

Paroteq H-System short manual

The Paroteq H-System is a semi-automatic flip-chip bonder. Samples can be picked up and placed with high lateral precision and with a controlled force and heat. The alignment is done by overlay imaging using beam splitter optics. This documents contains a short overview of the system and a step-by-step guide on using the tool. The detailed manual can be found on LIMS or on the CD next to the tool.

System overview

The system, as shown in Figure 1, features:

- Pickup tool motorized and programmable in z, manually movable in x and y, fine adjustable with alignment screws. Vacuum for sample pickup. Can be rotated fully (360 degrees) around z. Force range: 20cN to 200cN.
- Hotplate: 14x14mm (240W), separate temperature controller with adjustable temperature ramp.
- Touch panel: Programmable control of the process parameters and storage of recipes. Physical buttons (F1-F5) for quick navigation.
- Tactile buttons for fine adjustment of process parameters.

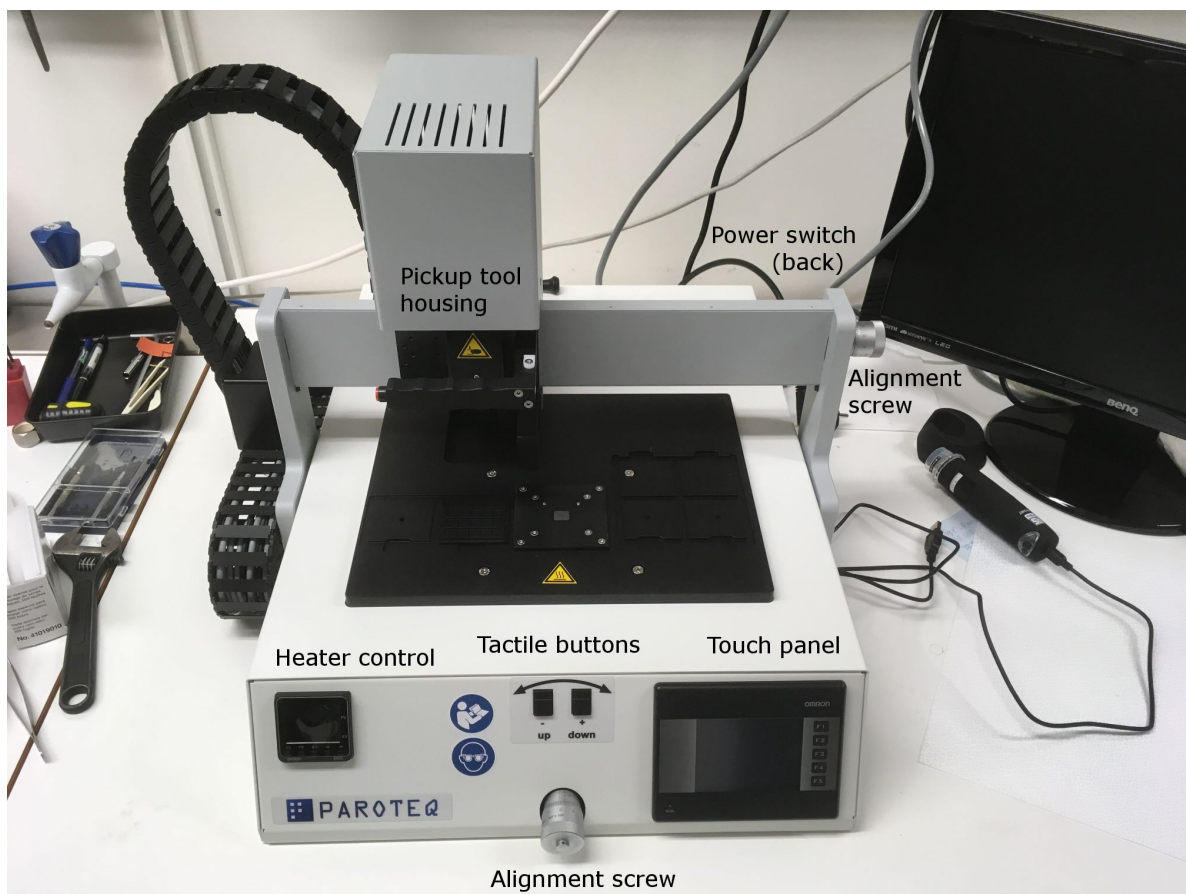


Figure 1: Overview of the Paroteq H-System

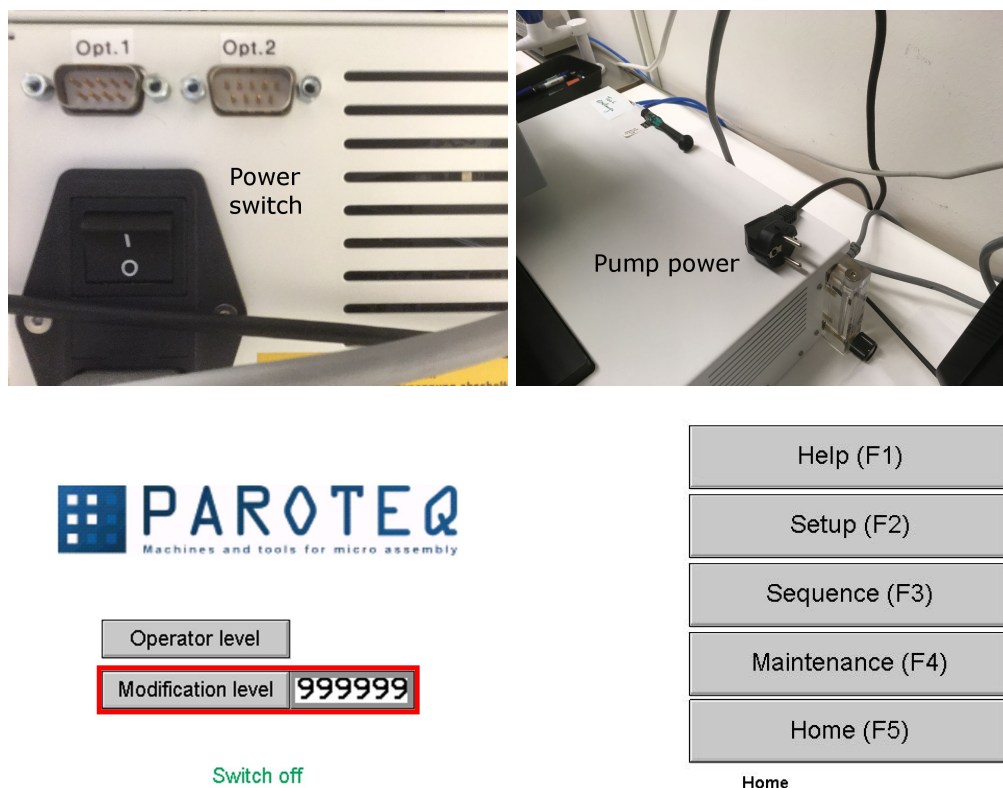


Figure 2: Starting up the system. Top row: rear side with power switch and pump power plug. Bottom row: login and home screens displayed on the touch panel on startup.

Starting the system

1. Plug in the **pump**.
2. Switch on the system by pressing the **power** switch. The system starts initialization.
3. When the touch panel shows the log in screen, type in the password **5387** to enter Modification level. The home screen should now display.
4. Go to Setup (**F2**) and select your **Set** (or create a new one) in the top-left corner (see Figure 3).

Operating the bonder

Picking up a sample

1. Place a box with samples to the left or right of the hotplate.
2. Move the pickup tool over the sample. Remember to keep the **red button** on the handle of the pickup tool housing pressed to unlock movement.
3. Adjust the viewing parameters and the polarizer at the camera in case you have problems seeing anything. On the setup screen adjust the **bottom focus first** then the tip focus.
4. Go to **Options** (a screen like the one to the left in Figure 4 appears). Leave most of the settings on default or see "Setting up a sequence" below for more details.
5. Switch the **tip vacuum on**.

