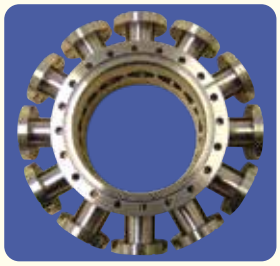
Custom Manufacture



Chambers

We can manufacture vacuum chambers and vessels to a high degree of accuracy and quality, from the basic, to the very complex.
Chambers are manufactured in accordance with your specification and drawings, supplied either as basic freehand sketches or detailed engineering drawings.
If you do not have the facilities to produce your own engineering drawings, we also offer a complete draughting service using state of the art CAD draughting software.
All chambers are manufactured using high quality UHV compatible materials, techniques and standards. Chambers are shipped leak tested, UHV cleaned, foiled, capped and bagged ready for use.
Our standard manufacturing tolerances and default manufacturing techniques are detailed in the following pages.

Bespoke Components

Whilst our catalogue contains many thousands of standard components, the situation will often arise where you cannot find the exact component to fit your particular application. Here at LewVac we will work closely with you to ensure that we understand your requirements in order that we can supply you with a custom manufactured part to a design that will fulfill your needs. In addition to the manufacture of bespoke chambers and components, we also offer an alteration service to standard catalogue items. Where a standard part meets most of your design requirements, but requires minor alteration to fit within your system, we are able to make these small alterations usually at low cost and on a short lead time.

All dimensions are nominal in millimetres unless otherwise specified

Chamber Design & Manufacture

LewVac chambers are manufactured in a modern workshop equipped with up to date manufacturing plant including:

- C.N.C. Turning.
- C.N.C. Milling.
- C.N.C. Machining centres.
- Large capacity boring.
- 6 axis FERO ARM inspection facility.
- Helium leak checking facility.
- Ultrasonic cleaning systems.
- D.I. Water systems.
- Electronic weld cleaning systems.
- T.I.G. Welding facility / automatic welding tables.
- 250°C Bakeout facility.
- R.G.A. Scan facility.

Vacuum chambers have many variables in their design and as such, careful consideration has to be given to all aspects of design of your chamber, such as:

Size
We can manufacture chambers up to 2m x 2m. Chambers up to 254mm diameter will, as standard be manufactured from standard size tubes unless otherwise specified. Chambers above this size will be manufactured from rolled sheet stainless steel.

Material
Standard material for manufacture of chambers is 304L stainless steel. Chambers can be manufactured from 316L stainless steel tube or plate along with 316LN stainless steel flanges for applications where low magnetic permeability is required.

Wall Thickness
Chamber wall thickness will vary according to the overall size of the chamber, as standard the following default wall thicknesses will apply:

Chamber Diameter	Wall Thickness
Up to 254mm	3.0mm
254mm to 610mm	4.8mm
Above 610mm	6.4mm

The above table is for guidance only.

Focal Points & Lengths
Chambers can be manufactured with as many or as few focal points as required. There are different ways to define the focal point of a chamber port and we are happy to receive this information in any form, so long as there is no ambiguity.

Surface Finish
Chambers will be dull polished inside and bright grained on external surfaces as standard. Other surface finishes are also available on request such as; grit blasted, electropolished and mechanically polished to the required surface finish.
Sealing faces will have a standard surface finish of 0.8Ra.

Water Cooling
Water cooling can be included into chamber manufacture, either by employing a double layer chamber wall, or by the addition of coolant tubes around the exterior of the chamber.

Tolerances
Standard manufacturing tolerances for chamber manufacture are as follows:

Angular tolerance ±0.5°

Linear tolerance

Linear Dimension	Tolerance
Up to 18mm	±0.1mm
19mm to 120mm	±0.15mm
121mm to 315mm	±0.2mm
316mm to 630mm	±0.35mm
631mm to 1000mm	±0.5mm
1001mm to 2000mm	±1.0mm

Tighter tolerances may be achieved on request.

