## Technical Data Sheet

**Forma Ultra-Low Temperature Upright Freezer**

**MODEL RELEASE - 65**

Thermo Fisher Scientific, Asheville, North Carolina

### Specifications

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Thermo Scientific Forma 88400A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Storage of General (non-flammable) Laboratory Materials</td>
</tr>
<tr>
<td>Storage Volume</td>
<td>548 liters / 19.4 cu. ft., 400 Standard 2&quot; Boxes</td>
</tr>
<tr>
<td>Temperature Rating</td>
<td>-50°C to -86°C</td>
</tr>
<tr>
<td>Electrical Power</td>
<td>120V, 60 Hz, 1 Phase</td>
</tr>
<tr>
<td>Instrument Rated Current</td>
<td>16.0 AMP</td>
</tr>
<tr>
<td>Building Supply Rating</td>
<td>20.0A dedicated grounded circuit. Protected by circuit breaker rated for inductive loads</td>
</tr>
<tr>
<td>Power Plug/Power Cord Length</td>
<td>NEMA 5-20P / IEC Cords, 3.048 Meters (10 Feet)</td>
</tr>
<tr>
<td>Agency Listings</td>
<td>UL, cUL</td>
</tr>
<tr>
<td>Indoor/Outdoor Usage</td>
<td>Indoor Use Only</td>
</tr>
<tr>
<td>Application Environment</td>
<td>Non-Corrosive, Non-Flammable, Non-Explosive, Good Air Ventilation, 15°C - 32°C (59°F - 90°F)</td>
</tr>
</tbody>
</table>

### Refrigeration Configuration

- **Refrigeration System**: Industrial-Rated Two Stage Cascade System
- **Compressor / Number**: Hermetic Compressor for Low Temperature Application / 2
- **Condenser Type/Number**: Enhanced Finned-Tube and Forced-Air Cooled / 1
- **Expansion Device**: Capillary Tube
- **Evaporator Type**: Cold Wall With Enhanced Heat Transfer Treatment
- **Defrost Method**: Manual Defrost
- **Refrigerant Charge/Flammability**: R404A in 1st Stage / R508B+R290 Mix in 2nd Stage / Non-Flammable

### Controller/Electrical System Configuration and Features

- **Controller Level**: 1st
- **Power Switch**: On-Off with Circuit Breaker
- **Controller Type**: Microprocessor Control with Touch Screen Input and Display. Includes USB System Data Retrieval
- **Setpoint Security**: Yes
- **Compressor Safe Guard**: High Pressure Cutout Switch/High Temp Cutout Switch/Current protection/Logic protection
- **Control Sensor**: Single RTD (1000 ohm Platinum RTD)
- **Remote Alarm Terminals**: RS485/4-20mA output
- **Adjustable Warm/Cold Alarms**: Fully Adjustable
- **Auto-Voltage Safeguard**: Buck/Boost System

### Dimensions and Construction

- **Interior Dimensions (H x D x W)**: 1300 H x 686 D x 589 W mm (51.2 H x 27 D x 23.2 W in.)
- **Exterior Dimensions (H x D x W)**: 1981 H x 960 D x 818 W mm (78 H x 37.8 D x 32.2 W in.)
- **Shipping Dimensions**: 2111 H x 1086 D x 920 W mm (83.12 H x 42.75 D x 36.23 W in)
- **Insulation**: High R-value Vacuum Insulation Panels and High Density Water-Blown Polyurethane Foam
- **Door Seal**: Silicone-Based High Performance Seal Gasket with Electrical Door Perimeter Heater
- **Shelves / Capacity**: 3 Stainless Steel Shelves Adjustable In 25mm (1in) Increments. Max. Cap. per Shelf: 73.4 kg (165 lbs.)
- **All-Direction Casters**: Standard with Locks
- **Shipping Weight**: Approximately 332 kg / 730 lbs.
- **Other Options**: LN2 or CO2 Back Up System, HID Controlled Access, SMS Text, Chart Recorder, 4 or 5 Inner Doors

