

# Chambers

# 9



## Section 9

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Typical stainless steel bell jar system

- Stainless steel bell jars
- Feedthrough collars
- Baseplates
- Base wells

### Stainless Steel Bell Jars

MDC stainless steel bell jars are designed for use with MDC baseplates, base wells and feedthrough collars. A dovetail groove in the jar's base flange holds a FKM / FPM fluoroelastomer elastomer gasket, which makes the vacuum seal with one of the forementioned components. All stainless steel bell jars are fitted with a four inch view diameter Pyrex<sup>®</sup> viewport. All vacuum welds are internal and provide UHV compatibility. For added convenience, all bell jars are fitted with a hoist or lift-ring that is welded to the chamber's domed top. These chambers can be purchased with an optional electropolished finish.

### Feedthrough Collars

MDC feedthrough collars are used to expand the capabilities of conventional bell jars by providing radially oriented access ports. Four, eight, or eighteen ports fitted with either 2-3/4 inch Del-Seal<sup>™</sup> CF metal seal flanges or ISO KF NW40 Kwik-Flange<sup>™</sup> flanges are available. These ports accept a variety of standard MDC vacuum components such as electrical, fluid and motion feedthroughs. Installation of a feedthrough collar also requires the use of an MDC baseplate. The feedthrough collar is positioned between a bell jar and the baseplate. The feedthrough collar / baseplate seal is made with either an L-gasket or circular cross section elastomer, depending on which collar model is used. The feedthrough collar seal is made with an L-gasket elastomer. Stainless steel bell jars would use a circular cross section elastomer in the jar's dovetail groove to make this seal.

### Baseplates

MDC base plates are required for installation of both bell jars and feedthrough collars. They provide a flat and stable platform upon which bell jar systems can be built. Baseplates are typically mounted atop a vacuum pump or the gate valve fitted to the pump. MDC offers three baseplate interface flanges for mating with standard pumps or gate valves. Interface flanges include ANSI ASA elastomer seal flanges, Del-Seal<sup>™</sup> CF metal seal flanges and bolt style Large-Flange<sup>™</sup> ISO LF elastomer seal flanges. Baseplates are available with baseplate flange diameters suitable for 12, 18 and 24 inch chamber body diameters.

### Base Wells

Base wells are the product of integrating both a baseplate and a feedthrough collar. They provide the functionality of both components and replace one vacuum seal with a weld joint. They are available with radially oriented access ports in four, eight, or eighteen port configurations and are fitted with either 2-3/4 inch Del-Seal<sup>™</sup> CF metal seal flanges or ISO KF NW40 Kwik-Flange<sup>™</sup> flanges. These ports accept a variety of standard MDC vacuum components such as electrical, fluid and motion feedthroughs. Both baseplates and base wells connect to the vacuum pumping system with a choice of standard smooth face ASA ANSI flanges, optional Del-Seal<sup>™</sup> CF metal seal flanges or ISO LF bolt-style Large-Flange<sup>™</sup> flanges. Gasket seals for any flange or port are not included with baseplates or base wells and must be purchased separately. For pump port or access port flange hardware, refer to individual flange specifications in the Flanges & Fittings section of this catalog.

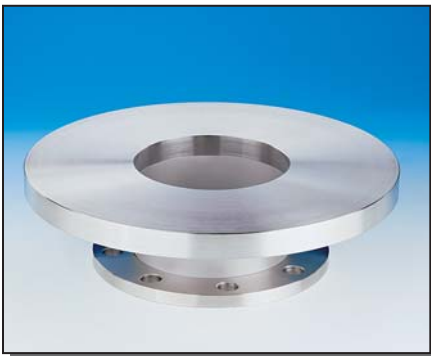
All dimensions in this catalog are given in inches unless specified otherwise.



Stainless steel bell jar page 474



Multi-port feedthrough collar page 476



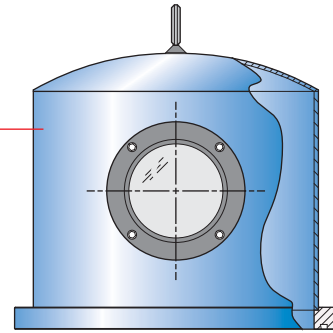
Baseplate page 478



Base well page 478

### Typical bell jar chamber installation

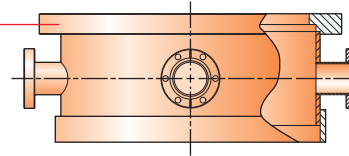
Stainless steel bell jars are found on page 474



