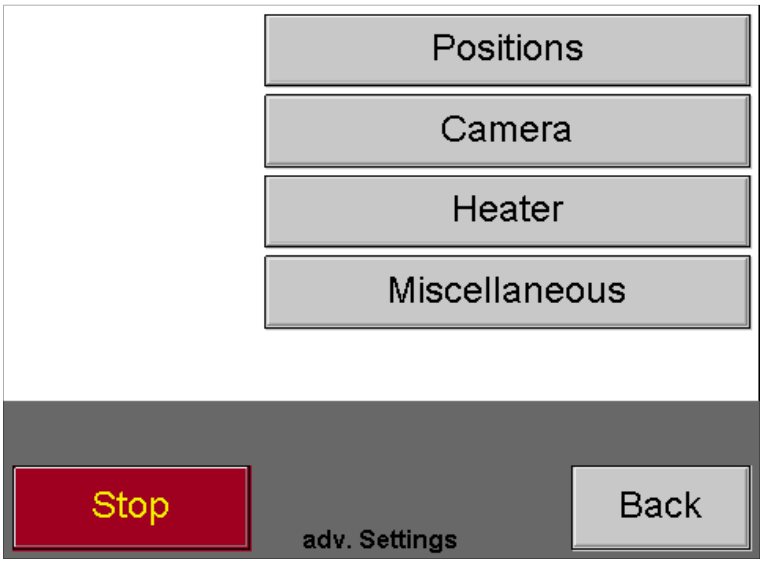
Parameter	Description / Possible Values	Data entry
Bond contactless	▪ Gives the halt position relatively upwards from the normal contact ▪ Turns off Force	Numeric keypad
Dispense adhesive / Dipper down	▪ Number of dispense operation / ▪ Number of dip down movements (epoxy pot turns on every dip down)	Numeric keypad
Apply distance	▪ Position of dispense operation	Numeric keypad
Halt after dispense	▪ For visual inspection	Toggle button
Drip off	▪ Wait after dispense operation	Numeric keypad
Heating process	▪ Process defined in advanced settings	Toggle button
Bond with vacuum	▪ Turns tip and chuck vacuum on/off while bonding	Toggle button
UV-light	▪ Time the light will be switched on	Numeric keypad

Process diagrams



7.6.3 Advanced Settings

Open this screen by navigating 'Home' → 'Setup' → 'Advanced Settings'

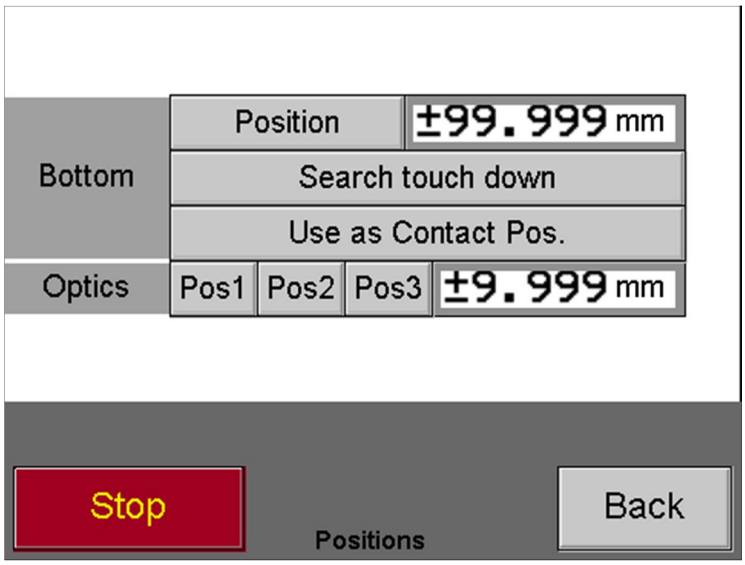


The 'Advanced settings' contain more options, which are needed more rarely.

- ☐ Positions
  - various settings for motors
- ☐ Camera
  - crosshair settings
- ☐ Heater
  - various settings for the heater controller
- ☐ Miscellaneous
  - other options

7.6.3.1 Positions

Open this screen by navigating 'Home' → 'Setup' → 'Advanced Settings' → 'Positions'.



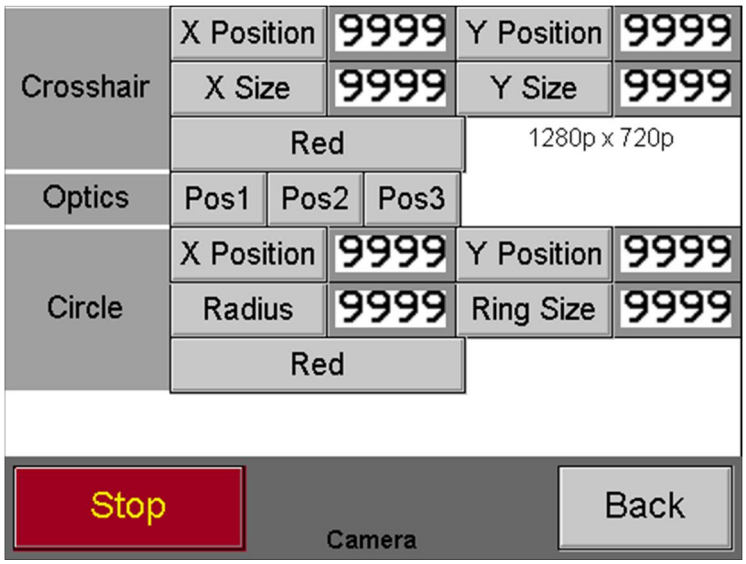
The positions here apply to all sequences.

Make sure to save changes to 'Focus bottom' by pressing 'Save' in the *Setup screen*.

Parameter	Description / Possible Values	Data entry
Current position	▪ Position of the Tip axis	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Search touch down	▪ Start searching for touchdown position ▪ The search speed is the same set in *7.6.2 Setup Options*	Toggle button
Use as Contact Position	▪ Use the current position of the pickup tool as the Contact position in the current Setup ▪ Configured correctly when bottom image is in focus	Toggle button
Optics Positions	▪ Shift the alignment image in the y axis ▪ 3 separate position available ▪ Position 1 is the standard position ▪ -5.000mm max	Numeric keypad Front switches (+ / -) **(+ down, - up)**

7.6.3.2 Camera

Open this screen by navigating 'Home' → 'Setup' → 'Advanced Settings' → 'Camera'.



The video signal has a resolution of 1280 by 720 pixels. The crosshair can be positioned freely inside this image.

Each of the 3 positions has separate Circle information.

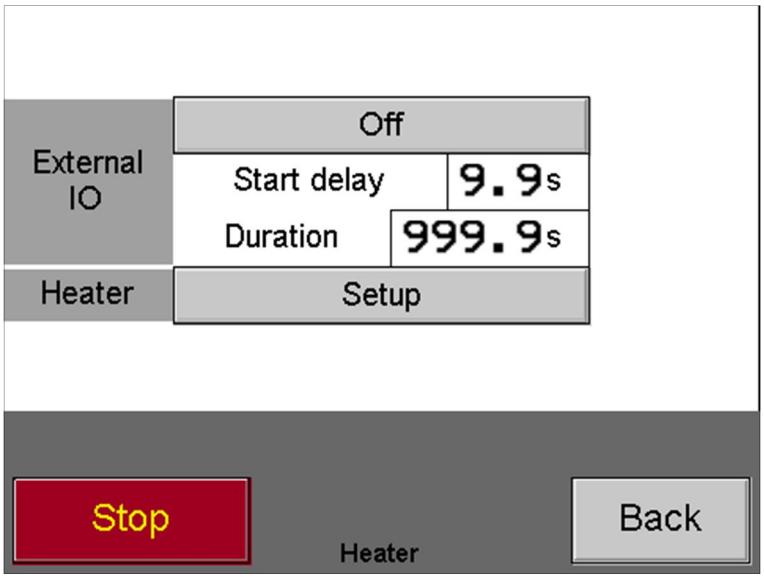
Make sure to save changes by pressing 'Save' in the *Setup screen*.

Parameter	Description / Possible Values	Data entry
Crosshair X Position	▪ 0 – 1280 pixel ▪ position of vertical line	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Crosshair Y Position	▪ 0 – 720 pixel ▪ position of horizontal line	Numeric keypad Front switches (+ / -) **(+ down, - up)**
X Size	▪ 0 – 1280 pixel ▪ width of vertical line	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Y Size	▪ 0 – 720 pixel ▪ height of horizontal line	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Crosshair Colour	▪ Black, white, red, green, blue, cyan, magenta, yellow	Toggle button
Optics position	▪ Shifts between 3 available alignment image positions ▪ Every position has its own Circle marker information	Toggle buttons
Circle X Position	▪ 0 – 1280 pixel ▪ Centre of Circle marker	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Circle Y Position	▪ 0 – 720 pixel ▪ Centre of Circle marker	Numeric keypad Front switches (+ / -) **(+ down, - up)**

Circle Radius	▪ Inner radius of the Circle marker	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Circle Ring Size	▪ Width of the Circle marker	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Circle colour	▪ Black, white, red, green, blue, cyan, magenta, yellow	Toggle button

7.6.3.3 Heater

Open this screen by navigating 'Home' → 'Setup' → 'Advanced Settings' → 'Heater'.

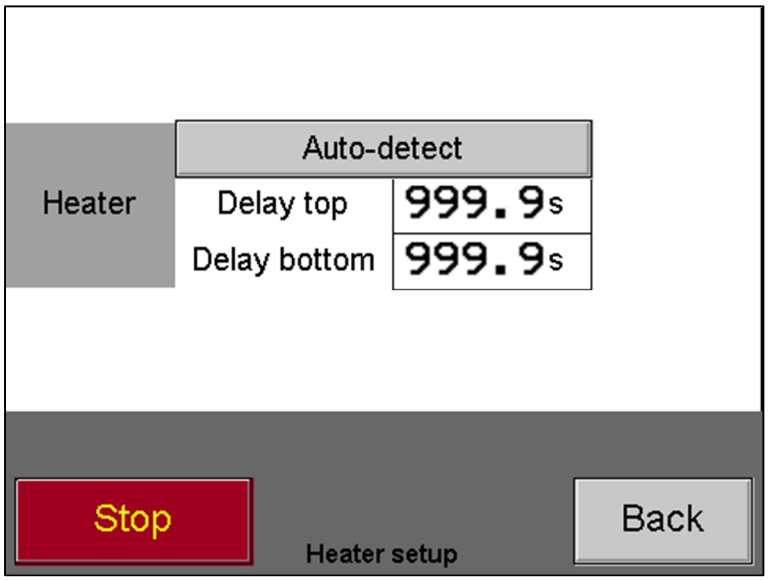


Changes do not have to be saved in the *Setup screen*, they are in effect immediately.

Parameter	Description / Possible Values	Data entry
External activation	▪ Turns the activation of the external connection while heating on/off	Toggle button
External start delay	▪ How long after start of heating the external connection is turned on	Numeric keypad
External duration	▪ The external connection is turned off after operating for this duration	Numeric keypad
Heater Setup	▪ Navigates to 'Heater setup' screen, refer to *7.6.3.3.1 Heater setup* for further information	Menu navigation

7.6.3.3.1 Heater setup

Open this screen by navigating 'Home' → 'Setup' → 'Advanced Settings' → 'Heater' → ‘Setup’.



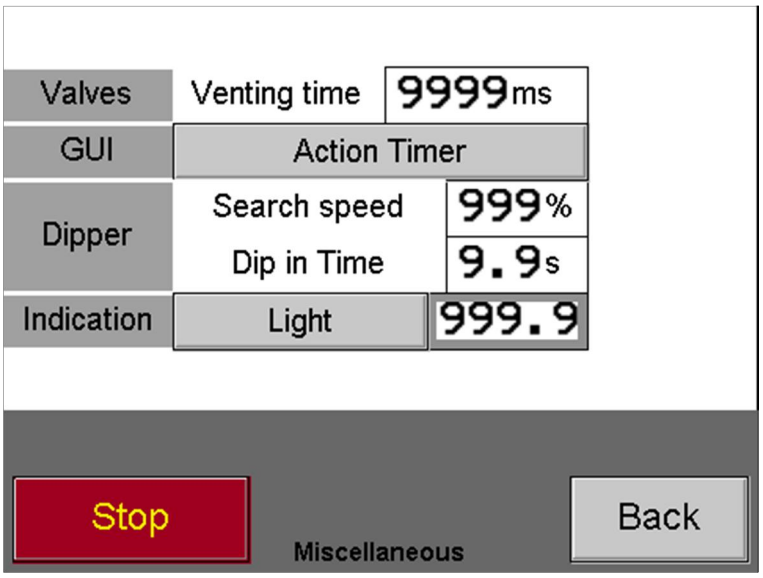
In this screen only the start of each heater can be timed. Refer to 8. *Configuring Omron E5CC temperature controller* for other settings.

Note: Do not park the optic of the machine above the oven. To avoid damage and instability to the system, the optic should be in this position only for alignment.

Parameter	Description / Possible Values	Data entry
Heater Auto-detect	▪ **Starts current heating process** ▪ Will change Delay top or Delay bottom, so that both heater reach working temperature SP1 at the same time	Toggle button
Delay top	▪ Delay activation of working temperature SP1 top heater, after start of heating process	Numeric keypad
Delay bottom	▪ Delay activation of working temperature SP1 bottom heater, after start of heating process	Numeric keypad

7.6.3.4 Miscellaneous

Open this screen by navigating 'Home' → 'Setup' → 'Advanced Settings' → 'Miscellaneous'.

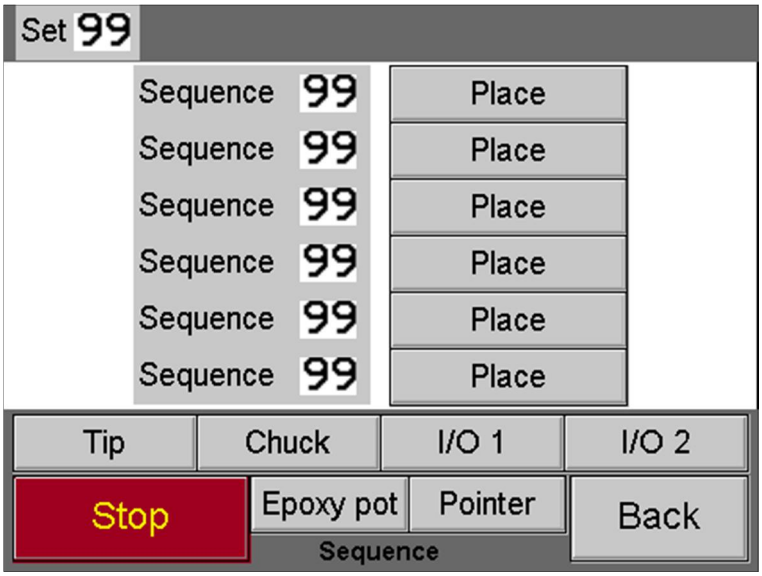


Changes do not have to be saved in the *Setup screen*, they are in effect immediately.

Parameter	Description / Possible Values	Data entry
Valve venting time	▪ Time delay after which switching valve is considered finished	Numeric keypad
GUI action timer	▪ Turns time display for operations on/off	Toggle button
Dipper search speed	▪ 2 – 5 % ▪ speed of search touchdown, relative to normal speed	Numeric keypad
Dip in time	▪ How long the adhesive stamp remains in contact	Numeric keypad
Indication Light	▪ Brightness of coax light when X/Y-is move to indicate optics position ▪ 0% will switch off this function	Numeric keypad Front switches (+ / -) **(+ down, - up)**

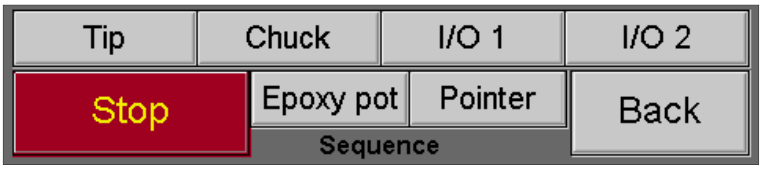
7.7 Sequence

Open this screen by navigating 'Home' → 'Sequence'.