All dimensions are nominal in millimetres unless otherwise specified

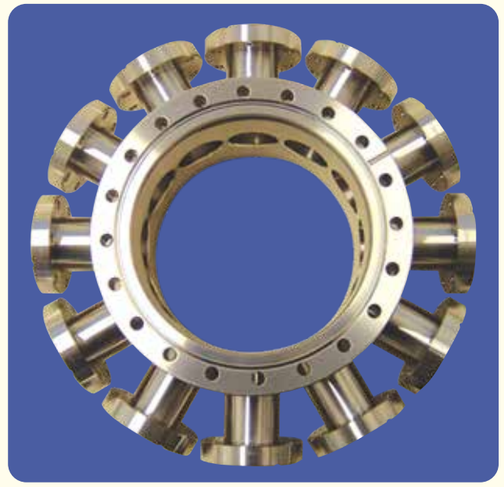
Cutting Oils
All cutting oils used during fabrication are water based and non-sulphurous.

Welding
Chambers are welded using tungsten inert gas (TIG) welding techniques, the inert gas being high purity argon.
Where possible welds are made using automated techniques, with manual welding being employed where automation is not practical.
UHV practices are closely adhered to during welding. All welds are made internally, where possible. Where it is not possible to make an internal weld, a 100% full penetration external weld will be used. Filler material is not used in the production of welds.
For constructional or strength requirements external welds may be used where necessary in addition to internal vacuum welds.

Leak Checking
All chambers and fabrications are helium leak checked using a mass spectrometer leak detector to ensure a leak rate of better than 2 x 10^{-10}mbar.l.s^{-1} prior to despatch.

Cleaning
All chambers and fabrications are thoroughly cleaned upon completion of manufacture, using a combination of detergent, water, de-ionised water, isopropanol, ultrasonic cleaning baths and electronic weld cleaning systems.

Packaging
All chambers are foiled, capped and plastic wrapped prior to shipment.
Where necessary chambers will be packaged in wooden crates to protect them during transit.
At additional cost chambers can be supplied with blank flanges fitted to each of the ports.



All dimensions are nominal in millimetres unless otherwise specified

Chamber Design & Manufacture

How To Specify A Chamber:

There are three basic steps to specifying a custom vacuum chamber

1 - Specify the main body style and dimensions.
2 - Specify chamber ports and port mounting configurations.
3 - Specify application specific design considerations.

Step 1

There are essentially three main body styles that are commonly used in vacuum applications today:

1. Spheres and hemispheres:

Two hemispheres are welded together to form a spherical chamber body. A spherical configuration provides the highest surface area to volume ratio and is (often) lighter than a cylindrical chamber of similar volume. However, manufacturing considerations often make spherical chambers the least economical solution.

2. Cylinders with hemispherical ends, flat ends, or flanged ends:

The body of these chambers is made of either vacuum grade tubing or a custom tubing "roll-up" depending on the diameter required. The lid and baseplate are made from a dish head, hemisphere or customized blank flange. Cylindrical chambers are the most commonly chosen vacuum chamber configuration.

3. Rectangular or cubic boxes:

These chambers are manufactured with metal plate material that is custom machined and welded to form the chamber body.

Once a main body style is chosen, specify the appropriate overall outer dimension(s). Figures 1 - 3 show examples of each main body style.

