

Cee® Apogee® Spin Coater and Developer Accessories Manual



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1 **Introduction**

1.1 **Confidentiality Statement**

Information supplied is for the 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® 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:

Cee® 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® Spin Coater are located on the rear panel. Software version information can be found on the *About* screen. See *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® diligently screens suppliers to ensure conflict-free sourcing of minerals and product components are constructed of recycled materials wherever 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.

1.6 General Safety Hazards / Precautions



Read this manual in its entirety before operating or servicing the 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.



Sound pressure measurements greater than 80 dB(A) are considered hazardous. The following sound pressure measurements were obtained from the Cee® Apogee® Spin Coater at a distance of 3 ft (0.9 m) from the system:

Stand-by Mode 54 dB(A).....

Normal Operations 70 dB(A).....

1.7 Electrical



High voltage is present in the machine. Disconnect power before servicing.



Stored electrical energy is present in the machine. Before servicing allow sufficient time for discharge. The servo amp contains a charge light. Do not service the machine until this light has been extinguished.



This unit must be connected to an outlet with proper grounding.

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.



Spin Coaters and Developers are capable of very high-speed rotation. Ensure all lids and panels are in place before rotating these devices.



This device is equipped with a lid interlock that immediately decelerates the spindle motor if the lid is opened at speeds greater than 100 rpm.



Ensure that all panels are on and in their correct locations before powering up or operating.



When opening lids be aware of the pinch point at the hinge cover. Open lids only by using the handles on the lids.

1.9 Chemical

Cee® does not supply or dictate chemicals to be used in conjunction with the Cee® Apogee® Spin Coater. Enclosure 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 the chemical supplier's specifications and Safety Data Sheets (SDSs). SDSs provide information on hazards, physical properties, spill response, handling, disposal, and personal protective equipment.



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.



Where dispensed materials share a waste collection path, verify compatibility and the potential for hazardous interactions before use. For systems fitted with a Waste Diverter, see Section 10.



Flammable Chemicals. No open flames/sparks.



Avoid the use of materials with an auto-ignition point $\leq 30^{\circ}\text{C}$.



Relieve pressure before opening canisters, tanks, cartridges, or syringes to refill.



Relieve pressure and shut off chemical valves before servicing supply lines, dispense valves or other components such as EBR/BSR tubes, dispense nozzles, spray tips, or spinner lid.



Flush tubing and valves with an appropriate solvent and drain system before servicing.



When draining waste tank, use appropriate containers and connection methods.



Ensure proper ventilation/exhaust is always used.



Always wear appropriate Personal Protective Equipment. This includes safety glasses, gloves, and other equipment, as needed, to protect from mechanical and chemical hazards.

Ensure the exhaust system is functional before using chemicals. Follow the exhaust requirements in the Operations Manual for the applicable Apogee® process module. **Error! Reference source not found.**

1.10 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® Spin Coater. 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® Spin Coater in accordance with applicable laws, regulations, and/or company policies.

For more information, please contact [Cee® Customer Support](#).

1.11 Intended Use of Machine

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

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

The Cee® Apogee® Spin Coater 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® Spin Coater and having not fully read this manual, should not operate the equipment.

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

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

Normal Operating Conditions

The Cee® Apogee® Spin Coater 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 100-120; 208-230VAC ±10%



If the Cee® Apogee® Spin Coater 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.

2 Available Accessories

Apogee® Spin Coater equipment supports a range of accessories designed to expand functionality, improve process control, and adapt the system to specific application requirements. These accessories allow users to tailor equipment configuration to their process, materials, and facility needs.

The following accessories are available for Apogee® Spin Coater equipment:

- **Bowl Liners** – HDPE liners used to protect the process bowl, simplify cleaning, and enable rapid material changeover
- **OptiFlow™ Exhaust** – Programmable exhaust control for improved facility integration and process optimization
- **Splash Rings** – Optional HDPE rings used to reduce splashback and minimize material redeposition
- **Vacuum Pumps** – Dedicated, oil-free vacuum sources used to secure substrates on the spin chuck
- **Nitrogen Purge** – Manual or recipe-controlled inert gas purge for oxygen-sensitive processes
- **Light Tree** – Three-color LED status indicator integrated with DataStream™ software
- **Waste Bottles** – HDPE waste collection assemblies with capacitive full sensors and software interlock
- **Waste Diverters** – Recipe-controlled pneumatic valves for diverting waste between multiple discharge paths

Additional accessory categories not covered in this manual include:

- **Spin Chucks and Centering Devices**
A variety of spin chuck and centering options are available to support different substrate sizes and geometries. Detailed information can be found in the **Spin Chuck Manual**.
- **Dispense Systems**
Automated and manual dispense options are available for fluid delivery and control. Detailed configuration and operation information can be found in the **Dispense Manual**.

For assistance selecting accessories or determining compatibility with a specific equipment configuration, contact Cee® Customer Support.

3 Bowl Liners

3.1 Description

Cee® Bowl Liners are made from high-density polyethylene (HDPE) designed to fit directly inside the Apogee® Spin process bowl. Bowl liners protect the process bowl from contamination, simplify cleanup, and enable rapid material changeover between incompatible chemistries.

Bowl liners may be used as disposable or reusable components depending on process requirements. Some users discard liners once heavily contaminated, while others periodically clean and reuse liners, achieving typical service lifetimes ranging from one month to six months under normal use.

Separate bowl liners are available for the Apogee® 200 Series and Apogee® 450 Series spin coaters and developers. While dimensions differ, both versions use the same material and function identically.

Users are responsible for verifying chemical compatibility between their specific process chemistries and HDPE prior to use. While bowl liners are compatible with most common spin coating and developing materials, chemical behavior may vary depending on formulation and exposure conditions.

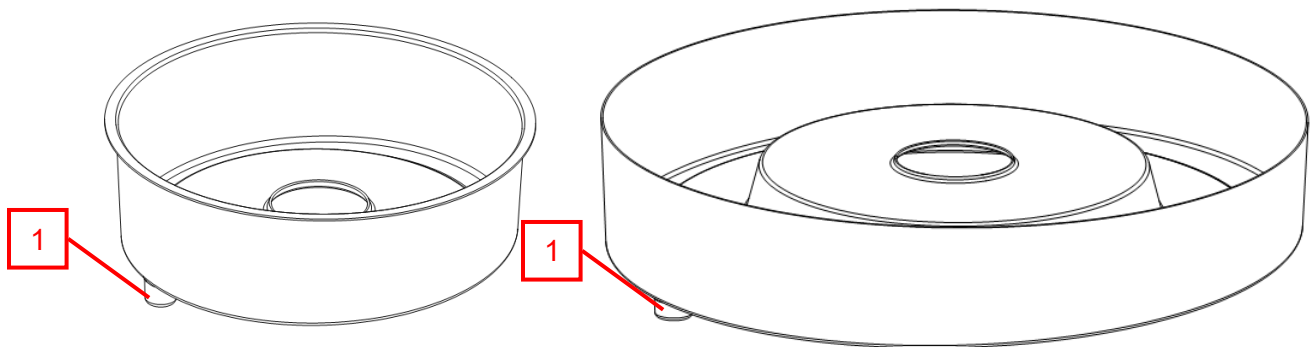


Figure 1 Apogee® 200 and 450 Bowl Liners

1. Drain closed drain location (may be cut to be open drain)

3.2 Dimensions

Bowl liners are designed to conform to the internal geometry of the Apogee® Spin process bowl and are available in configurations specific to the Apogee® 200 Series and Apogee® 450 Series equipment.

Dimensions listed below are provided to support shipping and storage planning. A dimensional reference figure is provided below for clarity.

Apogee® 200 Series Bowl Liner

11.5" (292mm) Diameter x 4.375" (111mm) H
Weight.....5 lb (0.23 kg)

Inside working diameter: 10.5" (266.7mm)

Apogee® 450 Series Bowl Liner

24" (609.6mm) Diameter x 5.375" (136.6mm) H
Weight.....1 lb (0.45 kg)

Inside working diameter: 23.75" (603.25mm)

Note: Minor dimensional variation may occur due to molding tolerances and does not affect installation or performance.

3.3 Features

- Protects the process bowl from chemical buildup and contamination
- Supports material changeover when used with an approved cleaning and waste-handling procedure.
- Embossed drain location allows optional user-defined drain opening
- Compatible with equipment equipped with backside rinse (BSR)

3.4 Reliability

Bowl liners are manufactured from chemically resistant HDPE to withstand repeated exposure to common spin coating and developing chemistries.

Reliability and service life depend on:

- Chemistry compatibility
- Frequency of use
- Cleaning practices

When used as reusable components, liners should be inspected regularly and replaced once excessive buildup or physical wear is observed.

3.5 Specifications

- Material: High-Density Polyethylene (HDPE)
- Usage: Disposable or reusable
- Chemical Resistance: Compatible with most common photoresists, developers, solvents, and rinse chemistries
- Drain Configuration: Shipped sealed; user-modifiable

3.6 Environment

Bowl liners are intended for use in cleanroom and laboratory environments consistent with Apogee® Spin Coater/Developer operating conditions.

- Indoor use only
- Cleanroom-compatible
- Environmental limits are governed by the host tool specifications

3.7 Unpackaging & Inspection

1. Remove the bowl liner from its packaging.
2. Inspect for cracks, tears, or damage that may have occurred during shipping.
3. Verify the liner matches the correct Apogee® model series.

Due to the flexible nature of the HDPE material, **minor deformation may be observed after shipping or storage**. This is normal and does not indicate damage. When placed inside the spin bowl, the liner will naturally conform to the shape of the bowl.

If deformation remains after placement, the liner may be gently reshaped by hand prior to installation. The material is flexible and may be manually adjusted to restore its intended form.

Do not install liners with cracks, punctures, or permanent damage.

3.8 Installation & Setup

1. Open the spin coater/developer lid.
2. Remove the spin chuck per the Apogee® Operations Manual.
3. Remove the splash ring (if equipped) as described in Section 5.
4. Place the bowl liner into the process bowl.
5. Align the embossed drain location on the liner with the bowl drain.
6. If applicable, verify alignment for backside rinse (BSR) tubing.
7. Reinstall the spin chuck.
8. Close the lid.

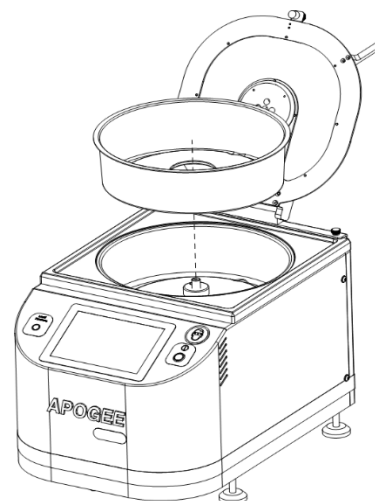


Figure 2 Bowl Liner Placement

Optional Drain Opening

By default, bowl liners ship with the drain fully sealed. If drainage through the bowl liner is required:

1. Locate the embossed drain outline.
2. Using scissors or an X-Acto® knife, cut along the embossed area.
3. The material cuts easily, similar to a plastic milk jug.
4. Remove the cut section completely before installation.

Cut only within the embossed drain outline. Remove loose cut material before installation.

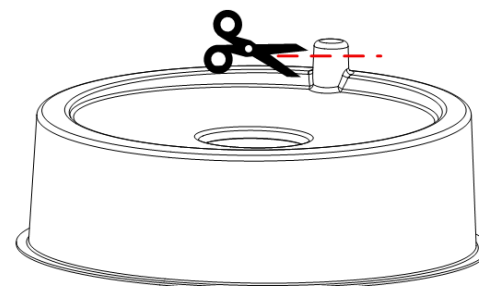


Figure 3 Bowl Liner-Create Open Drain

Backside Rinse (BSR) Accommodation

For tools equipped with a backside rinse:

- A clearance opening may be cut in the liner to allow the BSR tube to pass through.
- Remove only the material required to provide adequate clearance.

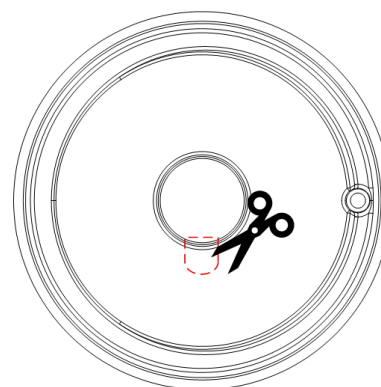


Figure 4 BSR Bowl Liner Cut Out

3.9 System Checks

After installation:

- Verify the liner is fully seated.
- Confirm drain and BSR cutouts (if used) are properly aligned.
- Ensure the spin chuck rotates freely without interference.

3.10 Maintenance

For reusable applications, bowl liners should be periodically inspected and cleaned to maintain performance and reduce contamination risk.

