How to Specify a Cylindrical Vacuum Chamber

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STEP 1: Specify the Material and Finish

MATERIAL OPTIONS:
- 304L Stainless Steel (standard)
- 316L Stainless Steel
- 6061 Aluminum

FINISH OPTIONS:

Tubing Finish Options:
- Glass Bead-Blasted (standard)

Flange Finish Options*:
- Machined (standard)
- Electropolished

*Sealing surfaces and knife edges are protected during any finishing process to ensure functionality.

Figure 1:
Cylindrical Example Chamber with Port Numbers, Flange Type & Size, and 3D Cartesian Coordinate System (Isometric)
Step 2: Specify the Main Body

The **MAIN BODY** of a cylindrical chamber is typically defined as the section comprised of the largest-diameter tubing segment and its associated flange terminations. On our **Cylindrical Example Chamber (Figure 1)**, the Main Body consists of Port 1, Port 2, and the section of tubing that connects them (Figure 2).

**A) SPECIFY THE MAIN BODY OVERALL LENGTH (OAL)**

The Main Body OAL is measured from flange face-to-flange face.

**B) SPECIFY THE MAIN BODY FLANGES (Type & Size)**

Please refer to the catalog for all possible flange sizes. Representative examples are provided in **Table 2** on page 6.

**C) SPECIFY MAIN BODY TUBING***

- Nominal Diameter
- Wall Thickness

*Pipe can be used in place of tubing upon request.
**STEP 3: Specify the Side Ports**

The **SIDE PORTS** of a cylindrical chamber are those ports that branch off from the Main Body. On our **Cylindrical Example Chamber (Figure 1)**, the Side Ports are **Port 3**, **Port 4**, and **Port 5**.

A) **SPECIFY PORT FLANGES***(Type & Size)*

Please refer to the catalog for all possible flange sizes. Representative examples are provided in **Table 2** on page 6.

*Each flange size has an associated standard tube size. Unless otherwise requested, this standard tube size will be used.

B) **SPECIFY PORT LOCATION AND ORIENTATION**

The following features and dimensions define a port’s location and orientation on the cylindrical chamber (**Figures 3, 4, & 5**):

**FOCAL POINT:** A port’s Focal Point is a feature that helps define the port’s orientation and focal length.
- Locate each Focal Point in space using a 3-dimensional Cartesian coordinate system.

**AZIMUTHAL ANGLE:** A port’s Azimuthal Angle defines its angular position along the circumference of the cylindrical chamber.
- Specify each port’s Azimuthal Angle relative to a common azimuthal origin.

**POLAR ANGLE:** A port’s Polar Angle defines its angular orientation relative to the Z-Axis of the Main Body.
- Specify each port’s Polar Angle relative to a common polar origin.

**OFFSET DISTANCE:** A port’s Offset Distance defines how far its Focal Point is from the Z-Axis of the Main Body. This distance can be defined along the X-Axis or the Y-Axis of the Main Body.
- Specify each port’s Offset Distance.

**FOCAL LENGTH:** A port’s Focal Length defines the linear distance between the port’s flange face and Focal Point.
- Specify each port’s Focal Length relative to its flange face and its established Focal Point.

**ORIENTATION:** A port’s Orientation is a term that quickly describes key qualities of the port. There are four different Orientations that can describe a port:

- **Standard:** (e.g., Port 3)
  - Polar Angle equals 90-degrees
  - Focal Point lies on the Z-Axis of the Main Body

- **Angled:** (e.g., Port 4)
  - Polar Angle does not equal 90-degrees
  - Focal Point lies on the Z-Axis of the Main Body

- **Offset:** (e.g., Port 5)
  - Polar Angle equals 90-degrees
  - Focal Point does not lie on the Z-Axis of the Main Body

- **Angled-Offset:** (no example shown)
  - Polar Angle does not equal 90-degrees
  - Focal Point does not lie on the Z-Axis of the Main Body

**Table 1** on page 5 summarizes all the information needed to specify the Side Ports on our **Cylindrical Example Chamber**.
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**Figure 3:** Cylindrical Example Chamber - Features and Dimensions of a Standard Port (e.g., Port 3)

**Figure 4:** Cylindrical Example Chamber - Features and Dimensions of an Angled Port (e.g., Port 4)

**Figure 5:** Cylindrical Example Chamber - Features and Dimensions of an Offset Port (e.g., Port 5)

**Table 1:** Side Port Specifications for Cylindrical Example Chamber

<table>
<thead>
<tr>
<th>Port</th>
<th>Orientation</th>
<th>Flange</th>
<th>Focal Point</th>
<th>Focal Point Coordinates (X, Y, Z)</th>
<th>Azimuthal Angle</th>
<th>Polar Angle</th>
<th>Offset Distance</th>
<th>Focal Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port 3</td>
<td>Standard</td>
<td>CF275</td>
<td>Point A</td>
<td>(0.000, 0.000, 3.500) in.</td>
<td>180.0°</td>
<td>90.0°</td>
<td>0.000 in.</td>
<td>3.209 in.</td>
</tr>
<tr>
<td>Port 4</td>
<td>Angled</td>
<td>CF133</td>
<td>Point A</td>
<td>(0.000, 0.000, 3.500) in.</td>
<td>225.0°</td>
<td>60.0°</td>
<td>0.000 in.</td>
<td>3.335 in.</td>
</tr>
<tr>
<td>Port 5</td>
<td>Offset</td>
<td>CF133</td>
<td>Point B</td>
<td>(1.125, 0.000, 1.750) in.</td>
<td>180.0°</td>
<td>90.0°</td>
<td>1.125 in.</td>
<td>2.930 in.</td>
</tr>
</tbody>
</table>
# How to Specify a Cylindrical Vacuum Chamber

## Table 2: Flange Types, Sizes, Vacuum Ratings, and Temperature Ratings

<table>
<thead>
<tr>
<th>FLANGE TYPE</th>
<th>FLANGE SIZES</th>
<th>VACUUM RATING</th>
<th>TEMPERATURE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF - Conflat</td>
<td>133, 212, 275, 338, 450, 462, 600, 675, 800, 1000, 1200, 1325, 1400, 1450, 1650</td>
<td>1X10⁻¹³ Torr</td>
<td>-200°C to 450°C</td>
</tr>
<tr>
<td>WF - Wire-Sealed</td>
<td>1200, 1400, 1700, 1900, 2200, 2700</td>
<td>1X10⁻¹³ Torr</td>
<td>-200°C to 450°C</td>
</tr>
<tr>
<td>QF - Quick Flange</td>
<td>10, 16, 25, 40, 50, 63, 80, 100, 160, 200</td>
<td>1X10⁻⁸ Torr</td>
<td>-50°C to 200°C</td>
</tr>
<tr>
<td>LF - Large Flange (Clamp)</td>
<td>63, 80, 100, 160, 200, 250, 320, 400, 500</td>
<td>1X10⁻⁸ Torr</td>
<td>-50°C to 200°C</td>
</tr>
<tr>
<td>LFB - Large Flange (Bolt)</td>
<td>63, 80, 100, 150, 200, 250, 320, 400, 500</td>
<td>1X10⁻⁸ Torr</td>
<td>-50°C to 200°C</td>
</tr>
<tr>
<td>ASA</td>
<td>100, 150, 200, 300, 400, 600, 800, 1000</td>
<td>1X10⁻⁸ Torr</td>
<td>-20°C to 200°C</td>
</tr>
</tbody>
</table>

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