www.costeffectiveequipment.com

+1-573-466-4300

Operations Manual

Apogee® Thermal Bonder

Cost Effective Equipment

1 Introduction

1.1 Confidentiality Statement

Information supplied is for use in the operation and/or maintenance of Cee® equipment. Neither this document nor the information it contains shall be disclosed to others for manufacturing or any other purpose without written authorization from Cost Effective Equipment, LLC.

1.2 Warranty

Cost Effective Equipment, LLC warrants to the original purchaser (Buyer) that equipment is free from defects in material and workmanship under normal use and service in accordance with Cee® instructions and specifications. Buyer shall promptly notify Cee® of any claim against this warranty, and any item to be returned to Cee® shall be sent with transportation charges prepaid by Buyer, clearly marked with a Return Authorization (RMA) number obtained from Cee® Customer Support. Cee's obligation under this warranty is limited to the repair or replacement, at Cee's option, of any equipment, component or part which is determined by Cee® to be defective in material or workmanship. This obligation shall expire one (1) year after the initial shipment of the equipment from Cee®. This warranty shall be void if:

- Any failure is due to the misuse, neglect, improper installation of, or accident to the equipment.
- Any major repairs or alterations are made to equipment by anyone other than a duly authorized representative of Cee®. Representatives of Buyer will be authorized to make repairs to the equipment without voiding warranty, on completion of the Cee® training program.
- Replacement parts are used other than those made or recommended by Cee®.

CEE® MAKES NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, WITH RESPECT TO EQUIPMENT. NO WARRANTY IS MADE AS TO THE MERCHANTABILITY OF THE EQUIPMENT NOR ITS FITNESS FOR ANY PARTICULAR PURPOSE. In no event shall Cee® be liable for consequential loss or damages, however caused. No person or representative of Cee® is authorized to assume for Cee® any liability in connection with equipment nor to make any change to this warranty unless such change or modification is put in writing and approved by an authorized representative of Cee® in writing.

This warranty shall be governed by the laws of the state of Missouri, U.S.A.

1.3 Returned Materials

Any materials, parts, or equipment returned to Cost Effective Equipment, LLC must be clearly labeled with a Return Material Authorization (RMA) number.

To obtain an RMA number, contact:

Cost Effective Equipment, LLC Customer Support
Telephone ..... +1-573-466-4300
Email..... *support@costeffectiveequipment.com*
Web Address..... *www.costeffectiveequipment.com*
Physical Address..... 6 Industrial Drive; St. James, Missouri 65559

1.4 Model and Revisions

The model and serial number information for the Cee® Apogee® Bonder are located on the rear panel. Software version information can be found on the *About* screen. Refer to the *DataStream™ Manual* for screen shots and a detailed explanation of the system software.

1.5 Environmental Considerations

	Cee® fosters sustainability through innovation in the durability and reliability of our precision tools and equipment. Individual component modules are engineered for serviceability ensuring long lasting performance. Processes are designed to minimize use & consumption of chemical compounds ensuring accurate, replicable, industry-leading results every time.	Cee® favorise la durabilité grâce à l'innovation dans la durabilité et la fiabilité de nos outils et équipements de précision. Les modules de composants individuels sont conçus pour une facilité d'entretien garantissant des performances durables. Les processus sont conçus pour minimiser l'utilisation et la consommation de composés chimiques, garantissant à chaque fois des résultats précis, reproductibles et à la pointe de l'industrie.
	Cee® diligently screens suppliers to ensure conflict-free sourcing of minerals and product components are constructed of recycled materials wherever possible.	Cee® sélectionne avec diligence les fournisseurs pour garantir que l'approvisionnement en minéraux est sans conflit et que les composants des produits sont fabriqués à partir de matériaux recyclés dans la mesure du possible.
	Cee® tools and equipment operate without the use of ozone depleting substances (ODSs) including chlorofluorocarbons (CFCs), methyl chloroform, hydrochlorofluorocarbons (HCFCs), carbon tetrachloride, perfluoro compounds (PFCs), or other volatile compounds/organic solvents.	Les outils et équipements Cee® fonctionnent sans utilisation de substances appauvrissant la couche d'ozone (SACO), notamment les chlorofluorocarbures (CFC), le méthyle chloroforme, les hydrochlorofluorocarbures (HCFC), le tétrachlorure de carbone, les composés perfluorés (PFC) ou d'autres composés volatils/solvants organiques.

1.6 General Safety Hazards / Precautions

	Read this manual in its entirety before operating or servicing the machine.	Lisez ce manuel dans son intégralité avant d'utiliser ou d'entretenir la machine.
	The unit is very heavy and proper precautions should be taken when handling the machine to minimize the risk of injury. Labels are placed on the machine to identify areas where caution is needed during operation.	L'unité est très lourde et des précautions appropriées doivent être prises lors de la manipulation de la machine pour minimiser le risque de blessure. Des étiquettes sont placées sur la machine pour identifier les zones où des précautions sont nécessaires pendant le fonctionnement.
	Sound pressure measurements greater than 80dB(A) are considered hazardous. The following sound pressure measurements were obtained from the Cee® Apogee® Bonder at a distance of 3 ft (0.9 m) from the system: Stand-by Mode: 40dB(A) Normal Operations: 40dB(A)	Les mesures de pression acoustique supérieures à 80 dB(A) sont considérées comme dangereuses. Les mesures de pression acoustique suivantes ont été obtenues à partir de la plaque de cuisson Cee® Apogee® Bonder à une distance de 3 pieds (0,9 m) du système: Mode veille: 40 dB(A) Fonctionnement normal: 40 dB(A)

1.7 Electrical

	High voltage is present in the machine. Disconnect power before servicing.	Une haute tension est présente dans la machine. Débranchez l'alimentation avant l'entretien.
	Stored electrical energy is present in the machine. Before servicing allow sufficient time for discharge.	L'énergie électrique stockée est présente dans la machine. Avant l'entretien, prévoyez suffisamment de temps pour la décharge.
	This unit must be connected to an outlet with proper grounding.	Cet appareil doit être connecté à une prise avec une mise à la terre appropriée.

1.8 Mechanical

	This machine may contain compressed gases which can provide motive force for components and can expand violently upon decompression. Disconnect N2 or CDA before removing any panels.	Cette machine peut contenir des gaz comprimés qui peuvent fournir une force motrice aux composants et peuvent se dilater violemment lors de la décompression. Débranchez le N2 ou le CDA avant de retirer les panneaux.
	Ensure that all panels are on and in their correct locations before powering up or operating.	Assurez-vous que tous les panneaux sont allumés et à leur emplacement correct avant la mise sous tension ou l'utilisation.
	When opening lids be aware of the pinch point at the hinge cover. Open lids only by using the handles on the lids.	Lorsque vous ouvrez les couvercles, faites attention au point de pincement au niveau du cache de la charnière. Ouvrez les couvercles uniquement en utilisant les poignées des couvercles.
	When operating lid, be aware of the risk of the lid falling and crushing/closing on fingers/hands.	Lorsque vous utilisez le couvercle, soyez conscient du risque de chute et d'écrasement/fermeture du couvercle avec les doigts/mains.

1.9 Thermal

	Platens can reach sufficient temperatures to cause severe burns and may remain hot for a long-time following operation. Do not service the machine until all surfaces have cooled to a safe thermal condition (e.g., room temperature).	Les plateaux de cuisson peuvent atteindre des températures suffisantes pour provoquer de graves brûlures et peuvent rester chaudes longtemps après l'opération. N'entretenez pas la machine tant que toutes les surfaces n'ont pas refroidi à un état thermique sûr (par exemple, température ambiante).

1.10 Chemical

	Cee® does not supply or dictate chemicals to be used in conjunction with the Cee® Apogee® Bonder. Material data will be reviewed during equipment design and configuration to ensure compatibility with the customer's proprietary process. Prior to introducing new chemicals, refer to your chemical supplier's factory specifications and MSDS. Material Safety Data Sheets (MSDS) contain crucial information regarding chemical safety, including details about hazardous components, physical properties, spill and leak procedures, waste disposal guidelines, and personal protective equipment requirements for handling.	Cee® ne fournit ni n'impose aucun produit chimique à utiliser avec la plaque de cuisson Cee® Apogee® Bonder. Les données matérielles seront examinées lors de la conception et de la configuration de l'équipement pour garantir la compatibilité avec le processus exclusif du client. Avant d'introduire de nouveaux produits chimiques, reportez-vous aux spécifications d'usine et à la fiche signalétique de votre fournisseur de produits chimiques. Les fiches signalétiques (MSDS) contiennent des informations cruciales concernant la sécurité chimique, notamment des détails sur les composants dangereux, les propriétés physiques, les procédures en cas de déversement et de fuite, les directives d'élimination des déchets et les exigences en matière d'équipement de protection individuelle pour la manipulation.
	Ensure chemical compatibility of all chemicals and materials being used inside the machine. This includes all wetted parts of the storage, supply, dispense, and waste systems.	Assurer la compatibilité chimique de tous les produits chimiques et matériaux utilisés à l'intérieur de la machine. Cela inclut toutes les parties mouillées des systèmes de stockage, d'alimentation, de distribution et de déchets.
	Potential for flammable Chemicals. No open flames/sparks.	Potentiel de produits chimiques inflammables. Pas de flammes nues/étincelles.
	Relieve pressure and shut off chemical valves before servicing supply lines, dispense valves or other components.	Relâchez la pression et fermez les vannes chimiques avant d'entretenir les conduites d'alimentation, les vannes de distribution ou d'autres composants.
	Ensure proper ventilation/exhaust is always used.	Assurez-vous qu'une ventilation/évacuation adéquate est toujours utilisée.
	Always wear appropriate Personal Protective Equipment. This includes safety glasses, gloves, and other equipment, as needed, to protect from mechanical and chemical hazards.	Portez toujours un équipement de protection individuelle approprié. Cela comprend des lunettes de sécurité, des gants et tout autre équipement, si nécessaire, pour se protéger des risques mécaniques et chimiques.
	Exhaust and fume management is important to prevent the release of hazardous materials and ensure a safe working environment. Users should assume that all fumes are hazardous and take appropriate precautions to ensure system exhaust is functional per the guidelines outlined in section **Error! Reference source not found.** of this manual.	La gestion des gaz d'échappement et des fumées est importante pour empêcher le rejet de matières dangereuses et garantir un environnement de travail sûr. Les utilisateurs doivent supposer que toutes les fumées sont dangereuses et prendre les précautions appropriées pour garantir que l'échappement du système est fonctionnel conformément aux directives décrites dans la section 6 de ce manuel.

1.11 Lockout/Tagout Procedures and Information

Before servicing, turn off the machine and remove the power inlet cord by disconnecting the plug where it enters the machine.

Note: There are no LOTO (Lock Out/Tag Out) facilities supplied with the Cee® Apogee® Bonder. It is the responsibility of the customer/installer/end-user to ensure that the suitable LOTO devices are provided on utilities being supplied to the Cee® Apogee® Bonder in accordance with applicable laws, regulations, and/or company policies.

For more information, please contact *Cee® Customer Support*.

1.12 Intended Use of Machine

The Cee® Apogee® Bonder is intended for use as a semiconductor/optical application machine.

The Cee® Apogee® Bonder is not intended for use in food or medical applications or for use in hazardous locations.

The Cee® Apogee® Bonder is intended for use only by trained personnel wearing the proper personal protective equipment. Anyone not trained in the proper use of the Cee® Apogee® Bonder and having not fully read this manual, should not operate the equipment.

The Cee® Apogee® Bonder is intended for use in a cleanroom environment to provide the proper processing conditions for substrates. If it is used outside of a cleanroom environment, substrate cleanliness may be compromised.

The Cee® Apogee® Bonder is not intended for use in a hazardous or explosive environment.

Normal Operating Conditions

The Cee® Apogee® Bonder is designed for indoor use only.

Ambient Temperature ..... 10°C - 30°C

Relative Humidity ..... ≤80%

Altitude ..... up to 3000 m

Pollution Degree 2

Overvoltage Category II

Permissible Voltage Fluctuations ..... 208-230VAC ±10%

	If the Cee® Apogee® Bonder is used in a manner not specified by Cee® or with accessories not provided by Cee® the protection provided by the equipment may be impaired.	Si la plaque de cuisson Cee® Apogee® Bonder est utilisée d'une manière non spécifiée par Cee® ou avec des accessoires non fournis par Cee®, la protection fournie par l'équipement peut être altérée.

2 Equipment Description

The Apogee® Bonder from Cost Effective Equipment is a floor-standing system engineered for temporary wafer bonding processes. The tool utilizes two precision-controlled heated platens to apply uniform heat and pressure, enabling reliable bonding of device wafers to carrier substrates with a wide range of temporary adhesives. The platen assemblies are designed for excellent thermal uniformity and process repeatability, ensuring consistent results across wafer sizes and adhesive types. Integrated controls allow the operator to define bonding temperature, pressure, and time profiles, providing flexibility for both R&D and pilot-line applications. The robust design, uniform heating performance, and ease of use make the Apogee® Bonder a dependable platform for advanced packaging and material research.

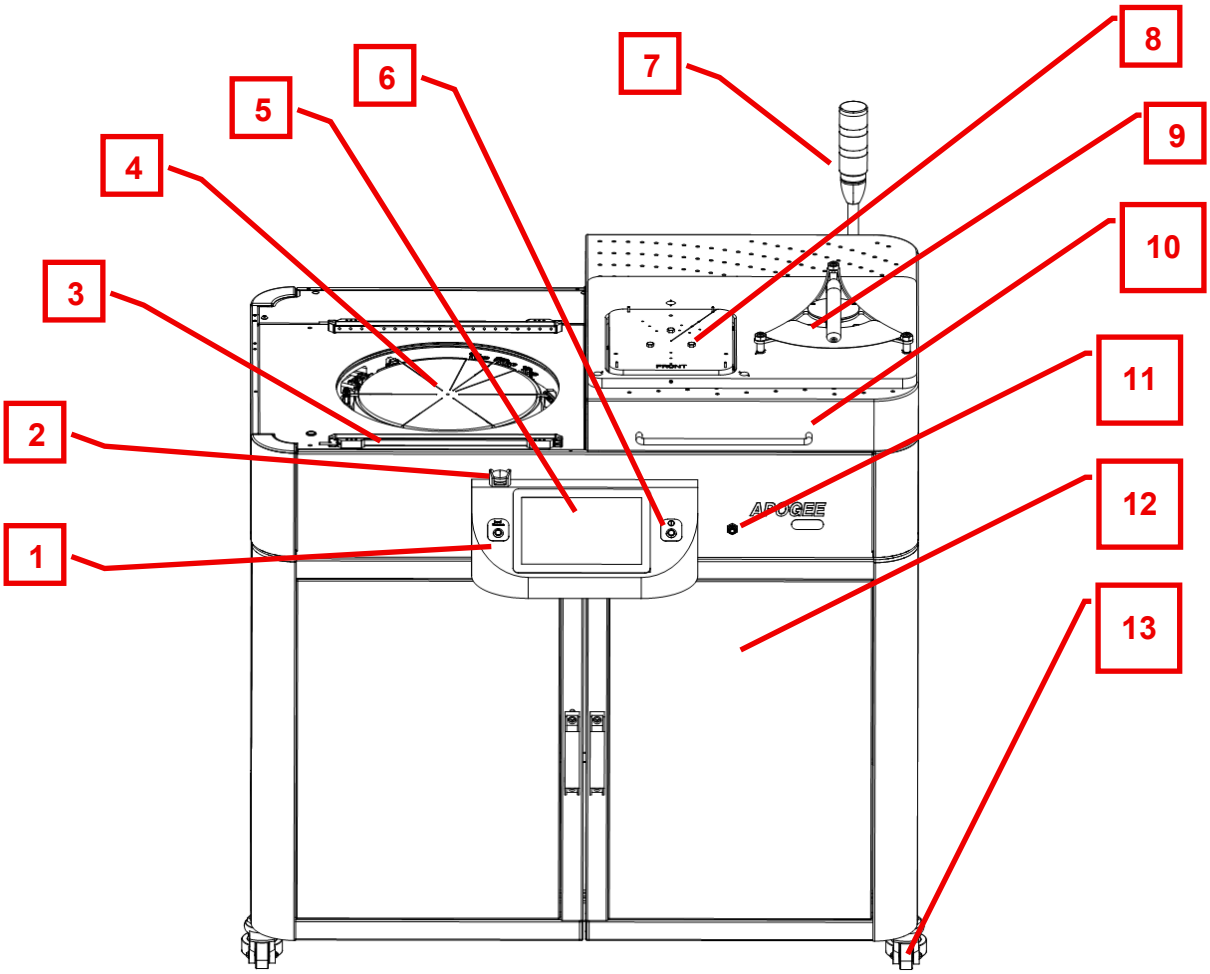


Figure 1 Apogee® Bonder User Controls

2.1 User Controls

1. local presence button[1] .... used for remote access
2. EMO[2] ..... immediately shuts down all process functions
3. safety light curtain ..... optical guard preventing access during operation
4. lower platen..... the platen in which the device and carrier wafer are loaded
5. touchscreen interface ..... graphical display for equipment operation and feedback
6. power button ..... used to turn the tool off and on
7. light tree ..... visual indicator for equipment state and alerts

[1] Refer to the DataStream™ Manual for more detailed information.
[2] Emergency Machine Off (EMO)

8. load/unload station ..... location for carrier pickup and bonded wafer cooling
9. wafer transfer ..... picks up and aligns carrier wafer and extracts bonded pair
10. bonder lid ..... covers the upper platen and components
11. wafer transfer vacuum port ..... vacuum sources for the wafer transfer tool
12. door ..... open for storage and vacuum pump access
13. leveling feet ..... used to move the equipment and fix it into place

2.2 System Components and Layout

Baseplate

The Apogee® baseplate assembly is depicted in Figure 10 (below). The assembly / construction is divided up into the main areas identified in the image.