Fig. 1. - Spherical

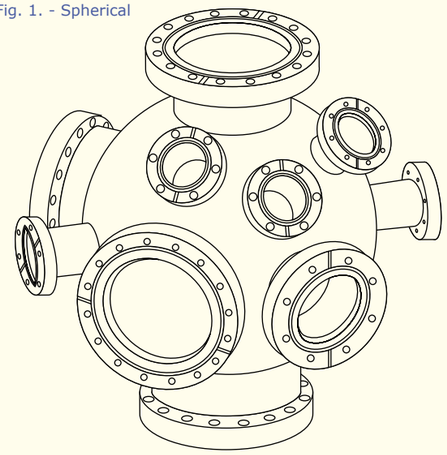


Fig. 2. - Cylindrical

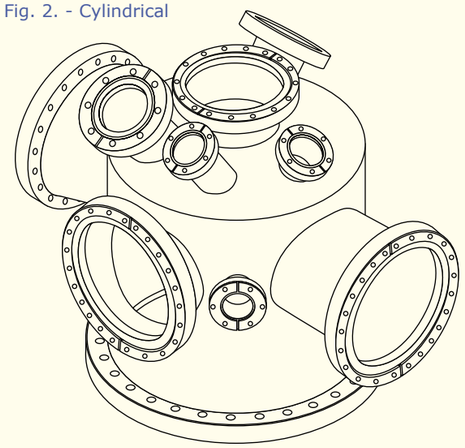
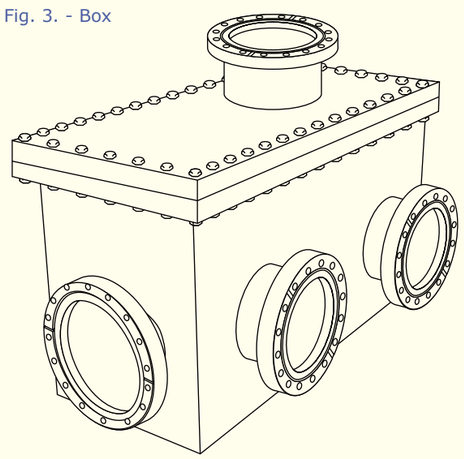


Fig. 3. - Box

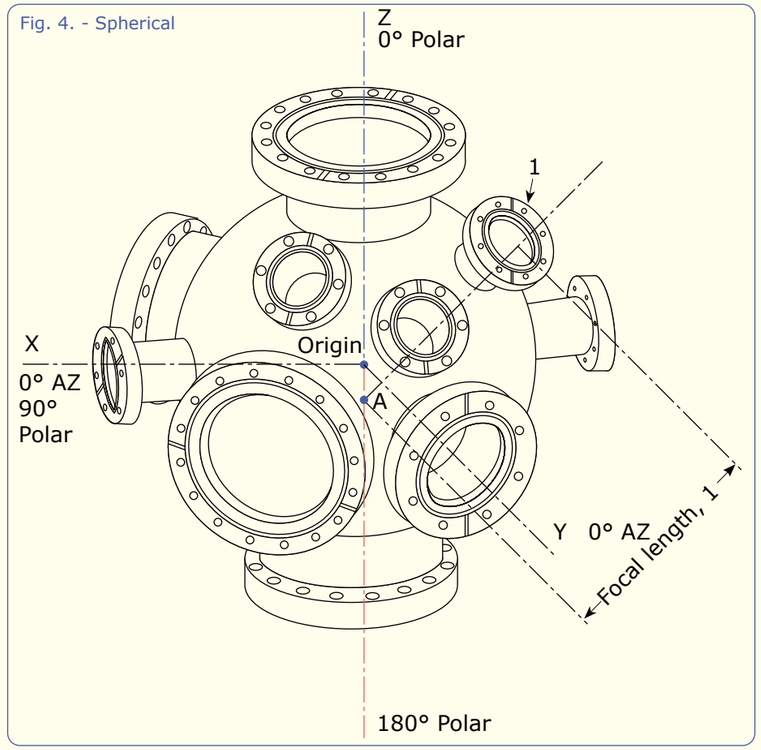


All dimensions are nominal in millimetres unless otherwise specified

Step 2

Choose the appropriate three-dimensional coordinate system (spherical, modified cylindrical, or cartesian) and specify each port centre in coordinates of the chosen system. A complete specification of a port centre includes: 1) The centre point of the port in the appropriate coordinate system, 2) The focal length, 3) The focal point. Examples of how these coordinate systems are applied to each of the typical main body styles are provided in Figures 4 - 6. A complete port specification example for a cylindrical chamber is provided in Figure 7 and in the table on page 10:7.