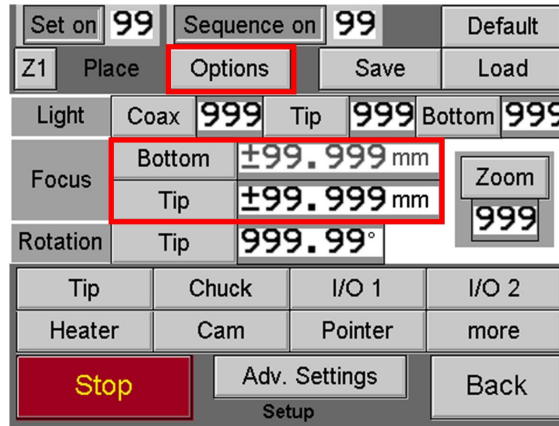


Figure 3: Basic operation: Setup screen

6. The right arrow below Adv. Settings brings you to a second options screen. Check that **heating** is deactivated. Afterwards go back by hitting the left arrow. Now the caption of the top button should say "Pick".
7. Go back one screen and **save changes**, so that you can repeat sample pickup for samples of the same kind to one of the sets, by first entering the number of the Set (1-6) and then pressing Save.
8. Go to Sequence (**F3**) and select the Set that you just set up. Follow the on-screen instructions, see "Running a sequence".

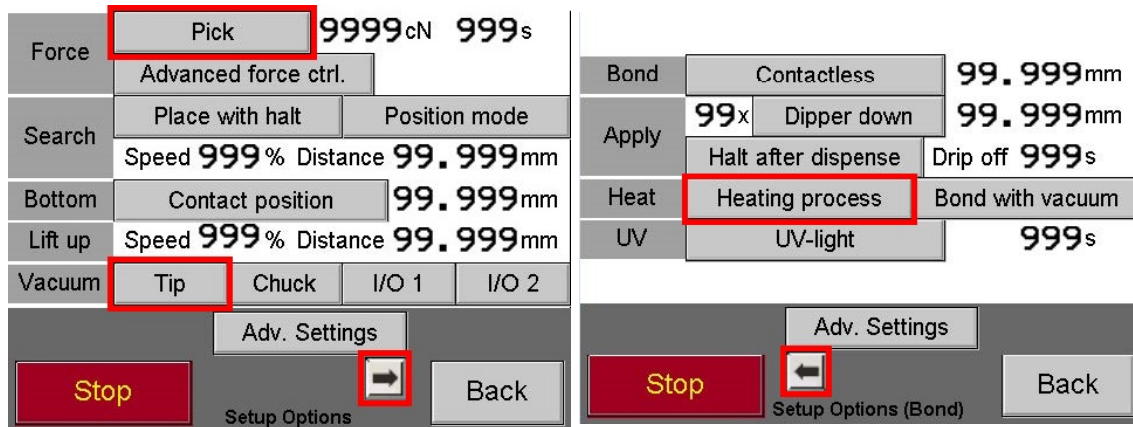


Figure 4: Basic operation: Option screen pages 1 and 2

Transferring the sample to a substrate

1. Place a substrate on the hotplate
2. Move the pickup tool holding the sample over the substrate.
3. Basically repeat steps 4-7 of "Picking up the sample", but set the vacuum and heating process for transferring the sample. Refer to "Setting up a sequence" for more details.