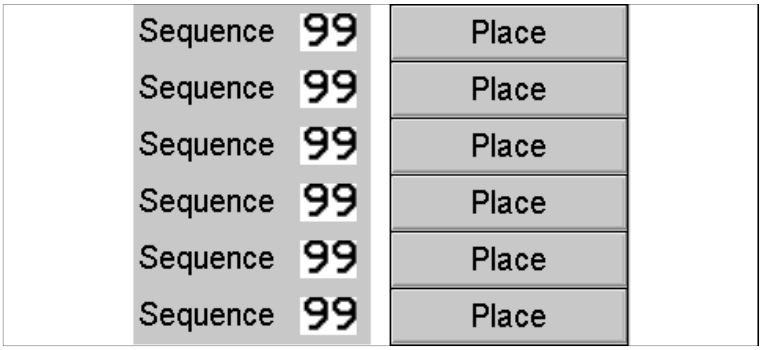


This screen allows easy access to all sequences and is the mainly used screen for 'Pick', 'Place', 'Bond' and 'Dispense' operations.

Before starting an operation make sure the correct set is selected.

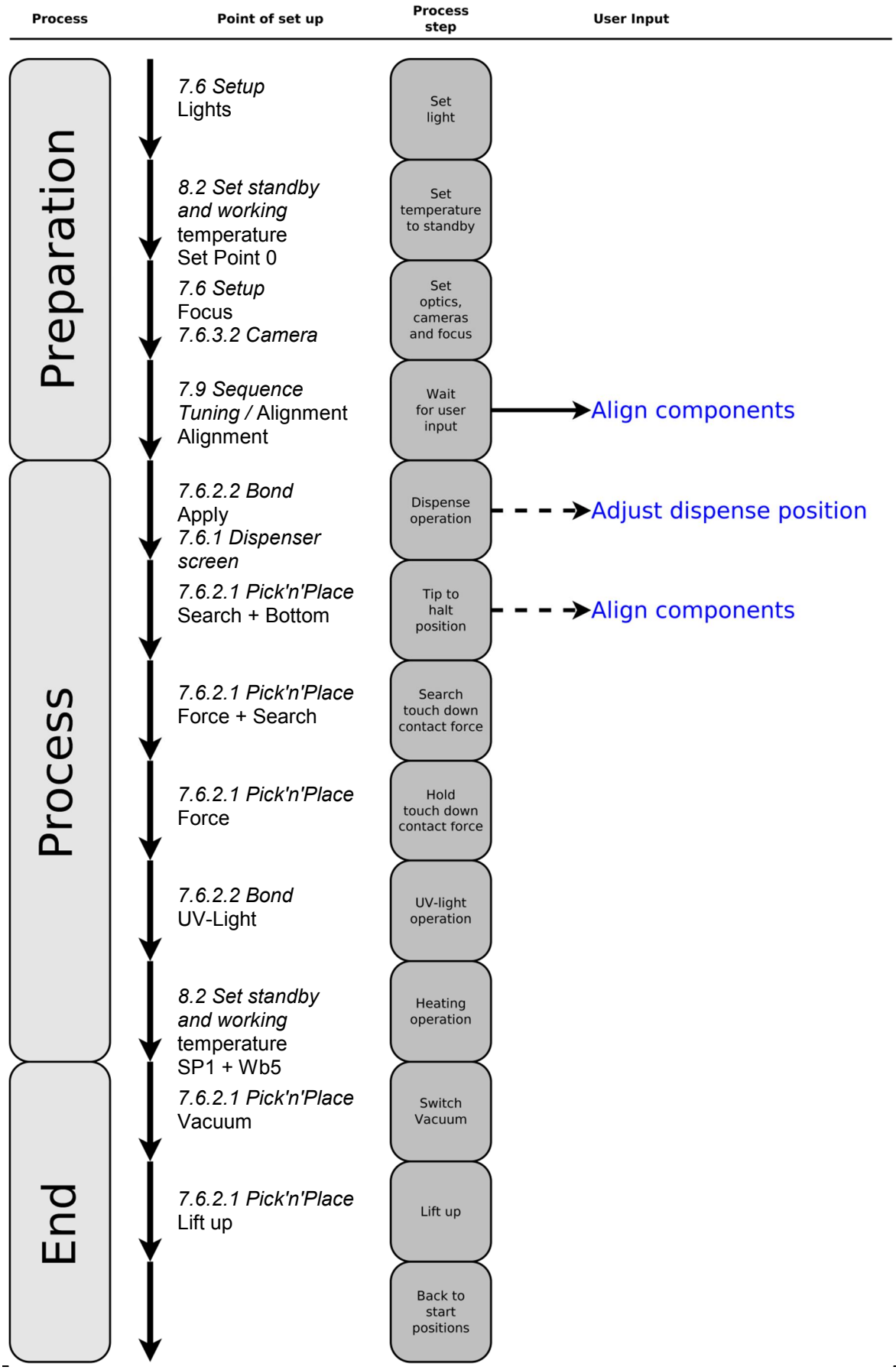


In this action bar, all vacuums can be switched on and off. If a sequence is in operation, the machine will switch them all like specified in the 'Setup' options. Also, if existing, the 'Epoxy pot' can be turned and the laser 'Pointer' can be switched on.

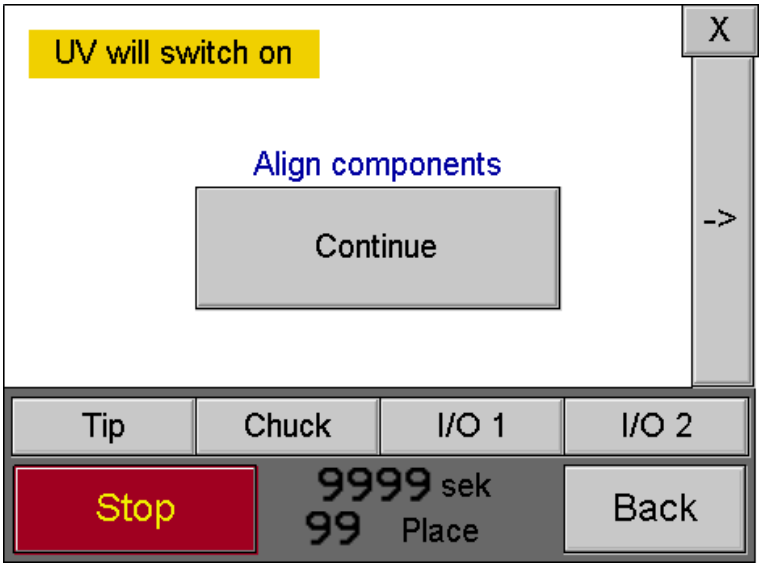


Pick a row to select a sequence, enter the number of the sequence and press 'Change' to choose between a 'Pick' or 'Place'/'Bond'/'Dispense' operation. To start the sequence press the according 'Pick' / 'Place' / 'Bond' / 'Dispense' button.

The following schema is an overview of the order of steps of a sequence and the necessary user interactions.


Process
Point of set up
Process step
User Input
Preparation
Process
End
7.6 Setup
Lights
8.2 Set standby and working temperature
Set Point 0
7.6 Setup
Focus
7.6.3.2 Camera
7.9 Sequence Tuning / Alignment
Alignment
7.6.2.2 Bond
Apply
7.6.1 Dispenser screen
7.6.2.1 Pick'n'Place
Search + Bottom
7.6.2.1 Pick'n'Place
Force + Search
7.6.2.1 Pick'n'Place
Force
7.6.2.2 Bond
UV-Light
8.2 Set standby and working temperature
SP1 + Wb5
7.6.2.1 Pick'n'Place
Vacuum
7.6.2.1 Pick'n'Place
Lift up
Set light
Set temperature to standby
Set optics, cameras and focus
Wait for user input
Dispense operation
Tip to halt position
Search touch down contact force
Hold touch down contact force
UV-light operation
Heating operation
Switch Vacuum
Lift up
Back to start positions
Align components
Adjust dispense position
Align components

7.8 Pop-up screens



While a sequence is running or another operation has been started, pop-up screens will guide through the process. The action bar is also available here. Pressing 'Back' in this screen will quit and stop the current sequence, but not activate the stop function for the machine.

In the according case, press 'Continue' to advance operation.

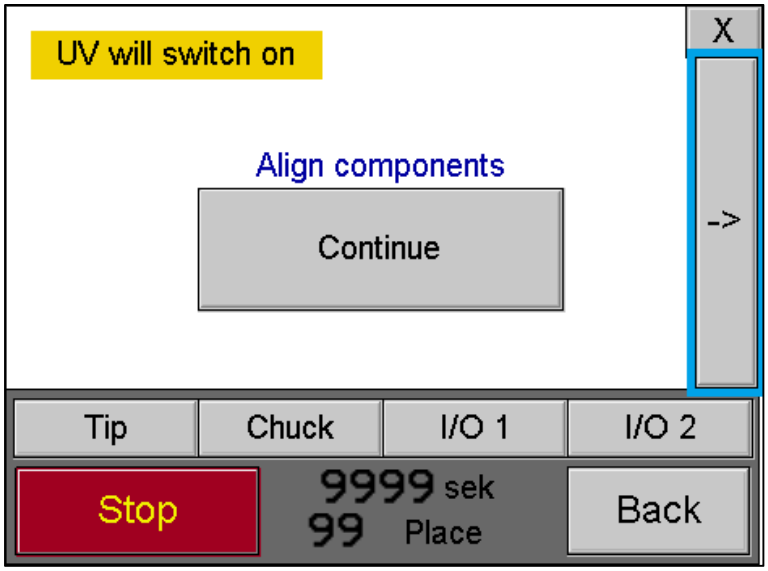
Message	Description
UV will switch on	▪ Warns of activation of the UV-light when the process continues; Attention: UV-light can be harmful without protection
Position not in focus	▪ In the Setup screen, the saved focus position cannot be in focus
Vacuum tool is on	▪ The pickup sequence cannot be started, because there might still be a component on the tool
No change of screen	▪ The desired change of screen is currently not allowed
Tool position is too big	▪ In the Setup screen, the saved position for the tool prevents the beam splitter optic from being used
Access denied	▪ The desired change of screen is not allowed in the current access level ▪ Log in with an adequate password to access this option
Heater necessary	▪ The operation cannot be executed, a set up heating element is missing
Start loop	▪ Confirm to start loop
Restart machine	▪ Switch power for the machine off and on again
Start record sensor	▪ Confirm to start recalibration of the sensor
Save complete	▪ Changes have been successfully applied
Moving to position	▪ An axis is currently changing its position
Searching Touchdown	▪ Adjusting pick and place-axis to certain pressure
Start motor-operation	▪ Starting routine in motor controller
Initialize	▪ Reference run for motors ongoing

Vacuum chuck is off	▪ The component on the chuck is not fixed ▪ Press ‘Continue’ to continue the current process
Machine will be reset	▪ The Tip vacuum will switch off
Apply to setup	▪ The value has been applied to the current setup ▪ Press ‘Continue’
Tip goto	▪ The Two-hand-safety must be used to continue
Load complete	▪ The Setup has been loaded
Heating	▪ The heating process is active
Align components	▪ Confirm, when alignment is finished
Wait	▪ Process in progress, please wait
Adjust dispense pos.	▪ Align dispenser tool with micrometer screws is and continue
Adjust dipp pos.	▪ Align dipper tool with micrometer screws is and continue
Stop activated	▪ The Stop-function has been activated, press continue to reset the machine
Critical error	▪ A critical error has occurred

7.9 Sequence Tuning / Alignment

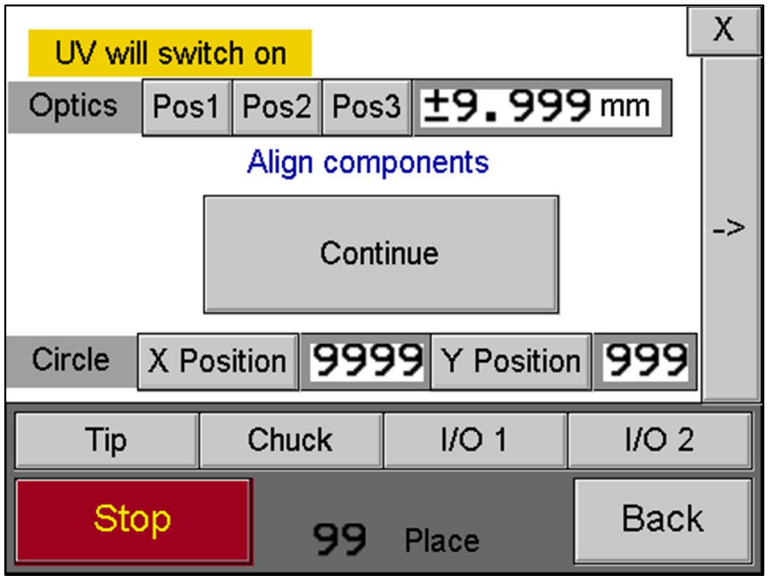
The Alignment is a step in a Sequence and the corresponding Popup/Screen will show.

Alignment camera with zoom



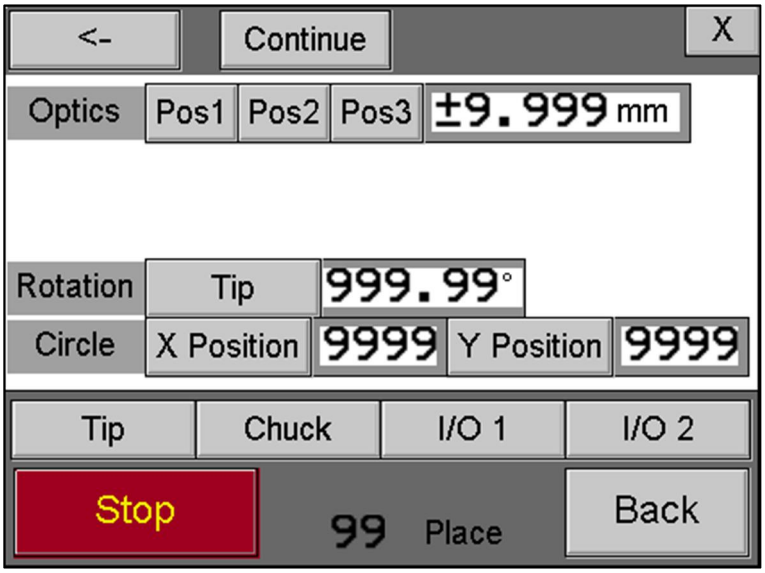
At one point during a Sequence the Alignment options can be extended by clicking the Button with an Arrow at the right hand side.

