

Comprehensive Safety Compliance and Label Design Package for the SC Series

Here is a comprehensive, fully localized safety compliance and label design package for the export of **the SC Series Semi-Automated Recovery System of Nano Contaminants** to the United States.

This document aligns the technical and hazard realities of the SC series (AC100-240V, high-pressure N₂, CDA, sampling arm, turntable, and HF/Nitric acid chemicals) with American **ANSI Z535.4** (Product Safety Signs and Labels), **OSHA 1910**, and **SEMI S2** standards.

1. ANSI Z535 Safety Label Design & Posting Recommendations

Under **ANSI Z535.4**, signal words must strictly match the hazard severity:



- **DANGER (Red):** Indicates an imminently hazardous situation which, if not avoided, **will** result in death or serious injury.



- **WARNING (Orange):** Indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.



- **CAUTION (Yellow):** Indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate injury, or equipment damage.

Label 1: Chemical Contact Hazard

- **Signal Word: DANGER** (White text on a solid red background with safety alert triangle)
- **ISO Symbol:** Chemical burn hazard (Corrosive pouring onto hands/surface) and Toxic substance hazard (Skull & Crossbones).
- **Message Panel (English):**

HYDROFLUORIC / NITRIC ACID HAZARD.

CONTACT WILL CAUSE SEVERE CHEMICAL BURNS, SYSTEMIC TOXICITY, OR DEATH.

- Do not operate without full chemical protective gear (PPE).
- In case of skin contact with HF, flush with copious water for 5 minutes, then immediately apply **2.5% Calcium Gluconate Gel** and seek emergency medical care.
- **Posting Location:** On the front-facing enclosure near the turntable.

Label 2: Electrical Shock Hazard

- **Signal Word: DANGER** (White text on a solid red background with safety alert triangle)
- **ISO Symbol:** Electric Shock hazard.
- **Message Panel (English):**

HAZARDOUS VOLTAGE INSIDE.

CAN CAUSE SEVERE SHOCK, BURN, OR DEATH.

- Disconnect all main power supplies and follow Lockout/Tagout (LOTO) protocols before removing this protective cover or servicing internal components.
- Verify input voltage matches equipment rating (AC 100-240V). Never operate with wet hands.
- **Posting Location:** Directly over the back panel housing the **Power Supply Unit (PSU)**, near the AC power inlet cord, and on the main electrical enclosure doors.

Label 3: High-Pressure Gas Hazard (N₂ & CDA)

- **Signal Word: WARNING** (Black text on a solid orange background with safety alert triangle)
- **ISO Symbol:** Pressurized tube bursting hazard.
- **Message Panel (English):**

HIGH-PRESSURE GAS HAZARD (N₂ / CDA).

SUDDEN COMPONENT RUPTURE CAN CAUSE SEVERE INJURY OR EYE DAMAGE.

- Maximum supply pressure must not exceed specified facility ratings.
- Depressurize the entire gas manifold and lines prior to maintaining or disconnecting pneumatic joints.
- **Posting Location:** On the back end next to the **N₂ and CDA pressurized utility supply inlets/regulators**.

Label 4: Sampling Arm & Turntable Pinch Hazard

- **Signal Word: WARNING** (Black text on a solid orange background with safety alert triangle)
- **ISO Symbol:** Hand crush/entanglement hazard (Gears/moving bars catching fingers).
- **Message Panel (English):**

PINCH POINT / MOVING PARTS.

CAN CRUSH, CUT, OR ENTANGLE HANDS AND FINGERS.

- Keep hands, hair, and loose clothing clear of the sampling arm and turntable during automated operation.
- **Posting Location:** Visible on the protective enclosure shield near the **Turntable**, and adjacent to the **Sampling Arm** travel path.

2. Product Manual Safety Instructions

Add the following sections to ensure strict US EHS (Environmental Health & Safety) compliance:

2.1 Chemical Handling & System Material Compatibility

- The system body and fluidic pathways are constructed from high-grade PVC, PTFE, and PFA to withstand specific concentrations of **Hydrofluoric Acid (HF)** and **Nitric Acid (HNO_3 < 5%)**.
- **CRITICAL:** Introducing non-compatible organic solvents or oxidizing acids outside specified recipes may degrade the structural integrity of the PVC enclosure, leading to catastrophic chemical leaks.

2.2 Facility Exhaust & Placement Requirement (SEMI S2 Compliance)

- The SC series **MUST** be permanently installed inside an active, certified **Clean**

Draft / Fume Hood equipped with an exhaust interlock system.

- The air pressure regulation exhaust pipe located at the rear of the unit must terminate safely within the exhaust path above the chemical handling zone to prevent toxic vapor accumulation.