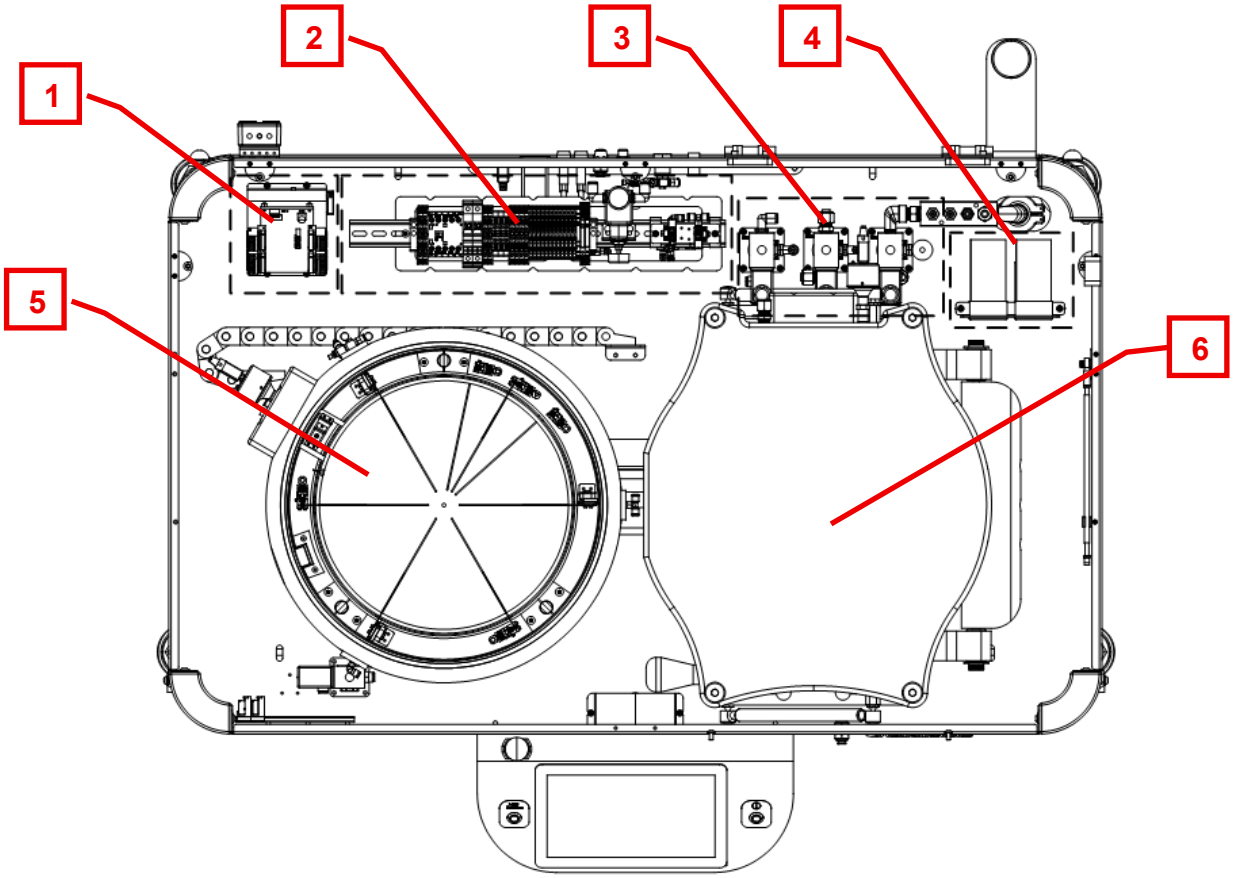


Figure 2 Apogee® Bonder Baseplate

1. I/O control ..... digital inputs and outputs
2. electrical distribution bus ..... distributes AC and 24VDC power
3. pneumatic control ..... vacuum and pressure valves
4. temperature control ..... process and over temperature controllers and relays
5. lower platen ..... the platen in which the device and carrier wafer are loaded
6. upper platen ..... the platen in which the carrier is pressed into

Lower Chamber

The Apogee® lower chamber is where the wafers are loaded in advance of being bonded. The press platen surface is heated to the process temperature programmed in the bonding recipe, and size-specific wafer alignment fixtures keep both carrier and device wafer precisely aligned during the bonding stage.

When closed (against the upper chamber) the space inside is evacuated via the vacuum pump system. The level of vacuum is measured by a vacuum transducer located on the side of the chamber and is controlled by a solenoid valve on the baseplate

During bonding, the press platen is forced upward at the force programmed in the bonding recipe. The force is measured by way of the upper chamber vacuum transducer & the lower chamber vacuum transducer and is controlled by software actuated solenoid valves on the baseplate.

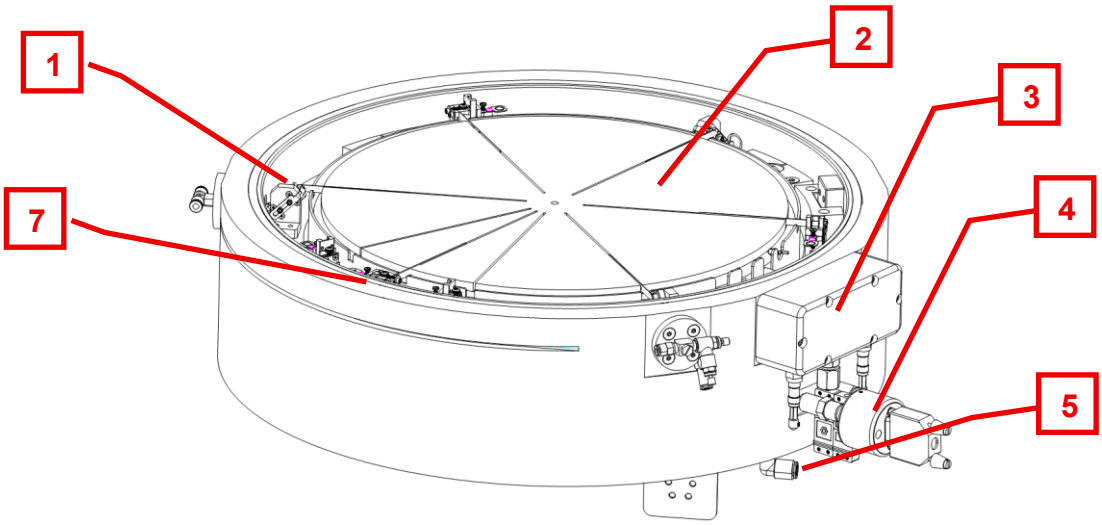


Figure 3 Apogee® Bonder Lower Chamber

1. wafer alignment/separation flags ..... aligns the wafers and keeps the wafers separated
2. heated platen ..... flat and heated surface that the wafers are loaded
3. power/control inlet ..... inlet for platen power and thermocouples
4. pressure transducer ..... reads the bonder press piston pressure
5. chamber open/close input ..... port that applies pressure to close the chambers
6. press pressure inlet ..... port that provides the bond pressure
7. o-ring ..... seals against upper chamber

Upper Chamber

In conjunction with the lower chamber, The Apogee® upper chamber completes the bond chamber system. A heated platen in this upper chamber is heated to the process temperature programmed in the bonding recipe and ensures thorough bonding of your wafer stack.

When closed (against the lower chamber) the space inside is evacuated via the vacuum pump system. The level of vacuum is measured by way of a vacuum transducer located on the side of the chamber and is controlled by a solenoid valve on the baseplate.

The chamber can be pivoted upward for easy cleaning and maintenance. The supplied gas springs will keep the chamber open without the need to physically keep the chamber lifted. The chamber handle provides a facility to lift the chamber open for cleaning while keeping personnel safe from burns or other hazards.

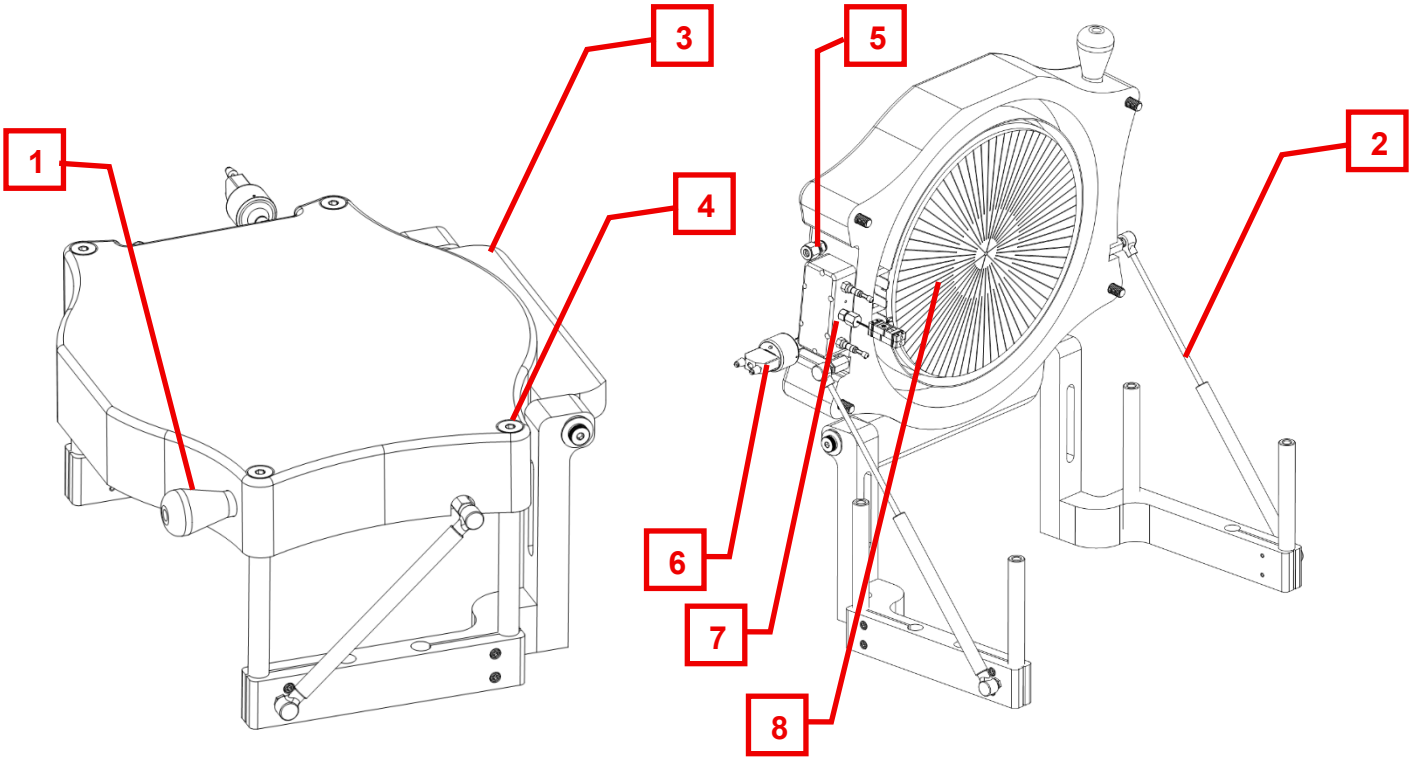


Figure 4 Apogee® Bonder Upper Chamber

1. handle ..... used to lift the upper chamber for service
2. gas spring ..... assists with the weight of the upper chamber
3. pivot hinge..... the point at which the chamber pivots about when opened
4. chamber bolts..... secures the chamber during operation, removed to open
5. chamber vacuum..... the port used to pump the chamber pressure down
6. vacuum transducer..... reads the upper chamber pressure
7. power/control inlet ..... inlet for platen power and thermocouples
8. heated platen ..... flat and heated surface that presses the wafer

Vacuum Pump Assembly

The purpose of the vacuum pump assembly is to provide a source of vacuum tor Apogee® Bonder operation. This is done by way of an Edwards nXDS series dry scroll pump. The pump is located in the cabinet beneath the bonder main assembly and is automatically activated by the Apogee® Bonder control system whenever vacuum is required for a bonding process. No further operator interaction is required.

Included in this assembly are the connection elements necessary to interface the pump to the Apogee® Bonder. Additionally, convenience elements such as an exhaust muffler and input vapor trap are included.

For additional information please refer to Edwards vacuum pump manual.

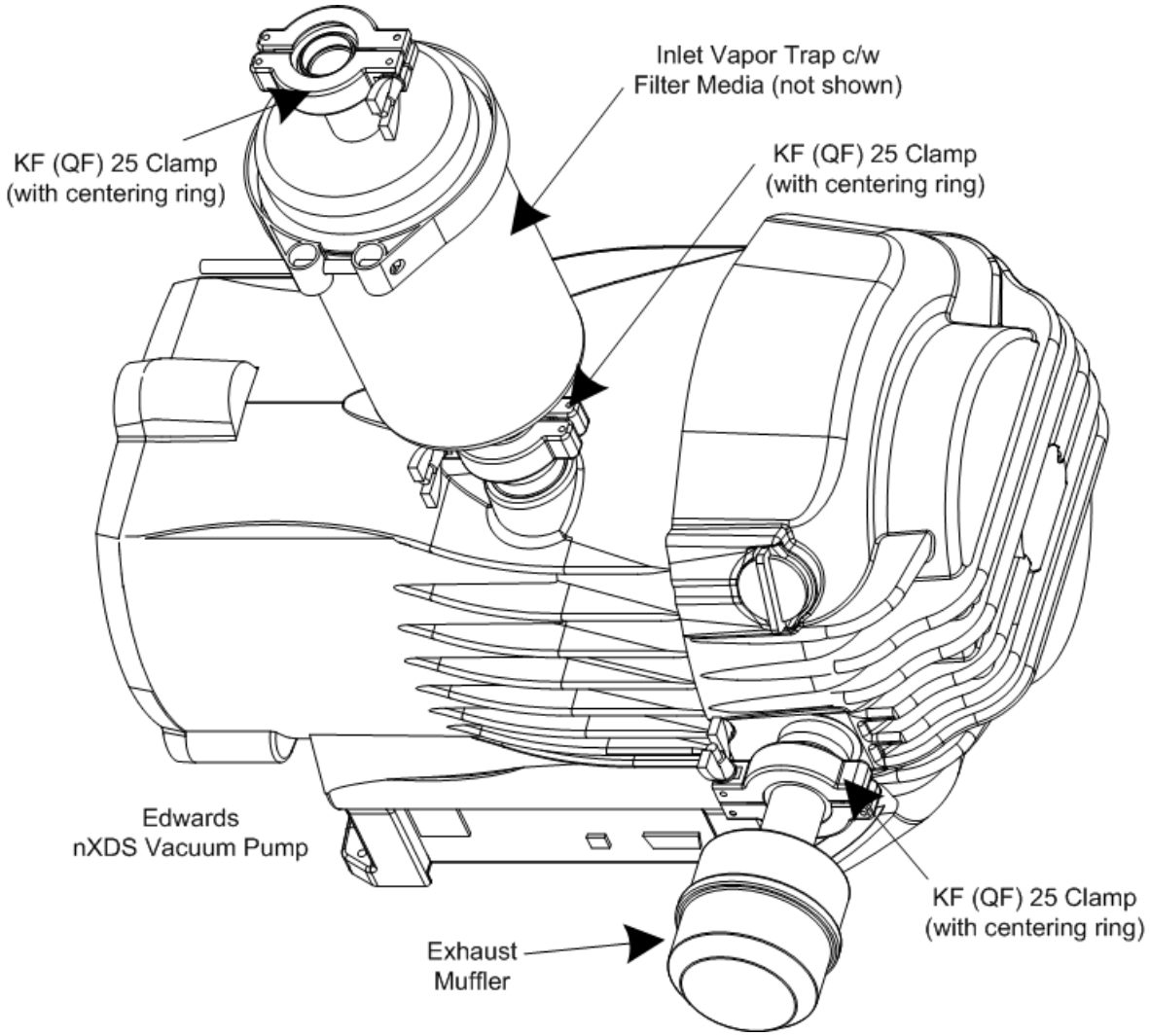
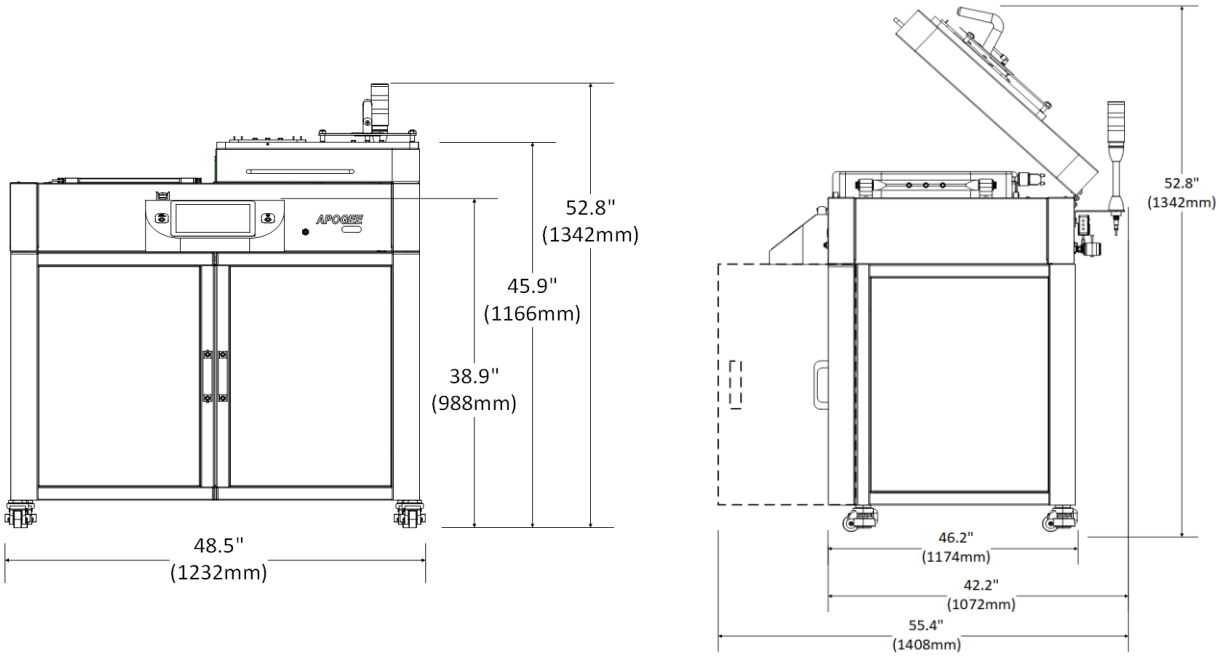


Figure 5 Apogee® Bonder Vacuum Pump

2.3 Dimensions

48.5” (1232mm) W x 42.2” (1072mm) D x 52.8” (1342mm) H
Machine Weight 500lbs (227kg)



Front View with Dimensions

Side View with Dimensions

Figure 6 Bonder Dimensions

2.4 Features

- Max. temperature: 300°C
- Piston force: 550 -12,000 N
- Force resolution: 10-N steps
- Dual heated platens with independent temperature controls
- Bond chamber evacuation time: <90 seconds
- Carrier and device are separated during pre-bond evacuation
- Platen temperature uniformity: 0.3% across working surface
- Mechanical alignment fixtures are compatible with wafer notches/flats
- Alignment accuracy: ≤0.5 mm (dependent on substrate tolerances)

2.5 Programmability

- full-color touch screen interface and display
- push notifications sent to any web-enabled device
- virtually unlimited number of user-defined recipe program steps
- 0.1-second resolution for step times (time: 0-9,999.9 s/step)
- view process status and download for offline analysis
- process traceability for every wafer
- on-line graphical process charts and logs for piston pressure, force, temperature, vacuum, and cycle time
- connectivity: USB/Ethernet port for communications for uploading/downloading process parameters with DataStream™ technology

2.6 Utilities

voltage ranges .....208-230 VAC, 50/60 hz, single phase
power requirements .....12.4A max, 2839 Watts
fuse protector.....MDA-20-R, Slow-Blow 250V, 20A *(qty 2)*
vacuum (for wafer handling).....20" HG(33kPa), 1/4" PTC OR 1/4" FNPT
nitrogen/CDA .....70 psi(483kPa),1/4" PTC OR 1/4" FNPT

Additional for supplied process vacuum pump:

voltage ranges .....100-127 / 200-240 VAC, 50/60 hz, single phase
power requirements .....10A max

3 Installation

3.1 Clearance Requirements

The Cee® Apogee® Bonder is a floor-standing unit requiring a sturdy and level floor for location. The recommended freestanding space requirements are: 3" (76.2mm) back to front and 3" (76.2mm) side to side.

