

REVOLUTION

Elevate your biorepository operation
to a new level of secure inventory management
and regulatory compliance



REVOLUTION

THE NEXT GENERATION OF HIGH-CAPACITY FREEZERS

For the past 50 years, little has changed in the design of standard liquid nitrogen storage freezers. A move towards vapor storage in the late 1980s has been the only major development in the field– until now.

IC Biomedical has created a new, innovative product line of freezers with features designed for operational compliance in regulated environments:

- cGMP for Bio Pharmaceutical production
- Clinical trials
- Regulated storage of transplant cells or tissue

By reviewing every aspect of the storage process and the systemic interaction of the freezer with production or process environments, we have created a storage system entirely fit-for-purpose within both current and anticipated future compliance frameworks.

Freezer Features

- Space-efficient with enhanced user ergonomics, racks are easier to place, find and remove
- Improved level and temperature management with completely redesigned liquid delivery
- Fail-safe level measurement
- Interior LED lighting and automatic defogging fan maximize sample visibility when working with the freezer
- Temperature management system compensates for temperature rises during operational use
- Optional motor drive for carousel facilitates individual access controls - quadrants can be limited to access with permissions linked to user
- Auto locking lid with password/biometric/card access



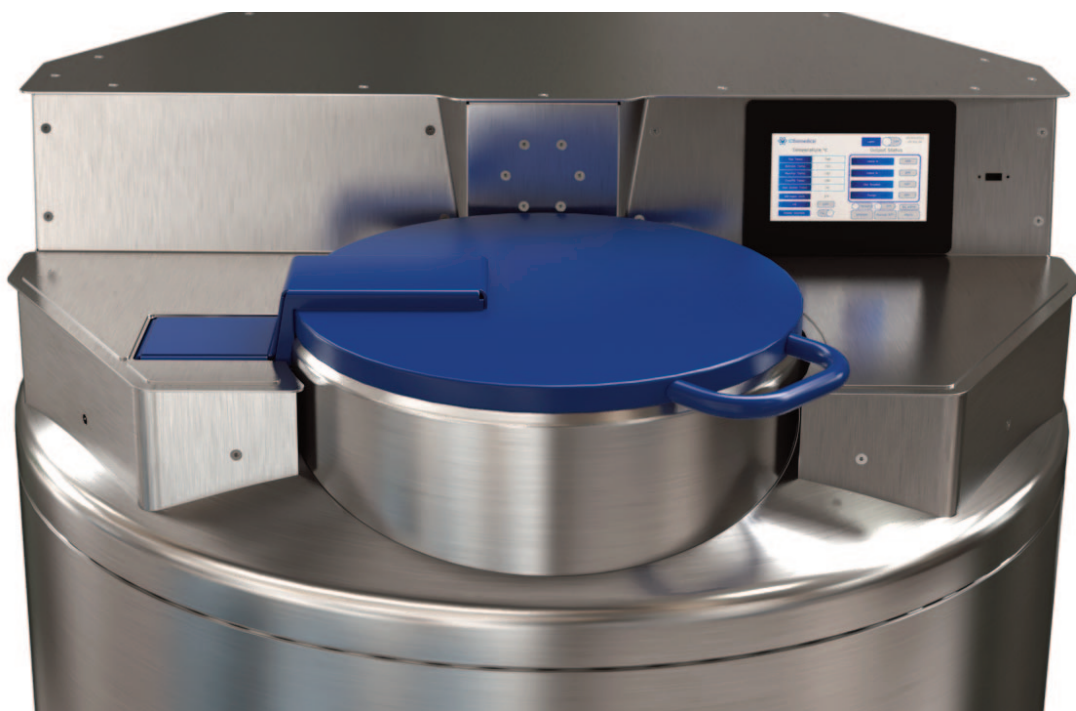
Solenoid-based lid locking mechanism requires password or biometric access



Automatic defogging fan and interior LED light maximize sample visibility



New leak-free plumbing manifold design





Control Features

Control systems are a fundamental building block of freezer functionality and the facilitation of compliance. The control unit has been designed to provide a simple, intuitive interface with an extremely robust, redundant control platform featuring state-of-the-art connectivity and simple user interaction.