As an optional first step, liners may be allowed to air-dry prior to solvent cleaning. In some scenarios, residual material may separate from the liner surface as it dries and can be removed by peeling. This behavior is more commonly observed with thicker or higher-solids films, but may occur with other materials as well. This method does not apply to all chemistries and results may vary.

Allow air drying to occur in the exhausted spin bowl, an appropriate ventilated area, or a fume hood to safely exhaust solvent vapors. The effectiveness of peeling or solvent cleaning depends on the material and process conditions.

Select solvents based on compatibility with both the processed material and HDPE to wipe and rinse clean. Any solvent effective at removing the processed chemistry may be used, provided it does not attack or degrade HDPE. Commonly used solvents may include, but are not limited to, acetone, isopropyl alcohol (IPA), PGMEA, or cyclopentanone.

Replace the bowl liner if residue buildup cannot be effectively removed, or if signs of physical wear such as cracking, thinning, or deformation are observed.

3.11 Service and Repairs

Bowl liners are consumable components and are not repairable. Replace as required.

3.12 Safety Checks

Before use, inspect the bowl liner for:

- Proper seating
- Excessive contamination
- Cracks, tears, or warping
- Do not operate the tool with a damaged or improperly installed liner.

3.13 Mechanical/Utilities Checklist

<u>Evaluate</u>	<u>Frequency</u>	<u>Detail</u>
Seating & Alignment	Before Use	Verify liner is fully seated and aligned with drain

3.14 Cleaning

To clean reusable bowl liners:

- Use the mildest solvent compatible with processed materials.
- Do not use abrasive tools or caustic chemicals.
- Allow liners to dry completely before reinstallation.

Do not use caustic acids or bases. Contact [Cee® Customer Support](#) with any questions or concerns.

4 OptiFlow™ Exhaust

4.1 Description

The Cee® OptiFlow™ Exhaust Control System, designed for use with Apogee® Spin Coater and Spin Developer Systems, delivers the ultimate in precision management of solvent vapors for semiconductor substrates. This advanced, automated system ensures unparalleled efficiency and accuracy, guaranteeing optimal performance in your semiconductor fabrication process.

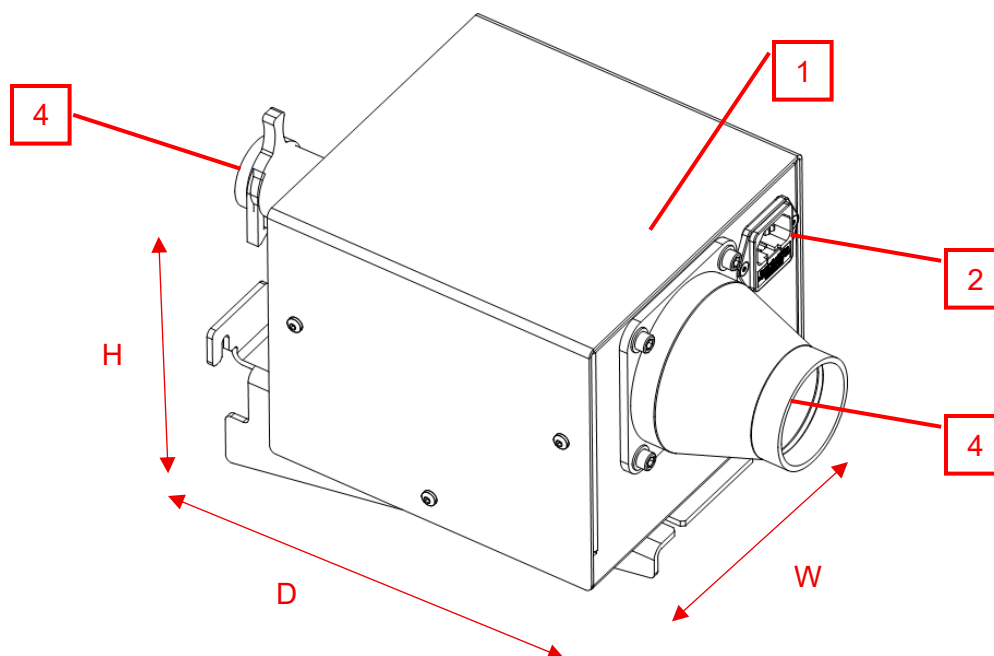


Figure 5: Cee® OptiFlow™ Exhaust Control System

- | | |
|---|--------------------------------------|
| 1. OptiFlow™ module..... | OptiFlow™ Exhaust Control System |
| 2. power inlet..... | main power supply |
| 3. coater exhaust connection..... | connector for spin bowl exhaust port |
| 4. system exhaust port ¹ | system exhaust connection |

4.2 Dimensions

When installed according to best practice recommendations, the unit adds 16" (406.4 mm) to standard Apogee® process module depth.² Where these clearances are not possible, an extension hose is provided for alternate OptiFlow™ placement. The connector hose should be as short as possible to protect against performance impacts.

6.5" (165mm) W x 11.25" (285.8 mm) D x 9.625" (244mm) H

Machine Weight 6.5 lb (3 kg)

¹ 2" OD

² Please refer to your Apogee® Operations Manual for standard dimensions.

4.3 Features & Programmability

- precision exhaust management supplements facility exhaust for improved process control
- recipe controlled via DataStream™ technology
- working range of 0-30 CMH in 0.1 CMH increments
- step exhaust parameters (up or down) 0-100%
- real-time monitoring and feedback for precise exhaust management

4.4 Reliability

- industry-leading reliability and uptime
- one-year full warranty on parts and labor
- complimentary remote technical support for the life of the product
- application process assistance for life of the product

4.5 Specifications

- Working Range: 0-30 CMH
- Resolution: ± 0.5 CMH

4.6 Clearance Requirements

The OptiFlow™ Exhaust Control System increases the depth of the standard Apogee® process module by a minimum of 16" (406.4 mm). Additional clearances may be required depending on configuration of facility exhaust connection.

Note: The Apogee® 200 Spin Coater is shown. The same dimensions are required for the Apogee® 450 Spin Coater.

rear 16" (406.4 mm)

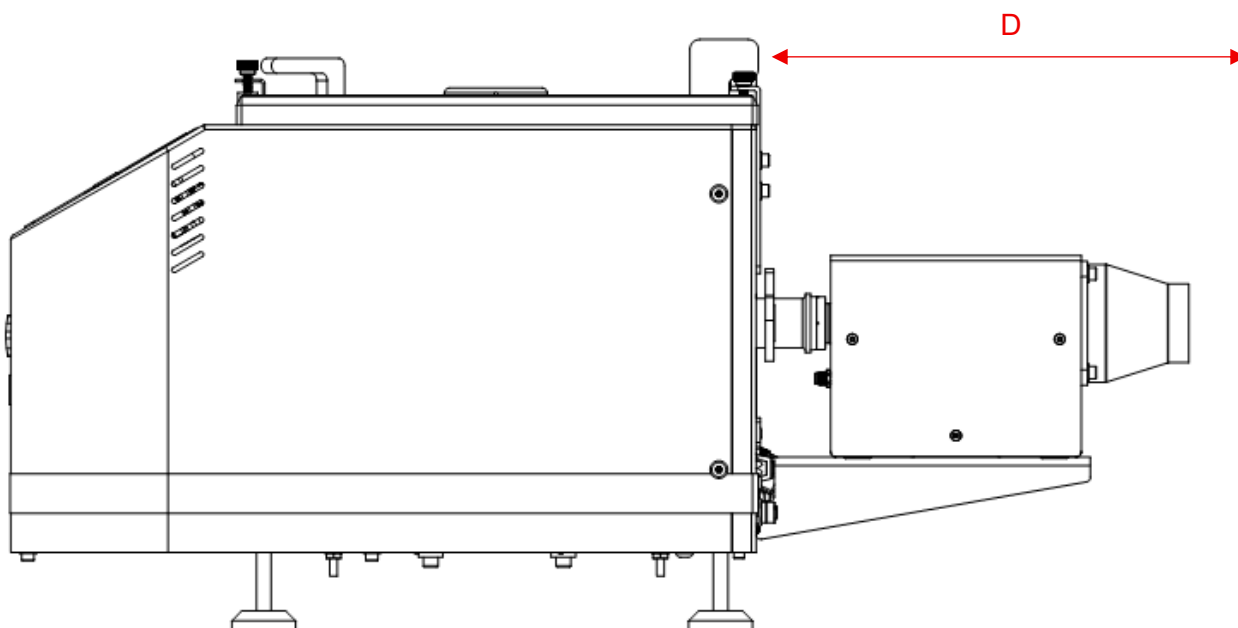


Figure 6 Apogee® Spin Coater Additional Clearance Requirements

4.7 Facilities Requirements

The Cee® OptiFlow™ Exhaust Control system requires the following utilities for operation.

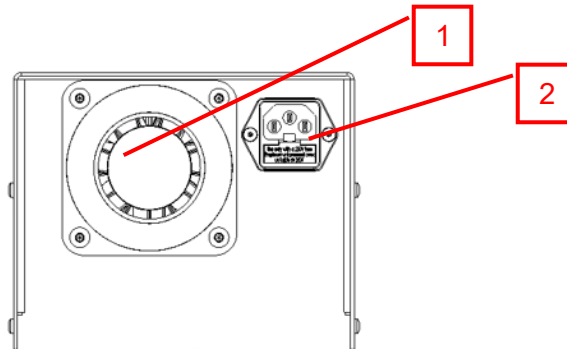


Figure 7 Optiflow™ Exhaust Requirements

1. Facility exhaust port 2" OD exhaust port for spin bowl vapors
2. AC power in³ single phase 100-120 / 208-230 VAC at 1.4A / 0.85A

4.8 Environment

The Cee® OptiFlow™ Exhaust Control system should be operated in a clean, low humidity environment.

4.9 Unpackaging & Inspection

*The OptiFlow™ Exhaust Control system will be shipped in the same crate as your Apogee® process module.

1. Carefully remove the smaller box from the shipping crate, open, and remove packing materials.
2. Place the Cee® OptiFlow™ Exhaust Control System on a table of proper height and strength to accommodate exhaust and Apogee® process modules.
3. Thoroughly inspect the OptiFlow™ for shipping damage. If physical damage is seen, DO NOT APPLY POWER! Contact Cee® Customer Support immediately.

The following items are included with shipment:

- (1) OptiFlow™ Exhaust Control System module
- (1) mounting bracket
- (1) power cord
- (1) coupling for remote mounting (Apogee® 200 series only)

³ 230 VAC at .85A option available (see back to verify).

4.10 Installation & Setup

***Please refer to your Apogee® process module's Operations Manual for process module installation & setup instructions before installing your OptiFlow™ Exhaust Control System.**

For optimal results, install the OptiFlow™ Exhaust Control System at the rear of the Apogee® process module using the supplied mounting bracket. For flange-mounted configurations, or when there isn't sufficient clearance to the rear of the process module, a remote mounting option is available. Ensure the hose length is as short as possible for maximum performance.

Machine-Mounted Configuration

1. Power off the equipment and disconnect power if required by facility procedures.
2. Drain routing must be completed before mounting OptiFlow™. See Apogee® process module's Operation Manual for more information on drain connection.
 - a. Verify the equipment drain connection is complete.
 - b. Connect the drain to a waste bottle or house drain as required.
3. Locate the two OptiFlow™ mounting screws on the rear of the equipment (see installation diagram).

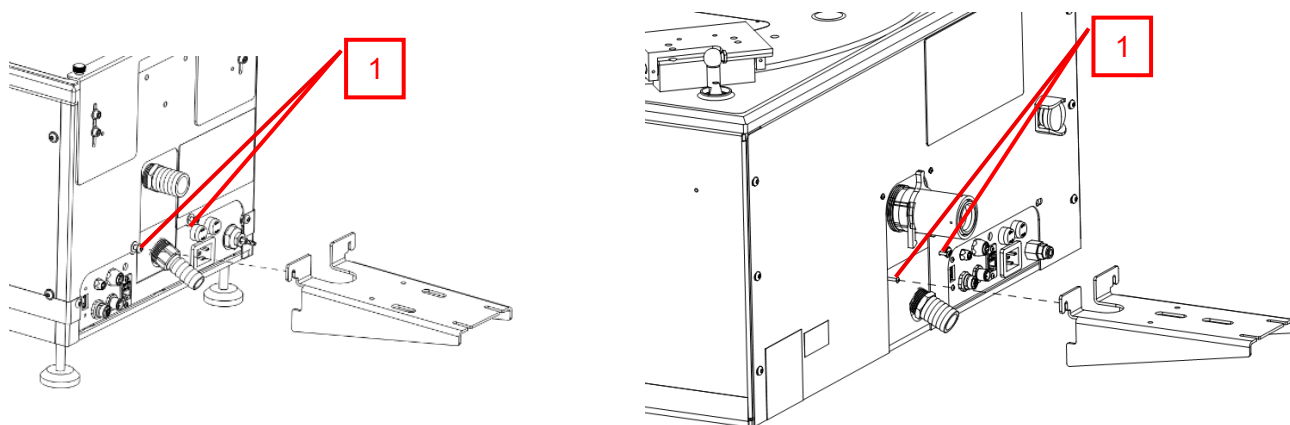


Figure 8 Apogee® 200 and 450 Spin Coater OptiFlow™ Bracket Install

4. Loosen the two mounting screws (labeled 1 in Figure 8). Do not remove the screws completely. Figure 8
5. Install the OptiFlow™ mounting bracket by sliding it over the loosened screws.
6. Tighten the mounting screws to secure the bracket to the equipment.
7. Connect the OptiFlow™ four-pin communication cable to the rear utilities panel RS-485 port (labeled Programmable Exhaust on older equipment). The connector is keyed and mates in only one orientation.