Fig. 4. - Spherical

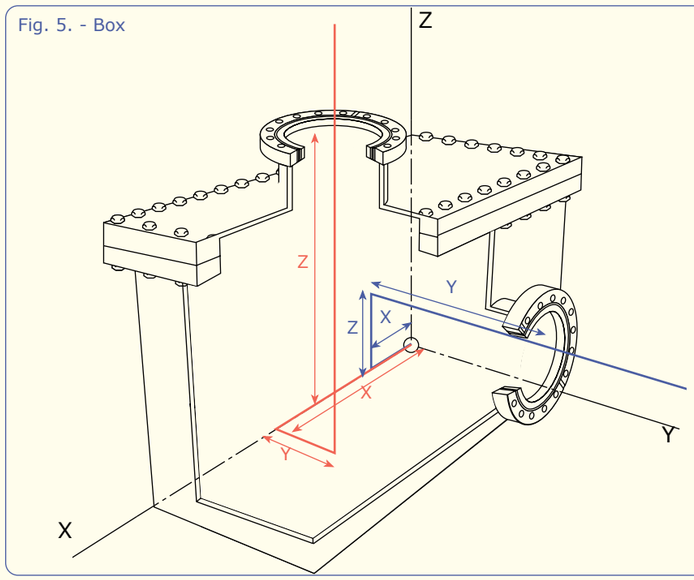


Sample Port Specification Data.

see page 10.7 for a full explanation.

Port Number: 1
Flange Size: DN40CF
Flange Style: Rotatable
Hole Style: Clearance
Mounting Config: Tubulated
Tube O.D.: 38.1mm
Tube Thickness: 1.5mm
Focal Point: A
Focal Length: 406.4mm
Azimuthal Angle: 135°
Polar Angle: 60°

Fig. 5. - Box



Centre of flange is specified using coordinates X,Y,Z.

All dimensions are nominal in millimetres unless otherwise specified

Chamber Design & Manufacture

Fig. 6a. - Cylindrical

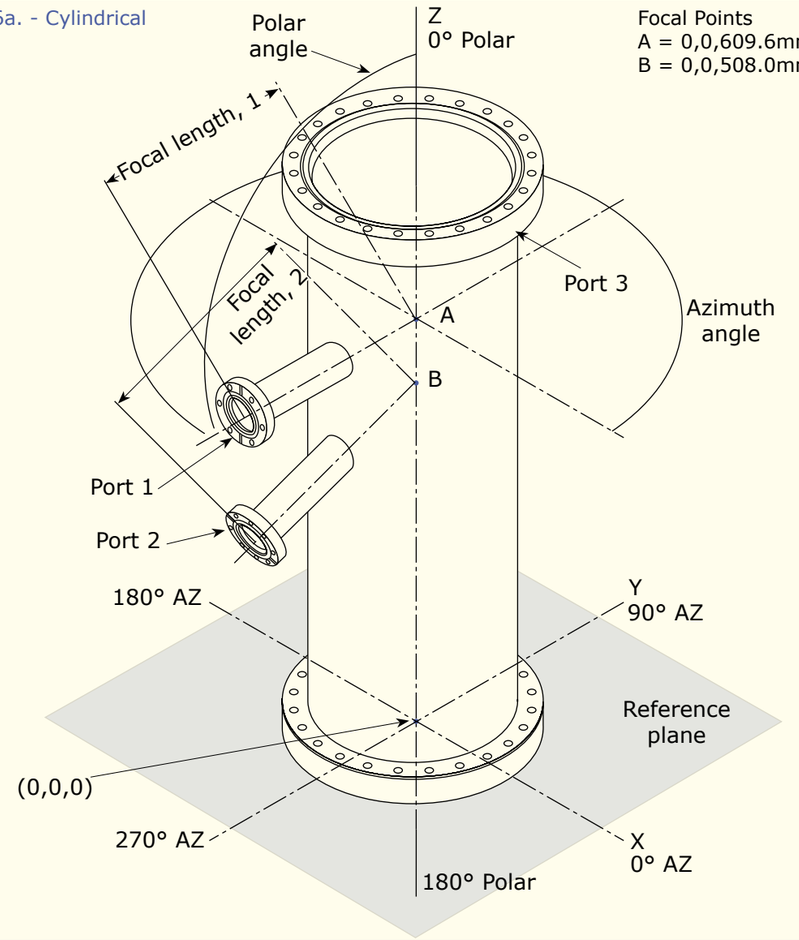
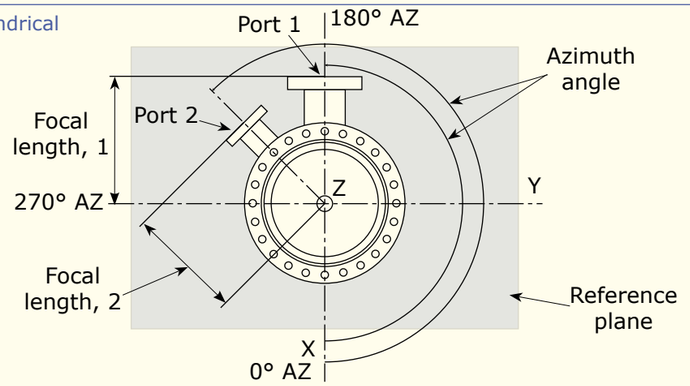