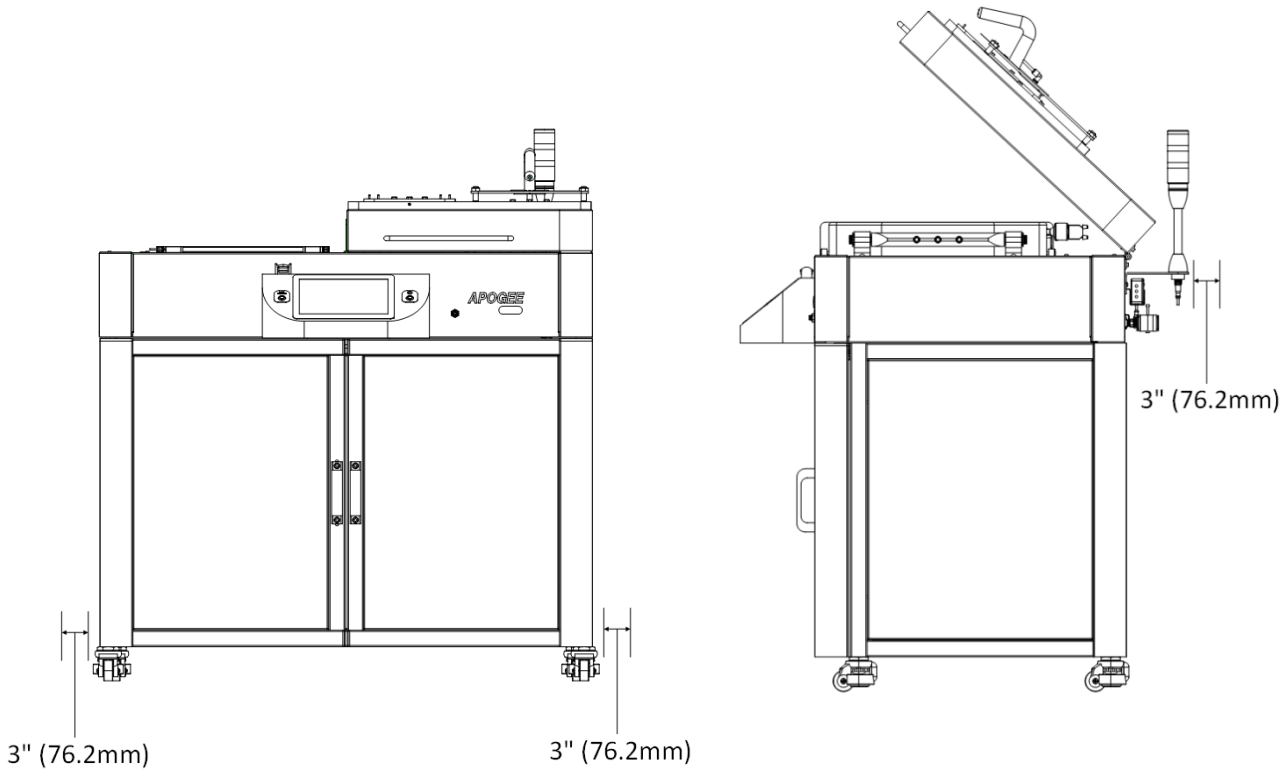


Figure 7 Bonder Clearance

3.2 Facilities Requirements

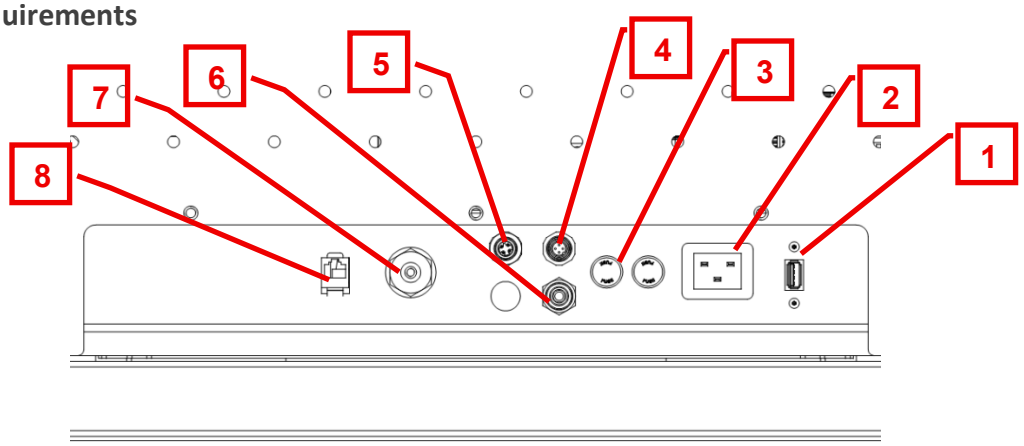


Figure 8 Utilities

1. USB Port[3] ..... facilitates data transfer
2. electrical power inlet ..... 20A | region specific | power cord supplied
3. fuses ..... system protection fuses
4. accessory connections[4] ..... enables communication with optional accessories
5. light tree connection ..... port that powers the light tree
6. vacuum ..... ¼" PTC or NPT system vacuum
7. N2 (CDA)[5] ..... ¼" PTC or NPT system N2/CDA
8. ethernet ..... facilitates remote recipe writing & remote device control

3.3 Environment

The Cee® Apogee® Bonder should be operated in a clean, climate-controlled environment.

3.4 Unpackaging & Inspection

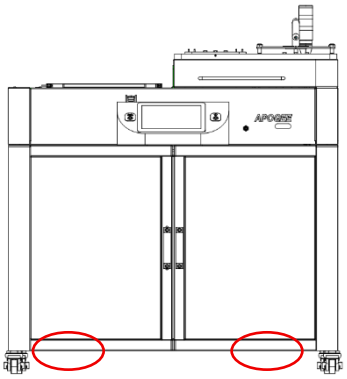


Figure 9 Fork Points

1. Carefully remove the sides from the crate. Lifting the unit from the crate base by forking at the points shown in, Do not lift by any of the top covers or protrusions. Do not roll or turn the unit on its sides.
2. Remove packing foam and plastic wrap.
3. Open the front doors to find all accessories, power cord, light tree, temperature/humidity sensors, and vacuum pump packed inside the equipment.
4. Place the Cee® Apogee® Bonder on a level floor of sufficient strength so that the controls are at the proper ergonomic height.
5. Thoroughly check machine for shipping damage. If physical damage is seen, **DO NOT APPLY POWER!** Contact Cee® Customer Support immediately.

[3] see DataStream™ Manual for more information
[4] M12 circular metric connectors facilities external comm
[5] Tools through July 2022 include ¼" barb connect as standard/ post-July 2022 tools are supplied with a ¼" push connect fitting as standard. Connection fittings may vary based on customer request.

3.5 System Installation & Setup

1. Thoroughly clean the exterior of the Cee® Apogee® Bonder. See section 7 for more information regarding proper cleaning procedures.
2. Install the light tree and temperature humidity sensor bracket onto the back of the machine (Figure 10) and plug both connectors in. The ports are labeled and only mate with the correct component.
3. Open the lid to bonder and locate the 4 upper platen bolts.
4. Remove all 4 bolts using the supplied allen key (shown in Figure 12).
5. Locate the locking posts (locations shown in blue circle in Figure 12) for the lower chamber and pull out to remove. The lower chamber can be pushed side to side to access or to allow the upper chamber to open.
6. Once the lower chamber is free to move, close the upper chamber, tighten all 4 bolts back down, and close the bonder lid.
7. Locate and unpack the vacuum pump and components.
8. Install the inlet vapor trap onto the pump using the supplied KF25 clamp and gasket.
9. Open the inlet vapor trap and insert one of the supplied mesh screens to the bottom.
10. Pour the activated carbon media into the trap and top with the second mesh screen.
11. Seal the lid on the trap.
12. Connect the bellowed vacuum line (coming from the bottom of the bonder baseplate) to the inlet vapor trap using a KF25 clamp and gasket.
13. Along with the bellow vacuum line, there is a DB15 connector coming from the bottom of the bonder baseplate. Connect that into the DB15 port of the vacuum pump.
14. Locate the power cord for the pump. Plug into the vacuum pump and then run it out of the bonder via one of the holes in the floor or the back panel. Connect to electrical power.
15. Optional: the vacuum pump is supplied with an exhaust muffler. The pump is a dry scroll suitable for cleanroom operation but if you wish to vent the exhaust, remove the muffler and connect the exhaust line to this point.
16. Connect utilities per reference diagram in section □.
    - connect the vacuum supply to the vacuum fitting
    - connect nitrogen/CDA to the N_2 fitting
    - connect system power inlet, plug in the machine
    - optional- connect ethernet

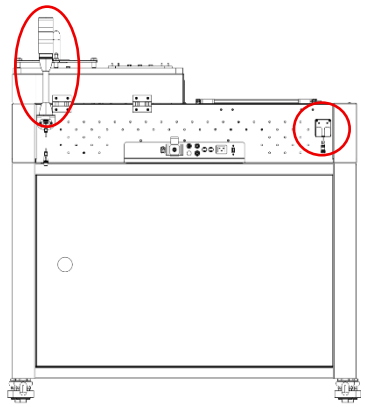


Figure 10 Light Tree and Temp/Humidity Sensor

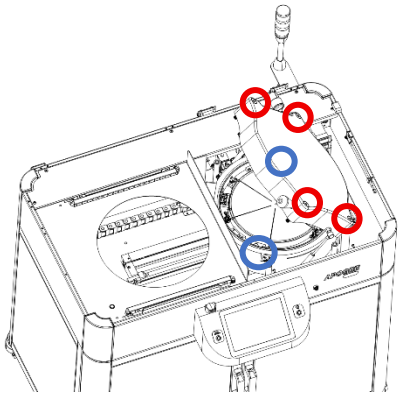


Figure 11 Platen Access

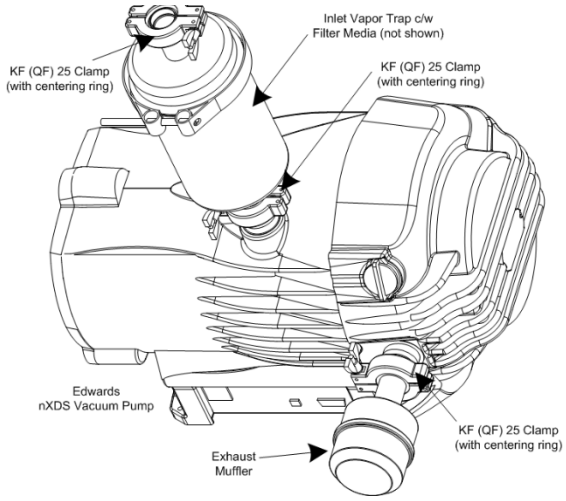


Figure 12 Vacuum Pump

3.6 Start Up

1. Rotate the EMO button clockwise until it returns to the released position.
2. Turn the machine on by pressing the lighted power switch. The display will cycle through a series of boot screens before arriving at the main login screen.
3. Enter the default administrative login credentials:

   Username: ..... admin
   Password: admin2

**Your Cee® Customer Support representative will conduct initial system checks and calibration procedures following installation.*

4 DataStream™ Technology

This section covers information specific to Apogee® Bonders and is intended as a companion to the DataStream™ Technology Software Manual. Please review the DataStream™ Operations Manual for detailed guidance on software usage.

4.1 System Parameters

Parameter	Actual	Set Point	Status
Lower Platen Temp	60.0 °C	60.0 °C	In Range
Upper Platen Temp	59.9 °C	60.0 °C	In Range
Chamber Pressure	97.8 kPA	0.5 kPA	In Range
Bond Force	0 N	0 N	In Range
Position	Unload	Unload	In Range
Ambient Temperature	34.3 °C		In Range
Humidity	19.3 %		In Range

Lower Platen Temp---------- the current temperature of the lower platen displayed against the target set point in degrees Celsius[6]

Upper Platen Temp---------- the current temperature of the upper platen displayed against the target set point in degrees Celsius[7]

Chamber Pressure---------- measurement of the vacuum pressure of the chamber in kPa

Bond Force---------- the current force pushing the lower platen into the upper platen displayed against the set point in Newton's force.

Position---------- indicates the position of the lower chamber

Ambient Temperature------ the air temperature of the environment where the equipment is housed

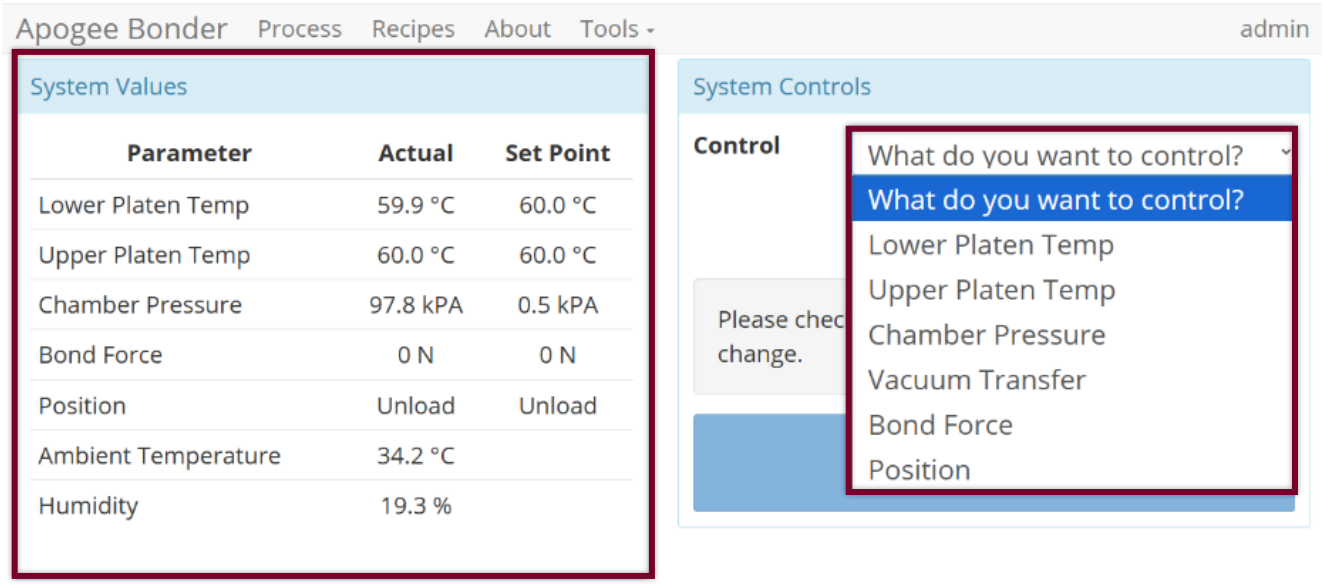
Humidity[8]---------- the ambient relative humidity in the environment where the equipment is housed

[6] A process will not wait to achieve desired temperatures before moving onto the next step. Utilize preconditions or manual controls to ensure platen temperatures are in range before a process is initiated.
[7] A process will not wait to achieve desired temperatures before moving onto the next step. Utilize preconditions or manual controls to ensure platen temperatures are in range before a process is initiated.
[8] Both Ambient Temperature and Humidity are measured via a custom sensor board mounted next to a ventilation inlet inside the tool. If sensor is disconnected, default of -1.1 is displayed.

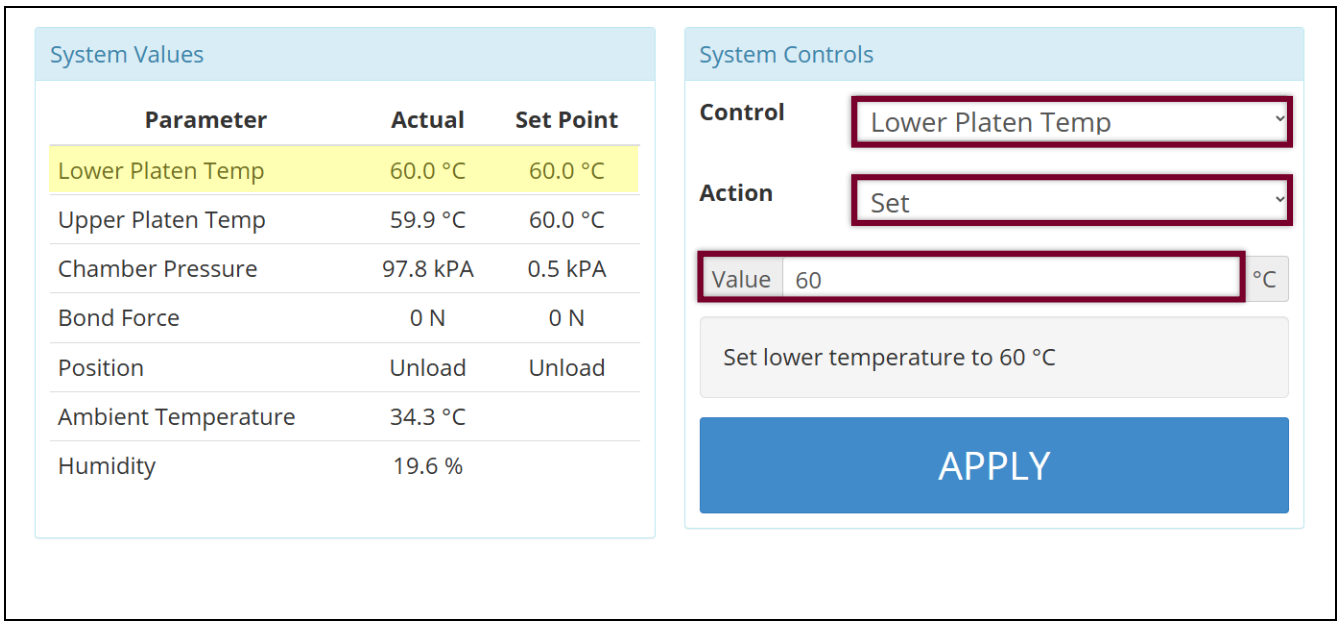
4.2 Manual Controls – Apogee® Bonder

The Manual Control activity is an advanced feature that allows users to run most operating processes outside of a recipe. This mode is useful for tasks such as prototyping processes, verifying equipment operation, and recovering from aborted processes. To access the activity, navigate to ***Tools > Manual Control***. Actual and set point parameter values are displayed on the left. A drop-down menu of available controls is located on the right.

If using remote feature, the user must confirm local presence to execute manual commands. Refer to the DataStream™ Manual for guidance on the Local Presence feature.