Alignment camera with circle marker



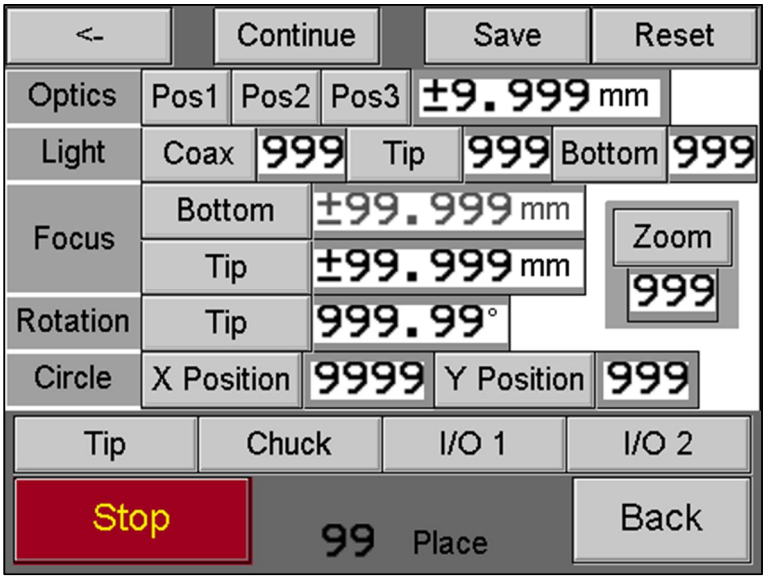
When Circle Markers are available this Screen will show instead. Use the Optics and Circle Marker options as described for the Camera Screen. Refer to *7.6.3.2 Camera* for more information.

Operator Mode



In Operator Mode the Alignment will expand to this screen.
Clicking 'Continue' will continue the current Sequence.
Use the options as described in the Setup screens. Refer to *7.6 Setup* for more information.

Tuning Mode



When not in Operator Mode the Alignment will expand to the Sequence Tuning screen.
Clicking 'Save' will save all changes made in this screen to the started Sequence.
Clicking 'Reset' will load the last saved changes of this Sequence.
Clicking 'Continue' will continue the current Sequence.
Use the options as described in the Setup screens. Refer to *7.6 Setup* for more information.

8 Configuring Omron E5CC temperature controller

The Omron E5CC temperature controller has five keys on its front side. After switching on the H-System the temperature controller opens the “operation level” and shows the current temperature and the configured standby temperature.

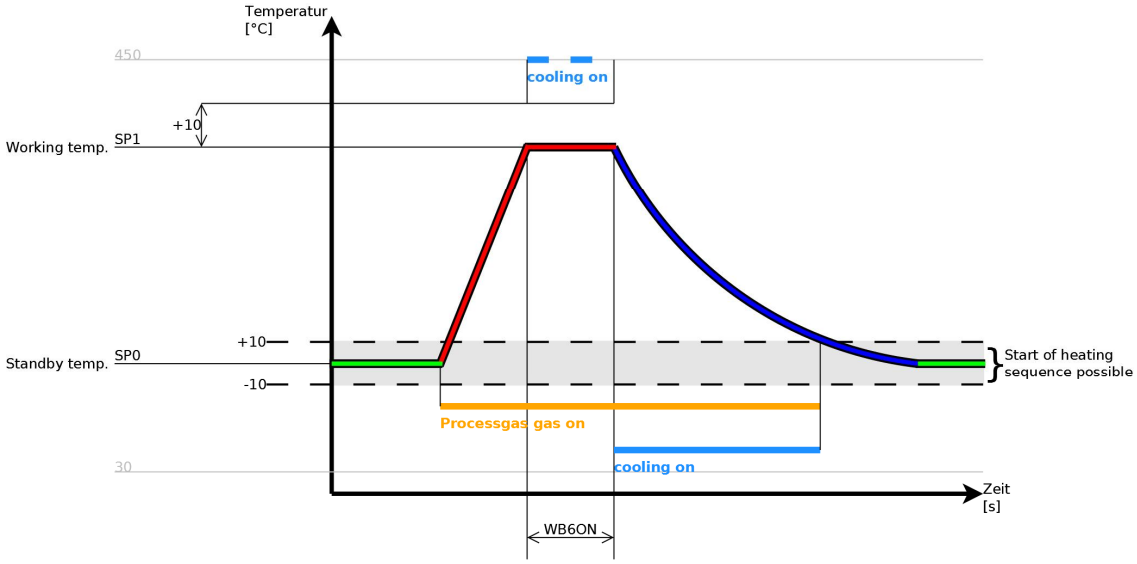
Level key.
Pressing this key less than 1 second opens the “adjustment level”. (For setting standby and working temperature, heater on time).
When you press this key within the adjustment you get back to the operation level.

Mode key.
Pressing this key runs through all configurable parameters of the adjustment level.

Shift key.

Up and down keys.
With those keys the value of a parameter can be edited.

8.1 Current temperature controller setup



☐ Start of heating sequence is possible between +/-10°C of standby temperature

☐ When heating sequence started:

- Process gas starts with the adjusted flow level shown on the flow meter
- Temperature will increase to the actual working temperature
- If the working temperature was exceeded by more than 10 °C it will be cooled down to the working temperature

☐ Parameter “Work bit 6 on” is the time the heater will be on.

- ☐ After the time specified in “Work bit 6 on”, the heater will be turned off and cooling starts
- ☐ Cooling stops when standby temperature is reached
- ☐ Process gas stops when cooling stops

8.2 Set standby and working temperature

Note: Standby temperature should not permanently exceed 100 °C.

The working temperature must be at least 11° higher than the standby temperature!

	Press the level key once.
PF	Press the mode key until you see the “Set point 0” parameter for adjusting the standby temperature. 
	Edit the standby temperature with the shift, up and down keys.
PF	To adjust the working temperature, press the mode key once again until the “Set point 1” parameter appears. 
	Edit the working temperature with the shift, up and down keys.
	Press the level key once to get back to the operation level.

8.3 Set “heater on”- time

	Press the level key once.
PF	Press the mode key *(if “Changed Parameters Only” is set “on”; refer to “8.4.2 Modification mode”)* until the “Work bit 6 on” parameter for adjusting the “heater on”- time appears. 
	Edit the “heater on” time (seconds) with the shift, up and down keys.
	Press the level key once to get back to the operation level.

8.4 Set protections

8.4.1 Operator mode

	Press **level key and mode key together** for 3 seconds to get into the protect level.
	The “Operation / Adjustment protect” parameter is displayed. 
	Set the value to “3” with the up and down keys.
	Press the mode key once until the “Initial setting / communication protect” parameter appears. 
	Set the value to “2” with the up and down keys.
	Press the mode key once until the “Setting change protect” parameter appears. 
	Set the value to “on” with the up and down keys.
	Press **level key and mode key together** for 1 second to get back to the operation level.

8.4.2 Modification mode

Press **level key and mode key together** for 3 seconds to get into the protect level.

The “Operation / Adjustment protect” parameter is displayed.

Set the value to “0” with the up and down keys.

Press the mode key once until the “Initial setting / communication protect” parameter appears.

Set the value to “2” with the up and down keys.

Press the mode key once until the “Setting change protect” parameter appears.

Set the value to “off” with the up and down keys.

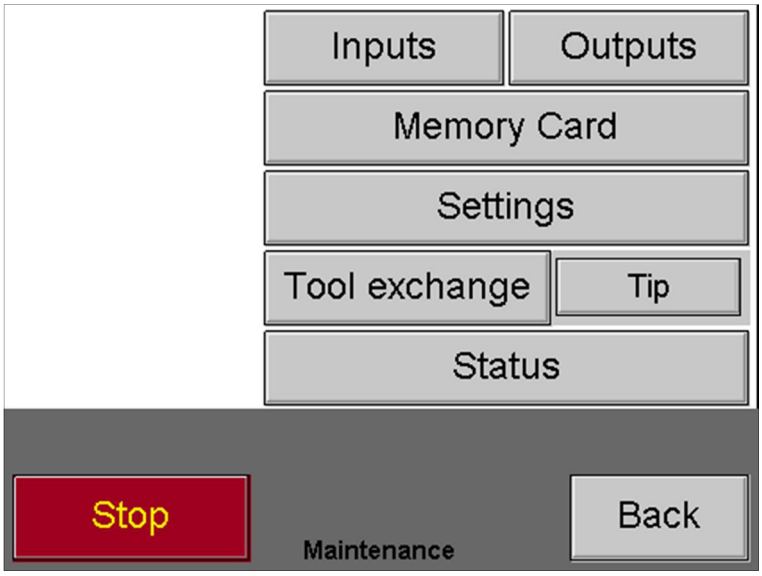
Press the mode key 2x until the “Changed Parameters Only” parameter appears.

Set the value to “on” with the up and down keys.

Press **level key and mode key together** for 1 second to get back to the operation level.

9 Maintenance screens

Open this screen by navigating 'Home' → 'Maintenance'.

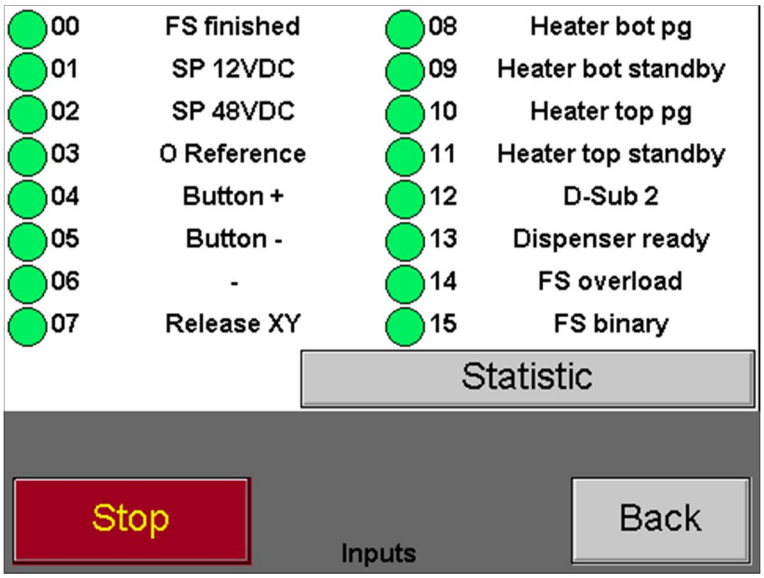


The maintenance screens will show in- and output states of the PLC unit for service issues and setups and settings for motors, sensors and optics. There are also the options for tool exchange and more options.

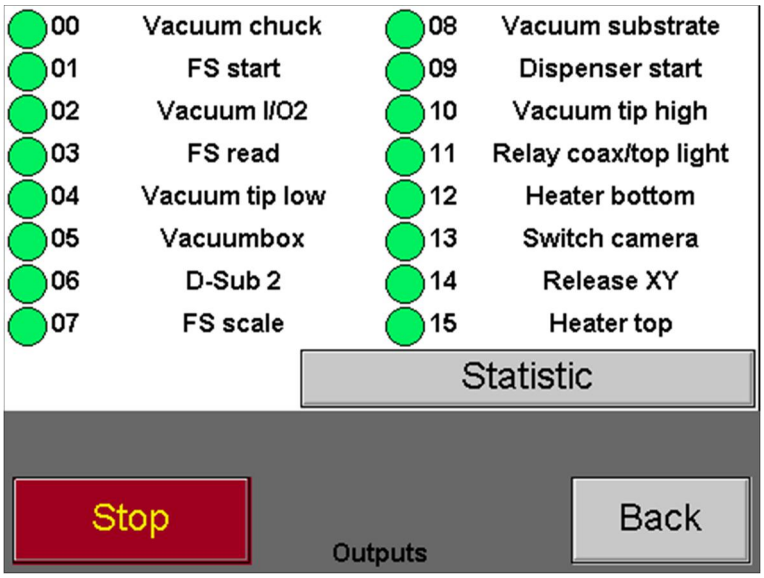
For more information on the button 'Tool exchange' refer to *6.5 Tool exchange*.

9.1 Inputs / Outputs / Statistic

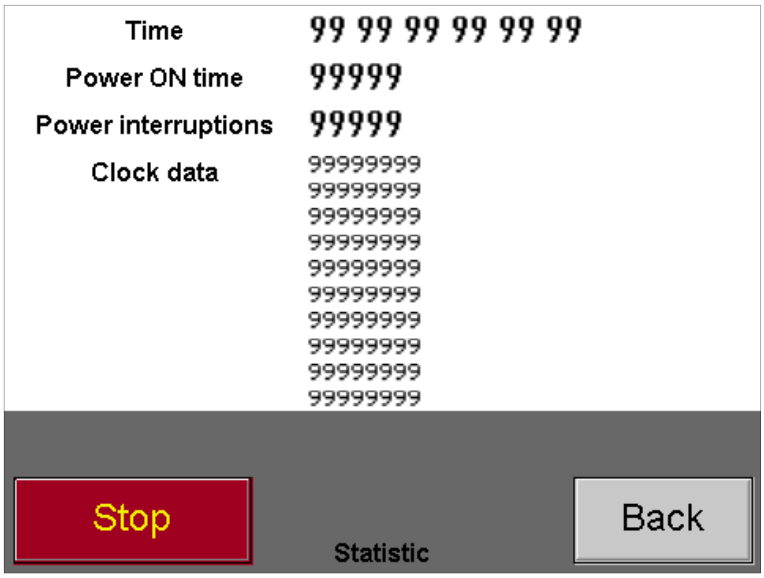
Open this screen by navigating 'Home' → 'Maintenance' → 'Inputs'.



Open this screen by navigating 'Home' → 'Maintenance' → 'Outputs'.



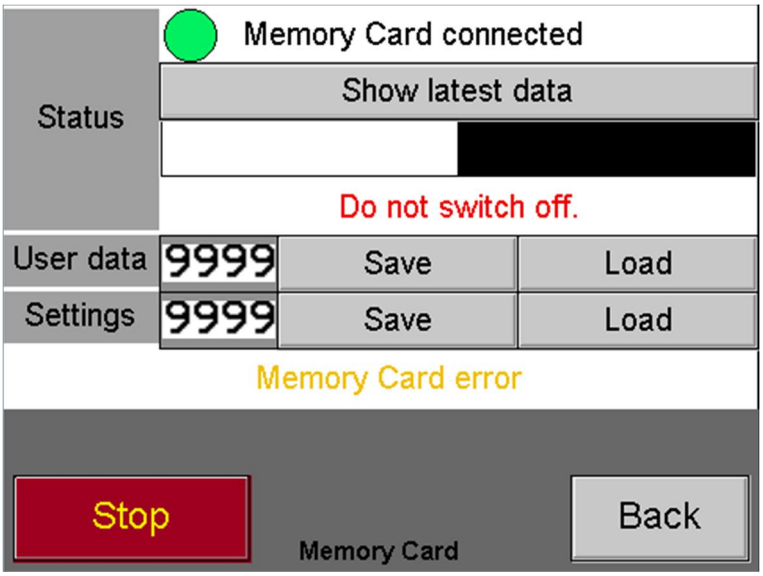
Open this screen by navigating 'Home' → 'Maintenance' → 'Inputs'/'Outputs' → 'Statistic'.



Title	Description
Time	▪ [second; minute; hour; day; month; year] ▪ Displays the current time
Power ON time	▪ Time in ten hour units the machine was turned on
Power interruptions	▪ Count of times the machine was turned on
Clock data	▪ [yy, mm, dd, hh] ▪ The last eight times the machine was turned on

9.2 Memory card

Open this screen by navigating ‘Home' → 'Maintenance' → 'Memory Card’.



In the Memory Card Screen data can be saved and loaded. While reading or writing is performed the **memory card must not be removed** and **power must not be switched off**.

The User data contains all sequences, which can be set up in the sequence screen. Loading the User data will **overwrite** all current sequences.

The Settings contain all data of the machine and how it is set up. Loading the Settings will **overwrite** all machine data.