- Dual, redundant level sensing guards against level control issues
- Large, touchscreen user panel
- Industrial PLC controller providing robust control platform
- Level- or temperature-based control as standard
- Web server and API supports BMS and Network connection
- User management and audit-trail functions

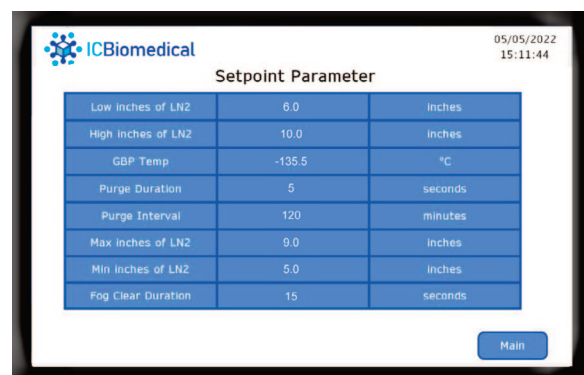
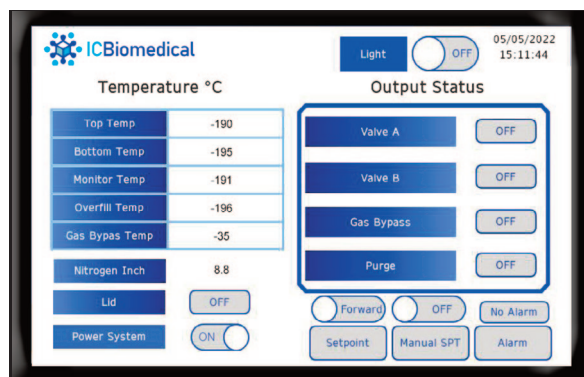
Access Control

Limiting, and more importantly, recording access to the sample space is a key requirement. The Revolution freezer offers multiple access levels and full audit trail options:

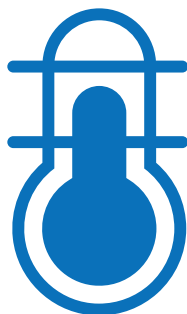
- Solenoid-based lid locking mechanism requires password or biometric access
- Optional motor control of sample tray provides ability to restrict user access to specific portions of the sample storage space
- Addition of automation options can restrict access to single racks, individual boxes or sample tubes

Sample Access and User Management

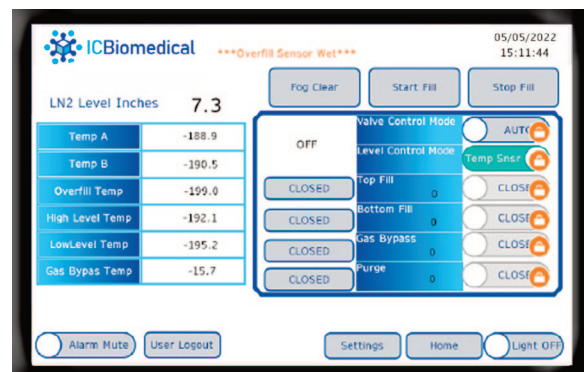
- User management allows for creation of unlimited user profiles with individual permissions
- Full audit trail records all actions undertaken by a signed-in individual, including time and date stamps
- Available inventory management software allows for onboard freezer inventory lists and sample location
- Inventory management can be networked to server application for creation of multi-freezer pick lists and sample searches