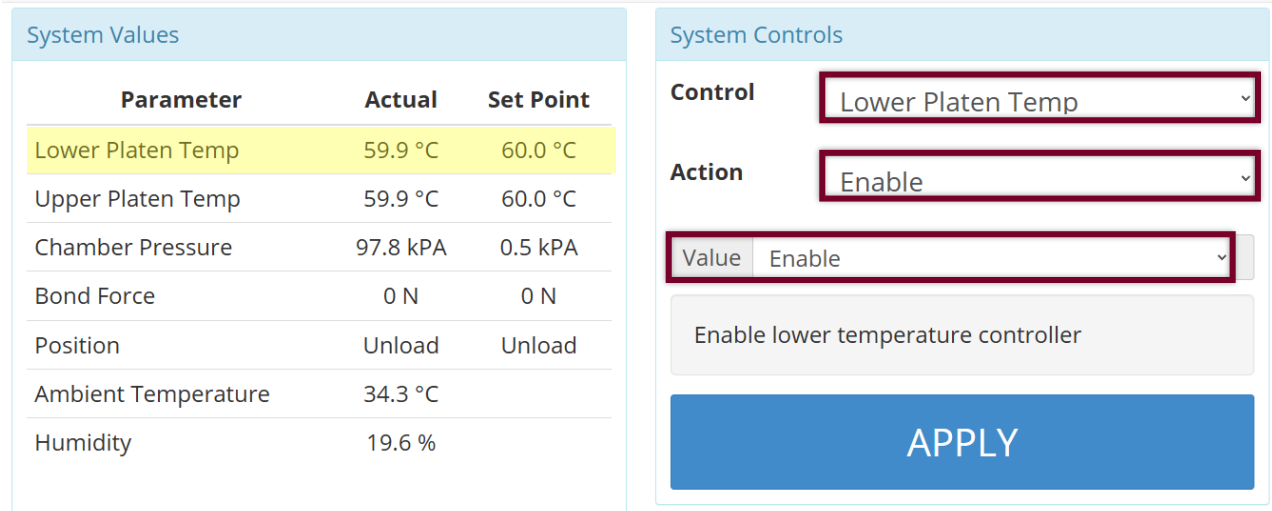
Lower Platen Temperature



Select a Control of Lower Platen Temperature
Select an Action of Set
Enter the desired value in °C

Click APPLY

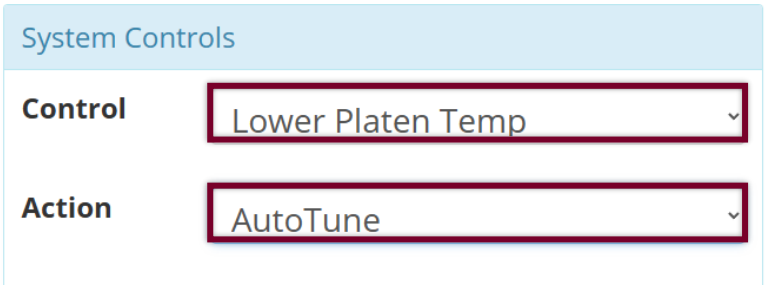
The Temperature Controller must be enabled to initiate the heating process. See next step.



Select an Action of Enable
Select a Value of Enable or Disable to activate or deactivate the temperature controller

Click APPLY

Note that the heating process has been initiated and a plate temperature set point has populated on the system values list. When a value of Disabled is selected, a Set Point of - - is displayed and the heating process is terminated.



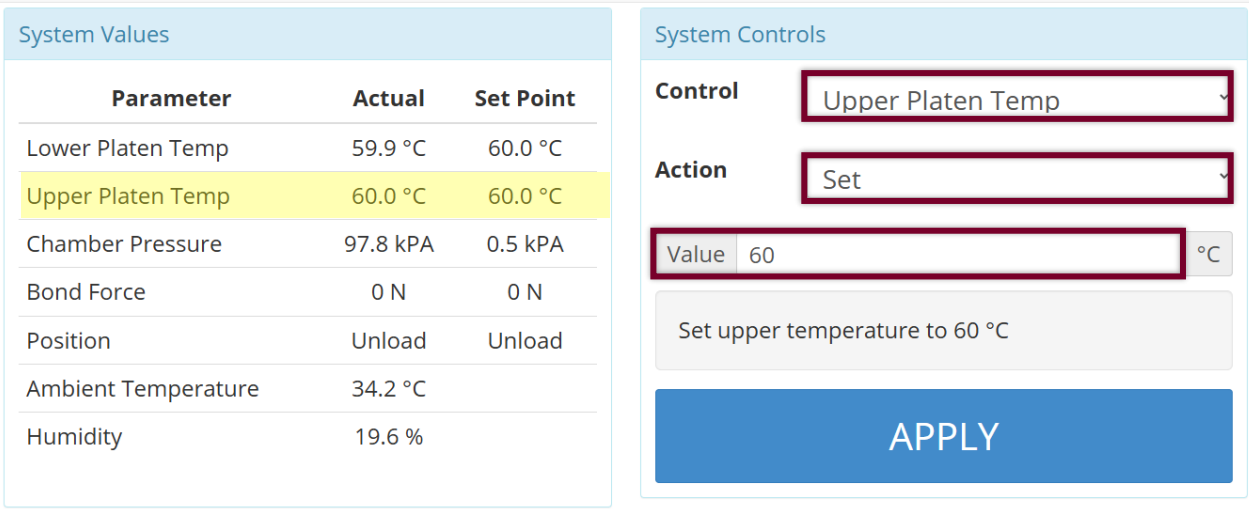
Select an Action of AutoTune

Click APPLY

User must first define the set point and enable temperature controller.

Useful for refining the temperature control for a given setting – note that this may take a significant amount of time.

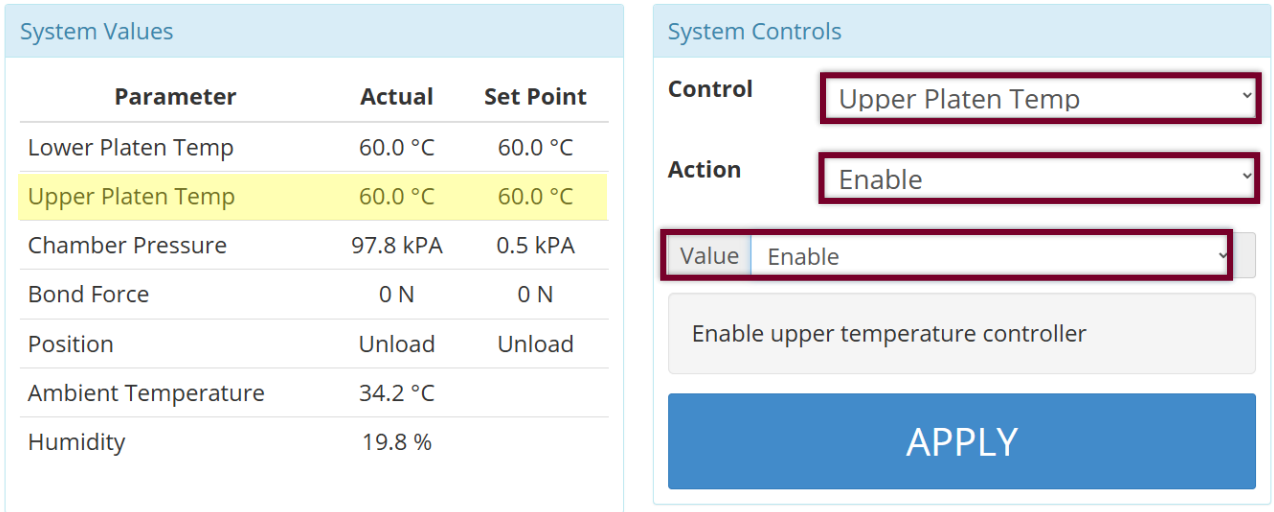
Upper Platen Temperature



Select a Control of Upper Platen Temperature
Select an Action of Set
Enter the desired value in °C

Click APPLY

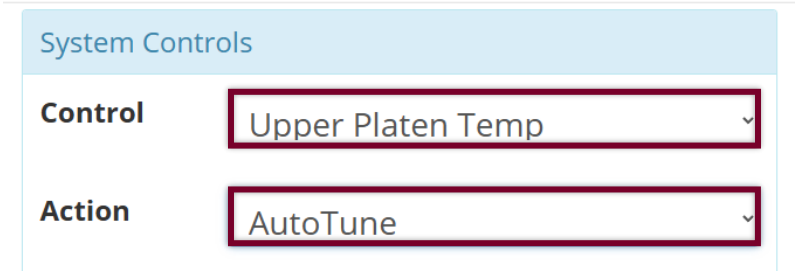
The Temperature Controller must be enabled to initiate the heating process. See next step.



Select an Action of Enable
Select a Value of Enable or Disable to activate or deactivate the temperature controller

Click APPLY

Note that the heating process has been initiated and a plate temperature set point has populated on the system values list. When a value of Disabled is selected, a Set Point of - - is displayed and the heating process is terminated.



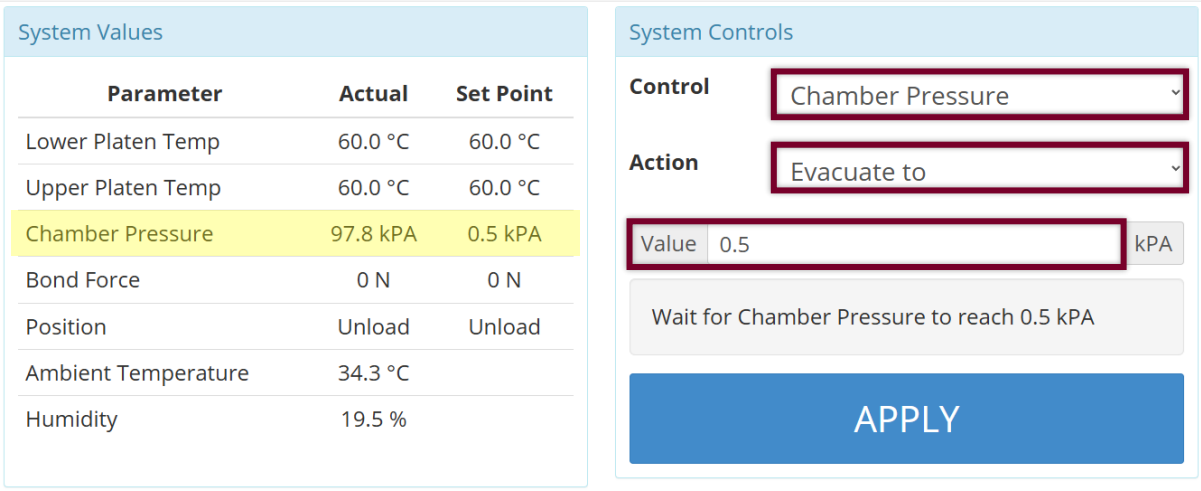
Select an Action of AutoTune

Click APPLY

User must first define the set point and enable temperature controller.

Useful for refining the temperature control for a given setting – note that this may take a significant amount of time.

Chamber Pressure



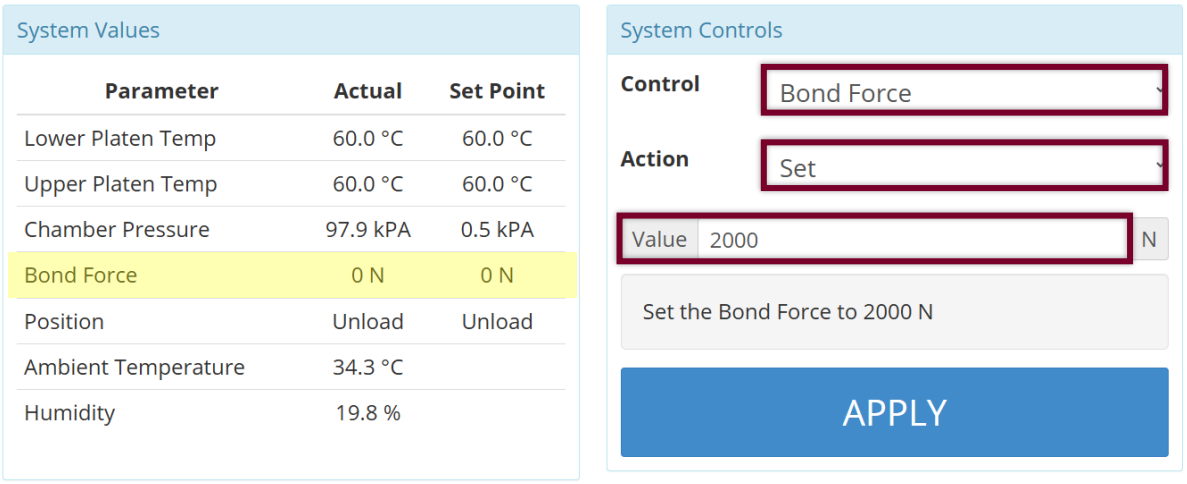
Select a Control of Chamber Pressure
Select an Action of Evacuate to
Enter a Value of the preferred chamber vacuum

Click APPLY

This will turn the vacuum pump on and will pump the chamber down to the set point. The *Apply* button will be the red *Abort* button until the set point is reached. The pump will continue to pump down below the setpoint (will not hold the set point)

Note that the Position needs to be set to Process first in order for the chambers to close and seal. Please see the step on Position.

Bond Force

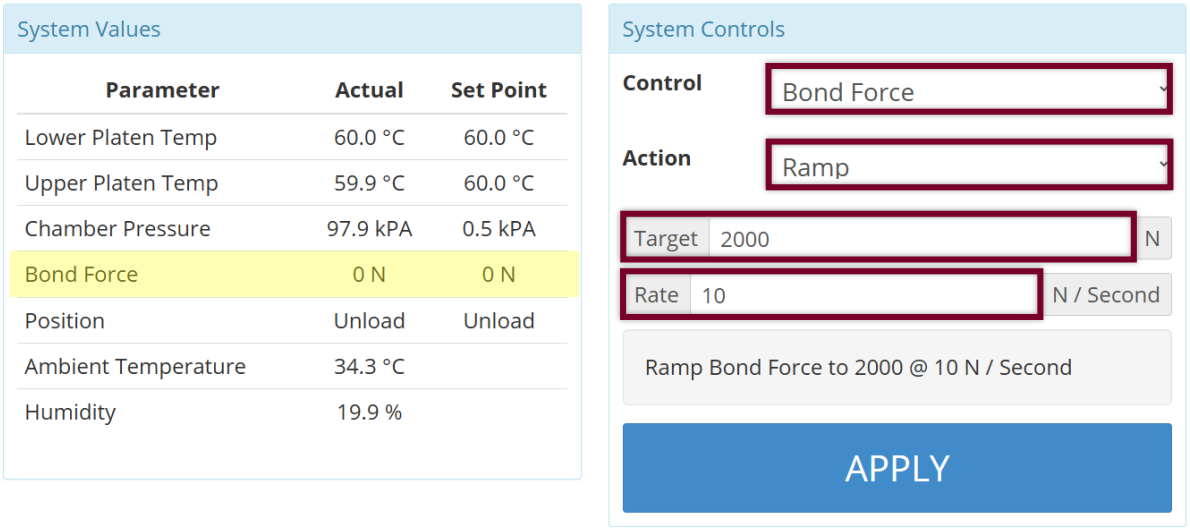


Select a Control of Bond Force
Select an Action of Set
Enter a Value of the preferred bond force

Click APPLY

This will toggle the vent and vacuum valve of the Bond piston to control the *Bond Force* to the desired set point.

Note that the Position needs to be set to Process first and Chamber Pressure evacuated.



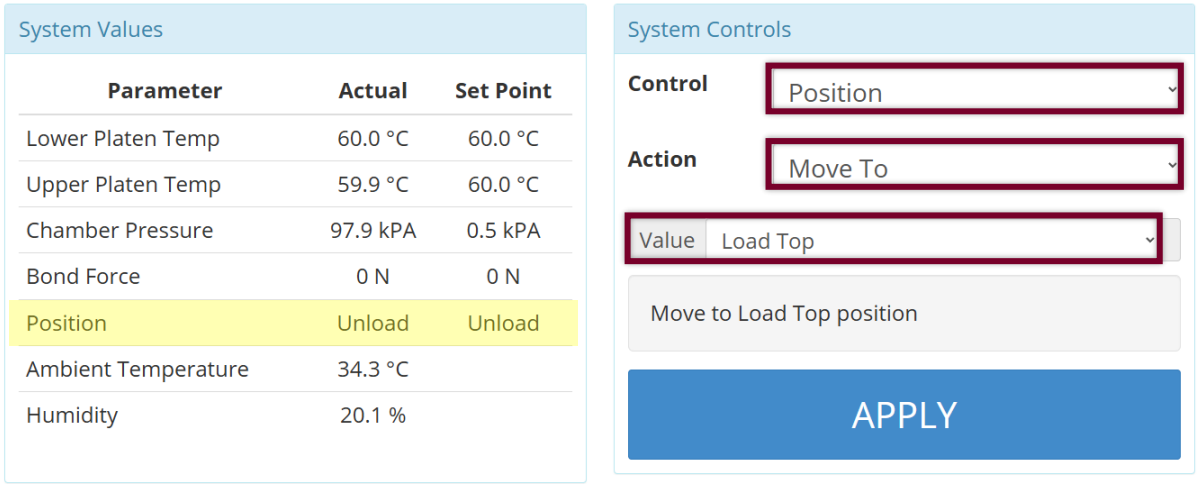
Select a Control of Bond Force
Select an Action of Ramp
Enter a Target of the preferred bond force
Enter a desired ramp Rate

Click APPLY

This will toggle the vent and vacuum valve of the Bond piston to ramp the *Bond Force* from the intial force to the desired set point at the rate specified, and then hold and control the *Bond Force* once the target has been reached.

Note that the Position needs to be set to Process first and chamber evacuated.