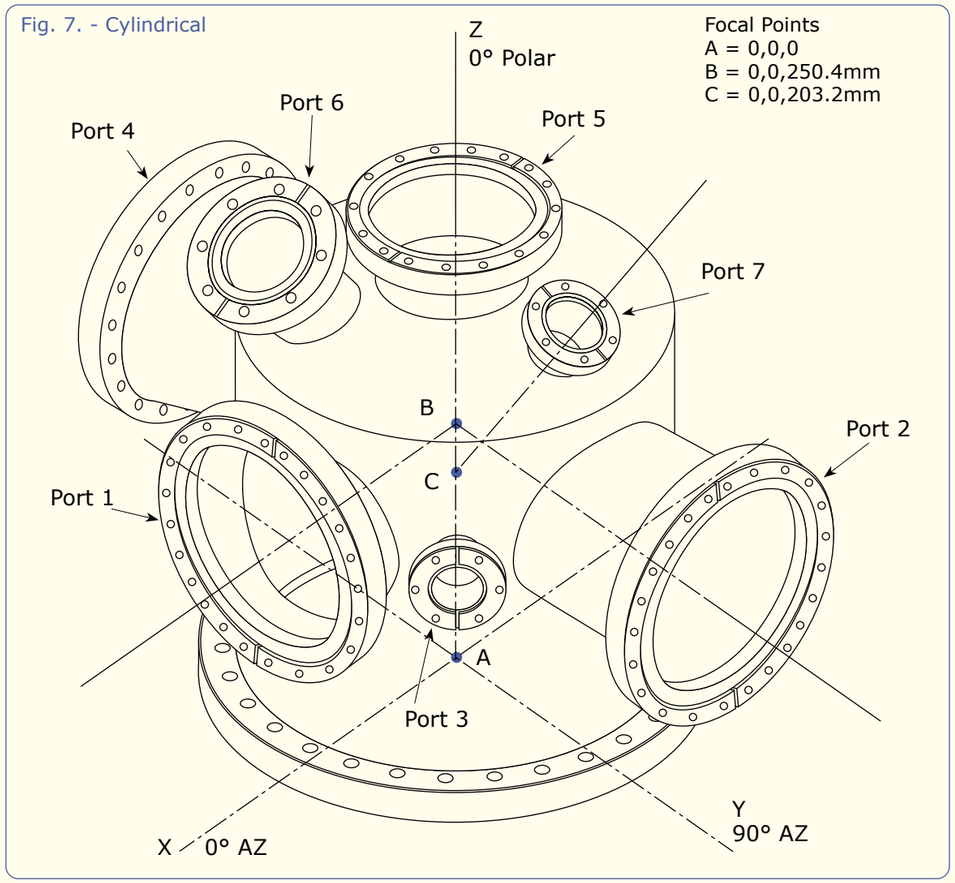
Fig. 6b. - Cylindrical



All dimensions are nominal in millimetres unless otherwise specified

Using the conventions provided in this section, the data for the seven ports shown on the cylindrical chamber below (Figure 7), is summarized in the table below.