Temperature Management

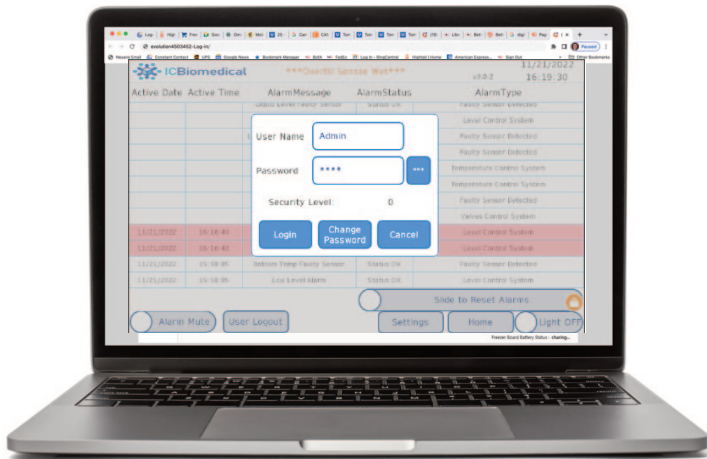


- Radiant temperature management utilizes internal directed nozzles to manage internal sample chamber temperature below set point during both static storage and sample storage and retrieval actions
- Revolution can be used as a temperature setpoint unit with no liquid nitrogen reservoir, operating at any temperature between -20° and -150°C with setpoint accuracy determined by the user



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External Data Management



- Each control unit can operate as a web server allowing for external access to all operational functions remotely, as required by the administrator
- Onboard IoT functionality connects to available cloud or intranet server for full data collection and storage with external access and monitoring
- External messaging via SMS, text or email is available
- API allows for integration with external proprietary BMS systems without hardwire requirement
- Automated alarm notification via SMS or email
- Wired Modbus interface is available

Revolution-Q

Upgrade Path to Automation

The Revolution-Q freezer option is designed for in-field automation additions. From a standard, manual freezer, the following options are available:

- Addition of motor control which can advance the tray to set points allowing for specific access control as allocated to users or to provide positive location for storage and removal of samples (*available also for standard Revolution freezers*)
- Addition of rack removal and box delivery automation robot provides specific box delivery as requested via the UI or server pick lists. This facilitates the full audit and event trail for individual samples during storage lifetime
- Addition of tube-picking automation allows for completely unattended operation, storage and removal of samples and the creation of retrieval tasks which, when complete, are replaced in the freezer awaiting collection by the user



Revolution Core Capabilities

Temperature & Level Controls	
Discrete RTD Level Control	Standard
Differential Pressure Level Control	Standard
Temperature Measurement	
- RTD	Standard
Freezer Temperature Set Point Control	Standard*
Top Vapor Assist	
- During Fill	Standard
- Active Cooling	Standard*
Cloud or Network Data Platform	Standard*
Audit Trail / User Activity	Standard
Access Management to Sample Level	Upgrade-Q
Automation	
Tray Motor Control - Jog Tray - Discrete Quadrant Selection - Discrete Quadrant Selection with Restricted Access	Optional
Automation Upgrade	
Rack Automation	Contact your rep for details
Sample Automation	
Operational Features	
Leak-Free Plumbing Manifold	Standard
In-Line Dual Solenoids	Standard
Plumbed-in DP Sensor – No Tubing	Standard
Hot Gas Bypass	Standard
Battery Back-up	Standard

* Included field upgrade

Dual redundant level measurement

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Can be delivered with a traceable temperature map which reduces compliance requirements on installation

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Individual user access profiles

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Liquid level or temperature control without requirement for modification

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Full audit trail, all temperature and level data plus user actions - lid openings, quadrant access, etc

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Full remote access - operational or service support

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Aggregated and displayed data management for freezer performance and operation

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Transactional data for individual sample events

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User data and activity recording

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Composite audit trail

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Integration into available or authored inventory management systems

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Logistics management, remote operation, connection to 3rd-party logistics operations

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Notification of adverse events, alarm states, etc.