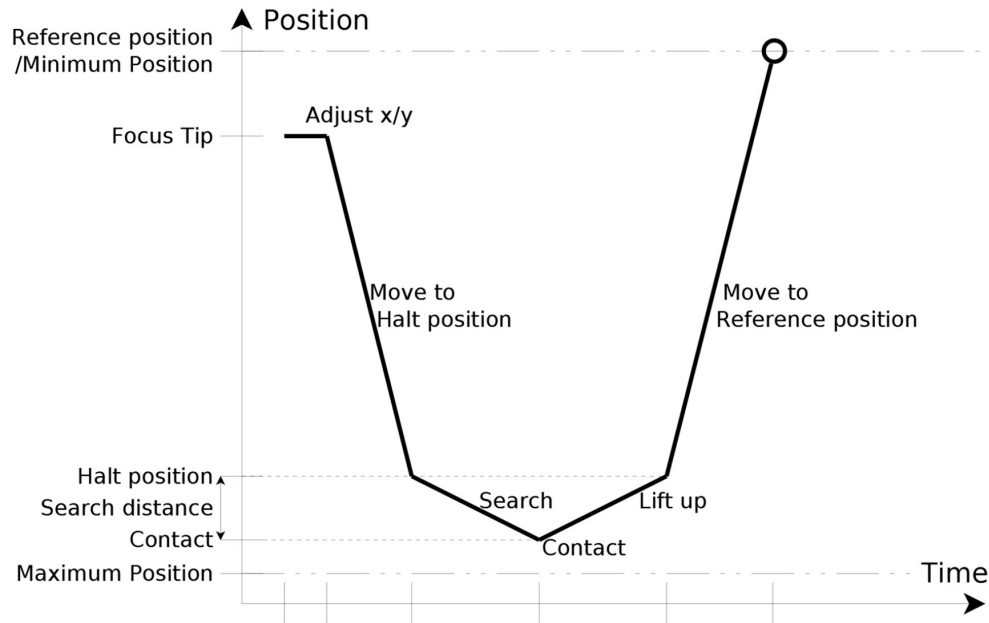


Figure 5: General schematic of the tool position when a sequence is run

Setting up a sequence

A set consists of up to 6 sequences, where a sequence can be either a pick, bond or place (automatically determined from the parameter set). A sequence is modified on the setup screen (**F2**).

Every sequence follows the scheme shown in Figure 5. The system first moves the tip to the halt position. If the user activates "Place with halt" the system pauses and prompts the user. Then it moves the search distance with reduced speed and senses for contact. After successful contact it switches vacuum on/off and optionally the heater on. It then moves the tool up with the lift up speed and finally returns to the reference position.

All distances are determined from the assumed **contact position**. Normally, this position is automatically determined from the bottom focus. To deactivate automatic determination of the contact position enable "Position mode". Now the contact position is independent of bottom focus.

The vacuum settings on the setup page define the momentary vacuum states and have actually no influence on the sequence, they are also not saved. On the other hand, the vacuum settings on the first options page are specific to a sequence and applied to the system on contact. A pick requires tip vacuum on when contact is made, while a place needs it switched off.

Any sequence requires **force** to be applied. The force is constantly measured during search of the contact. Force can also be applied for a certain time duration. The sequence then automatically changes to a bonding process. Both force and time values can be set on the first option page on the top right.

Thermal bonding requires activating "Heating process" on the second options page. This automatically sets the bonding time to 0. Instead, the bonding time, together with the temperatures and ramp rates are directly set on the temperature controller. Figure 6 shows how heat and cooling is applied to the hotplate in order to perform a controlled temperature ramp.