Fig. 7. - Cylindrical



Port Number	Flange Type/ Size	Flange Style	Bolt Hole Type	Mounting Type	Tube O.D.	Tube I.D.	Focal Point	Focal Length	Azimuth Angle	Polar Angle
1	DN160CF	Rotatable	Clearance	Tubulated	152.4	146.0	B	228.6	0°	90°
2	DN160CF	Rotatable	Clearance	Tubulated	152.4	146.0	B	304.8	90°	90°
3	DN40CF	Fixed	Clearance	Tubulated	38.1	35.0	B	203.2	45°	90°
4	DN160CF	Fixed	Clearance	Tubulated	152.4	146.0	B	304.8	270°	90°
5	DN100CF	Rotatable	Clearance	Tubulated	101.6	97.0	A	558.8	-	0°
6	DN63CF	Rotatable	Clearance	Tubulated	63.5	60.0	B	304.8	330°	30°
7	DN40CF	Rotatable	Clearance	Tubulated	38.1	35.0	C	304.8	90°	45°

Flange Size - Please refer to catalogue section 3 for all available flange types & sizes.

Flange Style - Fixed or rotatable.

Bolt Hole Type - Clearance or tapped.

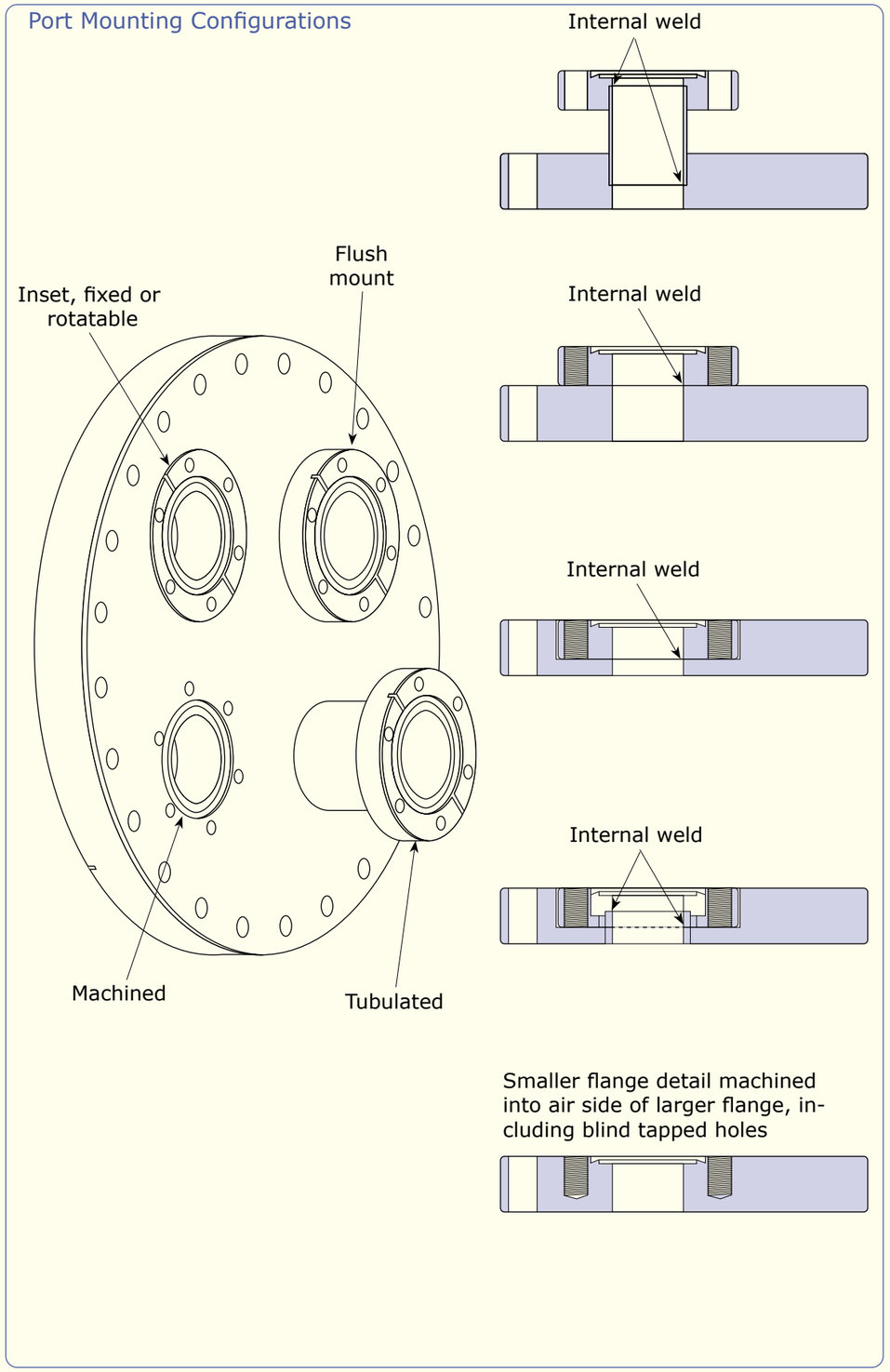
Mounting type - Flush mount, zero length fixed, zero length rotatable, tubulated or machined.