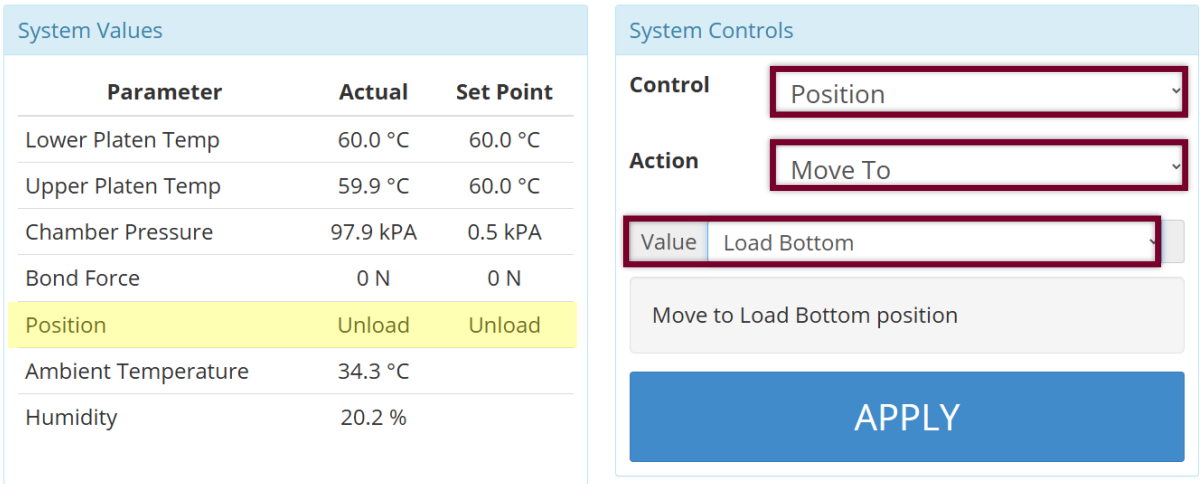
Position



Select a Control of Position
Select an Action of Move to
Select a Value of Load Top

Click APPLY

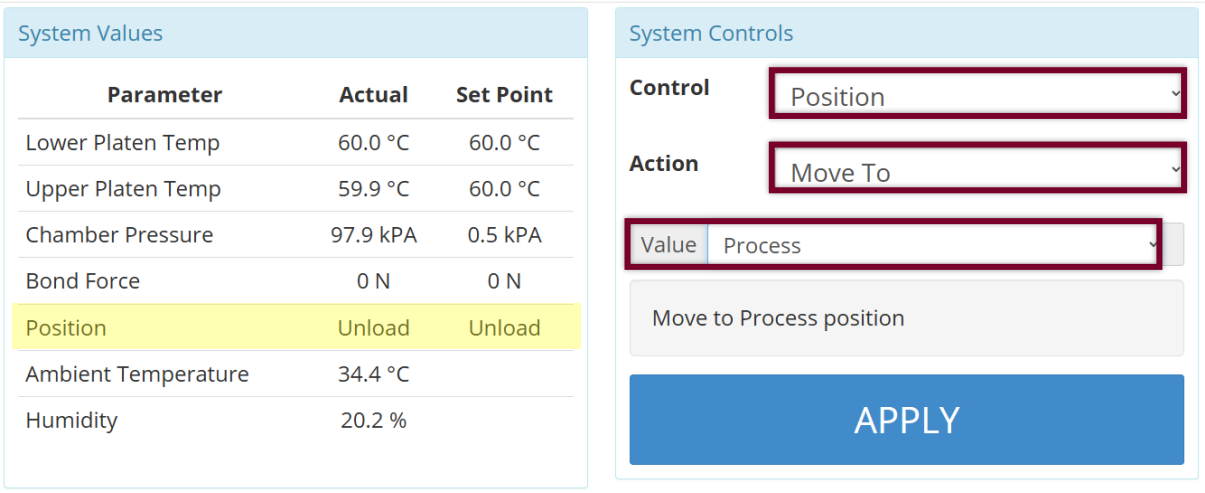
This will open the chamber, if it is not already, and move the separator flags up so that the top wafer can be loaded.



Select a Control of Position
Select an Action of Move to
Select a Value of Load Bottom

Click APPLY

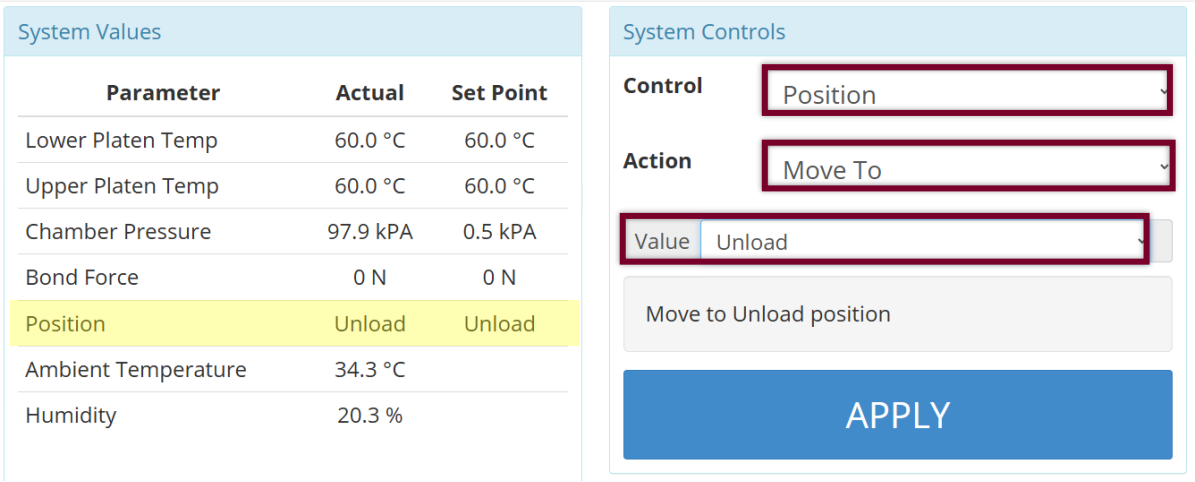
This will open the chamber, if it is not already, and move the separator flags down so that the bottom device wafer can be loaded.



Select a Control of Position
Select an Action of Move to
Select a Value of Process

Click APPLY

This will close the chamber, if it is not already.



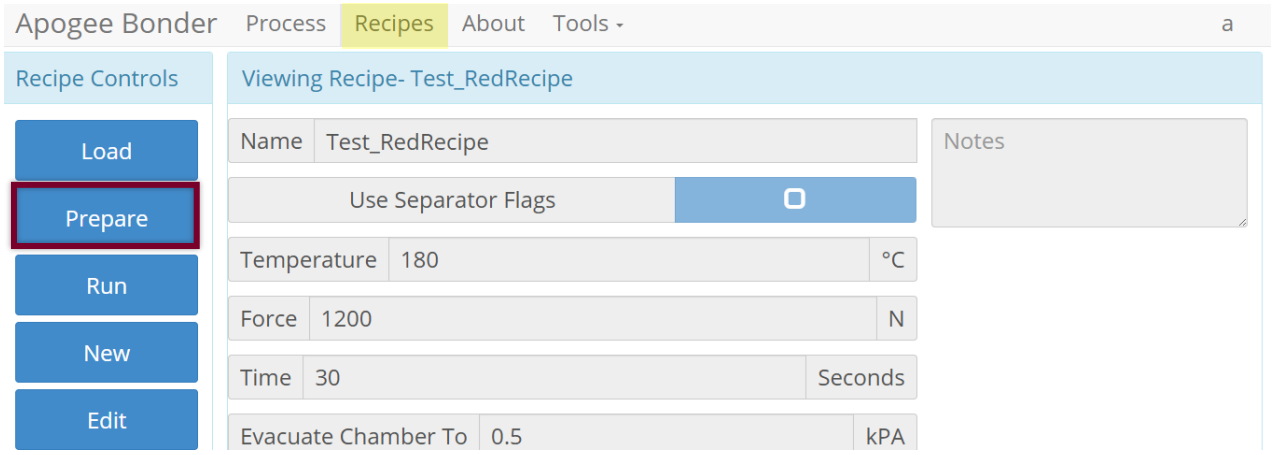
Select a Control of Position
Select an Action of Move to
Select a Value of Process

Click APPLY

This will open the chamber, if it is not already.

4.3 Preparation

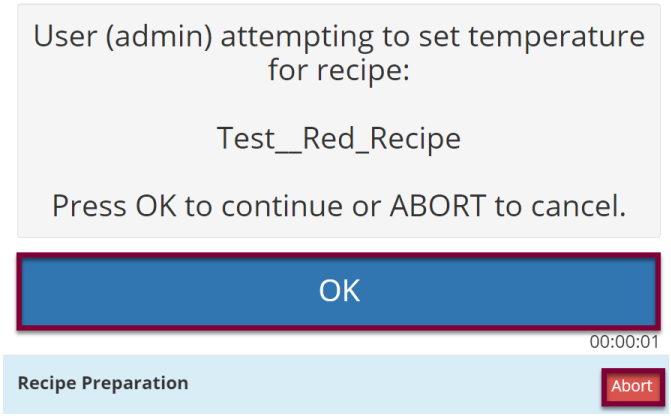
Users with sufficient privileges can ***Prepare*** equipment to run a recipe. This feature is useful for preconditions and parameters that take a significant amount of time such as hot chuck and platen temperatures. To initiate this feature, navigate to the ***Recipes*** tab, click ***Load*** to access the recipes list and select the desired recipe, then click ***Prepare***.



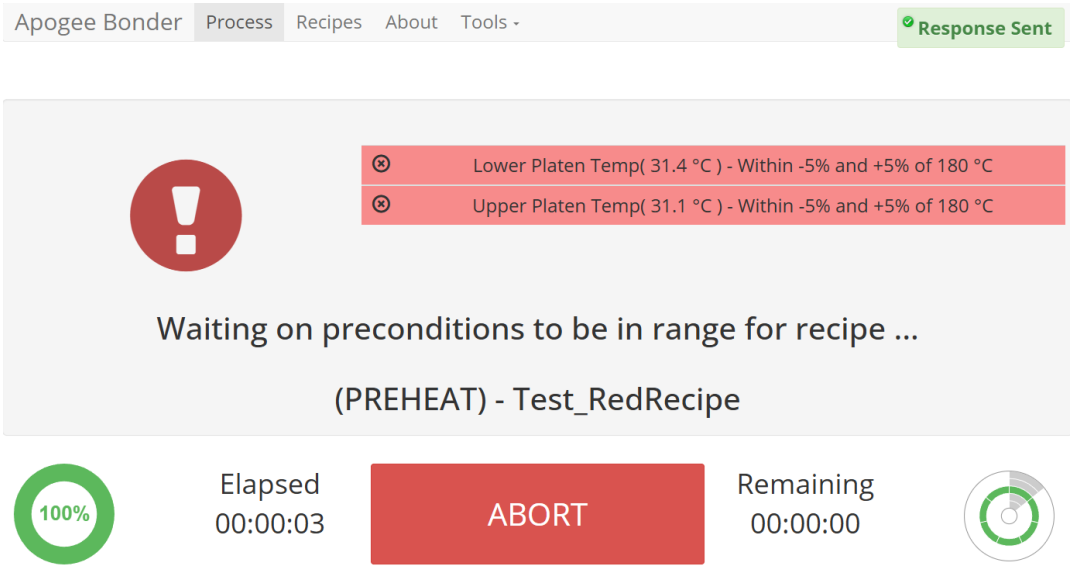
****Preparation processes cannot be initiated when the equipment is already in use.***

Local Display – When a ***Prepare*** command is entered, the user or device with active control of the machine receives an alert. This prompt includes the user and recipe to be prepared. The user with control of the machine can refuse the request by selecting ***Abort*** or accept the request by tapping ***OK***.

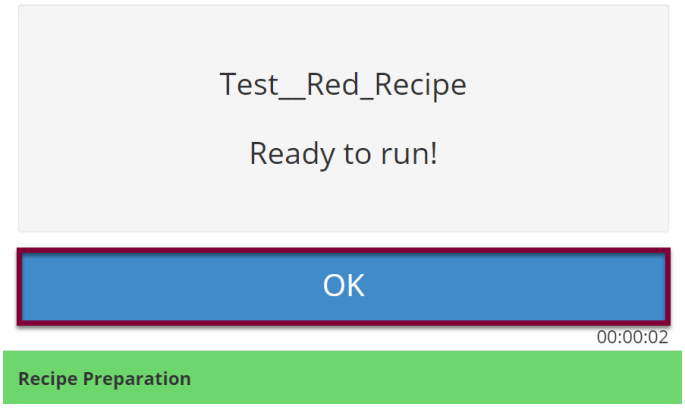
In the absence of a response, the request is auto accepted after two minutes.



Preparation In Process – progress toward the specified precondition(s) is displayed to the user with verified local presence.



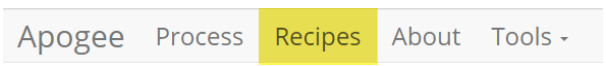
Preparation Complete – indicates that the equipment has reached all specified preconditions and the recipe can be initiated. Upon clicking ***OK*** the user is directed to the *Process* screen to begin the recipe.



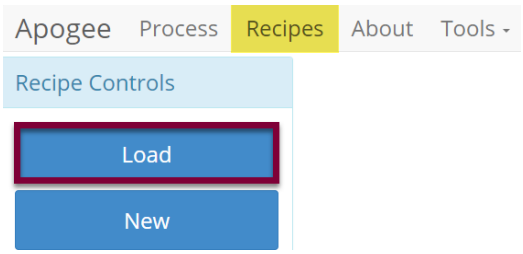
During recipe preparation the Prepare and Run commands are disabled to ensure no interruption to precondition processes.

4.4 Running Recipes

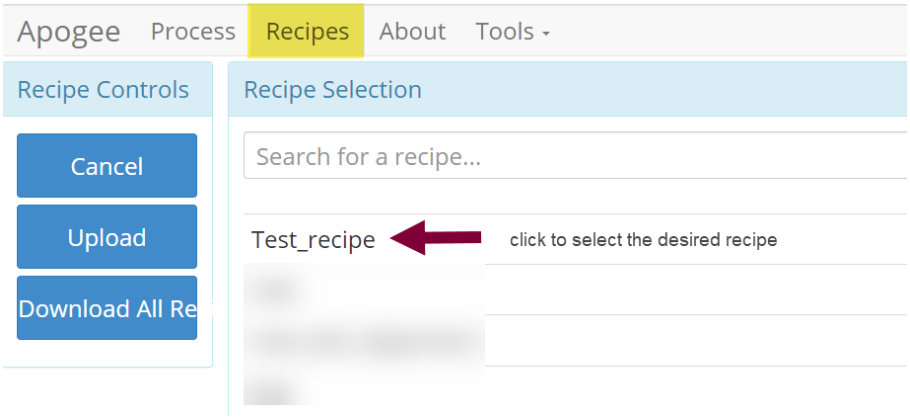
1. Navigate to the *Recipes* page.



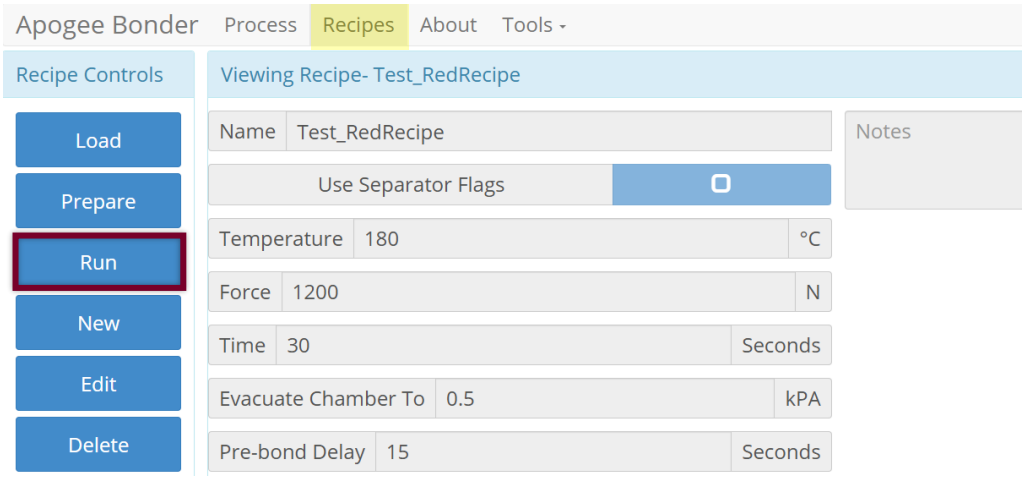
2. Click ***Load*** to access the recipes list.



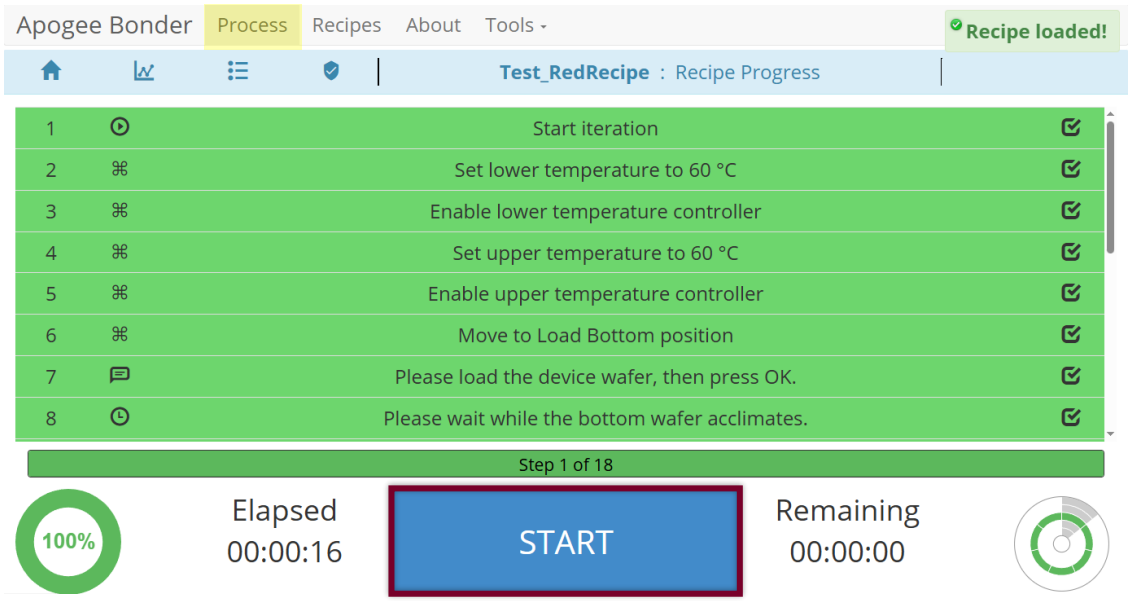
3. Search for, identify, & select the preferred recipe.



