

Whitepaper FDM

Carbonation Testing: Complete Procedures
A Technical Whitepaper for Plant and Agricultural Research

F.lli Della Marca S.r.l.
Viale Arcangelo Ghisleri, 40/42
00176 Rome - Italy

Contacts
(+39) 06 298042

Web
www.dellamarca.it

Executive Summary

Carbonation testing is a pivotal process in evaluating the impact of CO₂ on biological and structural materials, particularly within plant science and agricultural research. By simulating elevated CO₂ environments, researchers can investigate phenomena such as **concrete carbonation**, **plant vernalization**, and **crop response under altered atmospheric conditions**. This whitepaper provides a detailed overview of the procedures, parameters, and compliance frameworks essential for effective carbonation testing using FDM's advanced **climatic chambers**. With increasing focus on CO₂ behavior in controlled ecosystems, our goal is to support research institutions in achieving scientific excellence and regulatory compliance.

Technical Parameters or Operational Setup

Effective carbonation testing demands precise environmental control. FDM chambers are engineered to regulate:

- **Temperature:** from -20°C to +60°C, with ±0.2°C stability
- **Relative Humidity (RH):** from 20% to 95%, with ±1.5% accuracy
- **CO₂ Concentration:** programmable up to 5,000 ppm
- **Light Cycles:** adjustable for day/night simulation
- **Thermal Shock & Cyclic Transitions:** customizable for stress response analysis

These parameters are managed through integrated control systems ensuring **consistent, repeatable testing conditions** tailored to scientific protocols.

Normative, Procedures or Software Programming

FDM supports full compliance with international standards such as **ISO 12504**, **ICH Q1A**, and **IEC 60068**. Chambers are validated through **IQ (Installation Qualification)**, **OQ (Operational Qualification)**, and **PQ (Performance Qualification)**. Proprietary software ensures precise protocol execution, risk mitigation, and automatic logging. FDM's systems are designed to integrate seamlessly with **LIMS** platforms for streamlined data management and traceability.

Monitoring, Data Analysis or Maintenance

Environmental parameters are continuously monitored with multi-sensor arrays and stored via secure digital logging. FDM offers the **FDM Care** program, combining predictive maintenance, calibration services, and 24/7 technical support to minimize downtime and extend equipment lifespan—critical for uninterrupted experimental cycles.

Case Study

A botanical institute required simulation of **progressive concrete carbonation** for plant–substrate interaction studies. Using an FDM climatic chamber, they implemented a protocol with **28°C temperature, 85% RH, and 3,500 ppm CO₂**, over a 14-day cycle. Results allowed for validation against **ISO 1920-12**, confirming material reactivity and plant resilience under semi-industrial conditions. The study reinforced the necessity of **precise CO₂ and humidity regulation**, achieved effortlessly via FDM's adaptive control systems.

Conclusion

FDM climatic chambers offer unparalleled advantages for carbonation testing:

- **Precision** in environmental control
- **Flexibility** for diverse research applications
- **Tailored configurations** for specific protocols
- **FDM Care** for predictive maintenance
- **“100 Test” quality check** before shipment
- Aligned with our mission: *“We offer tailored climatic solutions for R&D”*
- In pursuit of our vision: *“To be a trusted partner to the scientific community”*
- Embodying FDM's core values: **innovation, experimentation, creativity, precision, reliability, expertise**

FDM is committed to advancing carbonation testing through dependable, customizable, and research-focused climatic solutions.

CONTACT Us FOR EXPERT CONSULTATION

**SEND
EMAIL**

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