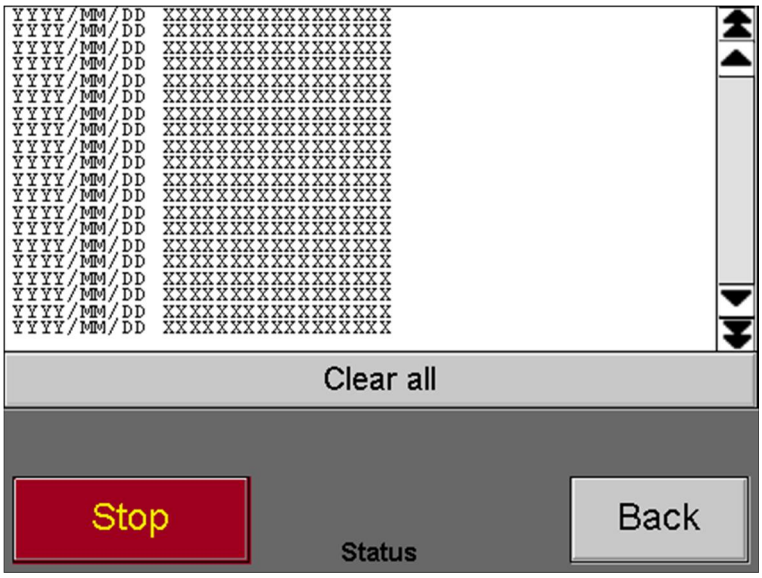
When an error has occurred a warning will appear and operation is unavailable. To enable normal operation again, clear the error in the Error Screen.

The User data and Settings with the index ‘0000’ contain the delivery status and cannot be changed without Service level 2.

Parameter	Description / Possible Values	Data entry
Connection status	▪ Shows if memory card is present	Display
Show latest data	▪ Updates number of most recently changed User data and Settings	Button
Loading bar	▪ Shows progress when reading or writing	Display
User data number	▪ Index of data that will be written to / read from	Numeric keypad
User data save	▪ Writing must not be interrupted	Button
User data load	▪ Reading must not be interrupted	Button
Settings number	▪ Index of data that will be written to / read from	Numeric keypad
Settings save	▪ Writing must not be interrupted	Button
Settings load	▪ Reading must not be interrupted	Button
Memory Card error	▪ Appears, when error occurred ▪ Error can be resolved in Errors Screen	Display

9.3 Status

Open this screen by navigating ‘Home' → 'Maintenance' → ‘Status’.



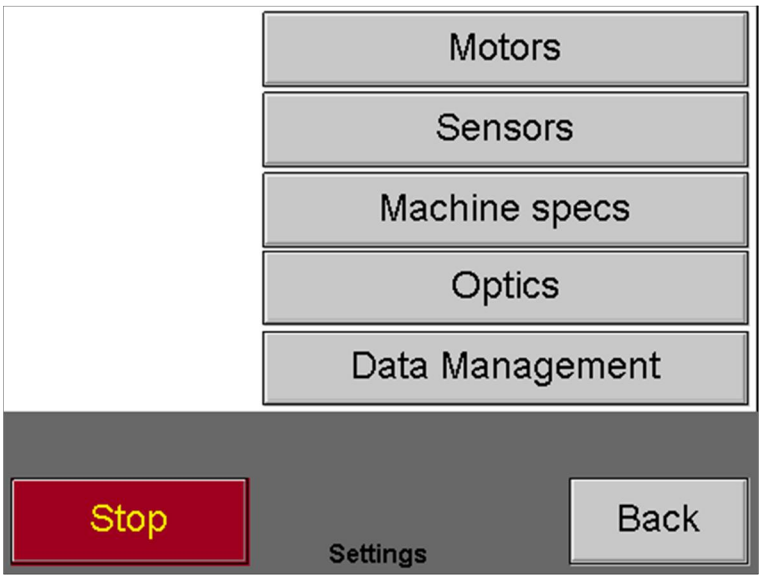
In the Status Screen error messages can be viewed and cleared.
Some Errors have to be cleared to enable a related function.

10 Settings (service level)

The settings are only to be accessed by instructed personnel. The settings are used for maintenance, repairs, and changes to the machine setup. They are not intended for change in normal operation.

If wrong settings prevent the correction of those settings by error messages there is a bail out skip. To be able to use the skip function in the popup screen Service level 2 (administrator) log in is required.

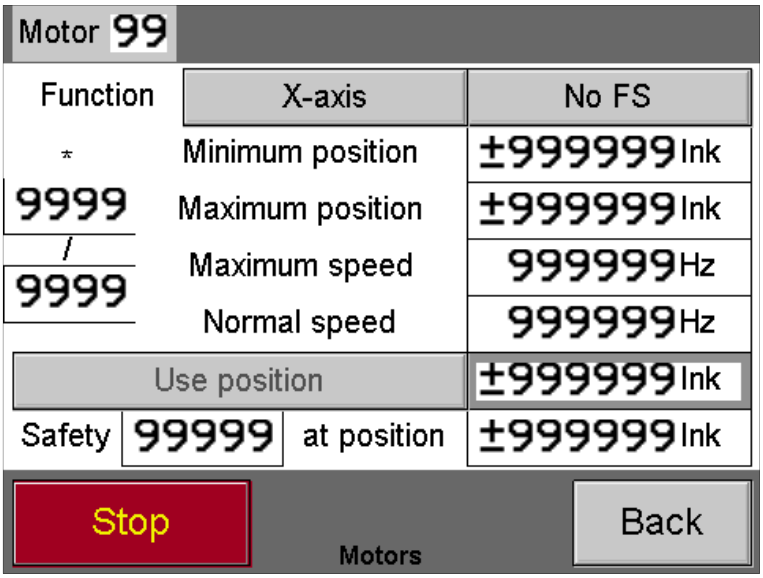
Open this screen by navigating 'Home' → 'Maintenance' → 'Settings'.



The machine setup is only used by service operators. To get to this screen you need to have sufficient access rights. It is necessary to log in with the correct password to gain at least service level 1.

10.1 Motors

Open this screen by navigating 'Home' → 'Maintenance' → 'Settings' → 'Motors'.



The machine setup is only used by service operators. To get to this screen you need to have sufficient access rights. It is necessary to log in with the correct password, to gain at least service level 2.

In this screen all essential parameters to the motors can be set up. If 'Function' is set to 'None' this motor address will not be used.

Options in this screen are not checked for mistakes and possible errors. **Wrong settings will likely lead to damage** to the machine. Make sure to check for correct input.

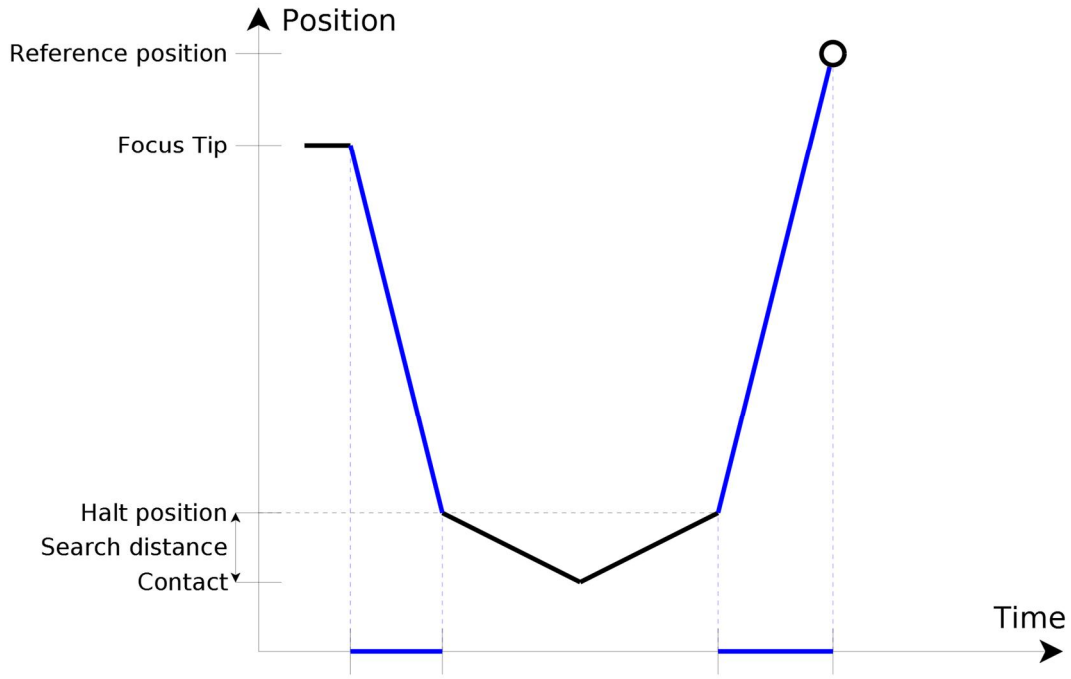
Parameter	Description / Possible Values	Data entry
Motor	▪ Address of motor in positioning controller	Numeric keypad
Function	▪ Logic function of this motor ▪ None, X/Y/Z/W-axis, optic, dispenser, dipper	Toggle button
Force sensor (to the right of function)	▪ Type of force sensor(FS) for this axis ▪ No FS, FS variable, FS binary, FS amplifier	Toggle button
Multiplication/Division	▪ Conversion from incremental steps to shown unit of measurement (1µm, 0.01°)	Numeric keypad
Minimum position	▪ Must be less than maximum position	Numeric keypad
Maximum position	▪ Must be more than minimum position	Numeric keypad
Maximum speed	▪ Must be more than normal speed	Numeric keypad
Normal speed	▪ Must be less than maximum speed	Numeric keypad
Use position	▪ Test drive for motor and axis-specific position	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Safety zone	▪ Only one motor in a safety zone can exceed the safety position at one time	Numeric keypad
Safety position	▪ Smaller positions are considered save	Numeric keypad

Function

- ☐ None
  - this motor address is not used
- ☐ X-axis
  - horizontal left-right movement
  - Use position: position of central chuck
- ☐ Y-axis
  - horizontal front-back movement
  - Use position: position of central chuck
- ☐ Z-axis
  - vertical up-down movement
  - Use position: position for tool exchange
- ☐ W-axis
  - rotation around vertical axis
  - Use position: position for tool exchange
- ☐ Optic
  - movement of beam splitter optic

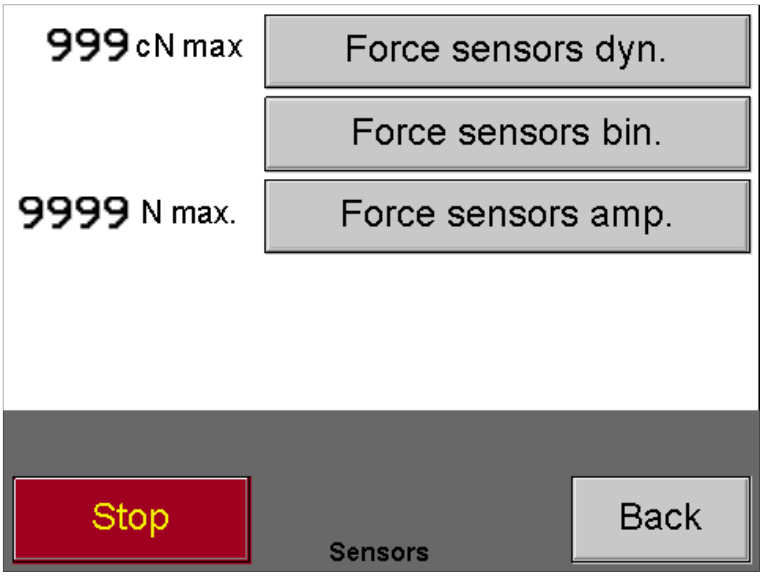
Normal speed (global) set up

Set to fastest valid and usefull value. Avoid bad Sound.



10.2 Sensors

Open this screen by navigating 'Home' → 'Maintenance' → 'Settings' → 'Sensors'. Prior to changing these options, the user has to know the limits and specifications of the machine and its parts. Wrong settings will lead to damaged or destroyed parts.



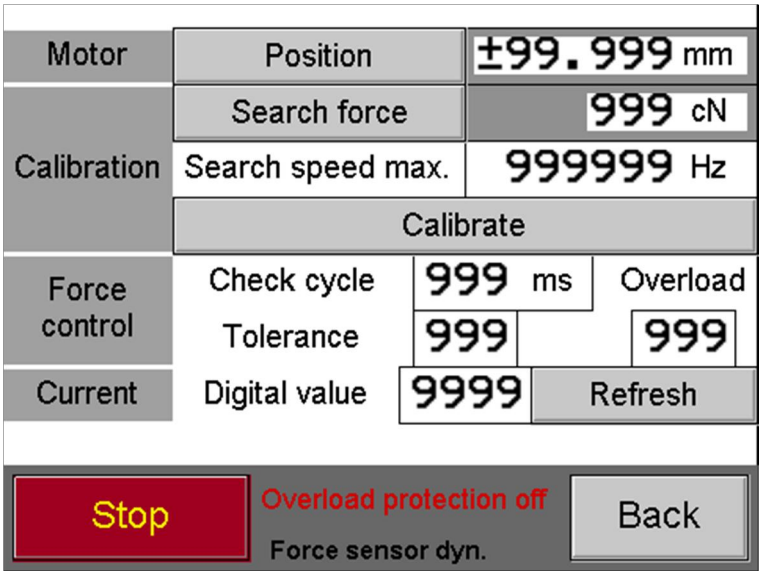
The sensors screen allows access to the force sensor settings.

The raw data of the force sensor are given in a digital value [0..1024]. Only after a correct setup a useful value for the force will be generated.

The number entries left to the corresponding buttons are for setting the maximum allowed force for other data entries in the setup. They should be 10% smaller than the maximum available value the force sensor is calibrated to.

10.2.1 Force sensors dynamic

Open this screen by navigating 'Home' → 'Maintenance' → 'Settings' → 'Sensors' → 'Force sensors dyn.'.



This screen allows the setup of the inductive force sensor. It can only be used when the according sensor is built in.

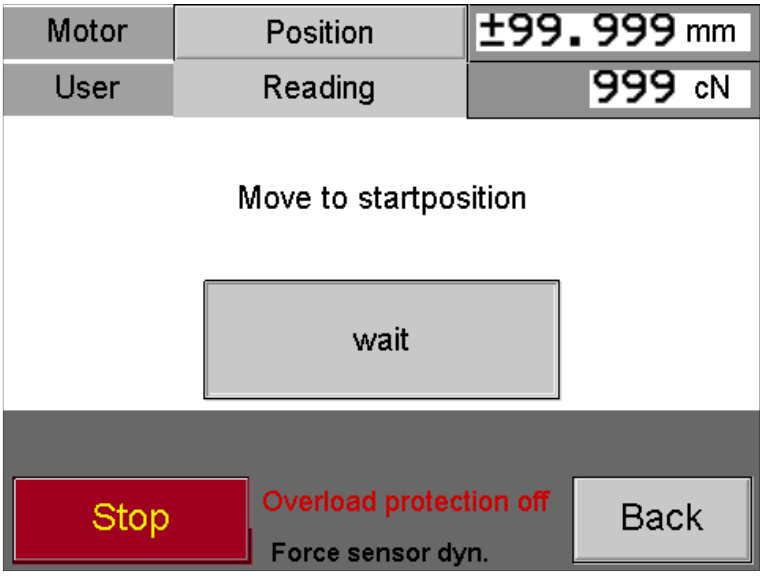
Clicking 'Calibrate' will lead to a process, in which measuring points are recorded.

Be aware, that the **overload function is not active** in this *Setup screen* and strong forces can destroy parts of the machine.

