

## Intelligent Protocol Development System

### Now With **FreezeBooster™** Controlled Nucleation Technology

**FreezeBooster™** is a patent applied for technique to enable controlled nucleation during the freezing step of the freeze drying cycle.

During freeze drying, the freezing step is considered the foundation to a repeatable and efficient process. A good freezing process can produce a consistent product and enable faster primary and secondary drying cycles.

Freezing without controlled nucleation results in different crystal structures and inconsistent pore sizes in the product, resulting in longer primary drying cycles.

To produce a consistent crystal structure and pore size a method of control is required that will nucleate all of the product in the freeze dryer at the same temperature at the same time and at the same rate.

**FreezeBooster™** includes a control system and simple system modifications to enable controlled nucleation. Unlike other techniques, **FreezeBooster™** does not need high positive pressures which require expensive ASME rated pressure rated vessels. **FreezeBooster™** has been demonstrated to work on systems as simple as laboratory style systems with clear acrylic doors and never produces a positive pressure.

Combining **FreezeBooster™** with Millrocks' **Auto-Dry** protocol optimization software can significantly reduce freeze drying times, resulting in a more efficient and repeatable freeze drying process.



- Reduction in Freeze Drying Cycle Times
- Improved Production Throughput
- Improved Product Consistency and Yields
- Reduced Operating Costs
- Reduced Stress on Biological Materials
- Repeatable to Enhance QbD
- Scalable from Lab to Production

### Auto-Dry Enables Success in a Single Run

Designed to automate and optimize the freeze drying cycle using Millrocks' patent pending **Auto-Dry** technique, the **Magnum™** provides all the tools you need to develop a robust protocol in as little as a single run.

**Auto-Dry** works with batch sizes from a single vial to a full load. The results are based on actual product temperatures, not batch averages, enabling the shelf temperature to compensate for the dynamic changes that occur throughout a freeze drying cycle. The result is the fastest cycle without melt-back or collapse.

Based on in-process product information, the **Auto-Dry** control system will determine the proper freezing cycle, the proper vacuum level and shelf temperatures and then dynamically control the shelf temperature throughout the entire freeze drying cycle while maintaining a safe drying environment. The End of Primary Drying will automatically be determined using one or a combination of methods.

Other protocol development systems require a large batch, use batch average data, and only work for a portion of primary drying, while the **Auto-Dry** control system is active for the entire primary drying cycle. **Auto-Dry** uses Millrocks' patent pending 'Critical Vial Method' to control the shelf temperature from the warmest vial at all times, thus providing the maximum shelf temperature while eliminating the possibility of melt-back or collapse.

- Reduce Development Times to Days
- Eliminates Guess Work
- Automatic Cycle Execution
- Conservative or Aggressive Cycles
- Results Based on Actual Measurements, Not Approximate Calculations
- Use 1 Vial to a Full Batch
- Works for 100% of the Primary Drying Cycle
- Dynamically Controls Shelf Temp
- Automatic Detection of the End of Primary Drying and Advancement to Secondary Drying
- Auto-Dry Controls can be used on any size Freeze Dryer from Laboratory to Production
- One Year Free Software Upgrades
- Remote Monitoring and Support

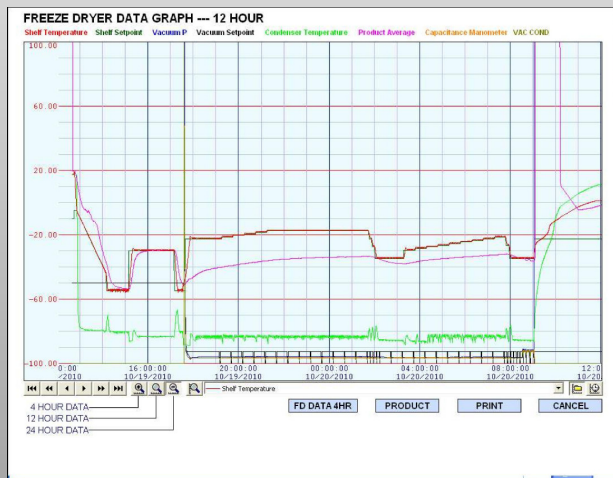
Magnum Specifications	
Shelf Area (sq ft)	10sf-20sf
Shelf Size and Finish	12" x 24", 316L, 20 Ra or better
Shelf Temperature Range	-70C to +65C
Shelf Temperature Uniformity	+/- 1 C
Shelf Cooling Rate	20C to -40C in less than 40 min
Condenser Temperature	-85C
Condenser Capacity	30L
Condensing Rate	20L in 24 hours
Vapor Port	6"
Isolation Valve	6" Pneumatic
Compressors	Copeland Scroll, 3.5 and 2 HP
Vacuum Pull-Down	< 20 min to 100 mT
Vacuum Pump	375 LPM, Corrosion Resistant
Vacuum Control	Pirani w/Solenoid & Needle Valve Proportional Control Option
Vacuum Sensors	Pirani and Capacitance Manometer
Vacuum Level	5 mT or less
Vacuum Leak Rate	< 30mT/hr
Product Sensors	16 Type-T
Trays—Removable Bottom	One per Shelf Included
Cabinet	46"W x 37"D x 80"H
Electrical	230V/60Hz or 200V/50Hz, 1PH

Model	Shelves	Spacing (in/mm)	Area (sq ft/sqM)
MG85S5	5	5.5/139	10/0.93
MG85S6	6	4.5/114	12/1.1
MG85S7	7	3.75/95	14/1.3
MG85S8	8	3.25/82	16/1.48
MG85S9	9	2.8/71	18/1.67
MG85S10	10	2.5/63	20/1.86

### Vial Capacity

Vial ml	Dia mm	Ht mm	5	6	7	8	9	10
2	16	41	3650	4380	5110	5840	6570	7300
5	22	48	1990	2388	2786	3184	3582	4030
10	24	58	1680	2016	2352	2688	3024	
20	29	71	1100	1320	1540	1760		
50	43	81	455	546	637	728		
100	52	92	330	396	462			

### Example Graph



### Available Options

- |                             |                   |
|-----------------------------|-------------------|
| Proportional Vacuum Control | CM on Condenser   |
| Shelf Latching Plates       | LN2 Trap          |
| Clean Room Configuration    | Acid Trap         |
| Extended Warranty           | IQ/OQ Workbook    |
| Validation Documents        | FAT and SAT       |
| Water Cooled                | Resistivity Probe |
| Isolator Interface          | H2O2 Compatible   |
| Stainless Steel Doors       | Sample Thief      |

### Thermocouple Holder Accessory

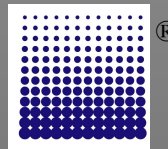


Note: Specifications subject to change without notice.  
All specifications based on 20C ambient on 60Hz

Patents Pending

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## Magnum™ Series

Rev 02032012

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