

Whitepaper FDM

TEST AUTOMATION: SETUP AND PROGRAMMING FOR CLIMATE CHAMBERS

Executive Summary

Automation is revolutionizing environmental testing, enabling consistent, reproducible, and efficient test cycles. From cycle programming to real-time data integration, automated climate chambers reduce human error, boost throughput, and provide precise control. This whitepaper explores best practices for setting up and programming test automation systems in climate chambers.

Core Elements of Test Automation

Automating climate chambers involves integrating software, sensors, and programmable logic to streamline testing. Key setup components include:

- **Programmable test cycles:** Time-based or condition-based (e.g., 72h at 60°C/90% RH)
- **Multi-stage programming:** Enable complex profiles with ramps, dwells, loops
- **Remote access:** Start/stop/modify tests via network interface
- **Sensor feedback:** Closed-loop control using real-time temperature, humidity, or voltage data

Advanced systems like FDM automation integrate with lab management software and can run up to 1000 predefined scenarios.

Programming Chambers: Best Practices

- **Use parameter libraries** to simplify recurring cycles
- **Avoid ramp spikes:** define smooth gradients between temperature stages
- **Include fail-safe conditions:** define shutdown rules for critical deviations
- **Integrate start/stop logs and automatic reporting**
- **Test simulations before launch** to validate logic

Programmable interfaces on FDM chambers allow intuitive cycle design and script-based automation for expert users.

Data Analysis Integration

Effective automation requires robust data handling:

- **Live monitoring:** dashboards for temperature/RH graphs in real-time
- **Auto-logging:** every test generates structured output (CSV/XML)
- **Analysis tools:** integrate with external platforms (Excel, LabView, MATLAB)
- **Anomaly detection:** alerts for deviations or system faults

Automation helps laboratories ensure auditability and comply with GLP/GMP requirements.

Case Study: High-Throughput Battery Lab

An international battery lab implemented FDM automation for cycling tests. They programmed 15-step temperature-humidity sequences with automated data capture. The automation cut manual intervention by 85% and improved repeatability, enabling certification of 10 products per week instead of 4.

Conclusion

Test automation is no longer optional in advanced labs—it's a performance necessity. FDM offers fully programmable climate chambers, expert integration support, and analytics-ready outputs to power your lab's digital transformation.

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