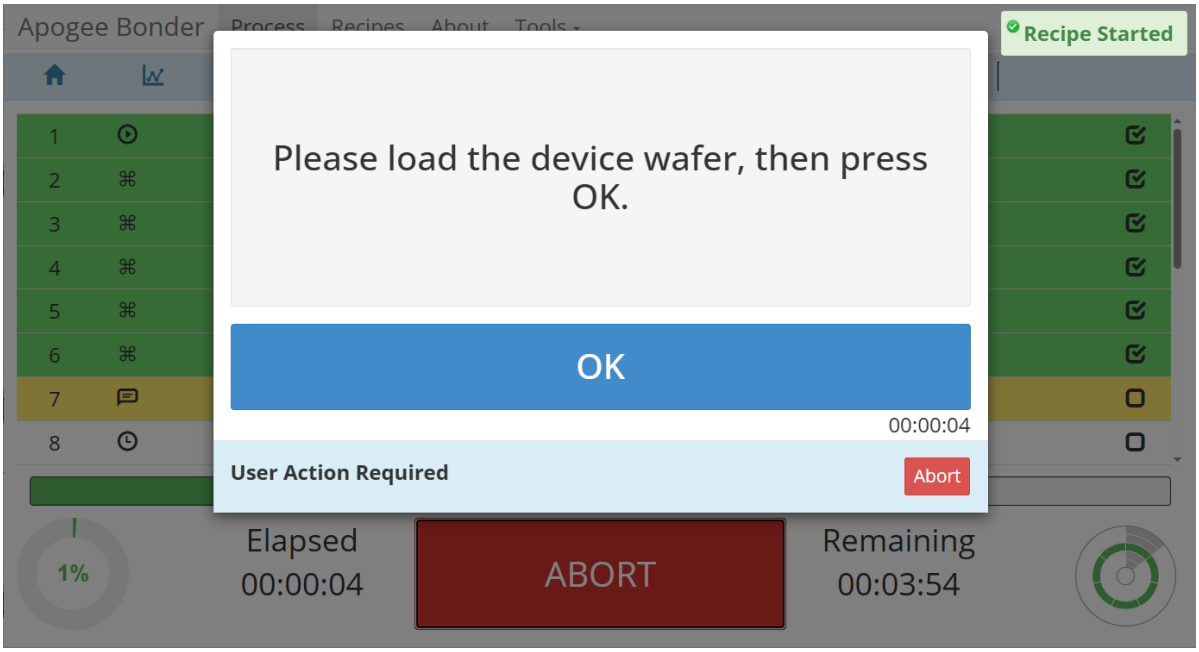
4. Click ***Run***.



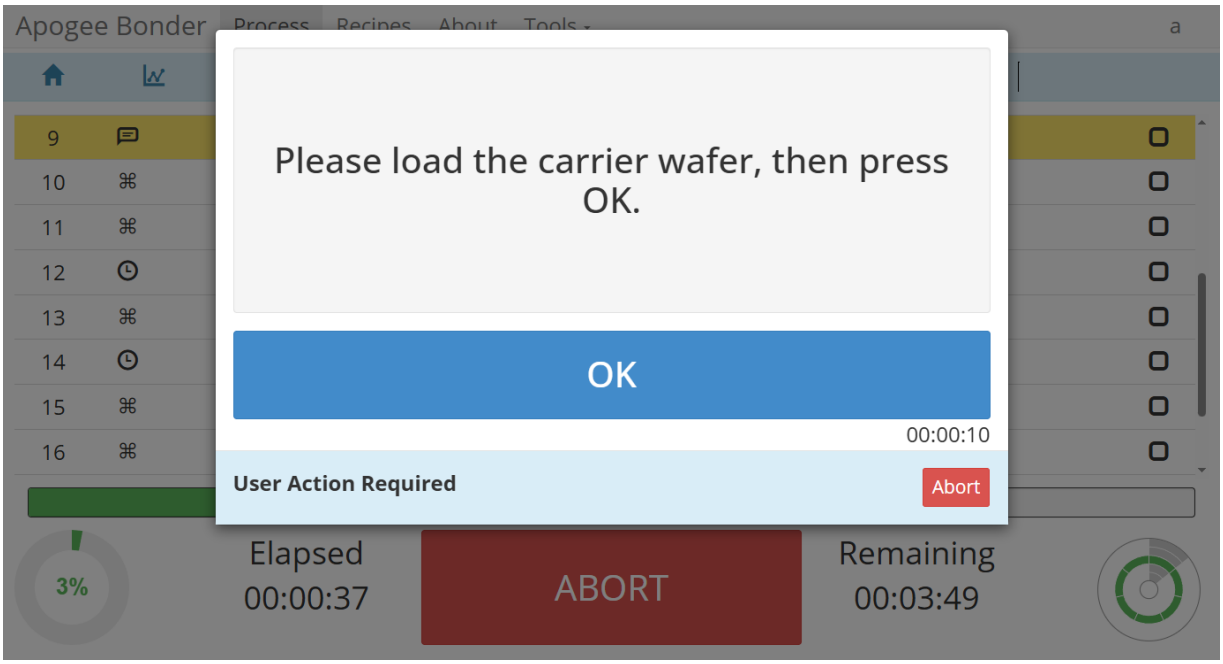
5. Click ***Start*** to initiate the recipe process.



6. Load the device wafer onto the lower platen and Click ***OK*** to continue the recipe process.



7. Load the carrier wafer onto the alignment and separation flags and Click ***OK*** to continue the recipe process.

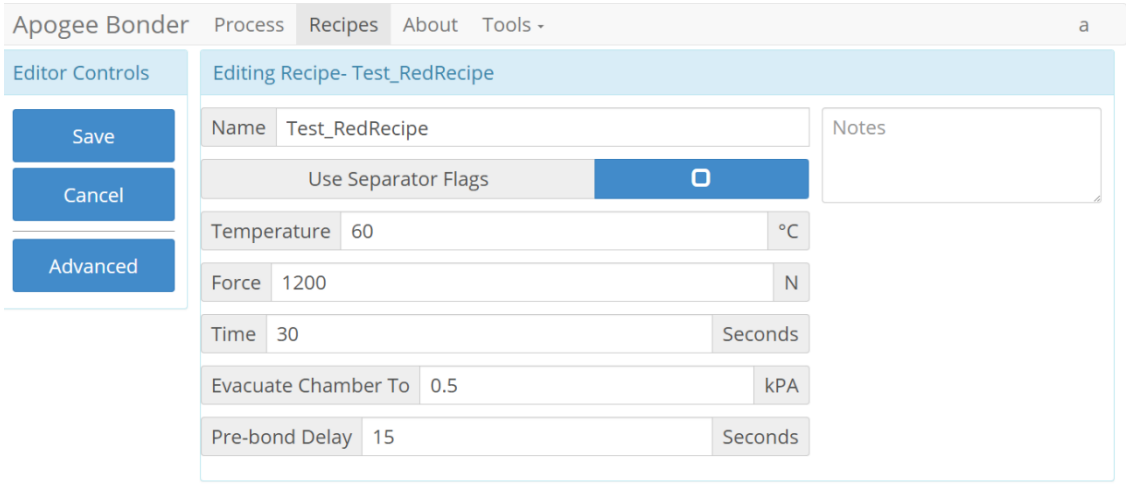


8. Recipe Execution.

*Users may be required to follow other prompts on the screen during recipe execution.

4.5 Editing Recipes

Basic bonder recipes use a predefined process with parameters that can be optimized for each process.



Name---------- recorded in log files and used as criteria when searching for recipes

Notes---------- a text field where generic notes can be recorded

Use Separator Flags-------- used when the device and carrier wafer are the same size or if separator flags are installed* If disabled, the load top move does not occur

Temperature[9]---------- sets the temperature of the upper and lower platens

Force---------- force in Newtons the lower platen will press up with

Time---------- the duration in seconds for the bonding step

Evacuate Chamber To------ upper threshold for chamber vacuum setpoint

Pre-Bond Delay---------- the delay time after Evacuate Chamber To setpoint has been reached.

4.6 Tool Specific Settings – Apogee® Bonder

Lower Platen Temperature Offset Calibration (°C)--- Offset used by the temperature controller to calibrate the reported lower platen temperature

Upper Platen Temperature Offset Calibration (°C)--- Offset used by the temperature controller to calibrate the reported upper platen temperature

[9] preconditions default to ± 5% of the target temperature, independent platen temperatures can be set in advanced mode

5 Bonder Use & Operation

5.1 Bonding Theory

Thermal adhesive bonding joins two substrates by softening a pre applied adhesive layer so it can make full contact with a carrier wafer or support substrate. The adhesive is applied using a spin coater and then set on a bake plate before entering the Apogee Bonder. Inside the bonder, controlled heat softens the adhesive so it can spread and wet the surfaces during bonding.

Bonding takes place under vacuum to remove air before the substrates meet. This step is essential because it prevents bubbles, voids, or trapped air that can lead to weak areas or breakage during thinning and other downstream processes. With air removed, the softened adhesive can flow evenly across the entire bonding surface.

Uniform pressure brings the substrates into full contact while the adhesive is soft. As the bonded stack cools, the adhesive returns to a solid state and forms a stable and uniform bond layer. The combined use of vacuum, controlled heat, and consistent pressure creates a repeatable and reliable bond that supports the device wafer or substrate through the rest of the process.

5.2 Process Flow

1. Upper and lower platen temperatures are set and verified.
2. The lower chamber moves to the unload position.
3. The user is prompted to load the device wafer, adhesive up.
4. The user presses OK and the separator flags move in (if equipped).
5. The user is prompted to load the carrier wafer onto the separator flags (release layer down if applicable).
6. The user presses OK and the lower chamber moves to the load position
7. Lower chamber moves up to close.
8. Air is vacuumed out of the chamber to the recipe controlled setpoint.
9. The separation flags are pulled out to allow the carrier wafer to rest on the device wafer.
10. Bond force is ramped to the recipe set point.
11. The force is held for a time specified by the recipe.
12. Once the time is reached, the chamber is vented to atmosphere.
13. The chamber is then opened, and the lower chamber then moves to the unload position.
14. The user is prompted to remove the bonded pair.
15. Once the bonded pair is removed, the prompt is acknowledged, and the process ends.

5.3 Loading Wafers

Once the bonding process is started, the software will first prompt the operator to load the device wafer. The device wafer is placed directly onto the bonder platen using tweezers or a vacuum wand. It must sit between the alignment flags and should fit tightly so the notch or flat is aligned correctly. The adhesive side of the device wafer must always face upward. After the device wafer is positioned, press OK on the screen to continue.

If the recipe uses the separator flags, they will then move up and in, ready to receive the carrier wafers. The software will then prompt the operator to load the carrier wafer. Place the carrier wafer into the load station, which centers and aligns the wafer. Position the wafer transfer tool above the carrier and press the vacuum button to turn vacuum on. This allows the transfer tool to lift the carrier wafer securely.

Move the transfer tool to the bonder platen and lower it into the three kinematic alignment points. Press the vacuum button again to release the carrier wafer. The carrier will then settle onto the separator flags or directly onto the alignment flags when using an oversized carrier. After the transfer is complete, remove the loading device from the lower platen and press OK to continue the bonding process.

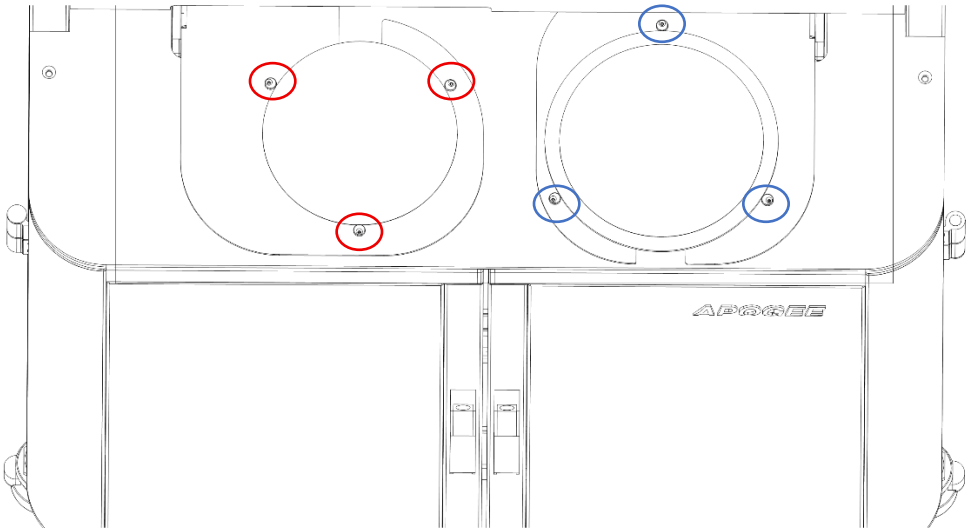


Figure 13 Load and Unloading Station

5.4 Unloading Wafers

When the bonding process is complete, the chamber will open and the GUI will display a prompt to unload the bonded pair. Using the wafer transfer tool, position it on the three kinematic alignment points located on the lower chamber. Press the vacuum button to turn vacuum on. You may need to apply light downward pressure so the transfer tool can securely pick up the bonded pair.

Once the bonded pair is attached to the transfer tool, lift it from the platen and move it to the unload station located to the right of the load station. Set the transfer tool into the unload station and press the vacuum button again to release the bonded pair. The bonded wafers will now rest on the unload station to cool.

After unloading is complete, press OK on the screen to end the process. The system is now ready to run the next bonded pair.

5.5 Wafer Alignment Flags

The wafer alignment flags are adjustable components that ensure the device wafer and the carrier wafer are correctly positioned during the bonding process. These flags keep each wafer in a fixed and repeatable location so both wafers remain concentric throughout loading and bonding. The flags also align wafer flats or notches, which maintains the correct orientation for downstream processing.

By setting the alignment flags for each wafer size in use, the operator can ensure consistent placement, reliable bonding, and accurate alignment between the device wafer and the carrier wafer.

Installation

The wafer alignment flags are packaged in a labeled box that identifies the wafer size they are designed for. Each flag is also labeled individually with the supported wafer size and the specific location where it should be installed on the lower chamber.

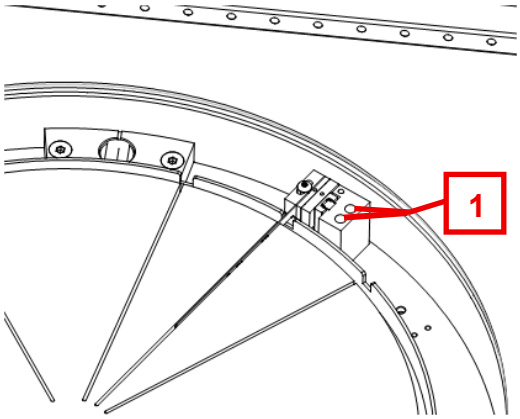
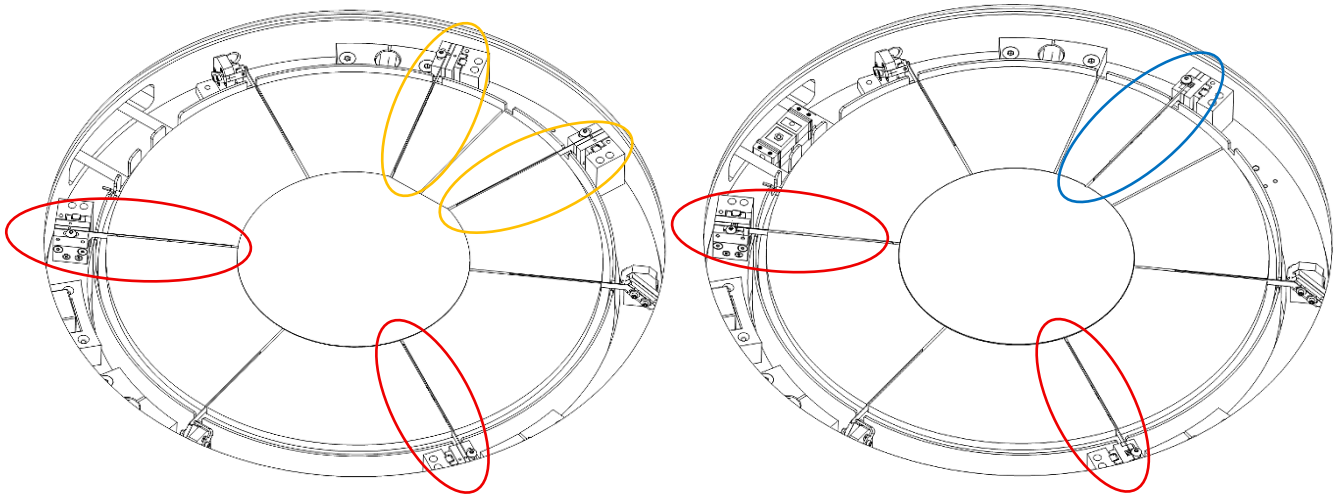


Figure 14 Alignment Flag Placement

To install an alignment flag, place it in the correct position on the lower platen and ensure the flag slides fully into the alignment groove as show in Figure 14. The two captive screws on the flag (labeled as 1) will line up with the corresponding bolt holes in the lower chamber. Tighten both captive screws until the flag is securely fastened. Repeat this process for all flags required for the selected wafer size.

Below shows the alignment flag configuration for wafers with flats (yellow) and wafers with notches (blue).



Wafer with Flat

Wafer with Notch

Figure 15 Alignment Flag Configuration

Alignment Height Adjustment

Before making any adjustments, verify that the correct alignment flags for the intended wafer size are installed (shown as 1 in Figure 16). Each flag must be installed in its labeled position on the lower chamber and securely fastened.

Once the correct flags are in place, begin by setting the proper height for each flag. On the top of each alignment flag base, locate the access hole that exposes the height adjustment screw (shown as 2 in Figure 16). Turning this screw counter-clockwise will the stop position of the alignment flag and clockwise will lower. The alignment flags are spring loaded, so remove Allen key to allow the mechanism to fully rise and verify position. In the fully up position, 0.135” (3.5 mm) of the alignment flag should be above the surface of the platen.

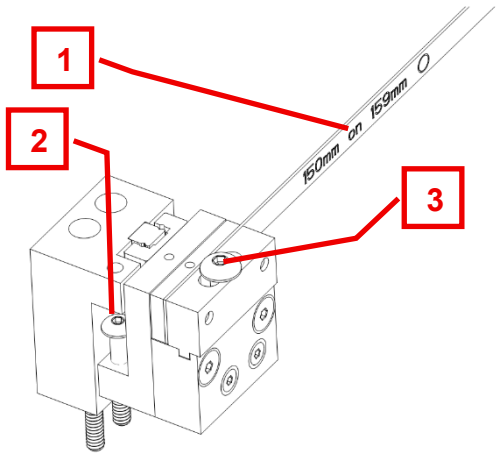


Figure 16 Alignment Flag Adjustment

First Alignment Flag Setup

The first alignment flag setup is different from all later setups. Start with the largest device size you plan to run on the system. Have a test device wafer of that size available before beginning.

Start by installing the alignment flags for the largest wafer size and performing the height adjustment outline in the section before. Once the flags are installed, locate the position adjustment screw on the top of each flag base. This screw is shown as number 3 in Figure 16. Loosen this screw and slide each flag outward so all flags move fully away from the center of the platen. The goal is to move every flag out as far as possible.

Important note: The platen must be at the process temperature. Performing the flag setup at a different temperature will result in incorrect alignment when running the actual process.
With all flags moved outward, place the test wafer on the center of the platen. Manually center the wafer using a ruler to confirm equal spacing around the platen. Take time to ensure the wafer is positioned as accurately as possible. Make note of the location of the wafer notch and confirm the corresponding notch flag is in the correct position.

Once the wafer is centered, slide each alignment flag inward until it just touches the edge of the wafer. Use care during this step to avoid moving or shifting the wafer. When the flag is in the correct position, tighten the adjustment screw to secure it. After tightening, lightly push the flag holder down and allow it to spring up to confirm smooth spring movement. The flag should contact the wafer firmly without scraping or chipping the edge. Continue to separator flag setup.