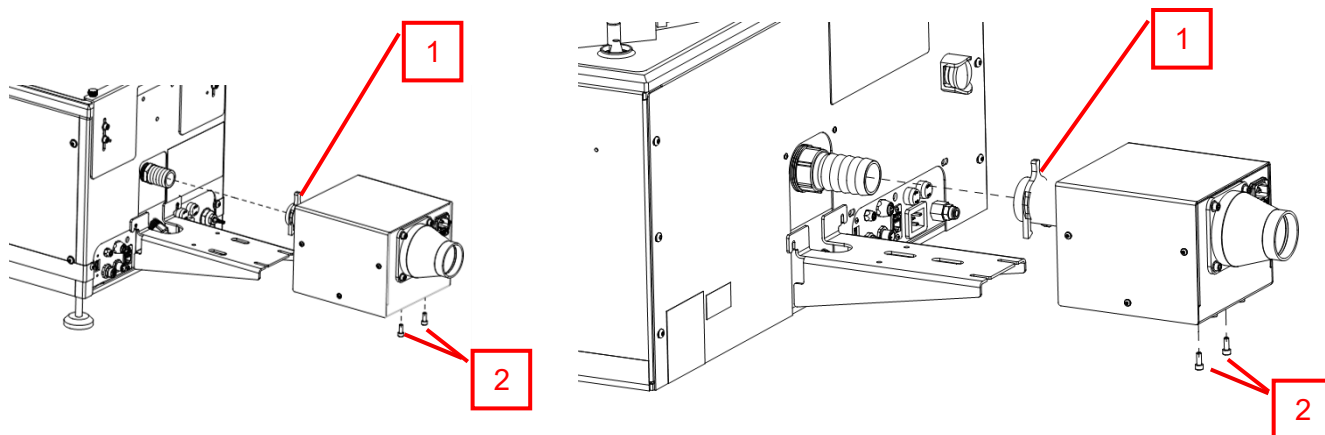


Figure 9 Apogee® 200 and 450 Spin Coater Optiflow™ Connection

8. Inspect the O-ring on the spin coater exhaust barb for damage and correct seating.
9. Align the OptiFlow™ exhaust coupling with the equipment exhaust barb.
10. Push the coupling fully onto the barb. The coupling retaining clip (#1 in Figure 9) will ratchet over the barb and lock in place.
11. Ensure the mounting screws (#2 in Figure 9) on the underside of OptiFlow™ are seated in the slots of the mounting bracket and tighten using an Allen key to secure the unit.
12. Connect the OptiFlow™ exhaust outlet to the facility exhaust system using a 2-inch exhaust hose and secure the connection with a hose clamp.
13. Connect the supplied power cord to the OptiFlow™ power inlet.

Remote Mount Configuration

1. Power off the equipment.
2. Remove the factory-installed inlet coupling from OptiFlow™ by removing the securing screws around the collar.
3. For Apogee® 200 Spin Coaters, install the supplied remote-mount coupling, and reinstall the screws. Apogee® 450 Spin Coaters do not need another coupling for remote-mount.
4. OptiFlow™ unit must be securely positioned within 3 ft (0.9 m) of the equipment. The unit may be mounted in any orientation.
5. Ensure the unit is firmly secured and cannot be bumped or moved.
6. Connect the OptiFlow™ four-pin communication cable to the rear utilities panel RS-485 port (labeled Programmable Exhaust on older equipment). The connector is keyed and mates in only one orientation.
7. Connect a hose (user-supplied) between the equipment exhaust port and the OptiFlow™ inlet.
 - a. Apogee® 200 Spin Coaters – 1 inch hose
 - b. Apogee® 450 Spin Coaters – 1.5 inch hose
8. Secure both ends with hose clamps.
9. Connect the OptiFlow™ four-pin communication cable to the rear utilities panel.
10. Connect a 2 inch exhaust hose from OptiFlow™ to the facility exhaust system.

11. Connect the supplied power cord to the OptiFlow™ power inlet.

4.11 Start Up

The OptiFlow™ Exhaust Control System is controlled with DataStream™ Technology via your Apogee® process module's graphical user interface. When connected to power, the fan will engage when the Apogee® process module is booted up.

4.12 System Checks

Please note that the following System checks are intended to be conducted in addition to, and only after, those outlined in your Apogee® Operations Manual.

On the **Process** screen, navigate to **Tools>Manual Control** and perform the following System checks for initial validation of the Cee® OptiFlow™ Exhaust Control System⁴.

Control: Programmable Exhaust

Action: Set

Enter 50 into the **Percent** field and press Apply.

You will receive the following error: Can't control programmable exhaust while holding pressure.

Tap OK.

Control: Programmable Exhaust

Action: Stop Holding

Press Apply

Control: Programmable Exhaust

Action: Set

Enter 50 into the **Percent** field and press Apply.

Confirm that the Percent Exhaust **Actual** parameter values reflect this value.

Confirm that the Percent Exhaust **Set Point** parameter values reflect 50%.

Note the Exhaust Airflow **Actual** parameter value will fluctuate and **Set Point** value will reflect -1.0 CMH.

Control: Programmable Exhaust

Action: Step

Enter 20 into the **Step Size** field

Direction will default to Up. Press Apply.

Note the Percent Exhaust **Actual** and **Set Point** values change to reflect a 20% increase.

⁴ See Section 4.13.2 Manual Controls – Cee® OptiFlow™ Exhaust Control System for more information about manual controls and parameters.

Note the Exhaust Airflow **Actual** value will fluctuate and **Set Point** value will reflect -1.0 CMH.

Control: Programmable Exhaust

Action: Hold Airflow

Enter 10 into the **Target Airflow (CMH)** field and press Apply.

Note the Percent Exhaust **Actual** and **Set Point** values will change to reflect the percent exhaust required to hold airflow at the target airflow in CMH.

Confirm that the Exhaust Airflow **Actual** value fluctuates within ± 0.5 CMH of 10 CMH.

Confirm that the Exhaust Airflow **Set Point** value reflects 10 CMH.

* Cee® recommends a baseline exhaust draw of 10 CMH for initial tool set-up and validation to ensure maximum flexibility of operation. While customer processes may require different exhaust values, the tool should be capable of pulling 10 CMH during these initial checks.

**10 CMH is the factory configured default flowrate for the OptiFlow™ Exhaust Control System. See Section 4.13.4 Tool Specific Settings – OptiFlow™ Exhaust Control System for details on how to modify this value.

Once operations have been validated, the Cee® OptiFlow™ Exhaust Control System is ready for use. Begin by creating a recipe. See the [DataStream™ Manual](#) for more information.

If a fault occurs, identify and correct its cause before restarting the equipment. Follow the applicable fault-recovery procedure.

4.13 DataStream™ Technology

This section covers information *specific to Cee® OptiFlow™ Exhaust Control System* and is intended as a companion to the [DataStream™ Technology Software Manual](#). **Please review the DataStream™ Operations Manual** for detailed guidance on software usage.

4.13.1 System Parameters

Apogee Spin Coater	Process	Recipes	About	Tools ▾
System Values				
Parameter		Actual	Set Point	
Spin Speed		0 rpm	0 rpm	
Spin Acceleration		500 rpm/s	500 rpm/s	
Percent Exhaust		0 %	0 %	
Exhaust Airflow		-0.9 CMH	-1.0 CMH	
Active Dispenses		None	None	
Dispense Source Empty		None		
Chuck Vac		98.5 kPa	101.3 kPa	
Waste Bottle Full		False		
Ambient Temperature		24.0 °C		
Humidity		39.8 %		
Vibration		3		

Percent Exhaust----- The percentage of OptiFlow™ max RPM at which it is operating.

Exhaust Airflow----- Exhaust draw measured in cubic meters per hour (CMH).

4.13.2 Manual Controls – Cee® OptiFlow™ Exhaust Control System

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.

Programmable Exhaust

Apogee Spin Coater Process Recipes About Tools - admin

System Values

Parameter	Actual	Set Point
Spin Speed	0 rpm	0 rpm
Spin Acceleration	500 rpm/s	500 rpm/s
Percent Exhaust	61 %	60 %
Exhaust Airflow	15.0 CMH	15.0 CMH
Active Disperses	None	None
Dispense Source Empty	None	
Chuck Vac	98.4 kPa	101.3 kPa

System Controls Motor Off

Control

What do you want to control?

What do you want to control?

Centering Routine

Spin Speed

Programmable Exhaust

Dispense

Chuck Vac

APPLY

Set: Allows users to operate the OptiFlow™ at a percentage of its maximum exhaust capability.

Must select **Stop Holding airflow before using the **Set** feature. (See below.)*

Apogee Spin Coater Process Recipes About Tools - admin

System Values

Parameter	Actual	Set Point
Spin Speed	0 rpm	0 rpm
Spin Acceleration	500 rpm/s	500 rpm/s
Percent Exhaust	25 %	25 %
Exhaust Airflow	6.2 CMH	-1.0 CMH
Active Disperses	None	None
Dispense Source Empty	None	
Chuck Vac	98.4 kPa	101.3 kPa
Waste Bottle Full	False	

System Controls Motor Off

Control Programmable Exhaust

Action Set

Percent 25 %

Set exhaust to 25 %

APPLY

Select a Control of Programmable Exhaust and an Action of Set.

Enter a value for the Percentage.

Click APPLY

Hold Airflow: Command OptiFlow™ to maintain a target exhaust airflow of [0-30] CMH

Apogee Spin Coater
Process
Recipes
About
Tools -
admin

System Values

Parameter	Actual	Set Point
Spin Speed	0 rpm	0 rpm
Spin Acceleration	500 rpm/s	500 rpm/s
Percent Exhaust	60 %	60 %
Exhaust Airflow	14.8 CMH	15.0 CMH
Active Dispenses	None	None
Dispense Source Empty	None	
Chuck Vac	98.4 kPa	101.3 kPa
Waste Bottle Full	False	

System Controls
Motor Off

Control
Programmable Exhaust

Action
Hold Airflow

Target Airflow
15
CMH

Hold Exhaust at 15 CMH

APPLY

Select a Control of Programmable Exhaust and an Action of *Hold Airflow*.
Enter a value for the Target Airflow.
Click APPLY

**OptiFlow™ will maintain exhaust within ± 0.5 CMH of the specified value, while accommodating for ambient/external conditions.*

Stop Holding: Directs OptiFlow™ to stop maintaining the previously specified CMH value and to maintain its *current* percentage exhaust, instead. (*See **Set** function above.)

Apogee Spin Coater
Process
Recipes
About
Tools -
admin

System Values

Parameter	Actual	Set Point
Spin Speed	0 rpm	0 rpm
Spin Acceleration	500 rpm/s	500 rpm/s
Percent Exhaust	41 %	41 %
Exhaust Airflow	10.0 CMH	-1.0 CMH
Active Dispenses	None	None
Dispense Source Empty	None	
Chuck Vac	98.4 kPa	101.3 kPa

System Controls
Motor Off

Control
Programmable Exhaust

Action
Stop Holding

Stops automatic control of exhaust

APPLY

Select a Control of Programmable Exhaust and an Action of *Stop Holding*.
Click APPLY

Step: Commands OptiFlow™ to increase or decrease the Set percentage according to the selected direction.

Apogee Spin Coater
Process
Recipes
About
Tools
admin

System Values

Parameter	Actual	Set Point
Spin Speed	0 rpm	0 rpm
Spin Acceleration	500 rpm/s	500 rpm/s
Percent Exhaust	51 %	51 %
Exhaust Airflow	12.6 CMH	-1.0 CMH
Active Disposes	None	None
Dispense Source Empty	None	
Chuck Vac	98.4 kPa	101.3 kPa
Waste Bottle Full	False	
Ambient Temperature	24.3 °C	

System Controls
Motor Off

Control
Programmable Exhaust

Action
Step

Step Size
10
%

Direction
Up

Step exhaust Up 10 %

APPLY

Select a Control of Programmable Exhaust and an Action of Step.

Enter a value for the Step Size.

Select a value for the Direction.

