

Parylene Coating System Acceptance Protocol Criteria

This acceptance procedure is applied to verify the installation, functionality, and performance of the Parylene coating system delivered in accordance with the technical specification.

1. Documentation and Records Check

The supplier shall deliver the following documents in full:

- 1.1. Operation Manual
- 1.2. Maintenance Manual
- 1.3. Electrical schematics and infrastructure requirements
- 1.4. Software interface and control system manual
- 1.5. Calibration certificates (if applicable)
- 1.6. CE Declaration of Conformity and relevant directive certificates
- 1.7. Complete list of delivered accessories and consumables
- 1.8. Warranty certificate

2. Physical Installation and Mechanical Inspection

- 2.1. The system shall be connected properly to the Turkish electrical infrastructure (220-240 V or 380-400 V / 50 Hz).
- 2.2. The vacuum chamber, chamber lid, sample carrier, vaporizer, pyrolysis zone, cold trap, and heated lines shall be visually and functionally inspected.
- 2.3. The chamber and lid surfaces shall be free of scratches, deformation, or sealing issues.
- 2.4. The internal rotary sample holder shall operate smoothly without vibration.
- 2.5. The soft-venting mechanism shall be tested (controlled and slow venting).
- 2.6. All cables, fittings, and pipelines shall be properly installed.

3. Vacuum System Tests

- 3.1. Vacuum pump operation and noise level shall be evaluated.
- 3.2. The system shall reach **1×10^{-3} mbar or better** in an empty chamber.
- 3.3. Pump-down time shall be recorded (typically 5-15 minutes).
- 3.4. Pressure sensors (Pirani / capacitive manometer) shall display accurate readings.
- 3.5. No backstreaming or reverse contamination shall occur when vacuum is released.

4. Cold Trap Tests

- 4.1. The cold trap shall be activated and reach its target temperature.
- 4.2. Chiller or electro-mechanical cooling components shall operate stably.
- 4.3. Temperature stability of the cold surface shall be verified.
- 4.4. Operation without liquid nitrogen shall be confirmed (as required by the specification).

4.5. The cold trap shall successfully prevent monomer transfer into the chamber (verified by an empty or low-mass test run).

5. Vaporizer and Pyrolysis Zone Tests

- 5.1. The dimer feed unit shall be inspected.
- 5.2. The pyrolysis unit shall be heated to its target range (650-750 °C).
- 5.3. Temperature stability within $\pm 1-2$ °C shall be confirmed.
- 5.4. The digital temperature control interface shall function correctly.
- 5.5. All heated lines and sensors shall operate without fault.

6. Software and Control System Verification

- 6.1. Access to the PC-based control software shall be confirmed.
- 6.2. Touchscreen interface functions shall be tested.
- 6.3. A new coating recipe shall be created, saved, and edited.
- 6.4. The system shall correctly control the following parameters:
 - i. Pyrolysis temperature
 - ii. Vaporizer (sublimation) temperature
 - iii. Cold trap status
 - iv. Vacuum levels
 - v. Chamber temperature
- 6.5. Parameter–time graphs shall be generated.
- 6.6. Data logging and export functions (Excel/CSV) shall be tested.
- 6.7. Alarm, error log, and maintenance reminder functions shall be verified.
- 6.8. Interlock functions for door, pressure, and temperature shall be tested.
- 6.9. Remote access (minimum: monitoring) shall be confirmed.

7. Safety Tests

- 7.1. Emergency stop button shall be tested.
- 7.2. Door-lock interlock shall be verified (system must not operate with door open).
- 7.3. Over-temperature and over-pressure protections shall trigger correctly.
- 7.4. CE certificates shall be checked and validated physically.

8. Coating Performance Test

(Performed to verify functional capability; not a process optimization requirement.)

- 8.1. The system shall perform a short coating run using Parylene C or Parylene N.
- 8.2. During deposition, the following shall be monitored:
 - i. Vacuum stability
 - ii. Pyrolysis temperature stability
 - iii. Cold trap performance
 - iv. Dimer vaporization stability
 - v. Real-time parameter monitoring via software
- 8.3. Coating thickness shall be measured on the test substrate (profilometer or optical method):

- i. Typical verification range: 1-5 μm
- ii. Coating uniformity shall be checked visually and by measurement.

8.4. No particles, delamination, discoloration, or burn marks shall be present.

9. Training Verification

The supplier-provided training shall cover the following topics:

- 9.1. System startup and shutdown
- 9.2. Dimer loading procedure
- 9.3. Recipe creation and modification
- 9.4. Pyrolysis and vaporizer settings
- 9.5. Cold trap maintenance
- 9.6. Daily vacuum system maintenance
- 9.7. Consumable replacement
- 9.8. Troubleshooting and safety procedures

10. Acceptance Criteria

The system shall be considered accepted when the following conditions are met:

- 10.1. Compliance with the technical specification is confirmed.
- 10.2. The vacuum system reaches the required base pressure.
- 10.3. The pyrolysis unit operates stably within the required temperature range.
- 10.4. Cold trap functions correctly.
- 10.5. Software and control system manage all parameters correctly.
- 10.6. All safety interlocks operate properly.
- 10.7. Coating performance test yields satisfactory results.
- 10.8. Operator training is successfully completed.
- 10.9. All documents and accessories are delivered in full.

11. Rejection Criteria

Acceptance shall not be granted if:

- i. The system does not meet the technical specification
- ii. The vacuum system cannot reach the required pressure
- iii. Pyrolysis temperature stability is inadequate
- iv. Cold trap performance is insufficient
- v. Safety tests fail
- vi. Software cannot operate critical functions
- vii. Coating test reveals major defects, non-uniformity, or anomalies
- viii. Documents or accessories are missing

(After corrections by the supplier, tests shall be repeated.)