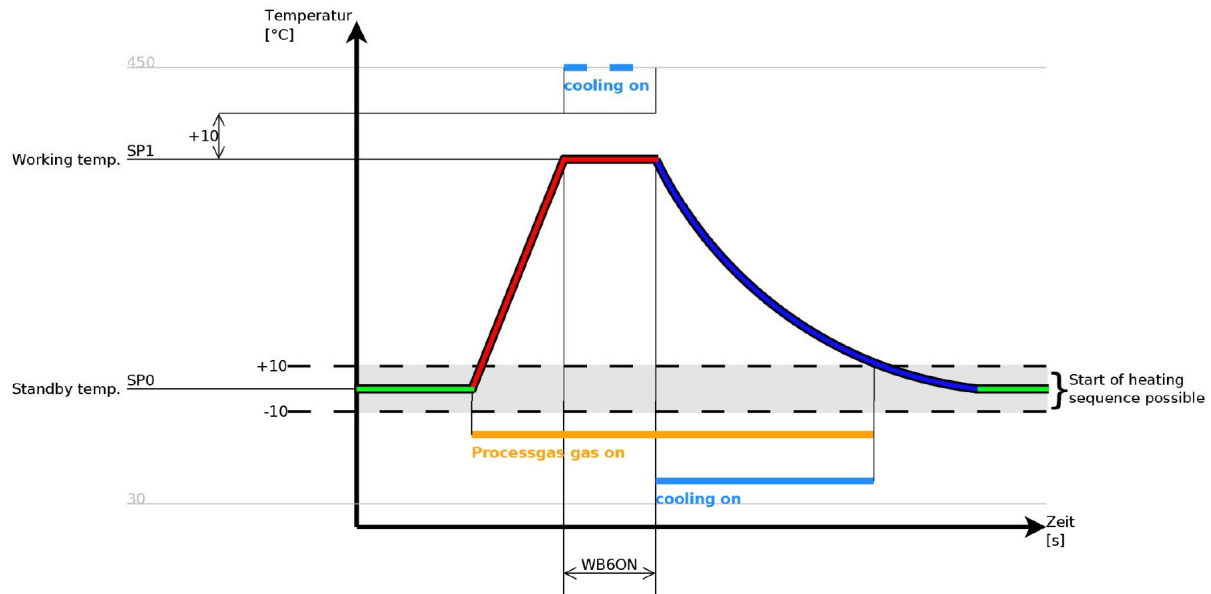


Figure 6: Schematic of the heating and cooling process used during thermal bonding.

Running a sequence

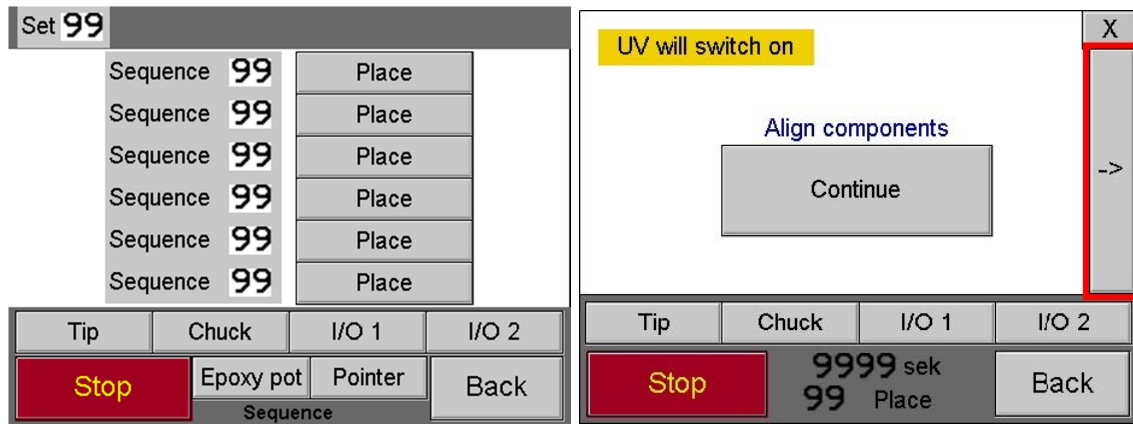


Figure 7: Running a sequence. Left: Sequence screen. Right: Pop-up screen guiding through a sequence.

A sequence that was configured on the setup screen cannot be run from there, instead switch to the sequence screen (**F3**). The correct set should already be selected and for each sequence in the set its type (pick, place or bond) is indicated. Make sure that the correct vacuum settings are enabled. For example, if you want to run a place vacuum tip has to be on. Activate a sequence by clicking on the button right next to it.

During a sequence **pop-up** screens guide through the individual steps and give information. Usually, a step has to be confirmed by pressing continue. Vacuum settings can be manipulated at any point of the process. Moreover, a button with a **right arrow** on the right edge of the screen allows to enter the sequence setup with access to some of the settings that are available on the normal setup screen. Some of these settings can even be saved as the new sequence configuration.