Click APPLY

**Only for use with the Set feature.*

***Not compatible with the Hold Airflow function.*

Additional Considerations:

Parameter	Actual	Set Point
Spin Speed	0 rpm	0 rpm
Spin Acceleration	500 rpm/s	500 rpm/s
Percent Exhaust	0 %	0 %
Exhaust Airflow	-0.9 CMH	-1.0 CMH
Active Disposes	None	None
Dispense Source Empty	None	
Chuck Vac	98.4 kPa	101.3 kPa
Waste Bottle Full	False	

Control
Programmable Exhaust

Action
Set

Percent
0
%

Set exhaust to 0 %

APPLY

When controlling OptiFlow™ via *Percent Exhaust* (**Set & Step** functions) the set point for the *Exhaust Airflow* parameter will reflect a value of -1.0 CMH.

To turn off the OptiFlow™ fan use one of the following actions:

Specify a **Set** percentage value of 0%
Specify a **Hold Airflow** value of 0 CMH

>>>>>> **Click Apply**

At the end of a recipe, the OptiFlow™ will revert back to the Idle Exhaust value configured in Tool Settings. Manual controls will not revert until a recipe is initiated or the tool is rebooted. (The factory configured default Idle Exhaust value is 10 CFM. See Section 4.13.4 for more details.)

4.13.3 Editing Recipes

Apogee Spin Coater Process **Recipes** About Tools - admin

Recipe Controls

Load Run New Edit Delete Upload

Viewing Recipe- Exhaust_1

Name Exhaust_1 Notes

Enable Chuck Vac ☒

Step	Velocity (rpm)	Ramp (rpm/s)	Time (seconds)	Exhaust (CMH)	Dispenses
1	500	10000	15	0	1
2	1000	20000	30	10	None
3	12000	20000	30	20	None

- Velocity**----- substrate RPM
- Ramp**----- substrate RPM/s
- Time** ----- the duration for which the specified actions will occur
- Exhaust⁵**----- the prescribed exhaust draw in CMH for a given step
- Dispenses**----- triggers the dispense of material for each nozzle

4.13.4 Tool Specific Settings – OptiFlow™ Exhaust Control System

To change tool settings: Enter the desired values, click **Update**, and then reboot your Apogee® process module.

Apogee Spin Coater Process Recipes About **Tools -** admin

Tool Settings

Tool Name Apogee Spin Coater

Local Time Zone Offset -5

SSL Encryption (https) Disabled

Idle Exhaust (CMH) 10

Exhaust Sensor Offset -206.5

Dispense Name Dispense 1

Update

Manual Control Log Browser **Settings** Diagnostics

⁵ Percent Exhaust controls can only be accessed via the Advanced Recipe Editor – see DataStream™ Manual for further details.

Idle Exhaust (CMH) -----	Sets the OptiFlow™ Exhaust Control System's default CMH value at startup and after process completion.
Exhaust Sensor Offset -----	Sensor calibration setting to neutralize ambient pressures detected within the Apogee® cabinet.

4.14 Maintenance

This maintenance manual provides personnel with procedures and guidelines for conducting routine maintenance on the Cee® OptiFlow™ Exhaust Control System. Below is a recommended maintenance schedule.

4.15 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.



When servicing the machine, use only replacement parts made or recommended by Cee®.



Use only Cee® supplied shielded cables with this machine.



Unauthorized repairs may lead to serious risks such as equipment malfunction, damage, personal injury, or even death.

4.16 Fault Condition

If a fault occurs, identify and correct its cause before restarting the equipment. Follow the applicable fault-recovery procedure.

4.17 Safety Checks

Inspect the OptiFlow™ for the following defects each day prior to use:

- loose assemblies

4.18 Mechanical/Utilities Checklist

<u>Evaluate</u>	<u>Frequency</u>	<u>Detail</u>
Connections	Every six months	Inspect all connections for proper installation.

4.19 Cleaning

To clean Cee® OptiFlow™ Exhaust Control System, use a cleaning agent compatible with the surfaces being cleaned. **Do not use caustic acids or bases.** Contact [Cee® Customer Support](#) with any questions or concerns.

5 Splash Ring

5.1 Description

Cee® Splash Rings are high-density polyethylene (HDPE) rings designed to reduce splash-back during spin coating processes. Splash rings are an optional accessory for Apogee® Spin Coater equipment and are used in applications where material spun from the wafer may rebound from the process bowl and redeposit onto the substrate, potentially causing defects.

Splash-back conditions are more commonly observed when processing larger diameter substrates, such as 200 mm wafers on Apogee® 200 Series equipment or 450 mm substrates on Apogee® 450 Series equipment.

During operation, material leaving the wafer contacts the angled, chamfered surface of the splash ring. This surface redirects the material downward into the process bowl, guiding it toward the drain and reducing the likelihood of material rebounding back toward the wafer.

Separate splash rings are available for the Apogee® 200 Series and Apogee® 450 Series equipment. While mechanical designs differ to accommodate bowl geometry, material composition and functional intent are consistent across both platforms.

While splash rings are optional for spin coating applications, they are provided as a standard component on Apogee® Spin Developer equipment due to the significantly higher fluid volumes encountered during developing processes.

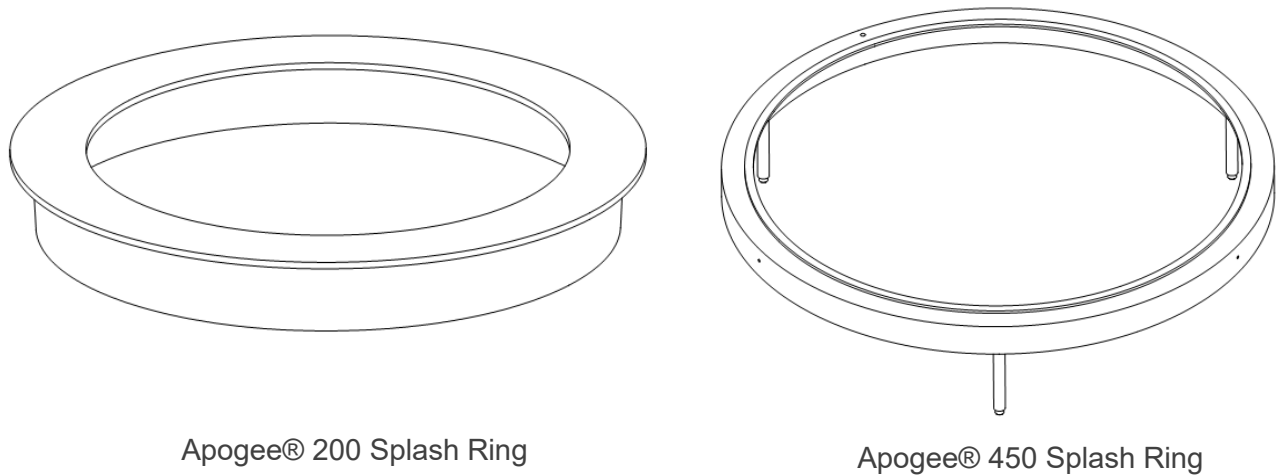


Figure 10 Apogee® Splash Rings

5.2 Dimensions

Splash rings are designed to conform to the internal geometry of the Apogee® Spin Coater process bowl and are available in configurations specific to the Apogee® 200 Series and Apogee® 450 Series equipment.

Dimensions listed below are provided to support shipping and storage planning. A dimensional reference figure is provided below for clarity.

Apogee® 200 Series Splash Ring

11.5" (292mm) Diameter x 1.75" (44mm) H
Weight..... 1 lb (0.45 kg)

Inside working diameter: 8.75" (222.25mm)

Apogee® 450 Series Splash Ring

23.75" (603.25mm) Diameter x 4.875" (123.8mm) H
Weight..... 5 lb (2.27 kg)

5.3 Features

- Reduces splashback during spin coating
- Helps minimize redeposition of material onto the wafer
- Angled chamfer directs material downward into the process bowl
- Compatible with bowl liners

5.4 Reliability

Splash rings are manufactured from chemically resistant HDPE to withstand repeated exposure to common spin coating and developing chemistries.

While splash rings are not considered consumable items under normal operation, they should be periodically inspected for signs of damage, excessive wear, or deformation. Replace the splash ring if defects are observed that could affect seating, alignment, or process performance.

5.5 Specifications

- Material: High-Density Polyethylene (HDPE)
- Usage: Optional for spin coating; standard on spin developer equipment
- Chemical Resistance: Compatible with most common photoresists, developers, solvents, and rinse chemistries

5.6 Environment

Splash rings are intended for use in cleanroom and laboratory environments consistent with Apogee® Spin Coater/Developer operating conditions.

- Indoor use only
- Cleanroom-compatible
- Environmental limits are governed by the host tool specifications

5.7 Unpackaging & Inspection

1. Remove the splash ring from its packaging.

2. Inspect for cracks, tears, or damage that may have occurred during shipping.
3. Verify the splash ring matches the correct Apogee® model series.

Do not install splash rings with cracks, punctures, or permanent damage.

5.8 Installation & Setup

1. Open the spin coater lid.
2. If a bowl liner is used, install the bowl liner first (see Bowl Liner section).
3. Place the splash ring into the process bowl.

Apogee® 200 Series Installation

- The splash ring is seated directly into the bowl.
- The outer lip of the splash ring rests on the top edge of the bowl, acting as a mechanical stop that automatically sets the correct height.
- No clocking or adjustment is required.

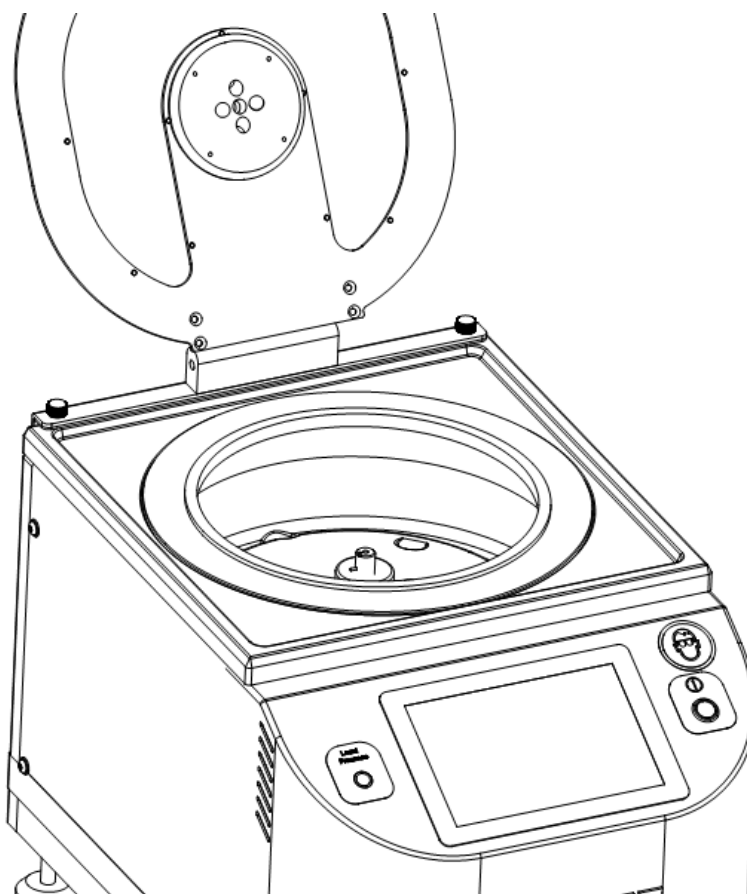


Figure 11 Apogee® 200 with Splash Ring

Apogee® 450 Series Installation

- The splash ring is supported by adjustable legs that rest on the bottom of the bowl.

- Leg height may be adjusted to achieve the best fit and minimize the gap between the splash ring and the lid.
- Because the Apogee® 450 Series bowl has a slope, the splash ring must be clocked correctly.

A set screw on the splash ring serves as a clocking indicator and must be positioned over the bowl drain to ensure proper alignment.

Important: If the splash ring is not fully seated or is incorrectly aligned, it may prevent the lid from closing completely. In this condition, the equipment may not recognize the lid as closed and will not allow a process to start.