### Typical Performance Characteristics in 25 °C Ambient

**Performance Data Summary (Typical Average Values)**

- Avg. Cabinet Temp. at -80°C Setpoint, High Performance (°C): -81.0
- Peak Variation From -80°C Setpoint, High Performance (°C): ±5.1 to ±5.7
- Peak Variation From -80°C Setpoint, Energy Swing (%): ±8.1 to ±4.1
- Stability, -80°C Setpoint, High Performance (°C): ±4.5
- Uniformity, -80°C Setpoint, High Performance (°C): ±5.8
- 1 Min Door Open Recovery to -75°C Avg. Cabinet Temp. (min): 24
- Cycle Rate, -80°C Setpoint, High Performance (on/off minutes): 29/33
- Duty Cycle -80°C Setpoint, High Performance (%): 57
- Energy Consumption, -80°C Setpoint, High Performance (kWh/day): 18.5
- Heat Rejection, -80°C Setpoint, High Performance (BTU/hr): 2620
- Energy Consumption, -80°C Setpoint, Energy Swing (BTU/hr): 16.7
- Heat Rejection, -80°C Setpoint, Energy Swing (BTU/hr): 2274
- Pulldown Time to -80°C Average Cabinet Temp. (hours): 7.7
- Warmup Time, From Average Cabinet Temp. of -80°C to -5°C (min): 229

1) Performance is nominal and individual units may vary.
2) Freezer performance will differ due to product amount, product size and operating conditions.
3) Continuous product enhancements may, without notice, result in amendments or omissions to this specification. Thermo Scientific cannot accept responsibility for damage, injury, loss or expenses resulting from misapplication of the information herein.

* Manufacturer measured compressor capacity taken at standard -23°C/49°C (Evap/Cond) condition.

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Typical Cabinet Temperature Map
400A ULT, 4 Inner-Shelves + Base, Single Outer Door

Temperatures are averages during > 12 hours of cycle after reaching setpoint of -80 °C

Top View of Shelves

Front View

1: -76.8 °C
3: -76.8 °C
5: -77.4 °C
10: -81 °C
11: -82.8 °C
12: -83 °C
13: -83 °C
14: -82.9 °C
15: -82.9 °C
20: -80.6 °C
21: -83.3 °C
22: -81.1 °C
23: -81.3 °C
24: -81.5 °C
25: -81.2 °C

Cabinet Average: -80.6 °C
Probe Average: -81.3 °C
Peak Variation: +6.6 °C / -5.4 °C

<table>
<thead>
<tr>
<th>MA1</th>
<th>MA2</th>
<th>MA3</th>
<th>MA4</th>
<th>MA5</th>
<th>MA10</th>
<th>MA11</th>
<th>MA12</th>
<th>MA13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg</td>
<td>-76.8</td>
<td>-76.8</td>
<td>-76.8</td>
<td>-77.6</td>
<td>-77.4</td>
<td>-81</td>
<td>-82.8</td>
<td>-83</td>
</tr>
<tr>
<td>Max</td>
<td>-73.5</td>
<td>-73.5</td>
<td>-73.9</td>
<td>-74.3</td>
<td>-74.1</td>
<td>-77.7</td>
<td>-80</td>
<td>-80.3</td>
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<tr>
<td>Min</td>
<td>-79</td>
<td>-79.1</td>
<td>-78.9</td>
<td>-78.6</td>
<td>-78.6</td>
<td>-83.2</td>
<td>-85</td>
<td>-85.2</td>
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</table>

<table>
<thead>
<tr>
<th>MA14</th>
<th>MA15</th>
<th>MA20</th>
<th>MA21</th>
<th>MA22</th>
<th>MA23</th>
<th>MA24</th>
<th>MA25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg</td>
<td>-82.9</td>
<td>-82.9</td>
<td>-80.6</td>
<td>-83.3</td>
<td>-81.1</td>
<td>-81.3</td>
<td>-81.5</td>
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<tr>
<td>Max</td>
<td>-79.9</td>
<td>-80</td>
<td>-78.6</td>
<td>-81.2</td>
<td>-79.4</td>
<td>-78.3</td>
<td>-79</td>
</tr>
<tr>
<td>Min</td>
<td>-65.1</td>
<td>-65</td>
<td>-62.6</td>
<td>-65.4</td>
<td>-63.5</td>
<td>-64.5</td>
<td>-64.7</td>
</tr>
</tbody>
</table>

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NOTE: DUAL DIMENSION IS INCH OVER METRIC

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