Setup of Additional Alignment Flags

Once the initial alignment flag, load station, and wafer transfer tool setup is complete, additional alignment flag sets can be installed for other wafer sizes. Install the correct alignment flags for the new wafer size and follow the height adjustment as before. Loosen the position adjustment screw on the top of each flag base (3 in Figure 16) and slide the flags outward so they are positioned as far from the center of the platen as possible. This creates maximum clearance for alignment.

Begin by moving the pins in the load station to the wafer size you wish to set up. Place a carrier wafer of that size into the load station. Use the wafer transfer tool to pick up the wafer from the load station, then move it to the lower chamber. Set the transfer tool into the kinematic alignment points of the lower platen, but do not release vacuum. The wafer must remain held by the transfer tool during the entire alignment flag setup process.

With the wafer still held by the wafer transfer tool and positioned above the platen, begin bringing each alignment flag inward until it just touches the edge of the wafer. Lock each flag in place by tightening the adjustment screw. As before, ensure the flag contacts the wafer firmly but without scraping or shifting it.

After all flags are adjusted, press the vacuum button to release the wafer onto the platen surface. Pick the wafer back up with the transfer tool and return it to the load station. A properly aligned setup will allow the wafer to drop cleanly and evenly into the load station and onto the platen without resistance. You may repeat this transfer between the load station and the lower platen several times to verify accurate centering and consistent fit.

Once you confirm proper operation, the alignment flag setup for that wafer size is complete. Continue to separator flag setup.

5.6 Wafer Separator Flags

Separator flags are used when the device wafer and carrier wafer differ in diameter by one millimeter or less. For oversized carriers with more than one millimeter difference in diameter, the alignment flags are designed to keep the wafers separated during the bonding process. Before setting up the separator flags, ensure that the alignment flags are fully installed and adjusted for the wafer size in use. Place a test device wafer on the platen. The wafer does not need adhesive; a blank test wafer is sufficient. Then navigate to Manual Controls in the GUI and set Position to Load Top.

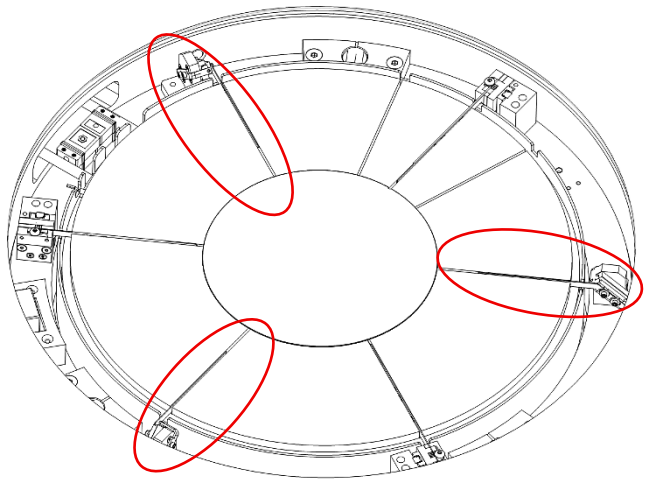


Figure 17 Separator Flag Locations

Install the separator flags in their labeled positions on the lower chamber. Each separator flag is marked with the wafer size it supports and its correct mounting location (see 1 in Figure 18). Position each flag on the lower chamber and secure it with the two mounting screws on the base (see 2 in Figure 18).

Once the separator flags are installed, adjust their position. Each flag has two side screws that can be loosened to slide the flag in or out (see 3 in Figure 18). This adjustment controls both how far the separator flag extends over the device wafer and its height above the wafer surface. Set the flags so the tips extend over the edge of the device wafer by 1 mm and position the top surface of each flag so it sits approximately 1 mm above the wafer.

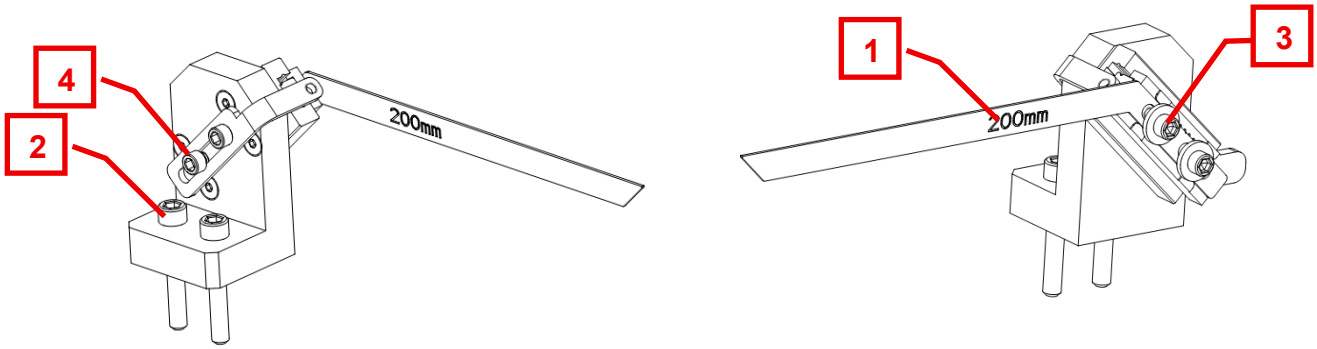


Figure 18 Separator Flags

After the position and height are correct, tighten the side screws to lock the flag in place. Each separator flag also includes a stroke limit adjustment. (see 4 in Figure 18) Use this to prevent the flag from rising too high or extending farther than intended. Adjust the stroke limiter as needed to ensure controlled movement during operation.

If this is the first time setting up the system and the wafer transfer tool has not yet been configured, continue to the next section of the manual. Do not return to this step until the wafer transfer tool setup is complete.

To verify the separator flags are adjusted correctly, place a carrier wafer into the load station. Use the wafer transfer tool to pick up the carrier wafer, then move the transfer tool to the lower chamber. Set the transfer tool into the kinematic points, remove your hand, and press the vacuum button to release the carrier wafer. The wafer should settle gently onto the separator flags, still be contained at the edges by the alignment flags, and be spaced off the device wafer.

5.7 Wafer Transfer

Before setting up the wafer transfer tool, ensure the alignment flags and separator flags are already installed and adjusted. Manually place a carrier wafer onto the separator flags on the lower chamber. This wafer will be used as the reference surface for setting the transfer tool height and alignment.

The wafer transfer tool uses three adjustable kinematic points to align itself with the lower chamber. Loosen the lock nuts on each of the three adjustment points. Place the transfer tool into the kinematic seats on the lower chamber, making sure it rests naturally in its reference positions.

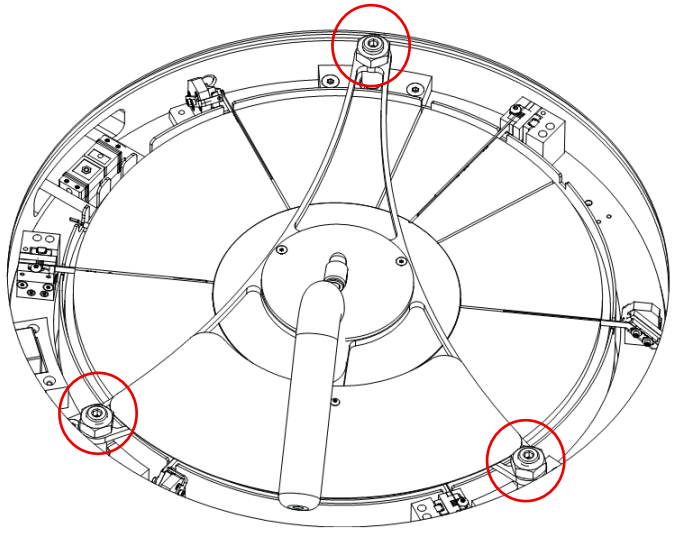


Figure 19 Wafer Transfer

Adjust the 3 points so that the vacuum pad sits directly above the carrier wafer. The vacuum pad must not touch or press down on the carrier wafer. Once the transfer tool is resting in place with the vacuum pad above the wafer, press the vacuum button to turn vacuum on.

With vacuum active, slowly adjust each of the three kinematic points. Make small adjustments until the vacuum pad lightly engages the carrier wafer. The wafer should lift slightly from the separator flags due to vacuum alone, not from physical pressure. Continue fine adjustments until the transfer tool consistently picks up the wafer with smooth, even engagement.

When the setup is correct, tighten the lock nuts on each adjustment point to secure the kinematic settings. Then continue to the load station setup.

5.8 Load Station

Before adjusting the load station, all other alignment work must be complete. The alignment flags, separator flags, and wafer transfer tool must already be set up. Once these steps are finished, you may adjust the load station.

The load station contains six lateral adjustment screws around its outer edge (red in Figure 20) and three height adjustment screws accessible from the top (blue in Figure 20). Before beginning any alignment, ensure that all lateral adjustment screws are threaded in fully so the load station can move freely within its cavity. Also confirm the three height screws are backed out so the load station sits fully down in its recess.

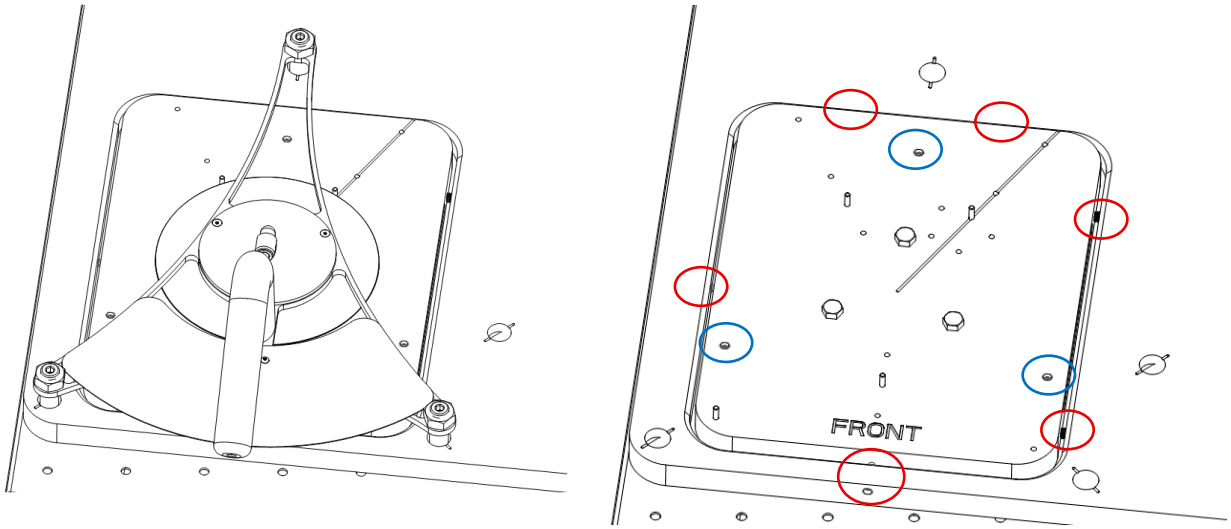


Figure 20 Wafer Load Station

Install the correct locating pins in the load station for the wafer size being used. The pins must be placed in the positions labeled for that size.

Begin with a carrier wafer placed on the separator flags in the lower chamber. Use the wafer transfer tool to pick up the carrier wafer by placing the tool into the three kinematic points and pressing the vacuum button. Lift the wafer from the platen and set it aside momentarily.

Next, move the wafer transfer tool with the carrier wafer back to the load station. Set the transfer tool into the load station kinematic points and remove your hand. The wafer should remain held by vacuum and centered above the load station.

With the transfer tool resting in the kinematic points and holding the wafer, move the load station itself until the wafer fits snugly and evenly between the three locating pins. When the wafer is properly centered, use the access holes on the front and left side of the load station to slowly turn in the corresponding set screws. These screws create the hard stops that fix the load station position when it is pressed into place. Verify the positioning several times by lifting the transfer tool off and setting it back down. When the load station consistently returns to the same centered position, the first two stops are correctly set.

Remove the wafer transfer tool and the wafer. Lift the load station our of the recess to access and adjust the additional screws on the right side, and back side of the load station. These screws define

the final lateral position and ensure the load station returns to a snug and repeatable fit within its cavity without excessive movement.

For height adjustment, place the load station back into the cavity and return the wafer transfer tool with the wafer to the load station. Use the three height adjustment screws on the top of the load station to raise it until it gently contacts the bottom of the wafer. The height is correct when turning vacuum off causes the wafer to drop very slightly and turning vacuum on allows the transfer tool to lift the wafer without being raised by it. The wafer must not lift or tip the transfer tool.

Verify the setup by placing the carrier wafer into the load station pins, lowering the wafer transfer tool onto it, and pressing vacuum. The wafer should pick up smoothly. Move the wafer back to the lower chamber, place the transfer tool into the kinematic points, turn vacuum off, and confirm the wafer is centered and resting correctly on the separator flags. A clean and consistent transfer in both directions confirms that the load station adjustment is complete.

5.9 Unload Station

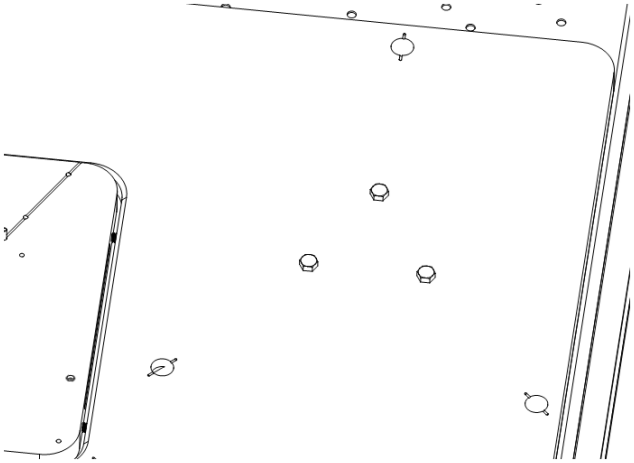


Figure 21 Load Station

The unload station is used to set the bonder wafers after bonding to cool. The only adjustment is the height of the stand offs. Pick up a bonded wafer pair from the lower platen with the wafer transfer tool and set into the unload station but do not turn off vacuum. The height between the standoffs and the bottom wafer should be < 2 mm. Unscrew or screw the standoffs as necessary to achieve this height.

6 Troubleshooting & Diagnostics

6.1 System Performance Failures

Failure Mode	Recommendation
Lower Chamber Will Not Open/Close	• Ensure sufficient air pressure supplied to tool • Check for physical obstruction to chamber motion. • Check for pinched airline or possible air leak.
Platens not a Correct Temperature	• Check process recipe for proper temperature. • Verify thermocouples are plugged in at the chamber inlets
Tool is Unresponsive	• Check Emergency Stop switch is not depressed • Check electrical (utility) supply to tool • Check fuses
Chuck Vacuum Cannot be achieved	• Check vacuum (utility) supply to tool • Check for debris on the platens • Check for pinched airline or possible vacuum leak Check for clogged vacuum lines

6.2 Wafer Alignment Failures

Failure Mode	Recommendation
Bond is Off-center	• Check to ensure that alignment hardware is of the correct size and is installed in the correct location.
Alignment Hardware Does Not Move Correctly	• Ensure that alignment hardware isn't bent or otherwise damaged. • Ensure that the groove in the heated platen surface is clean and free from debris or bond adhesive residue. • Ensure that all hardware associated with the alignment hardware is sufficiently tightened.

6.3 Wafer Handling Failures

Failure Mode	Recommendation
Unable to Remove Bonded Pair	• Clean wafer bonding residue from platen(s).
Broken Wafer-Thermal Shock	• Choose a handling method / system with low thermal conductivity.
Broken Wafer-Bonding	• Ensure both upper and lower platen(s) are clean are free of foreign • Ensure wafers are free from damage prior to bonding. • Check alignment and separator flags (see wafer alignment failures)

6.4 Wafer Bonding Failures

Failure Mode	Recommendation
Wafers Are Not Bonded	• Ensure wafers are not loaded upside down. • Ensure sufficient air pressure to tool. • Check for pinched airline or possible air/vacuum leak. • Check process recipe for proper temperature
Chamber Vacuum Cannot Be Achieved	• Check for proper operation of vacuum pump. • Check for pinched airline or possible vacuum leak. • Check for damaged o-ring on top surface of lower platen.
Bonded Wafers Have Voids	• Check for sufficient chamber vacuum. • Check quality of wafer coating prior to bonding. • Ensure sufficient bond pressure (recipe).

7 Preventative Maintenance

This section provides personnel with procedures and guidelines for maintaining a Cee® Apogee® Bonder.

7.1 Service and Repairs

Safety Notice: Important Repair Information for Cee® Equipment

⚠	In order to maintain safety and performance standards, only authorized representatives of Cee® are permitted to conduct repairs or alterations on Cee® equipment.	Afin de maintenir les normes de sécurité et de performance, seuls les représentants autorisés de Cee® sont autorisés à effectuer des réparations ou des modifications sur les équipements Cee®.
⚠	When servicing the machine, use only replacement parts made or recommended by Cee®.	Lors de l'entretien de la machine, utilisez uniquement des pièces de rechange fabriquées ou recommandées par Cee®.
⚠	Use only Cee® supplied shielded cables with this machine.	Utilisez uniquement les câbles blindés fournis par Cee® avec cette machine.
⚠	Unauthorized repairs may lead to serious risks such as equipment malfunction, damage, personal injury, or even death.	Les réparations non autorisées peuvent entraîner des risques graves tels qu'un dysfonctionnement de l'équipement, des dommages, des blessures corporelles ou même la mort.

7.2 Fault Condition

In the event of a fault condition, power cycle the tool to restore function.

7.3 Safety Checks

Inspect the Apogee® Bonder for the following defects each day prior to use:

- Loose assemblies
- Improper closure

7.4 Mechanical/Utilities Checklist

Evaluate	Frequency	Detail
Cleaning User Interface	Weekly or as Needed	See Section 7.6
Cleaning Lower Chamber	Weekly or as Needed	See Section 7.8
Cleaning Upper Chamber	Weekly or as Needed	See Section 7.9
Pressure Range	Bi-Annually	Check all pressures for ranges specified in tool manual.
EMO Function	Quarterly	See Section 7.5
Vacuum Pump	Quarterly	See Section 0
Pressure Range	Bi-Annually	Check all pressures for ranges specified in tool manual.
Connections	Bi-Annually	Inspect all connections for proper installation.
Power	Bi-Annually	Verify that AC power is connected and of the proper voltage.

7.5 EMO Function

Observe Lockout / Tagout Procedures

Wear safety glasses

Do Not Eat or Drink While Performing this Procedure

Wear Protective Gloves

Recommendation:

Quarterly check the Emergency Stop function to ensure proper operation.

Procedure:

With machine powered up and running, press the Emergency Stop button on the user interface console. Machine should shut down.

If the machine does not shut down, stop using the machine immediately, and contact Cost Effective Equipment Customer Support for additional help and instructions.