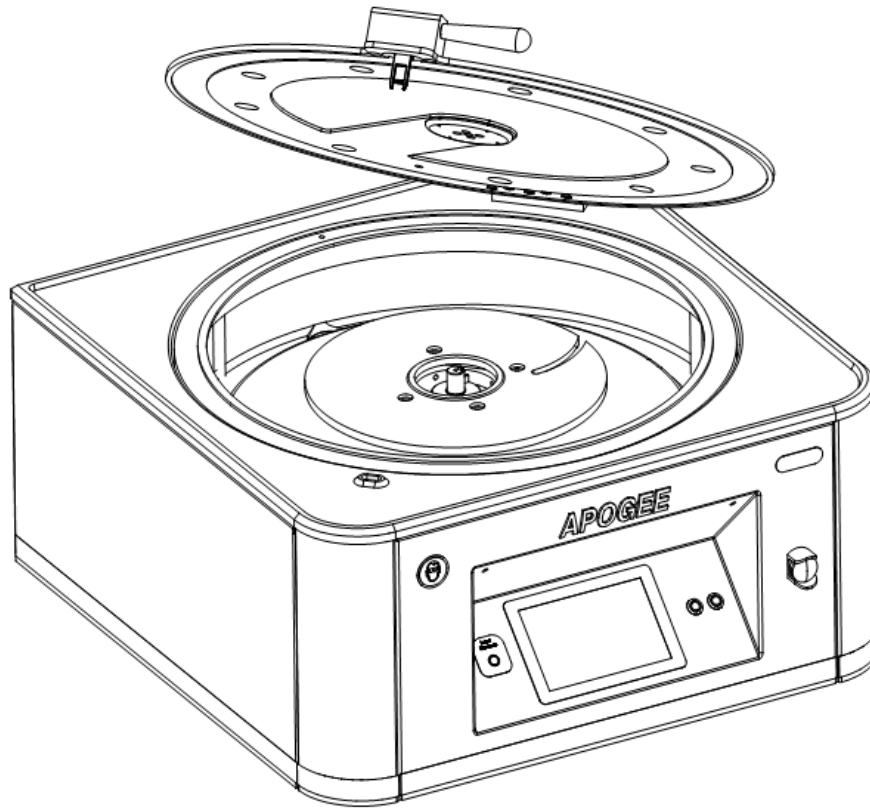


Figure 12 Apogee® 450 with Splash Ring

5.9 System Checks

After installation:

- Verify the splash ring is fully seated.
- Confirm correct clocking on Apogee® 450 Series equipment (set screw aligned over drain).
- Ensure the splash ring does not interfere with lid closure.
- Confirm the lid closes fully and the equipment recognizes a closed condition.

5.10 Maintenance

Splash rings should be periodically inspected and cleaned to maintain performance.

As an optional first step, splash rings may be allowed to air-dry prior to solvent cleaning. In some scenarios, residual material may separate from the surface as it dries and can be removed mechanically. This behavior is more commonly observed with thicker or higher-solids films, but may occur with other materials as well. This method does not apply to all chemistries and results may vary.

Allow air drying to occur in the exhausted spin bowl, an appropriate ventilated area, or a fume hood. The effectiveness of residue separation or solvent cleaning depends on the material and process conditions.

If additional cleaning is required, select solvents based on compatibility with both the processed material and HDPE. Any solvent effective at removing the processed chemistry may be used, provided it does not attack or degrade HDPE. Commonly used solvents may include, but are not limited to, acetone, isopropyl alcohol (IPA), PGMEA, or cyclopentanone.

Replace the splash ring if residue buildup cannot be effectively removed or if physical damage is observed.

5.11 Service and Repairs

Splash rings are not repairable. Replace damaged rings as required.

5.12 Safety Checks

Before use, inspect the splash ring for:

- Proper seating
- Correct clocking (Apogee® 450 Series)
- Excessive contamination
- Cracks, warping, or deformation

Do not operate the equipment with a damaged or improperly installed splash ring.

5.13 Mechanical/Utilities Checklist

<u>Evaluate</u>	<u>Frequency</u>	<u>Detail</u>
Seating & Alignment	Before Use	Verify splash ring is fully seated and does not interfere with lid closure

5.14 Cleaning

To clean splash rings:

- Use the mildest solvent compatible with processed materials.
- Do not use abrasive tools or caustic chemicals.
- Allow splash rings to dry completely before reinstallation.

Do not use caustic acids or bases. Contact [Cee® Customer Support](#) with any questions or concerns.

6 Vacuum Pump

6.1 Description

The vacuum pump provides the vacuum required to secure the substrate to the spin chuck during processing on Apogee® Spin Coater and Spin Developer equipment. Consistent and reliable vacuum is critical to maintaining substrate position and stability throughout spin operations.

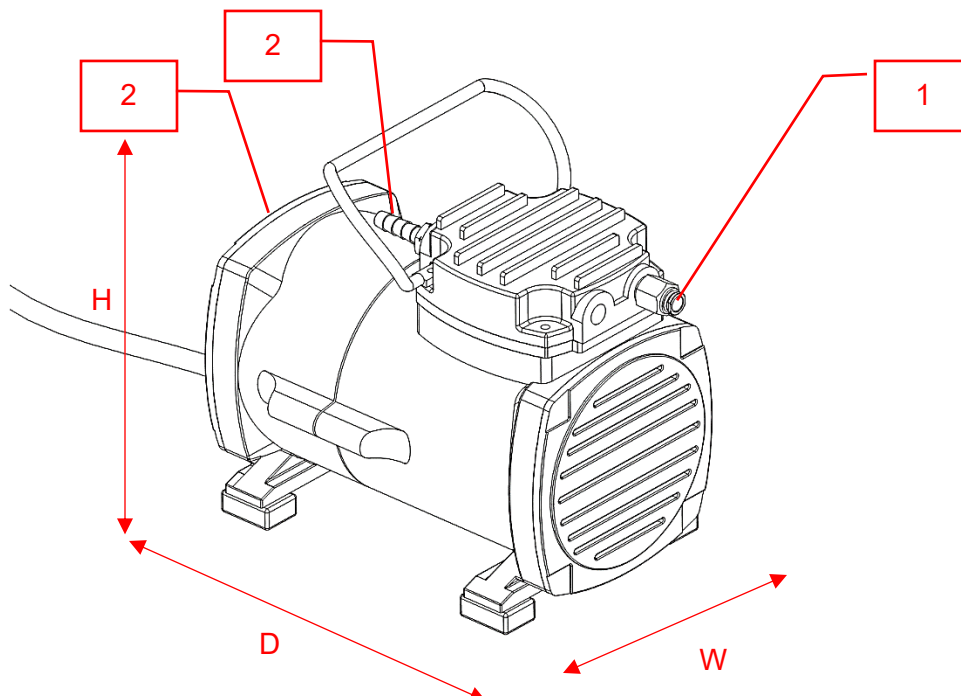
The vacuum pump supplies a dedicated vacuum source to a single piece of equipment and is designed for cleanroom-compatible operation. It is an oil-free, diaphragm-style pump that offers quiet operation, minimal maintenance requirements, and stable performance suitable for continuous laboratory and production use.

6.2 Dimensions

Vacuum pump dimensions are provided to support shipping, placement, and installation planning. A dimensional reference figure is provided below for clarity.

5.5" (140mm) W x 9" (229mm) D x 8" (203mm) H
Weight 8 lb (3.63 kg)

Note: Dimensions are for reference only and do not define clearance requirements. Adequate space should be provided around the pump for ventilation and access.



6.3 Features

- Dedicated vacuum supply for a single piece of equipment
- Cleanroom-compatible construction
- Oil-free, maintenance-free operation
- PTFE-coated diaphragm and pump head
- Quiet operation (~50 dB)
- Thermal overheat protection
- Available in 110 VAC or 220 VAC configurations

6.4 Reliability

The vacuum pump is designed for continuous operation in laboratory and cleanroom environments. Oil-free construction and minimal moving components contribute to long service life and stable vacuum performance.

While the pump is considered maintenance-free under normal operation, it should be periodically inspected to ensure adequate ventilation, proper connections, and normal operating behavior.

6.5 Specifications

- Vacuum Level: 20–25 inHg
- Flow Rate: up to 20 L/min
- Noise Level: ~50 dB
- Tubing: 6 ft of ¼ in tubing included

6.6 Clearance Requirements

To ensure proper cooling and reliable operation, the vacuum pump must be installed with adequate clearance on all sides.

- Maintain a minimum of 3 in (76 mm) clearance on all sides of the pump.
- Install the pump in a well-ventilated area to allow for proper heat dissipation.
- Do not enclose the pump in a sealed cabinet or restrict airflow around ventilation openings.

Insufficient clearance or restricted airflow may cause elevated operating temperatures and can lead to thermal shutdown or reduced service life.

6.7 Facility Requirements

- Electrical 110V, 0.7A max or 220V, 0.3A max
- Pressure 40 psi max.....
- flow rate 20 L/min max

6.8 Environment

The vacuum pump is intended for use in cleanroom and laboratory environments consistent with Apogee® equipment operating conditions.

- Indoor use only
- Operate in a well-ventilated area

6.9 Unpacking & Inspection

1. Remove the vacuum pump from its packaging.
2. Inspect for physical damage, loose fittings, or shipping damage.
3. Verify the correct voltage configuration prior to connection.
4. Do not apply power if damage is observed.

6.10 Installation & Setup

- 1) Place the vacuum pump on a solid, level surface with adequate ventilation clearance.
- 2) Locate the vacuum utility port on the Apogee® equipment utilities panel.
- 3) Connect the supplied ¼ in tubing from the pump outlet to the equipment vacuum connection.
 1. For barb fittings, fully seat the tubing over the barb.
 2. For push-to-connect fittings, insert tubing fully and gently pull to confirm engagement.
- 4) Connect the power cord to an appropriately rated electrical outlet.
- 5) Turn the rocker switch to the ON position to start the pump.

6.11 System Checks

After installation:

- Verify vacuum tubing is securely connected.
- Confirm the pump starts and runs smoothly.
- Ensure adequate airflow around the pump housing.
- Verify normal vacuum operation at the equipment.

6.12 Maintenance

The vacuum pump is designed for maintenance-free operation.

- Ensure ventilation openings remain unobstructed.
- Periodically inspect tubing and electrical connections.
- Clean the exterior as needed to remove dust or residue.

If the pump repeatedly enters thermal shutdown, verify adequate airflow and ambient conditions.

6.13 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.



When servicing the machine, use only replacement parts made or recommended by Cee®.



Use only Cee® supplied shielded cables with this machine.



Unauthorized repairs may lead to serious risks such as equipment malfunction, damage, personal injury, or even death.

6.14 Fault Condition

If a fault condition occurs:

- Identify and correct the fault before restarting the vacuum pump. Follow the approved recovery procedure.
- If repeated shutdown occurs, verify ventilation and ambient temperature.
- Contact Cee® Customer Support if issues persist.

6.15 Safety Checks

Before use, inspect the vacuum pump for:

- Secure tubing connections
- Proper ventilation clearance
- Normal operating sound
- No visible damage or overheating

6.16 Mechanical/Utilities Checklist

<u>Evaluate</u>	<u>Frequency</u>	<u>Detail</u>
Connections	Every six months	Inspect all connections for proper installation.
Clearance	Before Use	Ensure airflow paths are unobstructed

6.17 Cleaning

To clean the outside, use the a cleaning agent compatible with the surfaces being cleaned. ***Do not use caustic acids or bases.*** Contact [Cee® Customer Support](#) with any questions or concerns.

7 Nitrogen Purge

7.1 Description

The Nitrogen Purge accessory introduces nitrogen or another compatible inert gas into the process bowl to reduce oxygen concentration during spin coating. It supports processing of oxygen-sensitive materials; atmosphere performance depends on purge and exhaust conditions.

The nitrogen purge system uses a series of sintered diffuser elements mounted to the lid to evenly distribute inert gas throughout the process bowl. When used in conjunction with controlled or reduced exhaust, such as OptiFlow™ or low facility exhaust rates, the system enables effective displacement of oxygen within the bowl.

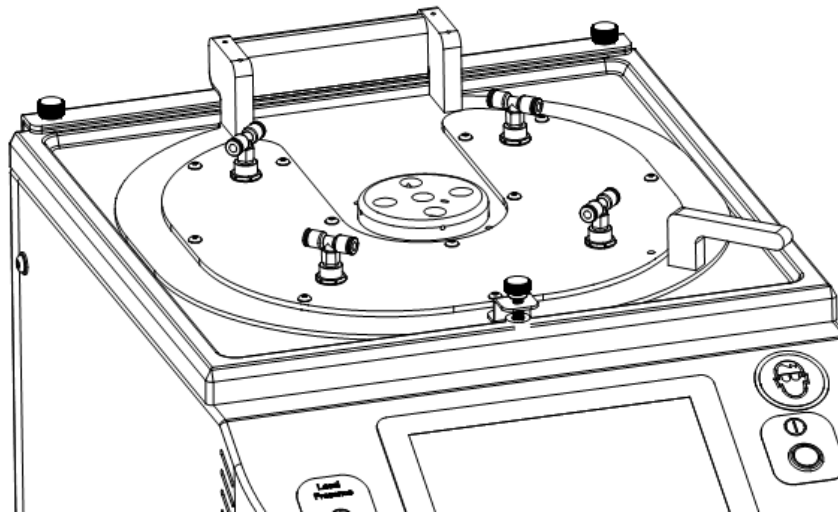


Figure 13 Nitrogen Purge Shown on Apogee® 200 Spin Coater

Nitrogen purge is available in two different configurations:

- **Manual configuration:** uses a mechanical slide valve to turn purge flow on or off.
- **Automated:** The recipe-controlled configuration is treated as an automated dispense within the software, allowing purge flow to be enabled or disabled on a per-step basis within a recipe.