Good to know

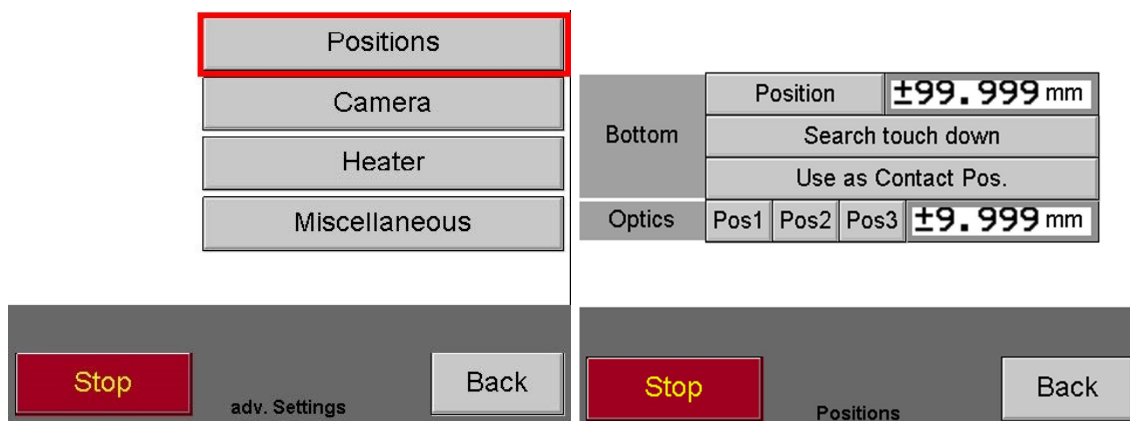


Figure 8: Advanced settings and positions screen

A very useful menu item is the **positions** screen which can be accessed for example by clicking on advanced settings on the setup screen. It allows to set bottom plate position manually or search for it automatically by clicking "Search touch down". Search speed as set in the options is applied and no focusing is needed. The value can be directly used as the contact position by clicking "Use as Contact Position". Further, the Optics positions 1 to 3 can be used to move the beam splitter manually back. This allows to image the sample further at the edge.

Tool exchange

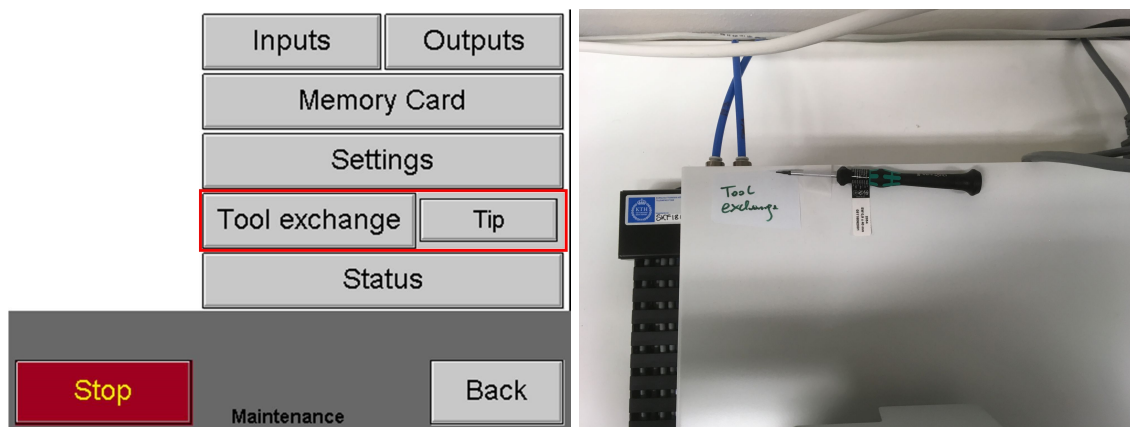


Figure 9: Tool exchange program setting and screw driver (system rear)

The tool should be exchanged with the system switched on. Go to the Maintenance screen (**F4**) and click on "Tool exchange". The system should now retract the beam splitter and park it in a save position. Pick up the **screw driver** at the back side of the system and use it to exchange the tip. After the exchange is performed confirm the exchange on the touch panel.