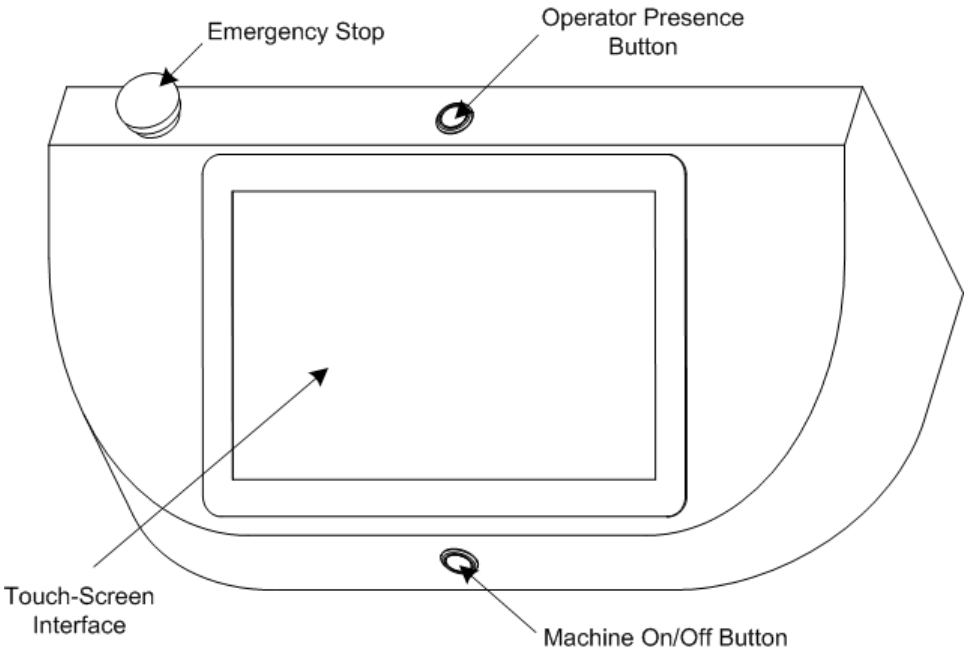
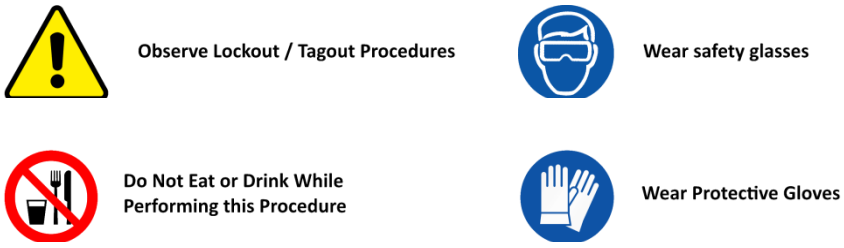


Figure 22 User Interface

7.6 Cleaning User Interface Assembly



Recommendation:

Promptly clean up any spills on the touch-screen surface.

Procedure:

Using a clean, absorbent material wipe any spills from the user interface touch screen surface. Do not apply solvents of any kind to the touch screen.

7.7 Vacuum Pump Assembly

The vacuum pump system in the Apogee® Bonder is of the scroll pump variety and is designed to provide a long service life with a minimum of required maintenance.

Recommendation:

Periodically check the clamps for all vacuum hose connection points to ensure that they are tight. Vacuum pressure cycling, vibration, and other environmental factors can cause them to loosen over time.

Procedure:

Observe Lockout / Tagout Procedures

Wear safety glasses

Every 100 hours of operation or every 1000 wafers processed (whichever comes first), physically check each clamp by grasping the clamp wingnut by hand and turning clockwise. Do not use any tools for this procedure; simple hand-applied force is all that is required. See Figure 1 (below).

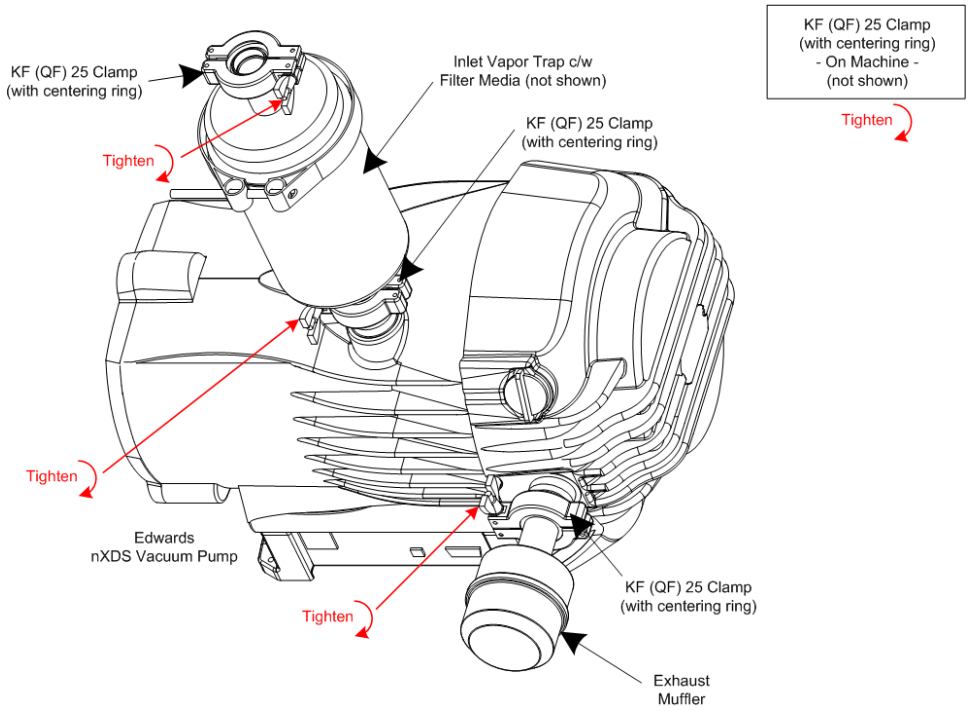


Figure 23 Vacuum Pump

Recommendation:

Periodically check the filter media in the inlet vapor trap to ensure that it is functioning as intended. The purpose of the filter media in the vapor trap is to capture and collect any vapors that may be drawn from the bonding chamber during a wafer bonding process. The filter media is chosen to prevent a wide variety of vapor types from entering the pump and/or being exhausted through the pump into the room.

Procedure:

Observe Lockout / Tagout Procedures

Wear safety glasses

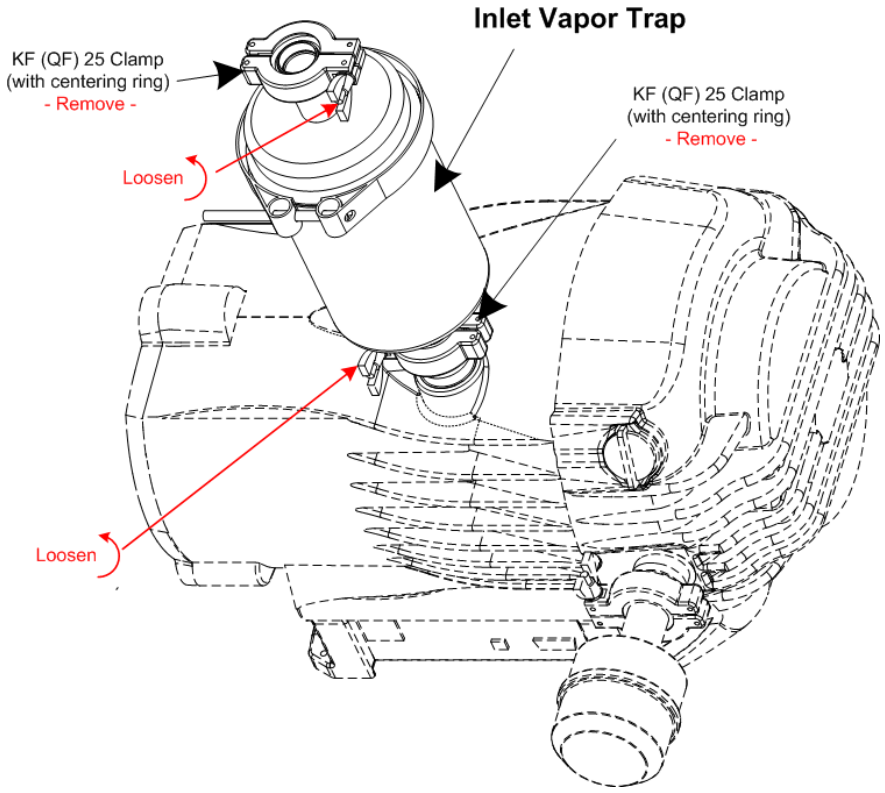
Do Not Eat or Drink While Performing this Procedure

Wear Protective Gloves

Locate the inlet vapor trap on top of the vacuum pump. See Figure 2 (below).

Remove the hose connecting the vapor trap to the rest of the machine by loosening the vacuum clamp wingnut (Turn counter-clockwise). Remove the clamp and the centering ring that is fitted between the two flanges.

While holding the vapor trap, loosen and remove the vacuum clamp and centering ring securing the trap to the pump.



Discard the carbon filter media in a manner suitable for your local area.

Do not discard the metal screens inside the trap since they will need to be re-used.

Replace the screens in the trap bottom to ensure that the carbon media stays contained within the trap bottom. Add replacement carbon media (BSI P/N: 611582). Other filter media types are available to accommodate different bonding materials. Please contact Brewer Science Customer Support for additional assistance in determining which filter media is right for your application.

Re-assemble the trap by reversing the procedure used for disassembling the trap.

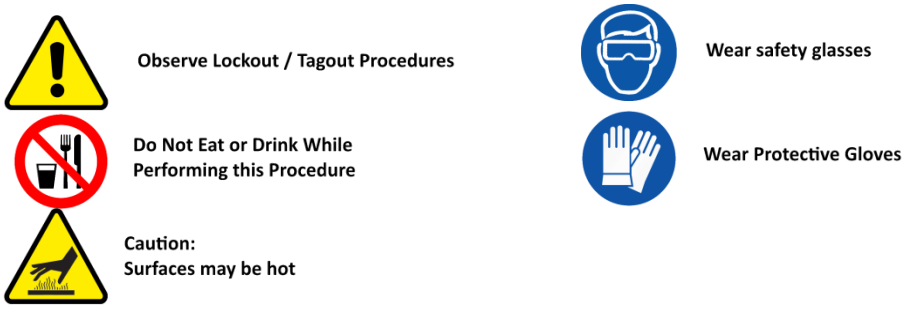
Re-attach the trap to the vacuum pump taking care to tighten each vacuum clamp fully.

7.8 Cleaning Lower Chamber Assembly

Recommendation:

Clean the heated bonding platen surface as required to ensure continued performance of the bonding tool and successful bonding of your substrates.

Procedure:



Allow platen surface to cool. If platen surface is hot, do not touch. Do not attempt to clean a platen that is too hot to touch.

A solvent compatible with the bonding agent used in your specific process should be all that is necessary for routine cleaning. For more persistent stains or heavier fouling, a stainless steel razor blade or glass microscope slide can be used. Use the edge to gently scrape the fouling from the surface of the platen.

Check to ensure that the platen grooves are free from fouling or other foreign objects (i.e. broken wafer shards). Foreign materials in the grooves can interfere with the operation of the wafer alignment/centering system and may have an adverse impact on your bonded wafers.

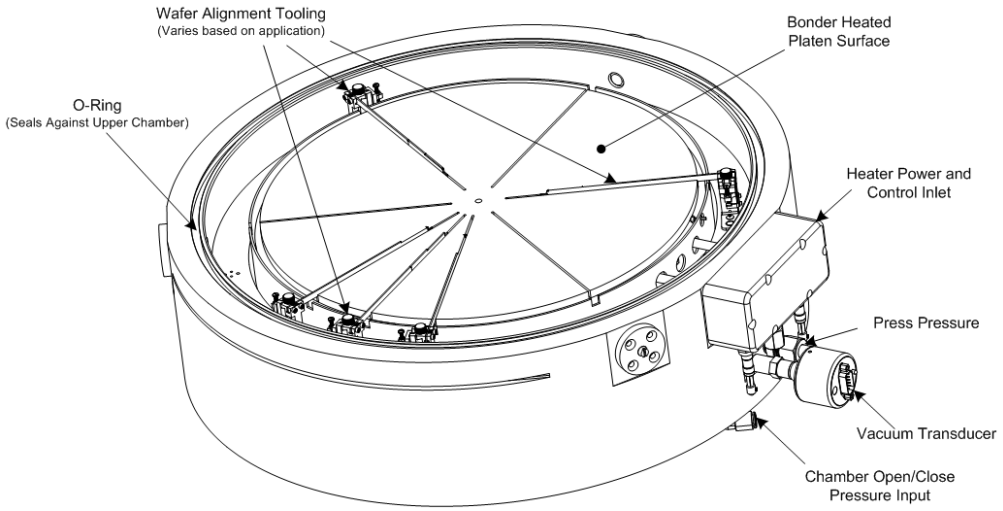


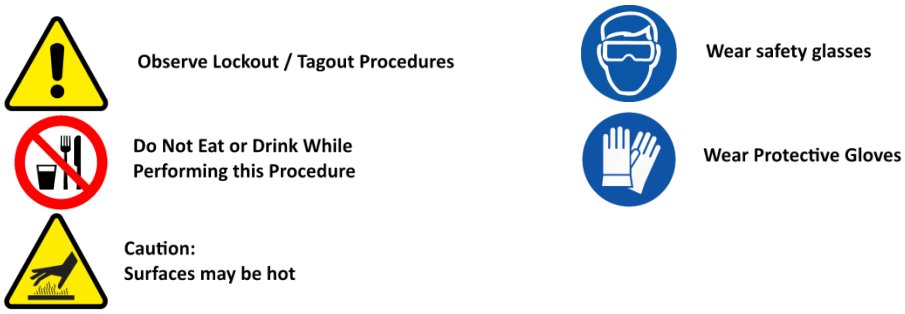
Figure 24 Lower Chamber

7.9 Cleaning Upper Chamber Assembly

Recommendation:

Clean the heated bonding platen surface as required to ensure continued performance of the bonding tool and successful bonding of your substrates.

Procedure:



Allow platen surface to cool. If platen surface is hot, do not touch. Do not attempt to clean a platen that is too hot to touch.

The Apogee® Bonder is equipped with a mechanism that allows the upper chamber assembly to be tilted upward for easier access for cleaning.

To access the tilt function, loosen the four (4) M12 screws located in the corners of the upper chamber housing with an 8mm hex wrench, and remove. See Figure 5 (below).

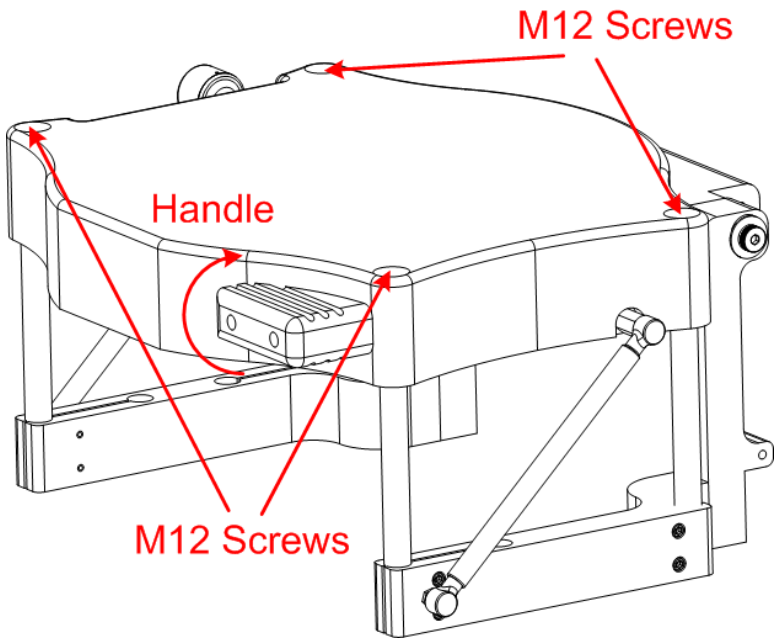


Figure 25 Upper Platen Closed

With the four screws removed, grab the handle, and lift upward until the chamber housing comes to rest as show in Figure 6 below.

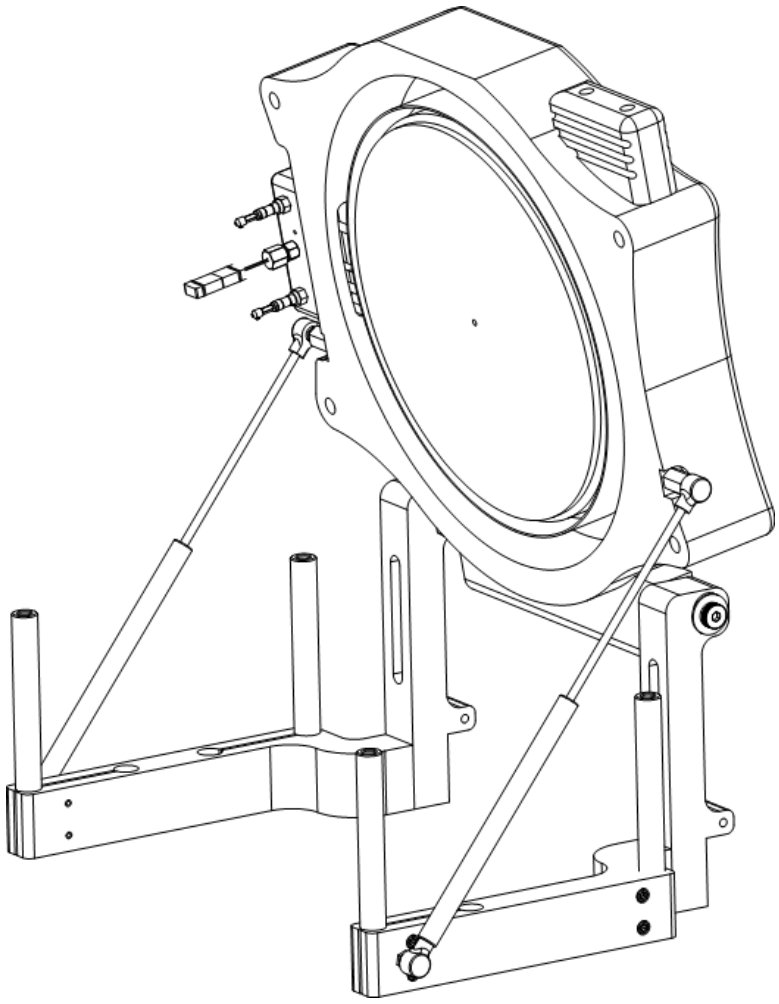


Figure 26 Upper Platen Open

A solvent compatible with the bonding agent used in your specific process should be all that is necessary for routine cleaning. For more persistent stains or heavier fouling, a stainless steel razor blade or glass microscope slide can be used. Use the edge to gently scrape the fouling from the surface of the platen.

To re-assemble the upper housing, reverse the steps of disassembly. Tighten the four (4) M12 screws to a final torque of at least 20 lb-ft. (27 N-m).

Check fasteners weekly for tightness.