7.2 Dimensions

The nitrogen purge hardware is pre-mounted to the equipment lid and does not add to the external footprint of the equipment.

Dimensions are therefore not applicable for installation or clearance purposes.

7.3 Features & Programmability

- Creates a low-oxygen environment within the process bowl
- Evenly distributes inert gas via sintered diffuser elements
- Supports oxygen-sensitive materials
- Available in manual or recipe-controlled configurations

- Integrates with exhaust control strategies such as OptiFlow™
- No electrical components within the purge assembly

7.4 Reliability

The nitrogen purge diffuser assembly contains no electrical components. The complete purge system includes tubing, fittings, diffusers, and a manual or pneumatically actuated valve, depending on configuration.

Once installed, the system is designed for long-term, reliable operation with minimal intervention. Periodic inspection for loose connections or damaged tubing is recommended.

7.5 Specifications

- Gas Type: Nitrogen or compatible inert gas
- Recommended Flow Rate: ~5 L/min
- Supply Pressure: 5–10 psi
- Control Options:
 - Manual (slide valve)
 - Recipe-controlled (automated dispense)

7.6 Facilities Requirements

- Inert gas supply (typically nitrogen)
- Recommended flow: ~5 L/min
- Supply pressure: 5–10 psi
- Clean, dry gas source consistent with cleanroom practices

7.7 Environment

The nitrogen purge system should be operated in a clean, low humidity environment.

7.8 Unpackaging & Inspection

The nitrogen purge diffuser assembly is **pre-installed on the equipment lid** at the factory.

For automated (recipe-controlled) configurations, additional components may be included with shipment, such as:

- Pneumatic valves
- Tubing and fittings
- Valve mounting brackets
- Dispense control hardware

Inspect all supplied components for shipping damage. Do not operate the equipment if damaged components are observed.

7.9 Installation & Setup

No mechanical installation of the purge diffuser is required.

Manual Configuration

- Connect the nitrogen supply line to the provided inlet fitting.
- Use the manual slide valve to control purge flow.

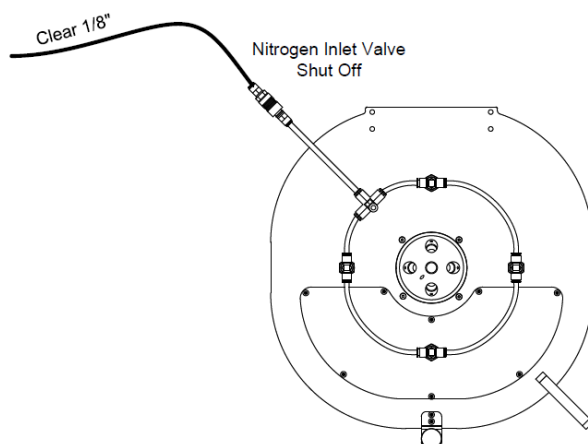


Figure 14 Manual N2 Purge Hood Connection

Recipe-Controlled Configuration

- Connect pneumatic and control components as supplied.
- Automated purge functionality is configured and controlled through the dispense system.
- Detailed connection and setup instructions are provided in the Dispense Manual.

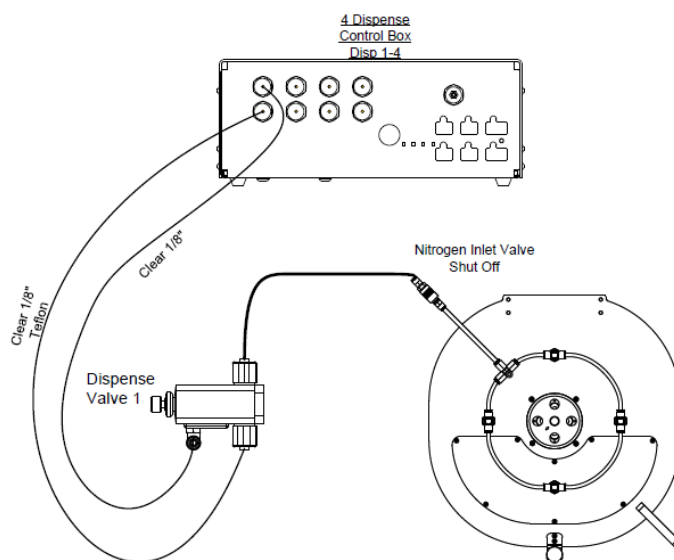


Figure 15 Automated N2 Purge Hood Connection

7.10 System Checks

After installation:

- Verify secure pneumatic connections.
- Confirm purge gas flows evenly into the bowl when enabled.
- Verify interaction with exhaust settings achieves desired purge behavior.

7.11 Maintenance

The nitrogen purge system requires minimal maintenance.

- Periodically inspect pneumatic connections for leaks or looseness.
- Verify tubing integrity and routing.

No routine preventive maintenance is required beyond basic inspection.

7.12 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.



When servicing the machine, use only replacement parts made or recommended by Cee®.



Use only Cee® supplied shielded cables with this machine.



Unauthorized repairs may lead to serious risks such as equipment malfunction, damage, personal injury, or even death.

7.13 Safety Checks

Before use, inspect the nitrogen purge system for:

- Secure pneumatic connections
- Undamaged tubing and fittings

Ensure purge gases are properly exhausted from the process bowl and that facility exhaust systems are operating as required.

7.14 Mechanical/Utilities Checklist

<u>Evaluate</u>	<u>Frequency</u>	<u>Detail</u>
Connections	Before Use	Inspect fittings and tubing for secure connection
Gas Supply	Before Use	Verify pressure and flow are within recommended range

7.15 Cleaning

To clean, use the a cleaning agent compatible with the surfaces being cleaned. ***Do not use caustic acids or bases.*** Contact [Cee® Customer Support](#) with any questions or concerns.

8 Light Tree

8.1 Description

The Light Tree is a three-color LED status indicator designed to provide clear, at-a-glance visibility of equipment state during operation. The light tree mounts externally and interfaces directly with the Apogee® equipment control system.

The three status indicators function as follows:

- Green: Active process running
 - Flashes green when user prompts or interactions are required
- Yellow: Equipment idle
- Red: Error or fault condition

Light tree behavior is fully integrated with DataStream™ software and is identical across both Apogee® 200 Spin Coaters and Apogee® 450 Spin Coaters.

The assembly includes the LED light tree, mounting bracket, and an attached cable for connection to the rear utilities interface.

8.2 Dimensions

The light tree and mounting bracket are designed for external visibility and flexible placement relative to the equipment.

- Light Tree Assembly: See reference drawing
- Mounting Bracket: See reference drawing
- Cable Length: Approximately 3 ft (0.9 m)

Dimensions are provided via reference figures for mounting and layout planning.

2" (50.8 mm) W x 3.5" (88.9 mm) D x 16.5" (419.1 mm) H
Machine Weight 2 lb (0.9 kg)

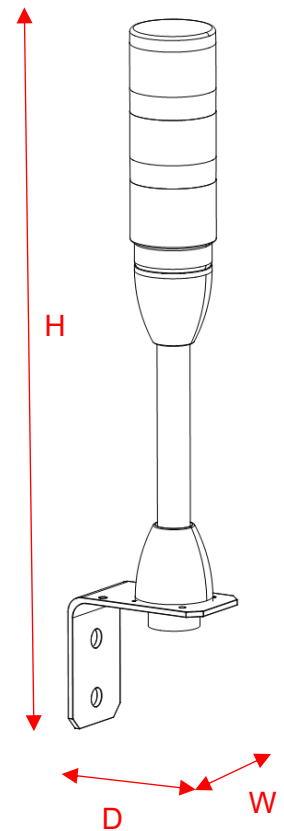
8.3 Features & Programmability

- Three-color LED status indication (red, yellow, green)
- Fully integrated with DataStream™ software
- Automatic operation with no configuration required
- External mounting for high visibility
- Single keyed connector for simple installation

8.4 Reliability

The light tree is a solid-state LED assembly designed for long-term, continuous operation. It contains no user-serviceable components and requires no routine maintenance.

Under normal use, the light tree is expected to provide reliable service for the life of the equipment.



8.5 Specifications

- Operating Voltage: 24 VDC (supplied by equipment)
- Connector Type: Keyed M12 connector

8.6 Clearance Requirements

The light tree generates no significant heat and introduces no additional clearance requirements. Ensure sufficient visibility for operators based on mounting location.

8.7 Facilities Requirements

No external facility utilities are required. The light tree receives all required power and control signals directly from the equipment.

8.8 Environment

The light tree is intended for use in cleanroom and laboratory environments consistent with Apogee® equipment operating conditions.

8.9 Unpackaging & Inspection

The light tree is shipped as a complete assembly, including:

- LED light tree
- Mounting bracket
- Attached cable with keyed connector

Upon unpackaging:

- 1) Inspect the assembly for physical damage.
- 2) Verify the connector and cable are intact.
- 3) Do not install damaged components.

The following items are included with shipment:

- (1) Light tree with bracket and cable

8.10 Installation & Setup

- 1) Power off the equipment before installation.
- 2) Access the rear utilities panel of the equipment.
- 3) Mount the light tree using the provided mounting bracket in a location that provides clear visibility.
- 4) Align the keyed connector with the corresponding port on the utilities panel.
- 5) Insert the connector fully and tighten the locking collar to secure the connection.
- 6) Restore power to the equipment.

8.11 Start Up

No startup procedure is required. Once connected and the equipment is powered on, the light tree becomes active automatically.

8.12 System Checks

After installation and power-up:

- Verify the light tree illuminates.
- Confirm status indication changes appropriately between idle, running, and fault conditions.

If the light tree does not illuminate, verify the connector is fully seated and secured.

8.13 Maintenance

The light tree is maintenance-free under normal operation. No preventive maintenance is required.

8.14 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.



When servicing the machine, use only replacement parts made or recommended by Cee®.



Use only Cee® supplied shielded cables with this machine.



Unauthorized repairs may lead to serious risks such as equipment malfunction, damage, personal injury, or even death.

8.15 Fault Condition

If the light tree does not operate as expected:

- Power cycle the equipment.
- Verify connector seating and locking collar engagement.

If the issue persists, contact Cee® Customer Support.

8.16 Safety Checks

Before use, verify:

- The light tree is securely mounted.
- The connector is fully seated and locked.
- Status lights are visible during operation.

8.17 Mechanical/Utilities Checklist

<u>Evaluate</u>	<u>Frequency</u>	<u>Detail</u>
Connections	Annually	Verify connector is fully seated and locking collar is secure
Light Operation	Before Use	Confirm light tree illuminates when equipment is powered

8.18 Cleaning

To clean light tree, only wipe dry or use isopropyl alcohol. Contact [Cee® Customer Support](#) with any questions or concerns.

9 **Waste Carboy**

9.1 **Description**

The Cee® Waste Carboy assembly is designed to collect liquid waste generated during spin coating and spin developing processes. The system is compatible with both Apogee® 200 Series and Apogee® 450 Series equipment and utilizes identical drain connections across both platforms.

The waste carboy is constructed from high-density polyethylene (HDPE) and incorporates a capacitive level sensor that interfaces directly with the equipment control system. When the waste carboy reaches its full level, the sensor communicates this condition to DataStream™ software.

When a full condition is detected:

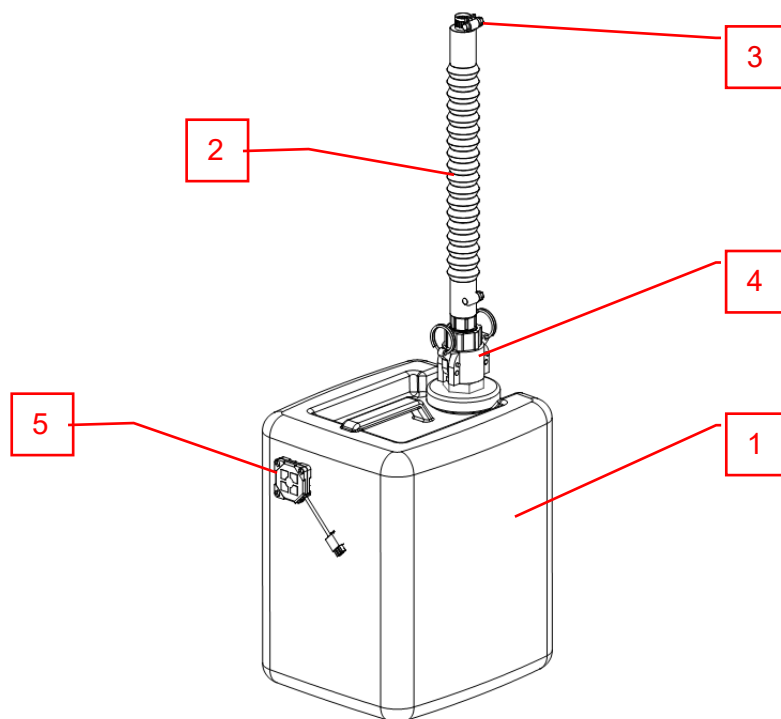
- The current process is allowed to complete.
- Additional processes are prevented from starting until the waste carboy has been emptied.
- A Waste Bottle Full notification is displayed when attempting to initiate another process.