Parameter	Description / Possible Values	Data entry
Motor position	▪ Current position of the Pick'n'Place axis	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Search force	▪ Force which confirms contact for search of touch down position	Numeric keypad
Search speed max.	▪ Highest velocity for search of touch down position	Numeric keypad
Calibrate	▪ Navigates to the calibration screen ▪ See below for further details	Button
Check cycle	▪ Time-out between changes in movement ▪ Too small values lead to vibration problems	Numeric keypad
Tolerance	▪ Digital value by which the target force can differ	Numeric keypad
Overload	▪ Digital value at which the overload function will stop the machine	Numeric keypad
Refresh	▪ Reads the current digital value of the force sensor	Button
Search(/Lift up) distance	▪ Standard search distance upwards from Contact position	Numeric keypad

Calibration screen

Clicking 'Calibrate' will lead to a process, in which measuring points are recorded. This process is handled in this new screen. The Tip speed during calibration is equal to the ‘Search speed max.’ Before starting the calibration, set up the Maximum speed in the ‘Force sensor dynamic’ screen. We recommend a speed of 300 Hz. After calibration we recommend 3000 Hz Search speed maximum.



The instruction in the middle of the screen will guide you through the process.

Do not adjust the table position during calibration.

Parameter	Description / Possible Values	Data entry
Motor position	▪ Current position of the Tip axis	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Reading	▪ Enter the required values here	Numeric keypad

Follow the instructions on screen from start to end. An unfinished calibration will be deleted completely. Make sure to have a **scale on the lower chuck** to measure the required forces.

Instructions

☐ Wait

- Process in action, wait until finished

☐ Move to start position

- Drive the Tip axis approximately 0.5 mm above the scale
- The tool must not touch the scale
- **Note: This position must not be smaller than 40.000mm**

☐ Move to maximum force

- Drive the Tip axis carefully into the scale until the limit of the desired measuring range
- The force should be 50 cN bigger than the maximum force
- Mind the limitations of the machine, too much force will damage the system

☐ Copy measurement

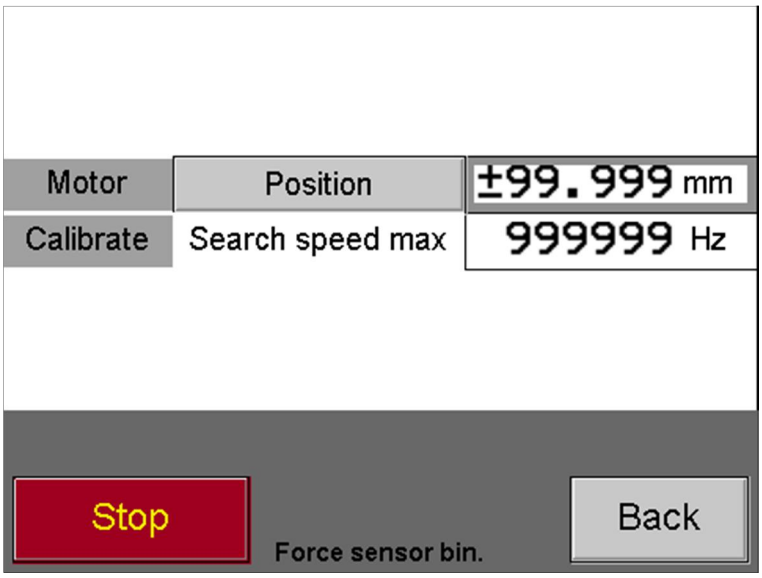
- Enter the scale measurement into the 'Reading' screen

☐ Setup finished

- The data is fully recorded and will be used now

10.2.2 Force sensor binary

Open this screen by navigating 'Home' → 'Maintenance' → 'Settings' → 'Sensors' → 'Force sensors bin.'.



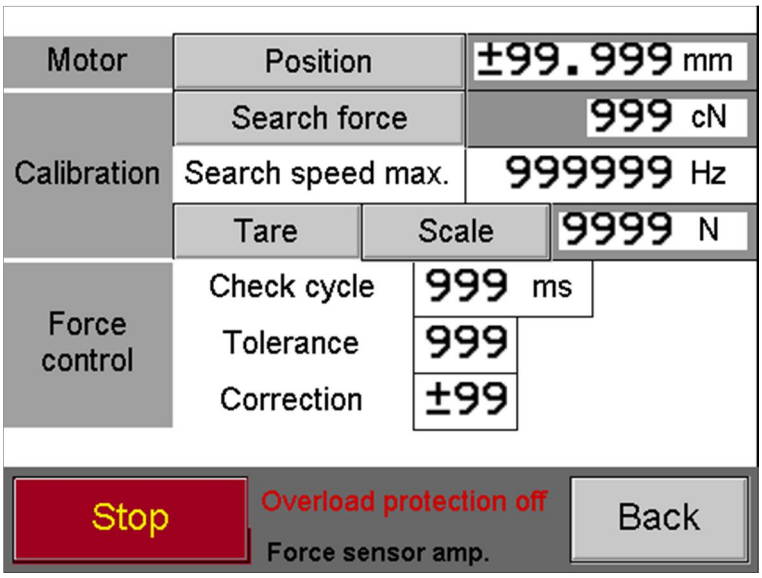
This screen allows the setup of the inductive force sensor. It can only be used when the according tool is built in.

This sensor is usually used by the dipper.

Parameter	Description / Possible Values	Data entry
Motor position	▪ Current position of the Pick'n'Place axis	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Search speed max	▪ Highest velocity for search of touch down position	Numeric keypad

10.2.3 Force sensor amplified

Open this screen by navigating 'Home' → 'Maintenance' → 'Settings' → 'Sensors' → 'Force sensors amp.'.



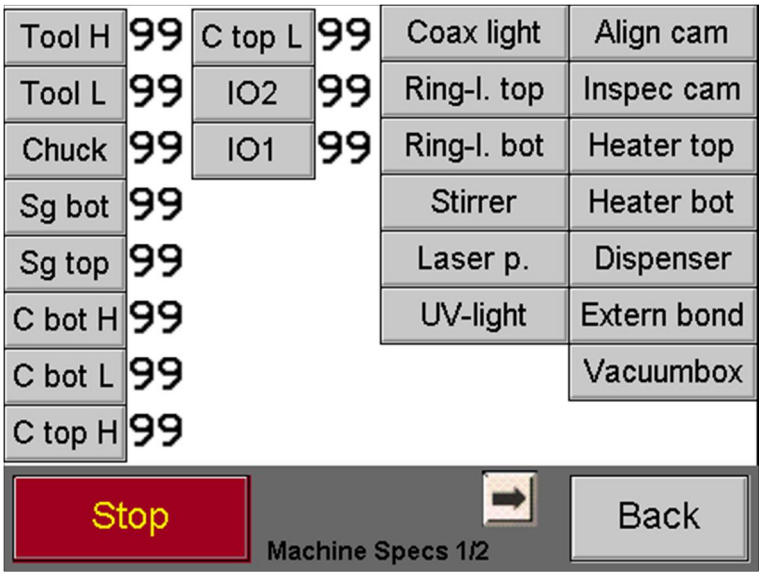
This screen allows the setup of the inductive force sensor. It can only be used when the according sensor is built in.

Be aware, that the **overload function is not active** in this *Setup screen* and strong forces can destroy parts of the machine.

Parameter	Description / Possible Values	Data entry
Motor position	▪ Current position of the Pick'n'Place axis	Numeric keypad Front switches (+ / -) **(+ down, - up)**
Search force	▪ Force which confirms contact for search of touch down position	Numeric keypad
Search speed max.	▪ Highest velocity for search of touch down position	Numeric keypad
Tare	▪ Starts zeroing	Button
Scale	▪ Scales to the currently applying force ▪ Overload will activate while 90% of this force is applied with standard settings	Button
Scale force	▪ Enter the reading on the scale while scale was clicked	Numeric keypad
Check cycle	▪ Time-out between changes in movement ▪ Too small values lead to vibration problems	Numeric keypad
Tolerance	▪ Digital value by which the target force can differ	Numeric keypad

10.3 Machine specifications

Open this screen by navigating 'Home' → 'Maintenance' → 'Settings' → 'Machine specs'.

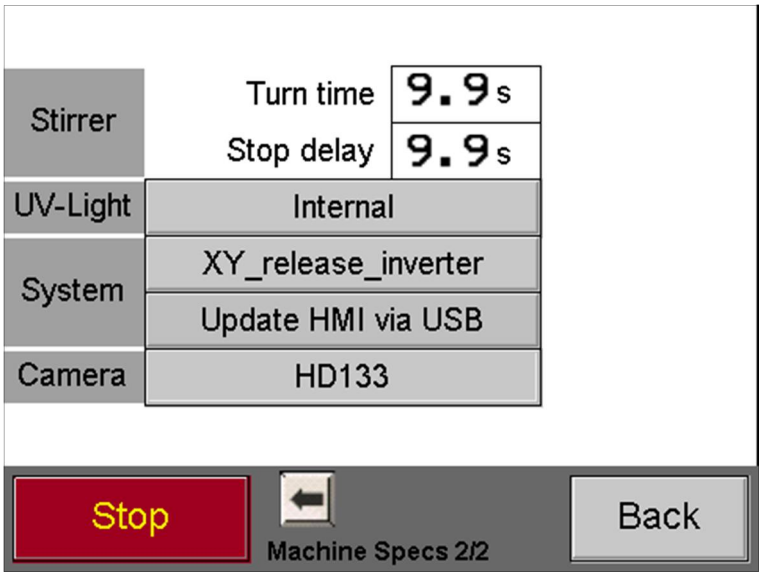


Navigate between the different Machine Specs screens by using the Arrows at the bottom hand side.

In this screen all existing parts can be switched on and non-existent parts switched off.

Furthermore the data entry beside the toggle button defines which PLC output the part belongs to.

Options in this screen are not checked for mistakes and possible errors. **Wrong settings will likely lead to damage** to the machine. Make sure to check for correct input.



Parameter	Description / Possible Values	Data entry
Tool H	▪ Vacuum tool high pressure [1]	Toggle button Numeric keypad
Tool L	▪ Vacuum tool low pressure [1]	Toggle button Numeric keypad
Chuck	▪ Vacuum chuck	Toggle button Numeric keypad
Sg bot	▪ Process gas bottom heater	Toggle button

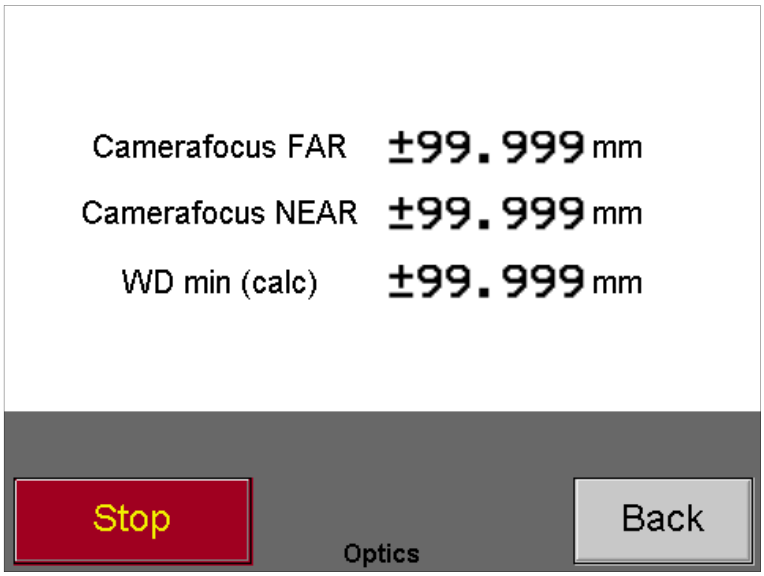
		Numeric keypad
Sg top	▪ Process gas top heater	Toggle button Numeric keypad
C bot H	▪ Cooling for bottom heater high pressure [1]	Toggle button Numeric keypad
C bot L	▪ Cooling for bottom heater low pressure [1]	Toggle button Numeric keypad
C top H	▪ Cooling for top heater high pressure [1]	Toggle button Numeric keypad
C top L	▪ Cooling for top heater low pressure [1]	Toggle button Numeric keypad
IO2	▪ Vacuum for input 2 on table	Toggle button Numeric keypad
IO1	▪ Vacuum for input 1 on table	Toggle button Numeric keypad
Coax light	▪ Coaxial polarized light for optics	Toggle button
Ring-l. top	▪ Top ring-light optics	Toggle button
Ring-l. bot	▪ Bottom ring-light optics	Toggle button
Stirrer	▪ Adhesive pot for dipping	Toggle button
Laser p.	▪ Laser pointer	Toggle button
UV-light	▪ Ultra violet light	Toggle button
Align cam	▪ Alignment camera optics	Toggle button
Inspec cam	▪ Inspection camera in front	Toggle button
Heater top	▪ Tool heater	Toggle button
Heater bot	▪ Tool chuck	Toggle button
Dispenser	▪ Adhesive dispenser	Toggle button
Extern bond	▪ External connection	Toggle button
Vacuumbox	▪ External pump for generating vacuum	Toggle button
Stirrer turn time	▪ Time of turning in automatic operation	Numeric keypad
Stirrer stop delay	▪ Time waited for stop in automatic operation	Numeric keypad
UV-light type	▪ Internal or external via D-Sub 2	Toggle button

XY release Inverter	▪ Flips function of XY-axis lock tactile button	Toggle button
Update HMI via USB	▪ Opens up window for HMI data management	Button
Camera type	▪ Alignment camera type	Toggle Button

[1] High pressure is accomplished by switching on the low pressure valve and the high pressure valve at the same time.

10.4 Optics setup (service level)

Open this screen by navigating 'Home' → 'Maintenance' → 'Settings' → 'Optics'.



This screen allows the correct setup of the alignment camera in relation to positioning.

The values should be set up at 100% Zoom.

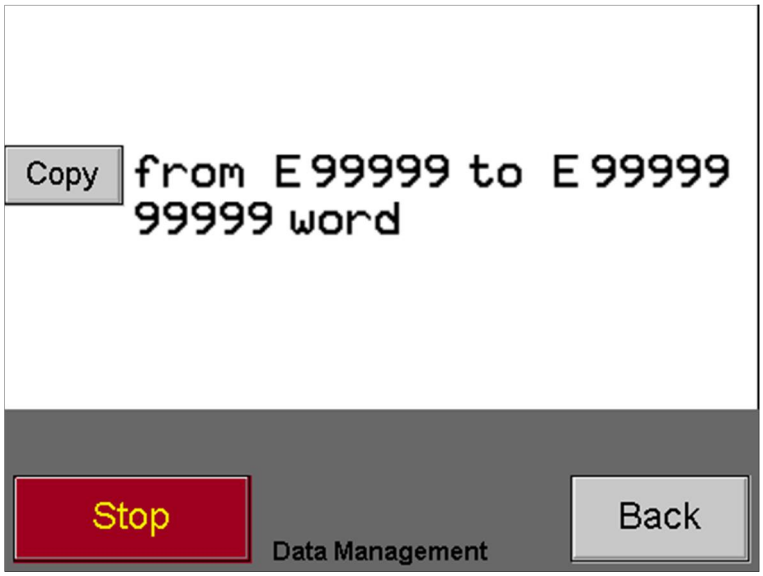
Do not change the pickup tool during this operation.

Parameter	Description / Possible Values	Data entry
Camera focus FAR	Lowest table position which can be in focus, measured by the Pick'n'Place axis	Numeric keypad
Camera focus NEAR	Highest table position which can be in focus, measured by the Pick'n'Place axis	Numeric keypad
WD min (calc)	Difference (absolute value) between Camera focus near and the tip position which is in focus, measured by the Pick'n'Place axis [Camera focus NEAR] – [Tip Position@Camera focus NEAR]	Numeric keypad

The difference between Camera focus far and Camera focus near should be close to 1,7mm.

10.5 Data Management

Open this screen by navigating 'Home' → 'Maintenance' → 'Settings' → 'Data Management'.