2.3 Electrical Infrastructure & Safety Interlocks

- The SC series accommodates a universal input range of **AC 100-240V (50/60Hz)**.
- **Facility Breaker Mandate:** The facility upstream power grid must be fitted with a dedicated circuit breaker (minimum 5A rating) supporting **Lockout/Tagout (LOTO)** hardware to isolate energy during servicing.
- The **Emergency Off (EMO)** button on the front panel cuts power to all kinetic actuators (Sampling Arm, Turntable, Syringe Pump). Ensure the EMO switch remains unobstructed at all times.

2.4 Personal Protective Equipment (PPE) Requirements

According to **OSHA 1910.132**, operators prepping chemical solutions (sampling liquid, wash liquid) or maintaining the fluidics cabinet **MUST** wear the following high-tier PPE:

- **Respiratory Protection:** Half-mask or full-face respirator with NIOSH-approved acid gas cartridges if chemical odors or vapors are detected.
- **Eye & Face Protection:** ANSI Z87.1 certified chemical splash goggles underneath an integrated clear chemical face shield.
- **Hand Protection:** Double-gloving is mandatory. Inner glove: Heavy-duty nitrile. Outer glove: **Heavy-duty Butyl or Viton chemical-resistant sleeves/gloves** (tested for >480 minutes breakthrough time against HF/Nitric acid).
- **Body Protection:** Chemical-resistant apron/vest and full-length protective sleeves over standard cleanroom garments.

3. Correct Operating Instructions (Safety-Critical Snippets)

3.1 Startup & Verification Sequence

1. Verify the facility N_2 and CDA gas regulators are stable and set within the required operational pressure window.
2. Release the **Emergency Off (EMO)** button. Turn on the main power switch.
3. Confirm the LED power indicator shifts status to active green. Launch the PC

control software and execute the "Initialize" command to home all moving coordinate axes.

3.2 Wafer Centering & Lifter Operation

1. When deploying the **Centering Jig**, insert the centering pins strictly into the designated slots correlating to your target wafer dimension (e.g., Slot '12' for 300mm wafers).
2. **SAFETY LOCKOUT:** Use the centering jig lever to carefully lift the wafer. Once alignment is completed, **the operator must fully depress the lifter handle (Push Down) to lower the wafer flatly onto the turntable before starting any automated sequence.**

3.3 Automated Sampling Execution

1. Verify that the correct recipe matching the current wafer size and profile (Standard/Bevel) is selected.
2. Ensure the correct **Holder** is secured on the holder stand.
3. Load the designated pipette tip. Check for cracks or loose fits.
4. Dispense the recovery/wash chemistry into the designated vial/bottle. Clear the enclosure of all manual tools, close the hood sash, and press the flashing **NEXT button** or click **Start** in the software interface.

4. User Installation & Chemical Safety (SDS) Verification Checklist

This checklist must be executed by the Field Service Engineer and the End-User EHS Manager prior to introducing any utility power or toxic chemicals into the system.

SC Series Site Installation & Safety Verification Sheet

No.	Category	Verification & Inspection Requirements	Status (P / F)
1	Exhaust & Enclosure	The system is fully enclosed inside a functional fume hood/clean draft with active exhaust airflow monitoring.	☐ Pass ☐ Fail
2	Utility Lines	N_2 and CDA inlet pressures are regulated, verified leaks-free, and locked within the equipment's specified upper limits.	☐ Pass ☐ Fail
3	Earthquake Bracing	The device chassis is secured to the work surface to prevent tipping.	☐ Pass ☐ Fail
4	LOTO & Breaker	Upstream electrical utility possesses a dedicated 5A circuit breaker supporting physical Lockout/Tagout padlock hardware.	☐ Pass ☐ Fail
5	Emergency Off (EMO)	Actuating the EMO button instantly severs power to the sampling arm, syringe, and turntable.	☐ Pass ☐ Fail
6	SDS Availability	Current English Safety Data Sheets (SDS) for Hydrofluoric Acid and Nitric Acid are printed and stored prominently at the workstation.	☐ Pass ☐ Fail
7	EHS Medical Prep	Unexpired 2.5% Calcium Gluconate Gel (at least two tubes) and a certified ANSI Z358.1 emergency eyewash station are located within a 10-second walking distance from the tool.	☐ Pass ☐ Fail
8	PPE Availability	Heavy-duty Butyl/Viton outer gloves, face shields, and chemical aprons matching the SDS requirements are verified present on site.	☐ Pass ☐ Fail

"By signing below, both parties acknowledge that the SC serious have been installed according to the specified EHS parameters. All relevant chemical SDS hazards are understood, proper ANSI Z535 warnings are posted, and mandated PPE is available to operators."

- **Customer Facility Name:** _____
- **End-User EHS Representative Name:** _____
- **Signature:** _____ **Date:** _____
- **Field Service / Installation Engineer Name:** _____
- **Signature:** _____ **Date:** _____