Waste Carboy assemblies are available in 2.5-gallon and 5-gallon capacities. Each size is offered as either a complete installation kit or a spare assembly.

The complete kit includes the waste carboy, capacitive level sensor, cap, and the necessary drain tubing and connection hardware for installation.

The spare assembly includes the waste carboy, capacitive level sensor, and cap, without the equipment connection tubing.

The quick-disconnect design allows the waste carboy to be removed for emptying and returned to service with minimal interruption.



1. waste carboy container that holds the waste
2. waste hose waste path from the spin coater/developer to the carboy
3. hose clamp secures waste hose to the spin coater/developer
4. quick coupling easy disconnect for removing and emptying
5. full sensor capacitive sensor to detect if waste carboy is full

9.2 Dimensions

Waste carboy dimensions are provided to support shipping, storage, and placement planning.

- Capacity Options:
 - 2.5-gallon
 - 5-gallon
- Hose Length: 6 ft (1.8 m) flexible PTFE tubing

Dimensional reference figures are provided for each carboy size.

2.5-gallon

8" (204mm) W x 9" (229mm) D x 16" (407mm) H
 Empty Weight 1.5 lb (0.7 kg)

5-gallon

10" (254mm) W x 12" (305mm) D x 20" (508mm) H
 Empty Weight 2.5 lb (1.2 kg)

9.3 Features

- Collects aqueous and solvent-based process waste
- Capacitive waste bottle full sensor
- Prevents new processes from starting when full
- Allows active processes to complete
- Quick-disconnect coupler for easy removal and emptying
- Compatible with Apogee® 200 Series and Apogee® 450 Series equipment
- Available in multiple capacities

9.4 Reliability

Waste carboys are manufactured from chemically resistant HDPE and are designed for repeated use. The assembly contains no moving mechanical parts. Long-term reliability depends primarily on:

- Chemical compatibility
- Proper routing of drain tubing
- Periodic inspection of the sensor and connections

Waste carboys are not considered consumables; however, additional carboys may be used to allow continuous operation while a full carboy is being emptied.

9.5 Specifications

- Material: HDPE carboy
- Capacities: 2.5-gallon or 5-gallon
- Drain Connection (Equipment): $\frac{3}{4}$ in hose barb
- Drain Hose: 6 ft Flexible PTFE tubing
- Sensor Type: Capacitive level sensor
- Sensor Power: 24 VDC supplied by equipment

9.6 Clearance Requirements

No fixed clearance requirements are introduced by the waste carboy. When placing the waste bottle:

- Ensure the drain hose maintains a continuous downward slope
- Avoid kinks, loops, or low points that could create traps
- Place the carboy below the equipment drain

Secondary containment is recommended per facility safety practices.

9.7 Facilities Requirements

No external utilities are required.

- Sensor power and signaling are supplied by the equipment
- Waste flows via gravity from the equipment drain

9.8 Environment

The waste carboy assembly is intended for use in cleanroom and laboratory environments consistent with Apogee® equipment operating conditions.

9.9 Unpackaging & Inspection

The Cee® Waste Carboy is available in two configurations: Full Kit and Spare Only. Both configurations are offered in 2.5-gallon and 5-gallon capacities.

Full Kit — Includes:

- (1) HDPE Waste Carboy (2.5-gallon or 5-gallon)
- (1) Capacitive level sensor (pre-mounted)
- (1) Carboy cap
- (1) Quick-disconnect waste coupler
- (1) 6 ft flexible PTFE drain hose
- (2) Hose clamps
- (1) Installation/Operations Manual

Spare Only — Includes:

- (1) HDPE Waste Carboy (2.5-gallon or 5-gallon)
- (1) Capacitive level sensor (pre-mounted)
- (1) Carboy cap

The Spare Only configuration is intended for customers requiring an additional or replacement waste container. Equipment connection tubing is not included.

Upon unpackaging:

- 1) Inspect all components for shipping damage.
- 2) Verify the sensor is securely attached to the carboy.
- 3) Do not install damaged components.

9.10 Installation & Setup

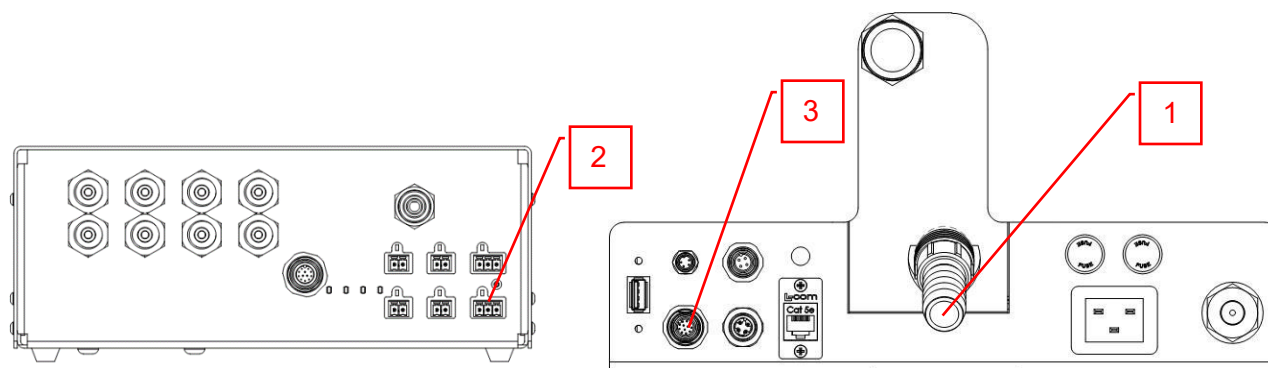


Figure 16 Control Box and Spin Coater Utilities

Drain Hose Connection

- 1) Power off equipment prior to waste bottle installation.
- 2) Locate the equipment drain port on the rear utilities panel (1 in Figure 16).
- 3) Slide a hose clamp onto the drain hose.
- 4) Push the hose fully onto the $\frac{3}{4}$ in hose barb on the equipment drain port.
- 5) Position the clamp over the barb and tighten securely.
- 6) Connect the opposite end of the hose to the hose barb on the waste carboy and secure with the second clamp.

Sensor Connection

Sensor connection depends on equipment configuration:

- **With automated dispenses:**
 - Connect the waste bottle sensor to the dispense control box (2 in Figure 16).
- **Without automated dispenses:**
 - Connect the sensor to the M12 connector on the rear utilities panel (3 in Figure 16).

The correct connector configuration is supplied at the time of purchase. The connector is keyed and will only mate in the correct orientation.

Placement

- Place the waste carboy below the equipment drain
- Ensure the drain hose slopes continuously downward
- Avoid sharp bends or kinks

9.11 Start Up

After installation:

- 1) Power on the equipment following standard operating procedures.
- 2) Navigate to the DataStream™ parameters page.
- 3) Verify the Waste Bottle Full parameter reads False (empty).
- 4) Inspect all hose connections for leaks.

A small volume of compatible liquid (e.g., DI water or IPA) may be introduced to verify leak-free operation.

9.12 System Checks

To verify sensor operation:

- 1) Confirm the Waste Bottle Full parameter reads False when empty.
- 2) Add liquid to the carboy until it covers the sensor area (or carefully tilt the carboy).
- 3) Verify the Waste Bottle Full parameter changes to True.

If the parameter does not change state, refer to the Sensor Setup in the Maintenance section.

Please note that the following System checks are intended to be conducted in addition to, and only after, those outlined in your Apogee® Operations Manual.

On the **Process** screen, perform the following System checks for initial validation of the Cee® waste bottle.

Add a small amount (roughly 100 mL) of liquid (DI water or IPA works well) to the waste bottle. Set back down on a flat surface.

Confirm the Waste Bottle Full parameter reads **False** when empty.

Carefully tilt the carboy so that the liquid covers the full sensor.

Verify the Waste Bottle Full parameter changes to True (the reading can take up to 1 second)

Once operations have been validated, the waste bottle is ready for use. Begin by creating a recipe. See the [DataStream™ Manual](#) for more information.

If a fault occurs, identify and correct its cause before restarting the equipment. Follow the applicable fault-recovery procedure.

9.13 DataStream Technology

9.13.1 System Parameters

Parameter	Actual	Set Point	Status
Spin Speed	0 rpm	0 rpm	In Range
Spin Acceleration	500 rpm/s	500 rpm/s	In Range
Active Dispenses	None	None	In Range
Dispense Source Empty	None		In Range
Chuck Vac	98.8 kPa	101.3 kPa	In Range
Waste Bottle Full	False		In Range
Ambient Temperature	27.9 °C		In Range
Humidity	44.4 %		In Range
Vibration	3		In Range

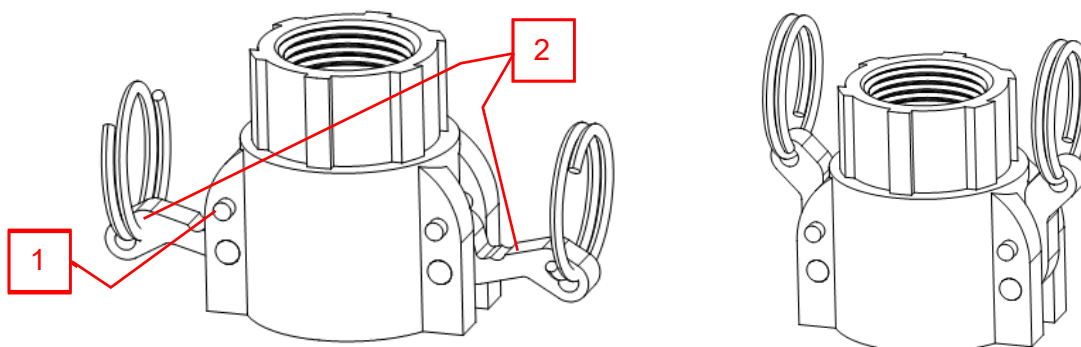
Waste Bottle Full ----- indicates whether the sensors detect a full waste bottle

9.14 Maintenance

Routine maintenance is minimal and primarily involves inspection and emptying.

9.14.1 Emptying Waste

1. Ensure the waste hose is free of material. If material is in the hose, lift and let drain into the carboy.
2. Release the hose from the carboy by pressing the buttons on both sides and flipping the arms down of the waste carboy coupler.

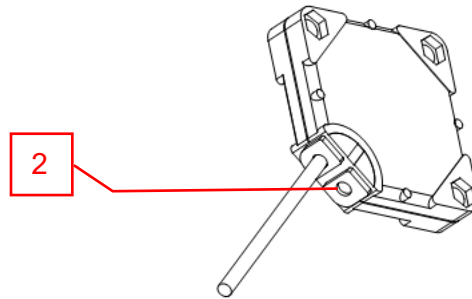


3. Lift up to remove the fitting from the waste carboy. Please note that the waste hose is open without the carboy.
4. Disconnect the sensor using the connector in line.
5. Transport to waste disposal area. When ready, remove the cap and pour waste out. Observe all waste management procedures of the facility.
6. Connect the sensor back to the connector (only one way to fit). Place the waste carboy coupler back onto the carboy. Press down and pull arms up and lock into place (can be done one at a time). Ensure that the hose is secured onto the carboy.

9.14.2 Sensor Setup

If the sensor is not reading full or you are getting a waste carboy full error when it is empty the sensor needs to be adjusted. Please read below for adjustment.

1. Locate the hole on the sensor next to the wire (shown below as 1). There is an adjustment screw inside.



2. Ensure that the waste carboy is connected and the equipment is on.
3. If there is a light on the sensor, rotate the screw clockwise until the light turns off. Go back slowly until the light comes back on and turn an additional $\frac{1}{4}$ of a turn counterclockwise.
4. If there is no light on the sensor, rotate the screw counterclockwise until the light turns on. Rotate clockwise until the light goes out. Go back slowly until the light comes back on and turn an additional $\frac{1}{4}$ of a turn counterclockwise.

9.15 Service and Repairs

The waste carboy assembly contains no serviceable internal components. If the sensor or carboy becomes damaged or unreliable, replacement of the complete assembly is recommended.

9.16 Fault Condition

In the event of an improper reading, verify sensor adjustment.

If a waste bottle full condition is reported unexpectedly:

- Verify the waste bottle level
- Power cycle the equipment
- Verify sensor connection and adjustment

If the issue persists, contact [Cee® Customer Support](#).

9.17 Safety Checks

Before use, inspect for:

- Secure hose connections
- No visible leaks
- Proper downward hose routing
- Secure sensor connection

Secondary containment is recommended.