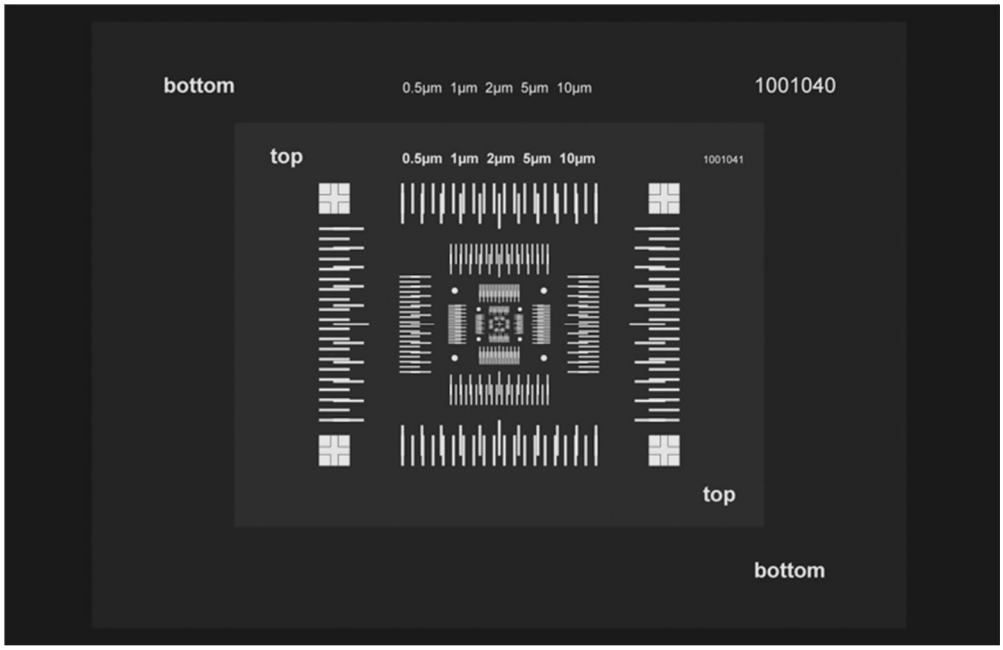
This screen allows copying data in address memory.

This screen is for service personnel only. Misuse may cause damage to the machine.

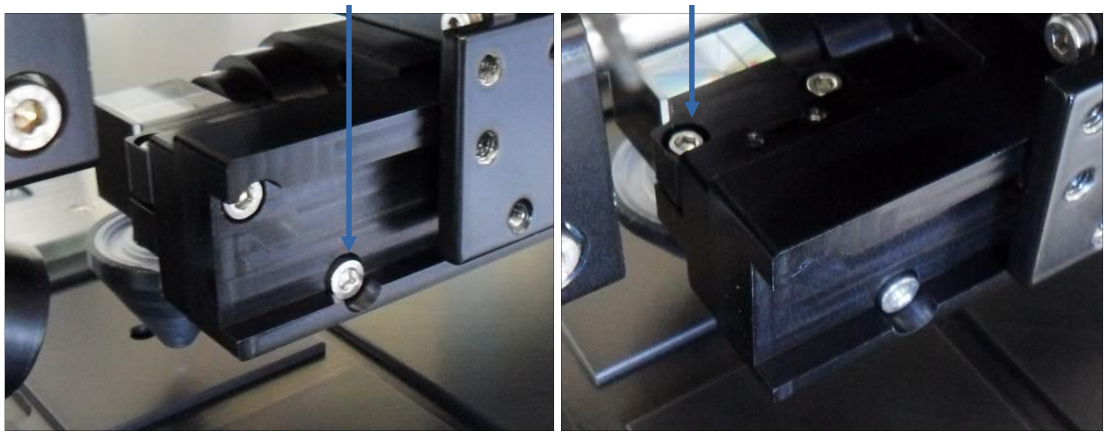
11 Maintenance (service level)

11.1 Beam splitter adjustment with glass scales

The set of glass scales is used to adjust the beam splitter. There is a bottom glass (labelled with “bottom”) and a top glass (labelled with “top”).



The beam splitter provides two screws for fine adjustment in x (left picture) and y (right picture) direction.

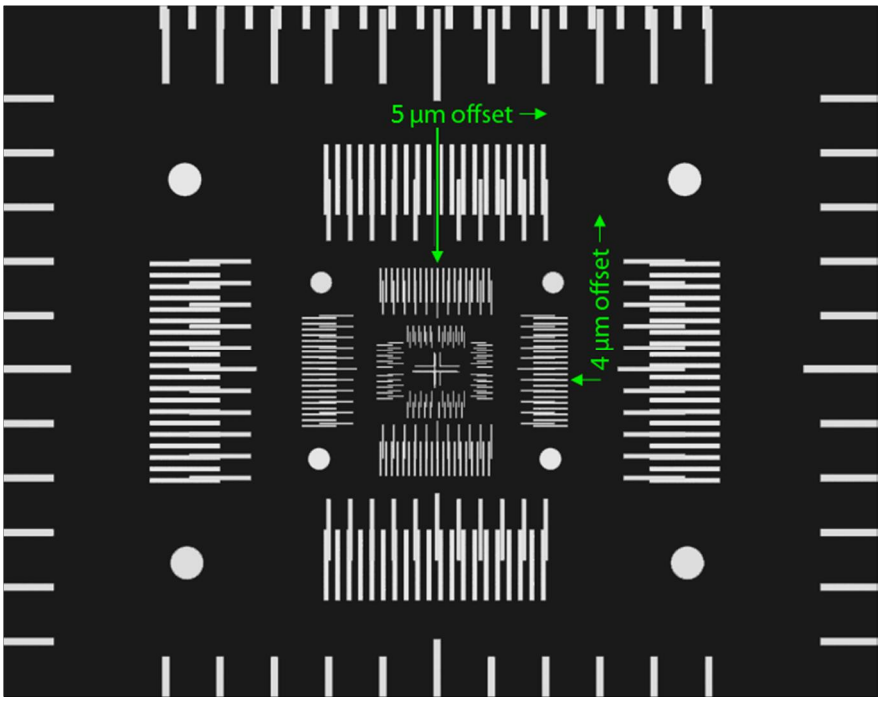


Note that the adjustment of the beam splitter will change the following parameters:

- Camera distances: *10.4 Optics setup (service level)*
- Beam splitter image position: *7.6.3.1 Positions*
- Laser pointer position: *11.2 Laser pointer*

- **For adjustment, do the following steps:**
- **NOTE: Make sure the pickup tool is clean so that the glasses do not stick to it.**
- Place bottom glass on lower chuck as shown in the previous illustration
- Open the *Setup screen* (chapter*7.6Setup*) and switch on Vacuum "**Chuck**"
- Place the top glass on the bottom glass as shown in the previous illustration
  - NOTE: Both structures need to be at the same focus point
- Configure two sequences for executing a'pick up' and a 'place' sequence
- **Pick sequence**
  - Open the *Setup screen*
  - Choose and remember a number for the sequence
  - Press "**Default**"
  - Adjust **Light** coax/top, bottom
  - Adjust focus "**Bottom**" until the glass is focused
  - Adjust focus "**Tip**" until pick up tool surface is focused
  - Adjust "**Zoom**" so that the lines on the glass are clearly visible
  - Press "**Options**", then press "**Tip**" and "**Chuck**", then click "**Back**"
  - Press "**Save**" and confirm
- **Place sequence**
  - Open the S*equence screen*
  - Choose the according number for the sequence to open the previously set up pick up sequence
  - Pick up the top glass
  - Open the *Setup screen*
  - Choose and remember a new number for the sequence
  - Press "**Default**"
  - Adjust **Light** coax/top, bottom
  - Adjust focus "**Bottom**" until the bottom glass is focused
  - Adjust focus "**Tip**" until top glass on the pickup tool is focused
  - Adjust "**Zoom**" so that the lines on the glass are clearly visible
  - Press "**Options**" and press "**Chuck**", then click "**Back**"
  - Press "**Save**" and confirm
- **Sequence screen**
  - Open the S*equence screen*
  - In another slot choose the according number for the sequence to open the previously set up place sequence
- **Beam splitter alignment:**

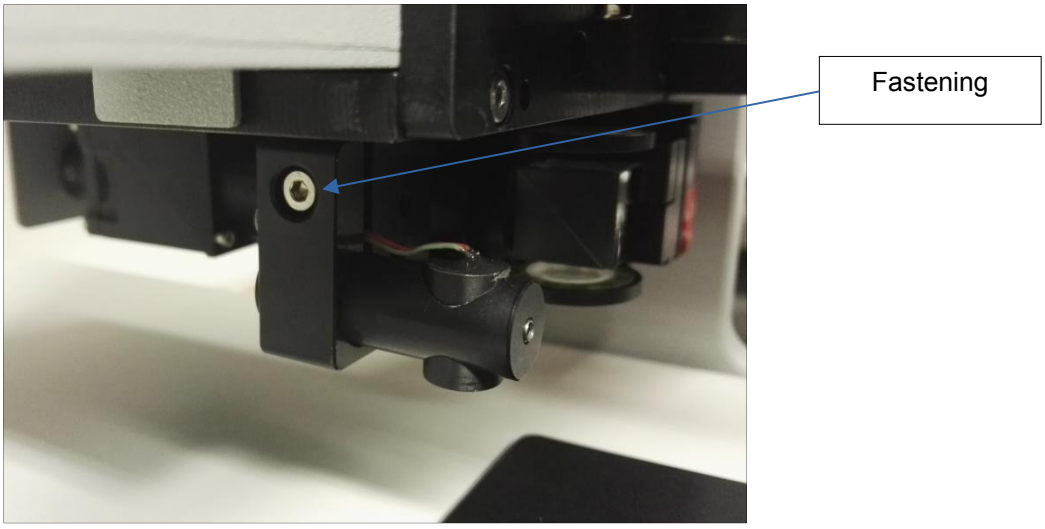
- **NOTE: The glasses need to be very clean and should not stick to each other and the tool. The glasses should always be handled with tweezers or vacuum pipette!**
- The top glass should be picked up on the tool; if not, do it so
- Align the top and bottom glass to each other (without any offset)
  - correct offset via the micrometer screws
  - correct rotation with the tactile buttons + and -
- Place the top glass onto the bottom glass
- If there is an offset (see below), write down the amount of offset and direction (in example: 4 µm y-offset; 5 µm x-offset)



- Pick up the top glass
- **Set the previous offsets of x and y via the alignment screws of the beam splitter**
- Align the top and bottom glass to one another via the micrometer screws again
- Place the top glass
- **Top and bottom glass should now be aligned correctly to each other (with placement accuracy of +/- 5 µm).**
- **If not, repeat all the steps for beam splitter adjustment.**

11.2 Laser pointer

To accurately use the dipper, the laser pointer indicates the point of contact onto the table.



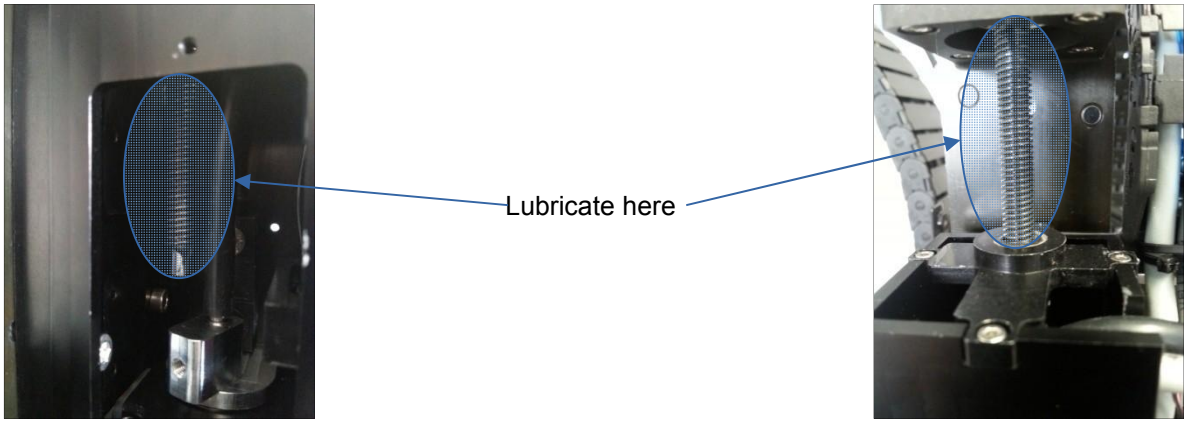
Instructions

- ☐ Switch on machine
- ☐ Open Setup Screen
  - Navigate ‘Home’ → ‘Setup’
- ☐ Determine contact point
  - Move portal to appropriate position
  - Do not move portal again
  - Activate dipper process
  - Capture point of contact
- ☐ Align laser pointer
  - Activate laser pointer
  - Loosen fastening screw
  - Align pointer to point of contact
  - Tighten fastening screw

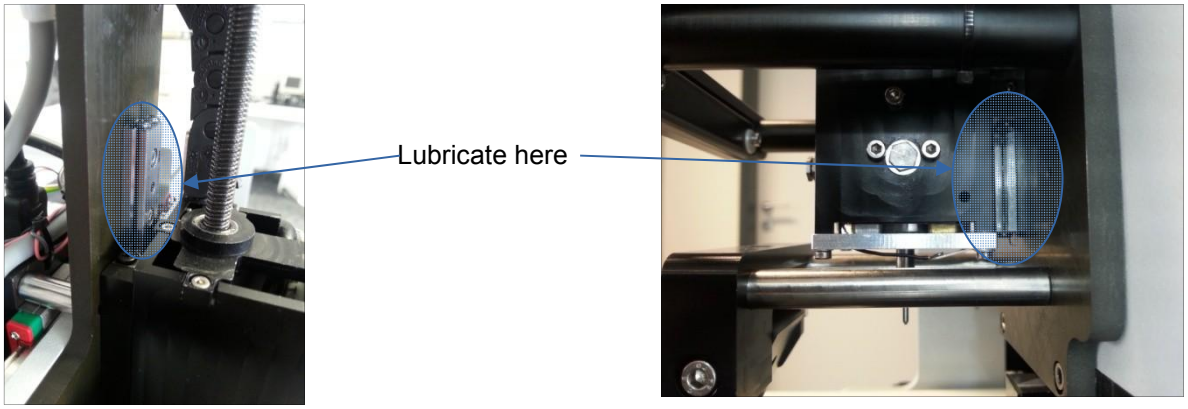
11.3 Lubrication instructions

- **Lubricants**
  - Reduce wear
  - Protect against dirt
  - Provide protection against corrosion
  - We recommend reviewing for sufficient lubrication at least once a week.
  - We recommend Microlube GL261