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Online access to status with app-based UI

Rack Capacity by Model

	414-P	415-P	414-R	415-R	614-P	615-P	614-R	615-R
Number Std Racks (Boxes)	24 (336)	24 (360)	26 (364)	26 (390)	54 (756)	54 (810)	60 (840)	60 (900)
Number Mini Racks (Boxes)	16 (56)	16 (60)	16 (56)	16 (60)	30 (105)	30 (112.5)	12 (42)	12 (45)
Number Half (Vertical) Racks (Boxes)	72 (360)	72 (432)	72 (360)	72 (432)	156 (730)	156 (936)	156 (730)	156 (936)

REVOLUTION MODEL	313-P	314-P	414-P	414-R	415-P	415-R
1.2 and 2 ml Vials	18,200	19,500	39,200	42,000	42,000	45,000
Quantity of Large Racks	12	12	24	26	24	26
Quantity of Mini Racks	4	4	16	16	16	16
Number of Shelves Per Rack	14	15	14	14	15	15
1.2 and 2 ml Vials	20,000	24,000	38,000	37,000	45,600	44,400
Quantity of Vertical Racks	40	40	74	76	76	74
Total LN2 Capacity Storage (L)	51	51	102	102	102	102
Total Inner Vessel Capacity (L)	689	806	978	978	1139	1139
Inside Diameter (in/mm)	29.9/760	29.9/760	39.8/1012	39.8/1012	39.8/1012	39.8/1012
Outside Diameter (in/mm)	32/814	32/814	42/1068	42/1068	42/1068	42/1068
Overall Height (in/mm)	56.5/1437	63/1602	55.8/1419	55.8/1419	61.9/1574	61.9/1574
Useable Height (in/mm)	30.9/785	36.8/936	31/788	31/788	37.2/947	37.2/947
Weight, Empty (lb/kg)	462/209.6	512/232.2	677/307	677/307	737/334.5	737/334.5
Weight, Full Without ICS (lb/kg)	553/250.8	603/273.3	858/389.1	858/389.1	918/416.6	918/416.6
Neck Opening (in/mm)	11.8/300	11.8/300	16.7/426	16.7/426	16.7/426	16.7/426
Blood Bag Capacities	25ml	-	1836	3320	-	-
	50ml	-	1024	1736	-	-
	250ml	-	520	812	-	-
	500ml	-	380	608	-	-

REVOLUTION MODEL	614-P	614-R	615-P	615-R
1.2 and 2 ml Vials	86,100	89,250	92,250	94,500
Quantity of Large Racks	54	60	54	60
Quantity of Mini Racks	30	12	30	12
Number of Shelves Per Rack	14	14	15	15
1.2 and 2 ml Vials	84,000	-	100,800	-
Quantity of Vertical Racks	168	-	168	-
Total LN2 Capacity Storage (L)	271	271	271	271
Total Inner Vessel Capacity (L)	1667	1667	1900	1900
Inside Diameter (in/mm)	57.9/1470	57.9/1470	57.9/1470	57.9/1470
Outside Diameter (in/mm)	60/1524	60/1524	60/1524	60/1524
Overall Height (in/mm)	57.8/1469	57.8/1469	63.9/1625	63.9/1625
Useable Height (in/mm)	31.5/800	31.5/800	37.7/958	37.7/958
Weight, Empty (lb/kg)	1271/576.6	1271/576.6	1358/615.9	1358/615.9
Weight, Full Without ICS (lb/kg)	1754/795.6	1754/795.6	1841/834.9	1841/834.9
Neck Opening (in/mm)	24.5/622	24.5/622	24.5/622	24.5/622
Blood Bag Capacities	25ml	-	6704	6432
	50ml	-	3936	3920
	250ml	-	1980	2010
	500ml	-	1380	1550



All products are produced in our medical-grade, ISO 13485-certified manufacturing facility in Cartersville, Georgia USA.