9.18 Mechanical/Utilities Checklist

<u>Evaluate</u>	<u>Frequency</u>	<u>Detail</u>
Hose Connections	Before Use	Inspect for leaks
Hose Routing	Before Use	Verify continuous downward slope

9.19 Cleaning

Waste carboys may be cleaned using solvents that are compatible with both the waste material and HDPE. **Do not use caustic acids or bases.** Contact [Cee® Customer Support](#) with any questions or concerns.

If residue buildup or staining affects sensor performance:

- Add a compatible solvent to the carboy
- Agitate gently to clean interior surfaces
- Empty and dispose of solvent per facility procedures

Allow the carboy to dry before returning it to service.

10 Waste Diverter

10.1 Description

The Waste Diverter is used to divert the equipment waste stream between two separate discharge paths, allowing segregation of waste streams based on chemistry, process step, or disposal requirements.

This accessory is most commonly used when processing incompatible materials or when different waste streams require separate disposal methods, such as:

- Aqueous vs. solvent-based waste
- Different solvent families
- Materials with distinct EHS handling requirements

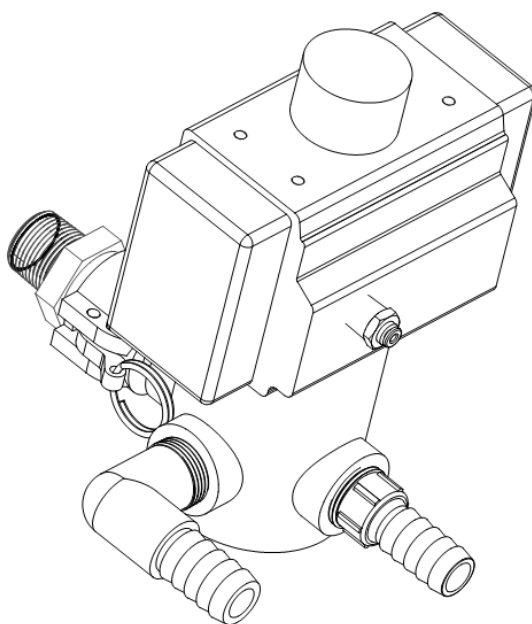


Figure 17 Waste Diverter

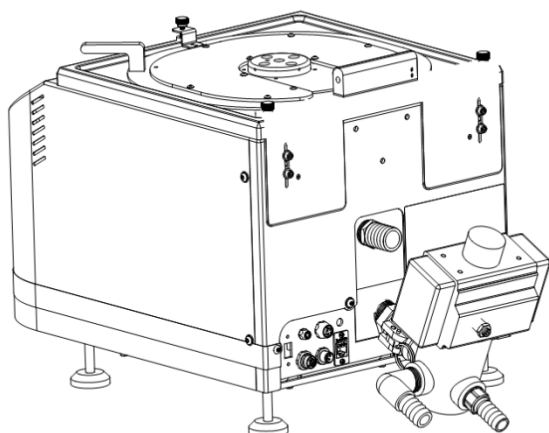
The Waste Diverter is compatible with both Apogee® 200 Series and Apogee® 450 Series equipment. Drain ports, hose sizes, and interfaces are identical across both platforms.

The Waste Diverter is recipe-controlled and is treated as a dispense within DataStream™ software. When the associated dispense is enabled within a recipe, the Waste Diverter actuates and routes waste to the secondary output. When the dispense is disabled, the Waste Diverter remains in its default (normally open) position, routing waste to the primary output.

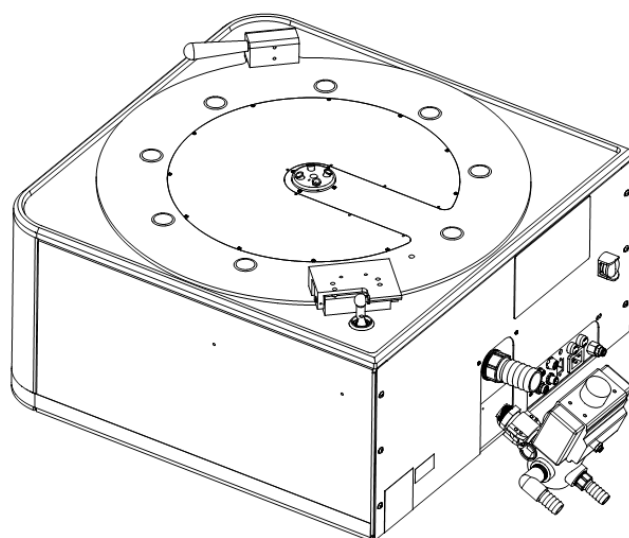
If no Waste Diverter command is included in a recipe, all waste is routed to the primary output by default.

10.2 Dimensions

The Waste Diverter mounts directly to the rear drain connection of the equipment and adds 8.5 inches of depth to the overall system footprint.



Apogee® 200 Waste Diverter



Apogee® 450 Waste Diverter

Figure 18 Waste Diverter mounted on Equipment

Dimensions are provided via reference figures for layout and clearance planning.

- Add 8.5 inches to equipment's standard depth

10.3 Features

- Supports separation of waste streams when used with an approved routing and changeover procedure.
- Diverts waste between two selectable outputs
- Recipe-controlled operation via dispense logic
- Normally open default state ensures continuous drainage
- Pneumatically actuated with spring return
- Polypropylene wetted body for chemical compatibility

10.4 Reliability

The Waste Diverter uses a polypropylene wetted body and a pneumatic actuator. Its use remains subject to the equipment's approved chemical and operating restrictions.

10.5 Specifications

- Wetted Material: Polypropylene
- Actuation: Pneumatic, spring return
- Default State: Normally open (primary output)
- Actuation Pressure: ≥ 70 psi
- Pneumatic Tubing: 1/8 in poly tubing
- Drain Connections: 3/4 in hose barbs

10.6 Clearance Requirements

The Waste Diverter does not introduce clearance requirements beyond the additional depth added at the rear of the equipment.

Ensure adequate space is available to accommodate the Waste Diverter body and connected hoses without kinking or interference.

10.7 Facilities Requirements

The Waste Diverter does not require a direct facility utility connection.

Pneumatic actuation is supplied via the **four-position control box**, which requires nitrogen or CDA per its specifications. Refer to the Dispense Manual for facility requirements related to pneumatic control.

10.8 Environment

The Waste Diverter assembly is intended for use in cleanroom and laboratory environments consistent with Apogee® equipment operating conditions.

10.9 Unpackaging & Inspection

The Waste Diverter ships as a complete assembly, including:

- Waste Diverter body
- Integrated hose barbs
- Quick-connect coupling for equipment drain interface

Upon unpackaging:

1. Inspect for shipping damage.
2. Verify fittings, couplings, and actuator are intact.
3. Do not install damaged components.

10.10 Installation & Setup

- 1) Power off the equipment before installing the Waste Diverter.
- 2) Locate the equipment drain port on the rear utilities panel.
- 3) If the Waste Diverter was purchased with the equipment, the required drain coupling will already be installed.
**If purchased after delivery of the spin coater, the coupling is supplied with the Waste Diverter.*
- 4) Open the quick-connect coupling by pressing the side buttons and lifting the cam arms.

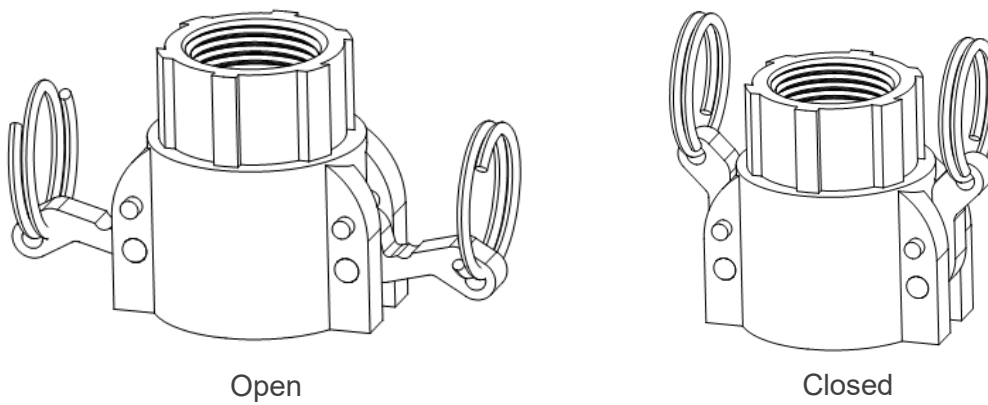
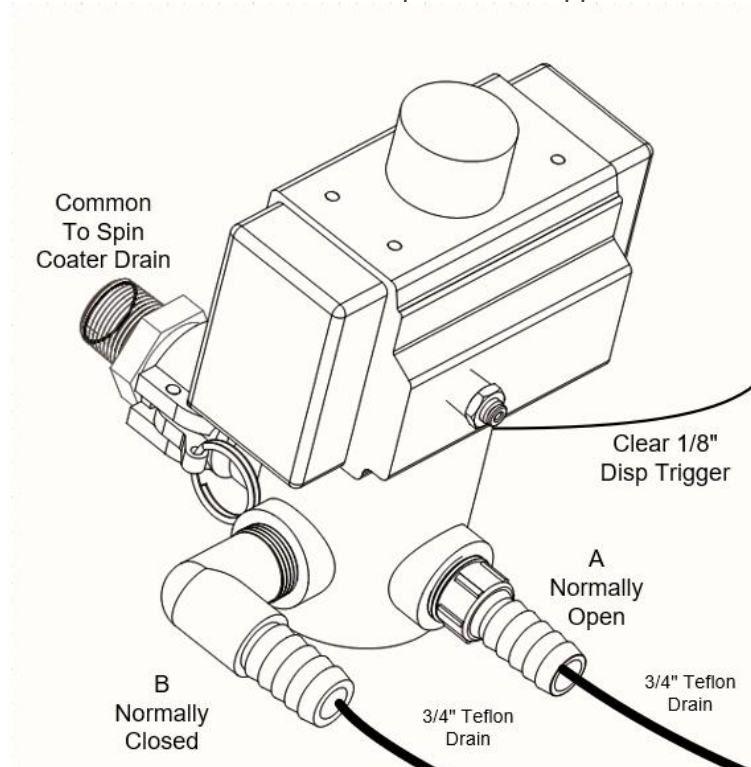


Figure 19 Quick Connect Coupling

- 5) Mate the Waste Diverter to the equipment drain coupling.
- 6) Press the cam arms down to lock the coupling securely in place.
- 7) Connect the pneumatic control line from the four-position control box to the Waste Diverter using the supplied 1/8 in tubing.
- 8) Connect drain hoses to both Waste Diverter outlets:
 - Primary outlet → default waste bottle or waste stream
 - Secondary outlet → alternate waste bottle or house waste

Note: House waste connections require user-supplied 3/4 in hose.



10.11 Start Up

After installation:

- 1) Power on the equipment following standard operating procedures.

- 2) Enable the assigned Waste Diverter dispense in DataStream™. Refer to the spin coater's Operations Manual for instructions.
- 3) Observe the actuator located on the top of the Waste Diverter:
 - When enabled, the actuator rotates approximately 90°
 - When disabled, it returns to the default position

Introduce a small volume of liquid (~100 mL) to verify:

- Leak-free operation
- Correct routing to each waste path in both states

10.12 System Checks

- Verify full actuation when commanded
- Confirm correct waste routing for both outputs
- Ensure pneumatic supply pressure meets minimum requirements

If partial actuation is observed, verify nitrogen or CDA pressure.

If no actuation is observed, verify dispense assignment and control box communication.

10.13 Maintenance

The Waste Diverter is maintenance-free under normal operation.

- Periodically inspect hose connections for leaks
- Verify pneumatic tubing remains secure and undamaged

No routine preventive maintenance is required.

10.14 Service and Repairs

The Waste Diverter contains no user-serviceable internal components.

If malfunction occurs, contact Cee® Customer Support for troubleshooting or replacement guidance.

10.15 Fault Condition

If the Waste Diverter does not actuate:

- Verify pneumatic supply pressure is ≥ 70 psi
- Confirm dispense assignment and control box communication
- Power cycle the equipment

If the issue persists, contact [Cee® Customer Support](#).

10.16 Safety Checks

Before use, inspect for:

- Secure coupling at the equipment drain
- Leak-free hose connections
- Proper pneumatic tubing routing
- Continuous waste discharge path is available

10.17 Mechanical/Utilities Checklist

<u>Evaluate</u>	<u>Frequency</u>	<u>Detail</u>
Drain Coupling	Before Use	Verify cam arms are fully engaged
Pneumatic Line	Before Use	Confirm secure connection and pressure
Hose Routing	Before Use	Verify correct waste stream selection

10.18 Cleaning

The Waste Diverter may be cleaned using solvents that are compatible with both the waste material and Polypropylene. **Do not use caustic acids or bases.** Contact [Cee® Customer Support](#) with any questions or concerns.

11 Table of Revisions

Doc Rev #	Author	Description of Change(s)	Reviewed/Approved By	Date
		-		
		-		