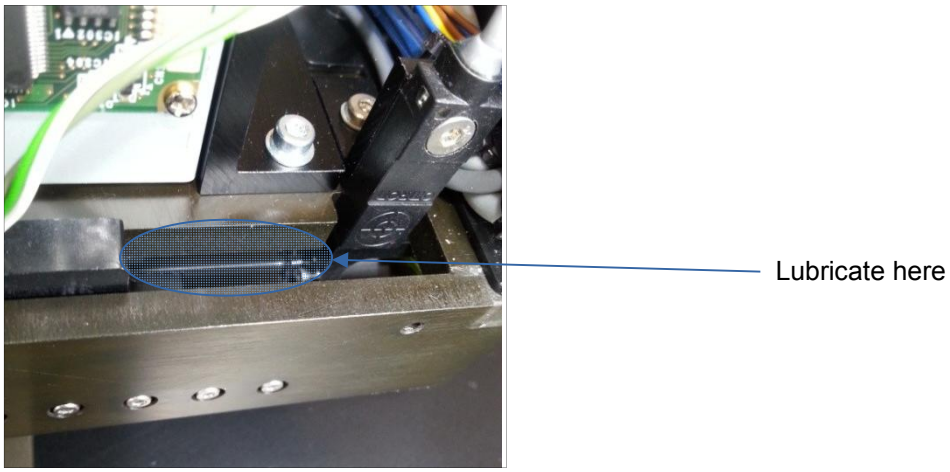
11.3.1 Tip axis shaft



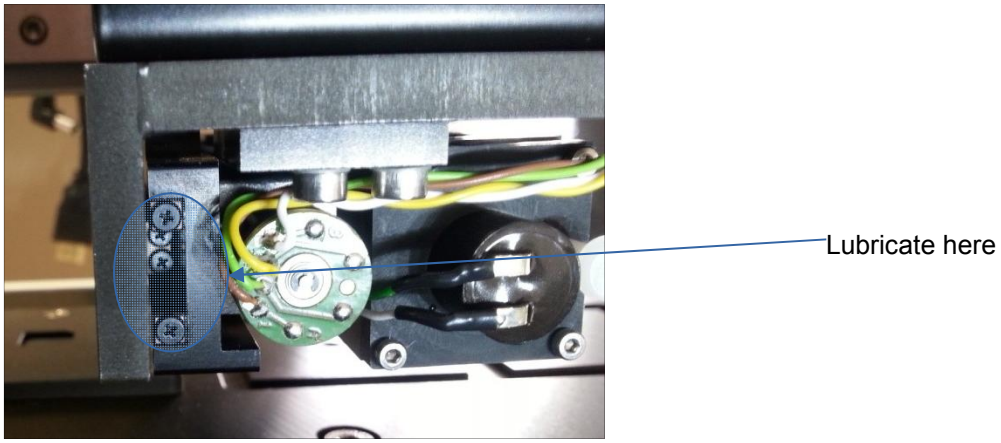
11.3.2 Tip axis linear bearing



11.3.3 Optic axis shaft

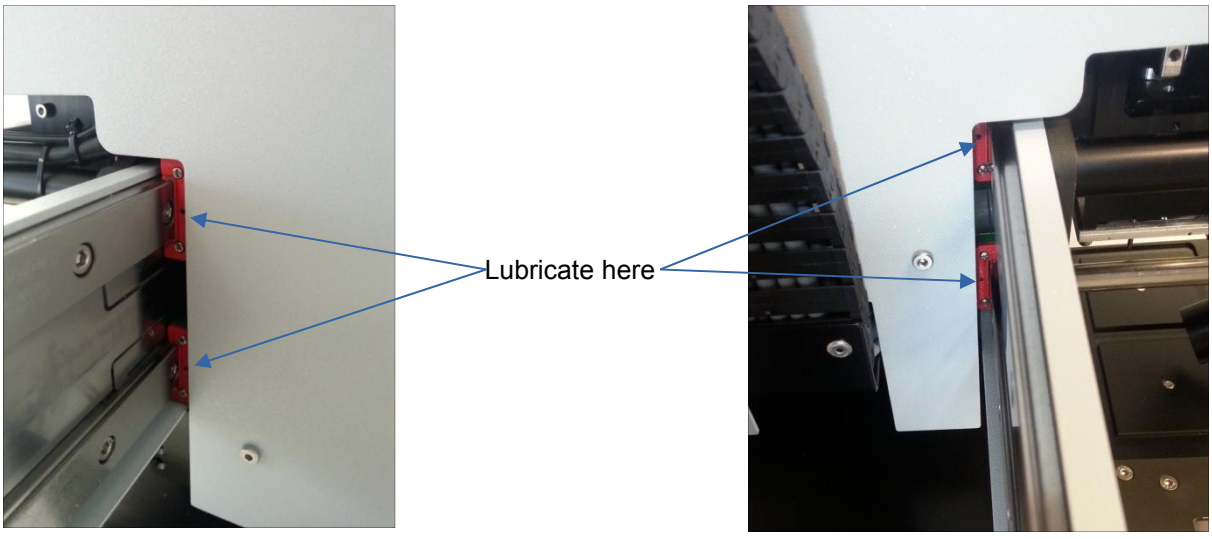


11.3.4 Optic axis stage



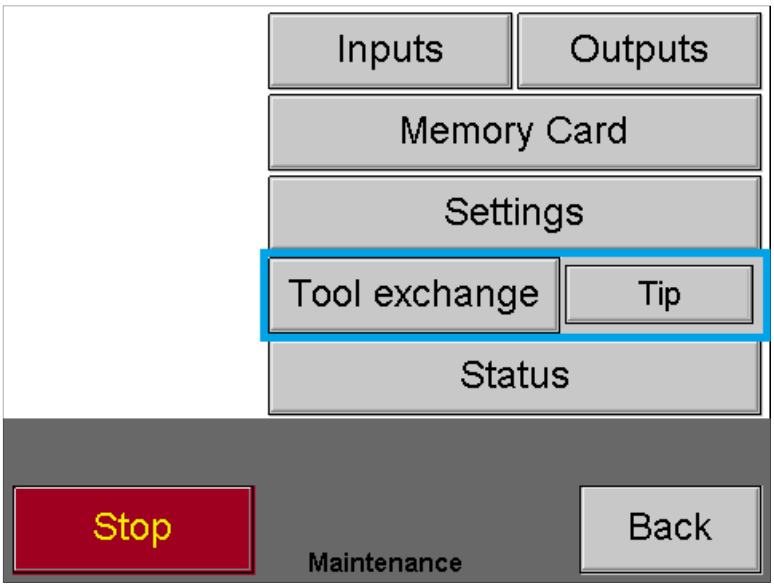
11.3.5 Y-axis

11.3.6 X-axis



11.4 Transportation locks

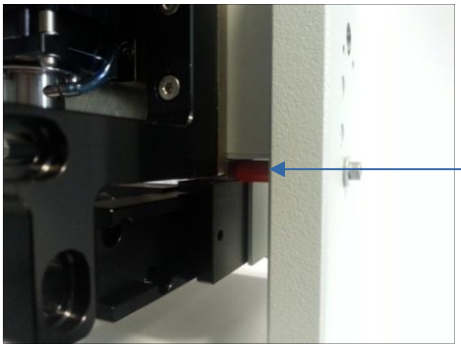
Open this screen by navigating 'Home' → 'Maintenance'.



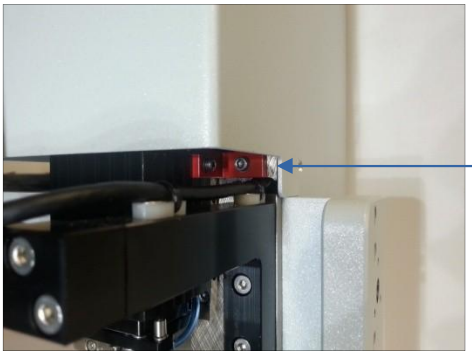
To lock the system for transportation press "**Tool exchange**" and switch the system off after the tip axis is at the according position.

Mount the transportation locking devices as shown in the pictures below to secure the system for transportation.

The vacuum can be manipulated with the according button to hold the tool in the tool chuck.



X-axis



Tip axis

11.5 Battery change

Replace the battery as soon as a battery error occurs or as soon as the specified battery backup timeexpires. Be sure to install a replacement battery within two years of the production date shown onthe battery's label.

Precautions for Correct Use

Be sure to install a replacement battery within two years of the production date shown on the battery's label.

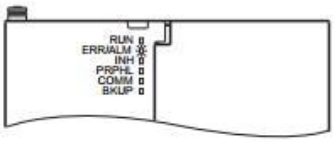
Production Date

OMRON
CJ1W-BAT01
08-06

Manufactured in June 2008.

Low Battery Indicators

If the PLC Setup has been set to detect a low-battery error, the ERR/ALM indicator on the front of the CPU Unit will flash when the battery is nearly discharged.



If the Battery Error Flag (A402.04) is ON*1, first check whether the Battery is properly connected to the CPU Unit. If the battery is properly connected, replace the battery as soon as possible.

Once a low-battery error has been detected, it will take 5 days (at an ambient temperature of 25°C*2) before the battery fails assuming that power has been supplied at least once a day. Battery failure and the resulting loss of data in RAM can be delayed by ensuring that the CPU Unit power is not turned OFF until the battery has been replaced.

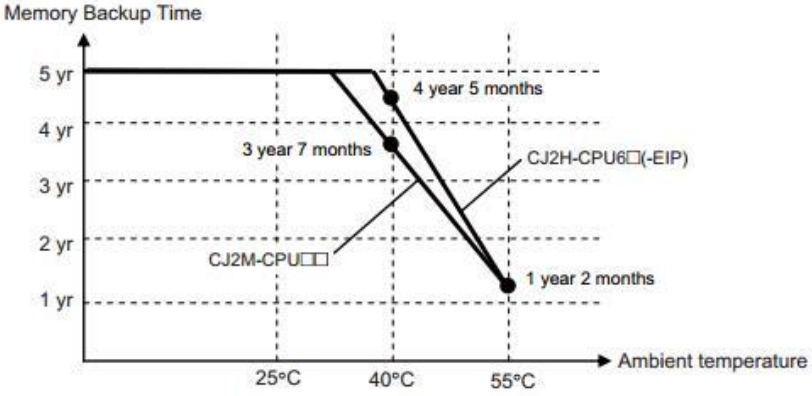
Battery Service Life and Replacement Period

At 25°C, the maximum service life for batteries is five years whether or not power is supplied to the CPU Unit while the battery is installed. The battery's lifetime will be shorter when it is used at higher temperatures and when power is not supplied to the CPU Unit for long periods.

The following table shows the approximate minimum lifetimes and typical lifetimes for the backup battery (total time with power not supplied).

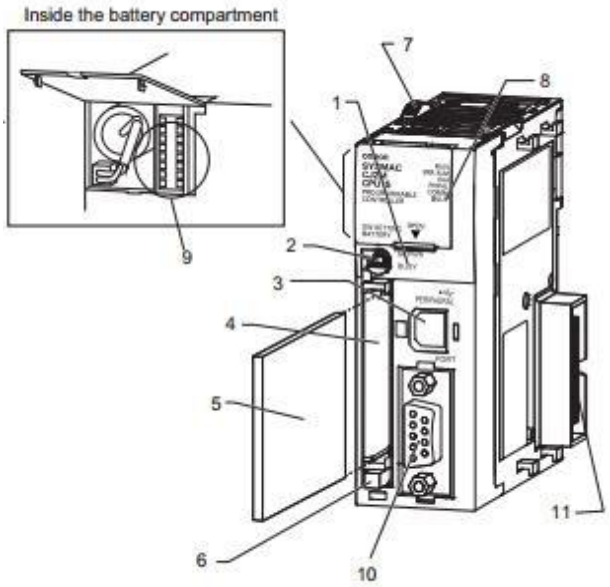
Model	Approx. maximum lifetime	Approx. minimum lifetime*1	Typical lifetime*1
CJ2H-CPU6□(-EIP) CJ2M-CPU□□	5 years	1 year 2 months	5 years

*1 The minimum lifetime is the memory backup time at an ambient temperature of 55°C. The typical lifetime is the memory backup time at an ambient temperature of 25°C.



This graphic is for reference only.

CJ2M-CPU1□

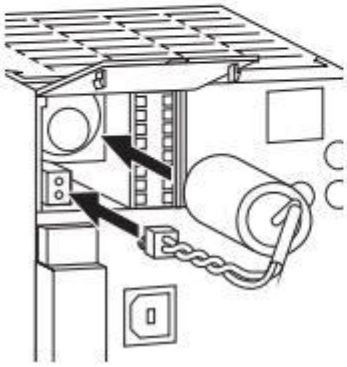


Before replacing the battery, turn ON power for atleast 5 minutes before starting the replacementprocedure and complete replacing the batterywithin 5 minutes of turning OFF the powersupply. Memory contents may be corrupted if thisprecaution is not obeyed.Do not short the battery terminals or charge,disassemble, heat, or incinerate the battery. Donot subject the battery to strong shocks. Doingany of the above may result in leakage, rupture, heatgeneration, or ignition of the battery. Dispose ofany battery that has been dropped on the floor orotherwise subjected to excessive shock. Batteriesthat have been subjected to shock may leak ifthey are used.UL standards require that only an experienced engineer can replace the battery. Make sure thatan experienced engineer is in charge of batteryreplacement. Follow the procedure for battery replacement given in hardware manual for your PLC.Dispose of the product and batteries according to local ordinances as they apply!

Additional Information

If power is not turned ON for at least five minutes before replacing the battery, the capacitor that backs up memory when the battery is removed will not be fully charged and memory may be lost before the new battery is inserted.

2 Open the compartment on the upper left of the CPU Unit and carefully draw out the battery.



Precautions for Safe Use

- You must complete this procedure within five minutes at 25°C after turning OFF the power to the CPU Unit to ensure memory backup. Data may be lost if more than five minutes is required.
- Never short-circuit the battery terminals; never charge the battery; never disassemble the battery; and never heat or incinerate the battery. Doing any of these may cause the battery to leak, burn, or rupturing resulting in injury, fire, and possible loss of life or property. Also, never use a battery that has been dropped on the floor or otherwise subject to shock. It may leak.
- UL standards require that batteries be replaced by experienced technicians. Always place an experienced technician in charge or battery replacement.
- Turn ON the power after replacing the battery for a CPU Unit that has been unused for a long time. Leaving the CPU Unit unused again without turning ON the power even once after the battery is replaced may result in a shorter battery life.

Additional Information

The battery error will be cleared automatically the next time the CPU Unit is turned ON after replacing the Battery.

11.6 Cable connections

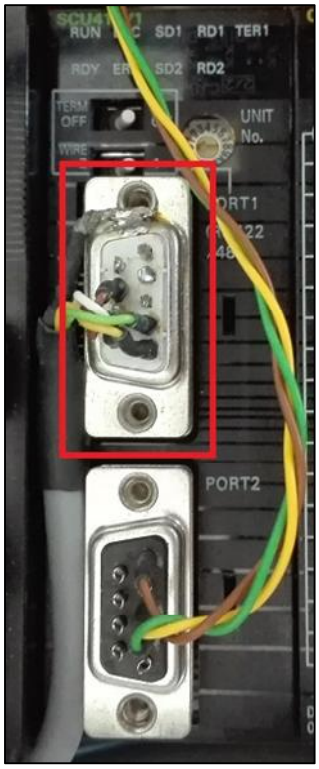
11.6.1 Motor control

To connect all motor controllers to a personal computer a converter cable is necessary.

The item ID is 112101.

Do **not Hot-Plug** this connector.

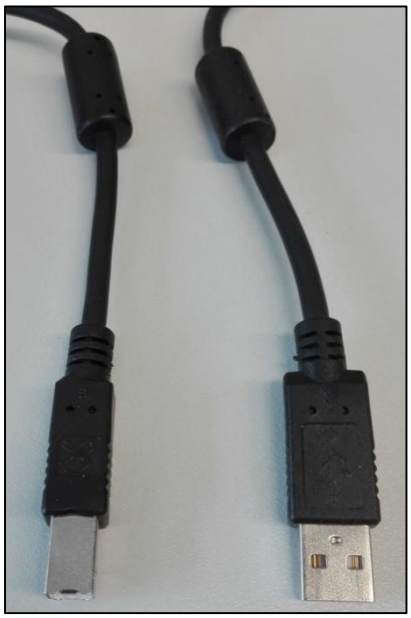
The driver for the personal computer needs to be installed before plugging in the cable.



To connect the cable to the motor controllers the **machine must beswitched off**. The female D-sub connector needs to be connected to the male D-sub connector plugged into Port 1 of the SCU41-V1 unit of the PLC. When the USB is also connected to the personal computer the power of the machine can be switched on.