O-rings are on page 475



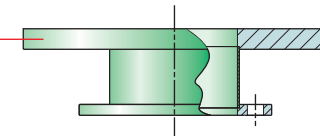
Multi-port feedthrough collars begin on page 476



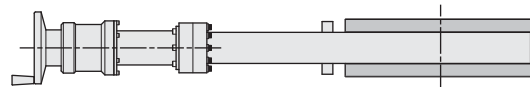
L-gaskets are on page 477



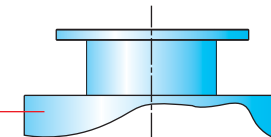
Baseplates and Base Wells are found on page 478



Gate valves are in Section 2.1, page 163



Cryogenic Sorption roughing pumps are in Section 3.2, page 259 — High vacuum pumps are customer supplied



Typical configuration shown without connecting hardware for clarity



Stainless Steel Bell Jar

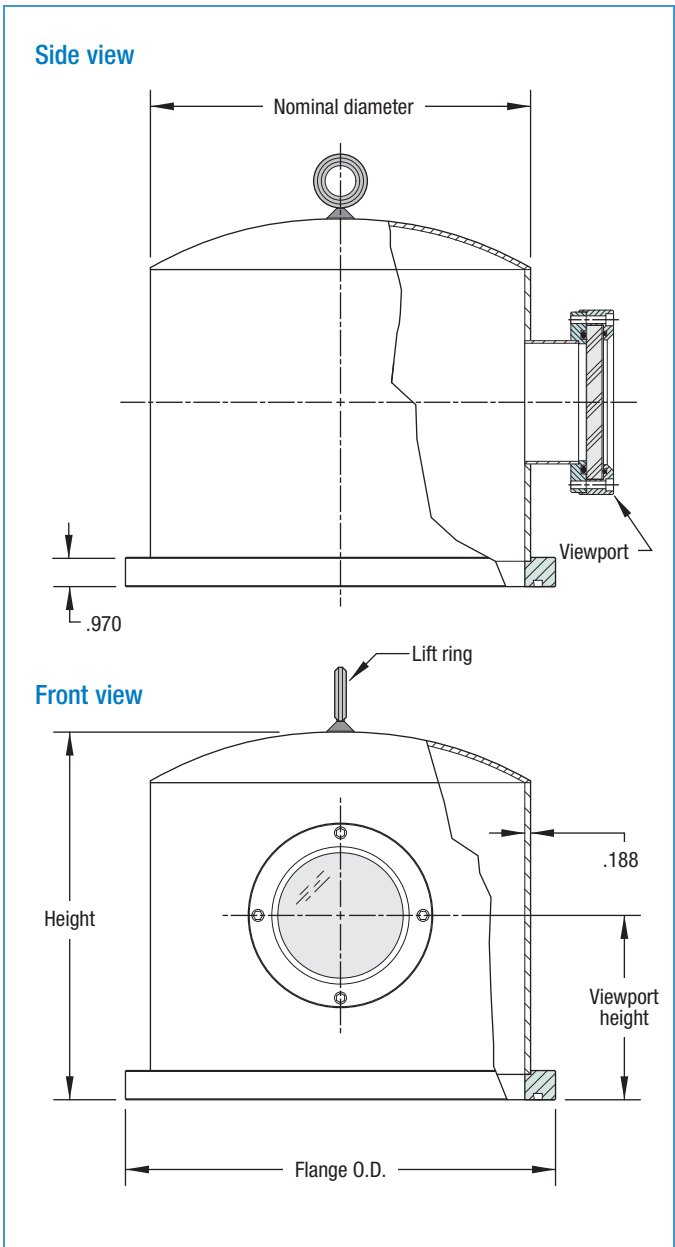
### HIGH VACUUM SERIES

#### Features

- 304ss material
- FKM / FPM fluoroelastomer gasket seal
- Three standard sizes
- Pyrex® viewport PVP-4

#### Description

Type 304 Stainless Steel Bell Jars are designed to be used with flat Baseplates, Base Wells and Feedthrough Collars. A dovetail groove in the jar's base flange holds a FKM / FPM fluoroelastomer O-ring, supplied with each unit, which makes the vacuum seal with a baseplate. A PVP-4 Pyrex® Viewport with a four-inch diameter viewing area is included. All welds are internal. A single top-center lift ring is included. Electropolished finish option is available.