Tube Sizes - Many different size tubes are available to suit your needs, please contact our sales office for further details.

All dimensions are nominal in millimetres unless otherwise specified

Chamber Design & Manufacture

Port Mounting Configurations



All dimensions are nominal in millimetres unless otherwise specified

Step 3

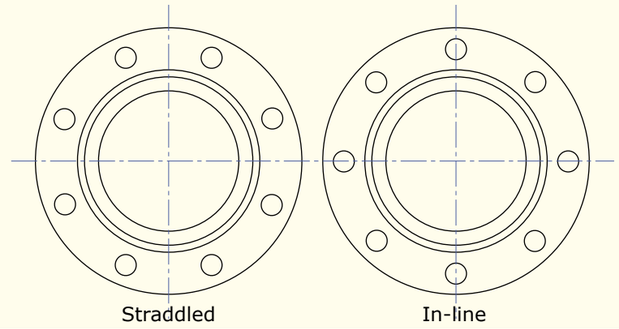
Specify application specific design considerations. A minimum set of criteria are provided here:

a. Material:
Specify if other than 304L stainless steel.

b. Main body wall thickness:
Specify if known or state “standard” for LewVac default thickness.

c. Bolt hole orientation:
Specify bolt hole orientation for fixed flanges as shown in Figure 8 below, if known, or state “standard” for LewVac standard bolt hole orientation.
LewVac standard bolt hole orientation will orientate the bolt holes in a straddled position on both the vertical and horizontal axis. If the number of bolt holes allows straddling of only one axis, the vertical axis will be straddled.
The orientation of leak check grooves on CF flanges should be indicated if critical.

Fig. 8.