To disconnect the cable to the motor controllers the **machine must beswitched off**. Also it must not be forgotten to **reconnect** the male D-sub connector to **Port 1** of the SCU41-V1 unit of the PLC.

11.6.2 Programmable logic controller



To connect to the PLC via USB cable to a personal computer a USB 2 type A to type B cable is necessary.

The USB device connectioncable 2m item ID is 112102.

To connect the cable to the plc the **machine should be switched off**. The USB type B connector needs to be connected to the Peripheral connector of the PLC CPU. When the USB type A connector is also connected to the personal computer the power of the machine can be switched on.

To disconnect the cable to PLC the **machine should be switched off**.

11.6.3 Temperature controller

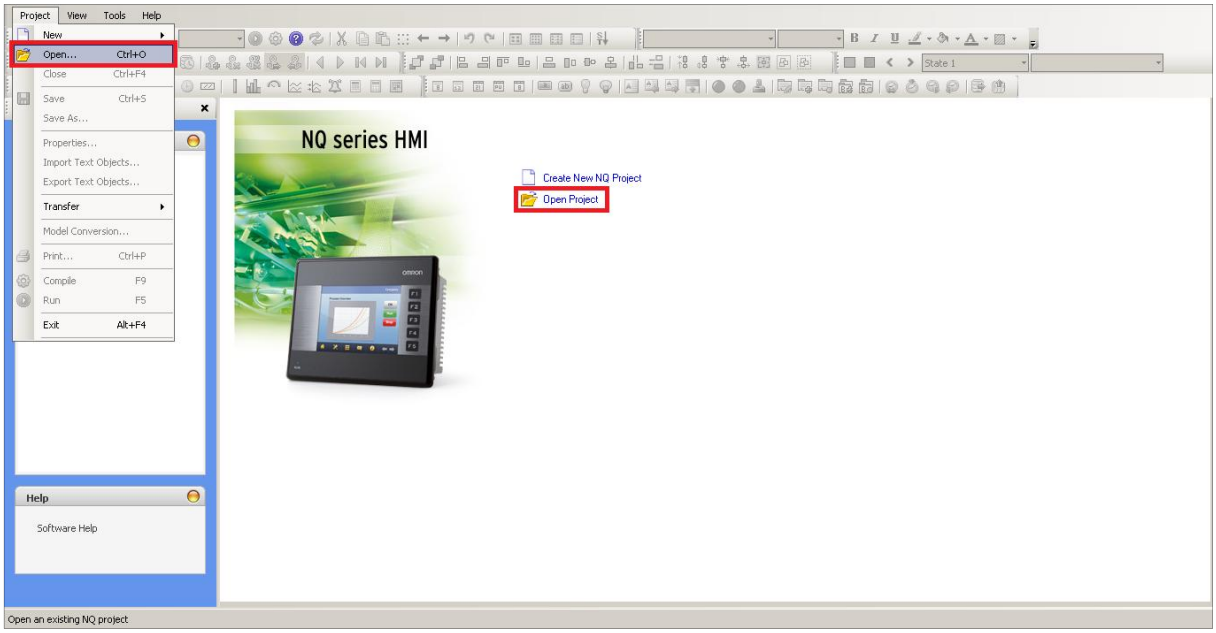
To connect to the temperature controller to a personal computer a special converter cable is necessary.

The item ID is 112103.

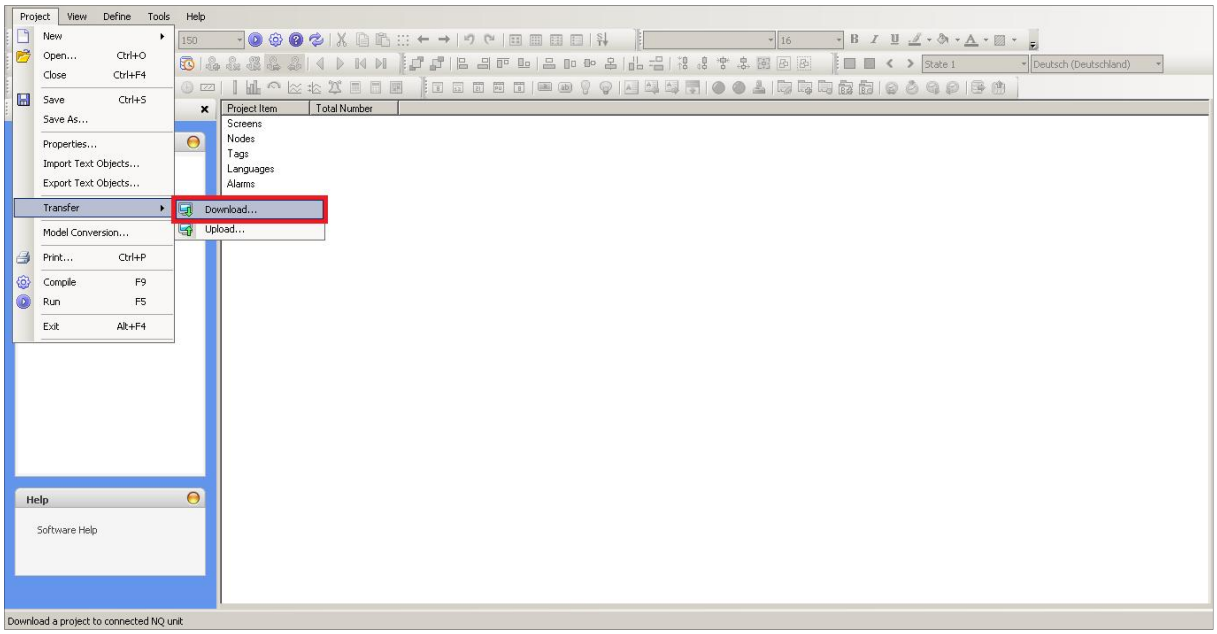
11.7 Touch Panel via PC

The Touch Panel needs to be connected to a PC via USB.

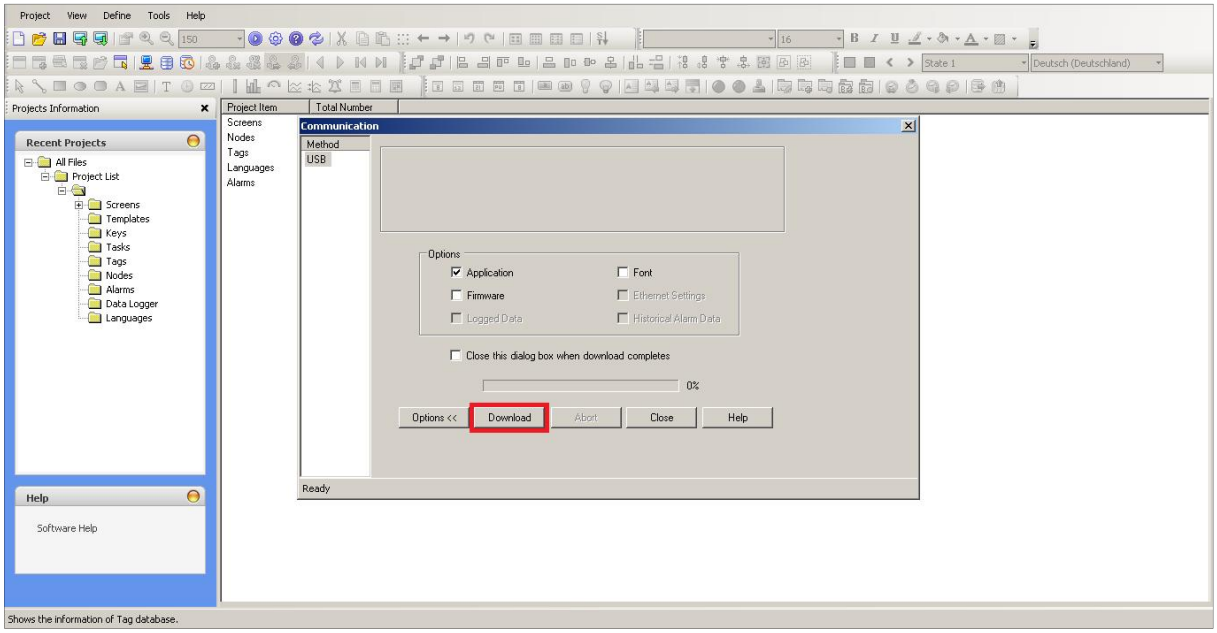
Start the NQ-Designer and open the Project. Enter the Password and the '.nqp' is loaded.



Open the download window to transfer the data.



Click Download and wait for the transmission to finish. Make sure to check-mark ‘Application’. The machine has to be powered.



11.8 Programmable Logic Controller

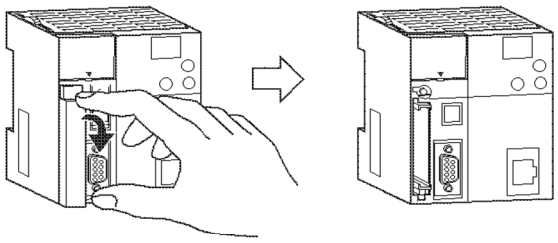
11.8.1 Memory card install

Before Using a Memory Card

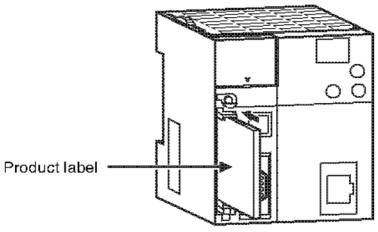
- Observe the following precautions while the Memory Card is being accessed. The Memory Card may become unusable if these precautions are not followed.
  - Never turn OFF the PLC while the CPU is accessing the Memory Card.
  - Never remove the Memory Card while the CPU is accessing the Memory Card. Press the Memory Card power supply switch and wait for the BUSY indicator to go OFF before removing the Memory Card.
- Never insert the Memory Card facing the wrong way. If the Memory Card is inserted forcibly, it may become unusable.
- To delete all the data on the Memory Card by formatting the Memory Card, insert the Memory Card in the CPU Unit and perform the operation from the CX-Programmer.

Installing the Memory Card

1 Pull the top end of the Memory Card cover forward and remove from the Unit.

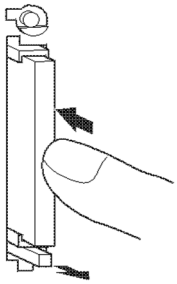


2 Insert the Memory Card with the label facing to the left. (Insert with the Δ on the Memory Card label and the Δ on the CPU Unit facing each other.)



3 Push the Memory Card securely into the compartment.

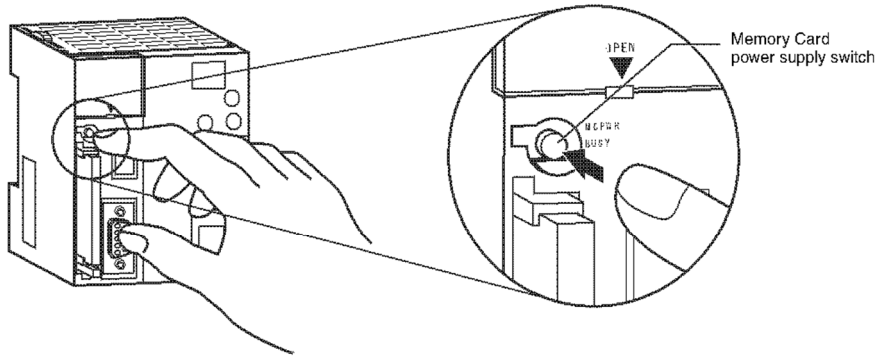
If the Memory Card is inserted correctly, the Memory Card eject button will be pushed out.



11.8.2 Memory card remove

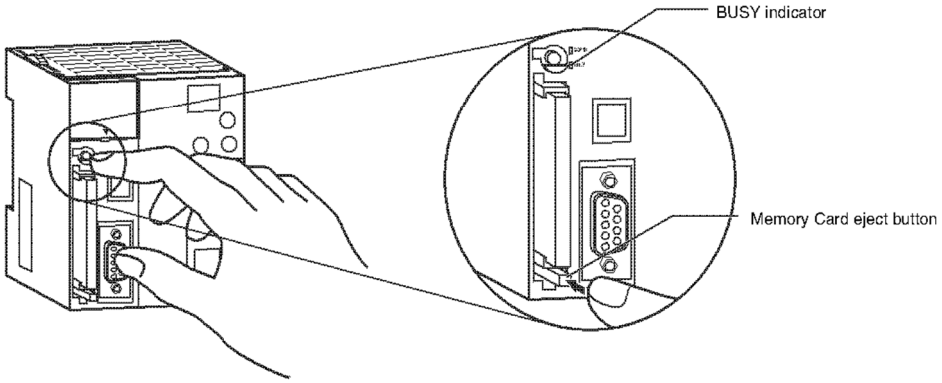
Removing the Memory Card

1 Press the Memory Card power supply switch.



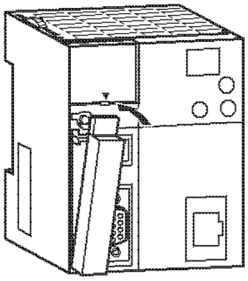
2 Press the Memory Card eject button after the BUSY indicator is no longer lit.

The Memory Card will be ejected from the compartment.



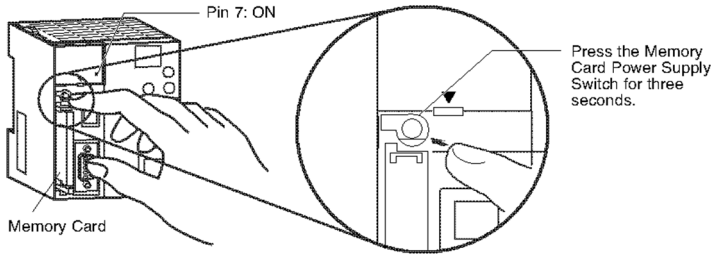
3 Pull out the Memory Card.

4 Install the Memory Card cover when a Memory Card is not being used.



11.8.3 Memory card back up

Backing Up Data from the CPU Unit to the Memory Card



1. Insert the Memory Card into the CPU Unit.
   The MCPWR indicator will light and the BUSY indicator will flash (meaning the Memory Card is being accessed) and then turn OFF.
2. Turn ON pin 7 on the CPU Unit's DIP switch.
3. Press the Memory Card Power Supply Switch for three seconds until the BUSY indicator lights, and then release the switch.
   The PLC will start backing up data to the Memory Card. The MCPWR indicator will flash once and then light while the data is being written. At the same time the BUSY indicator will flash. The MCPWR and BUSY indicators will both turn OFF when the operation is completed normally.
4. Turn OFF pin 7 on the CPU Unit's DIP switch.

Restoring Data from the Memory Card to the CPU Unit

1. Turn OFF the PLC power supply.
2. Insert the Memory Card containing the backup files into the CPU Unit.
3. Turn ON pin 7 on the CPU Unit's DIP switch.
4. Turn ON the PLC power supply.
   The PLC will start restoring the data from the Memory Card. The MCPWR indicator will flash once and then light while the data is being read. At the same time the BUSY indicator will flash.
   The MCPWR and BUSY indicators will both turn OFF when the operation is completed normally. If the MCPWR indicator flashes five times, or if only the BUSY signal turns OFF, it means that an error has occurred. (Refer to *8-3-3 Verifying Backup Operations with Indicators*.)
5. Turn OFF pin 7 on the CPU Unit's DIP switch.

Note 1 The backup function will override the automatic transfer at startup function, so the backup files will be read to the CPU Unit when the PLC is turned ON even if pin 2 of the DIP switch is ON.

2 Data will not be read from the Memory Card to the CPU Unit if pin 1 of the DIP switch is ON (write-protecting program memory).