#### Specifications

<b>Material</b>	
Bell Jar	304ss
Gasket, elastomer	FKM / FPM fluoroelastomer
<b>Seal</b>	
Gasket, elastomer	O-ring
Method	Gravity
<b>Vacuum Range</b>	1x10 <sup>-6</sup> Torr
<b>Temperature Range</b>	Ambient to 150°C
<b>Weight &amp; Dimensions</b>	See table

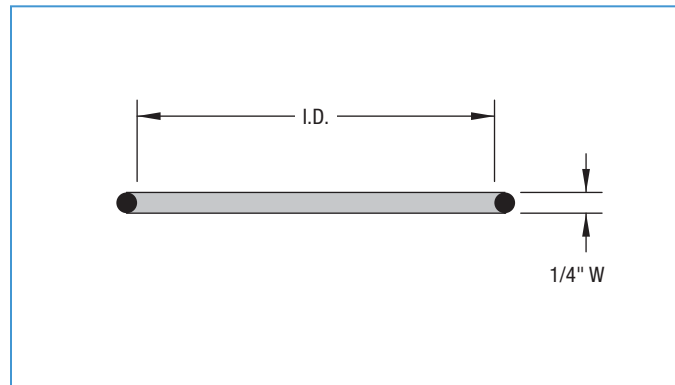


### Bell Jar



NOM. SIZE	I.D.	FLANGE O.D.	HEIGHT W/O RING	VIEWPORT HEIGHT	WT LB	REFERENCE	PART NUMBER
12	12.00	14.00	12.00	6.00	65	SSBJ-12	524000
18	18.00	20.00	30.00	12.00	195	SSBJ-18	524001
24	24.00	26.00	30.00	12.00	250	SSBJ-24	524002

### O-ring



- Use with Stainless Steel bell jar
- FKM / FPM fluoroelastomer material
- Three standard sizes
- Also used with stainless steel Feedthrough Collars on page 476

NOMINAL SIZE	NOMINAL I.D.	WT LB	REFERENCE	PART NUMBER
10	12-1/2	1/8	OR-12	521003
12	18-1/2	1/8	OR-18	521004
18	25	1/8	OR-24	521005

### Viewport spares



DESCRIPTION	WT LB	REFERENCE	PART NUMBER
REPLACEMENT GLASS, 7740 PYREX OPTICAL 5" O.D.	1	-	045010
BOLT, SOCKET HEAD, STAINLESS STEEL, .250-28 x 1" LONG (Pkg of 4)	1/4	-	190166
O-RING, GLASS-TO-FLANGE	1/4	-	041346
O-RING, GLASS-TO-RETAINER	1/4	-	041243

For viewport details, see page 310.



Feedthrough Collar, O-ring sealed



Feedthrough collar, L-gasket sealed

### Features

- Choice of 2-3/4" Del-Seal™ CF flange or Kwik-Flange™ KF port connections.
- All type 304 stainless steel construction
- Elastomer seal on collar, one included

### Description

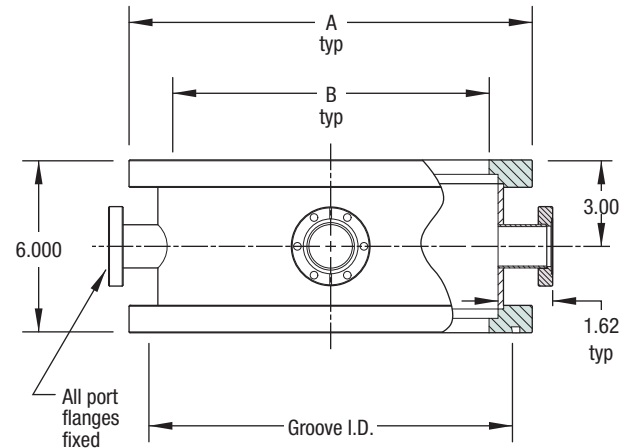
Standard MDC Feedthrough Collars add four, eight, or eighteen convenient feedthrough ports to bell jar vacuum systems. These ports accept a variety of feedthrough devices and other components mounted on mating Del-Seal™ CF 2-3/4" flanges or ISO NW40 Kwik-Flange™ KF ports.

Installation of a feedthrough collar is made by positioning it between a bell jar and a baseplate. The lower collar-to-baseplate seal is made with either a FKM / FPM fluoroelastomer L-gasket or O-ring, depending on which collar model is used. With Stainless Steel Bell Jars, a FKM / FPM fluoroelastomer O-ring in the jar's dovetail groove makes the seal.