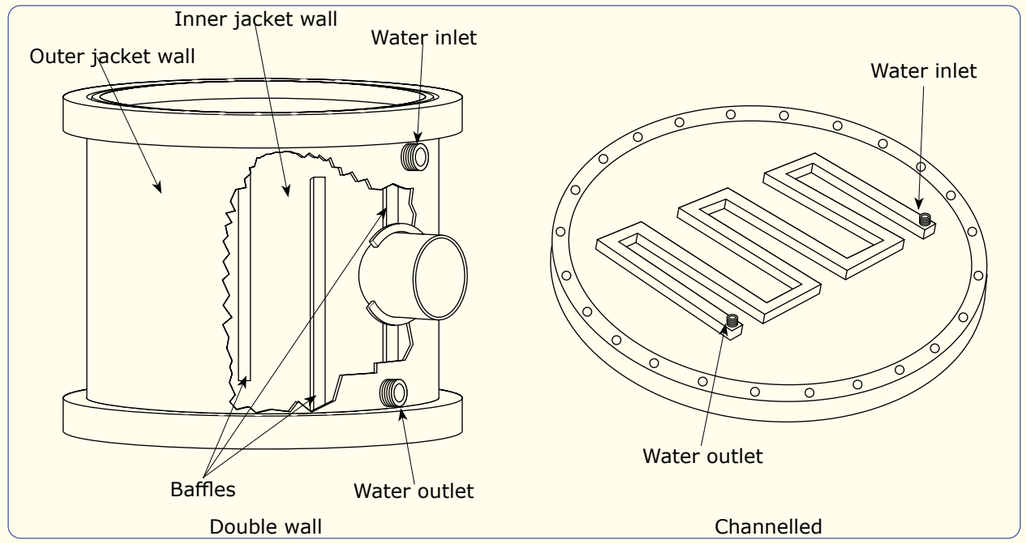


Water Cooled Jacketing:

We offer two styles of water cooling of chambers for high temperature or high heat flux applications:

1. Double Wall Construction:
Double wall construction is most often used in those applications requiring uniform internal chamber temperatures. Typically, double wall, water cooled chambers are made with internal baffles that help provide uniform, laminar water circulation.

2. Channel Construction:
Channel construction is most often used in those applications requiring localized or targeted cooling.



All dimensions are nominal in millimetres unless otherwise specified

Bespoke Components

Combination Coaxial & D Type Feedthrough Flange

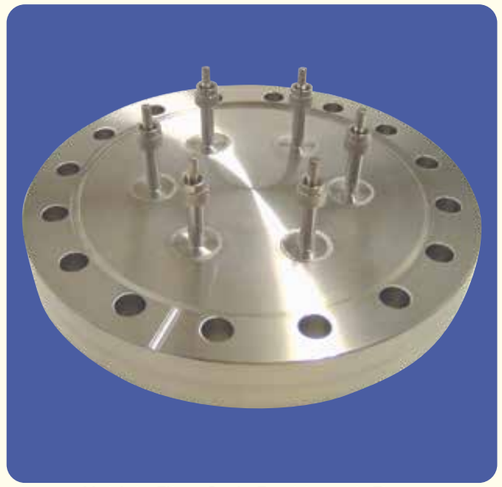
Complex Manifold

Our sales engineers will be happy to discuss your requirements for bespoke components, whether they are basic or complex, a one off piece or a batch quantity production part for inclusion into your end product.

One of our standard catalogue parts may meet much of your specification and may be easily customised to exactly meet your needs. We are able to manufacture individual parts or batches of bespoke components as required.

Please contact our sales engineers to discuss your requirements, or to arrange for one of our staff to visit you.

Adjustable Length ISO LF Full Nipple



Multiple Fibre Optic Feedthrough Flange

All dimensions are nominal in millimetres unless otherwise specified

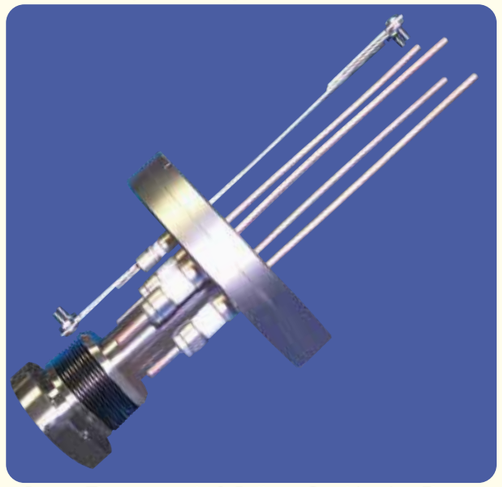
Multiple D Type Feedthrough Flange

Water Cooled Tee With Extra Ports

Custom Flanged Viewport

Adjustable Edge Welded Bellows

Irregular Tee Piece



Power, Thermocouple & Bellows Combination Flange

All dimensions are nominal in millimetres unless otherwise specified

All dimensions are nominal in millimetres unless otherwise specified