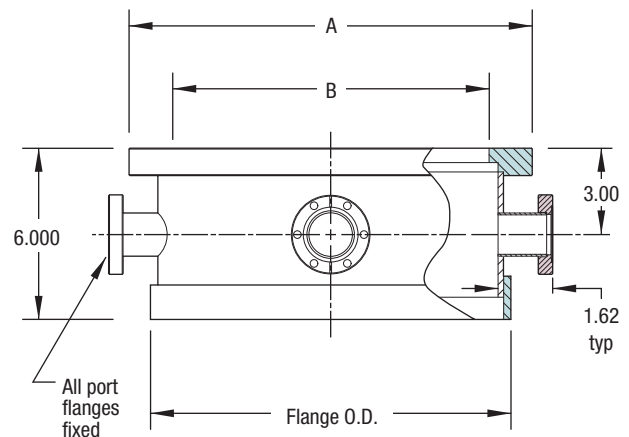
One O-ring or L-gasket is included with each collar. Dimensions and reordering information are found on the next page.

### HIGH VACUUM SERIES

#### O-ring sealed



#### L-gasket sealed



- Drawings show collars with four Del-Seal™ CF ports.
- All collar walls are nominally 3/16" thick.





#### O-ring sealed



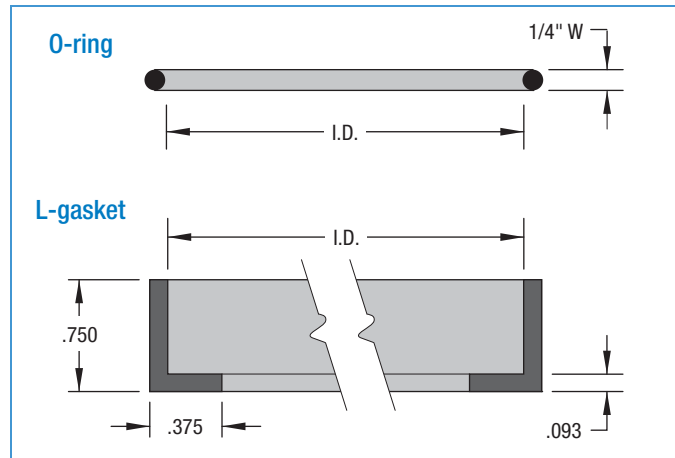
NOM. SIZE	NO. PORTS	PORT FLANGE O.D.	ISO REF.	A	B	O-RING GROOVE I.D.	WT LB	REFERENCE	PART NUMBER
<b>DEL-SEAL™ CF PORTS</b>									
12	4	2.73	-	14	11	12.50	65	FTCO-12	523002
18	8	2.73	-	20	16	18.50	150	FTCO-18	523003
24	18	2.73	-	26	23	25.00	230	FTCO-24	523004
<b>KWIK-FLANGE™ KF PORTS</b>									
12	4	2.16	NW40	14	11	12.50	50	FTCO-K150-12	523022
18	8	2.16	NW40	20	16	18.50	85	FTCO-K150-18	523025
24	18	2.16	NW40	26	23	25.00	130	FTCO-K150-24	523028

#### L-gasket sealed



NOM. SIZE	NO. PORTS	PORT FLANGE O.D.	ISO REF.	A	B	FLANGE O.D.	WT LB	REFERENCE	PART NUMBER
<b>DEL-SEAL™ CF PORTS</b>									
12	4	2.73	-	14	11	12.5	35	FTC-12	523000
18	8	2.73	-	20	16	18.5	65	FTC-18	523001
<b>KWIK-FLANGE™ KF PORTS</b>									
12	4	2.16	NW40	14	11	12.5	35	FTC-K150-12	523031
18	8	2.16	NW40	20	16	18.5	60	FTC-K150-18	523034

#### Seals



- FKM / FPM fluoroelastomer material
- Three standard sizes for each type seal

NOMINAL SIZE	NOMINAL I.D.	WT LB	REFERENCE	PART NUMBER
<b>O-RING</b>				
10	12-1/2	1/8	OR-12	521003
12	18-1/2	1/8	OR-18	521004
18	25	1/8	OR-24	521005
<b>L-GASKET</b>				
10	9-1/4	1/4	GVL-10	521000
12	11-1/2	1/4	GVL-12	521001
18	17-1/4	1/4	GVL-18	521002



Baseplate and Base Well

### Features

- 2-3/4" Del-Seal™ CF flange or Kwik-Flange™ KF NW 40 port connections on Base Wells
- Standard ASA pump port flange, with optional Del-Seal™ CF or ISO Large-Flange™ LF port
- All type 304 stainless steel construction
- Elastomer seal surface

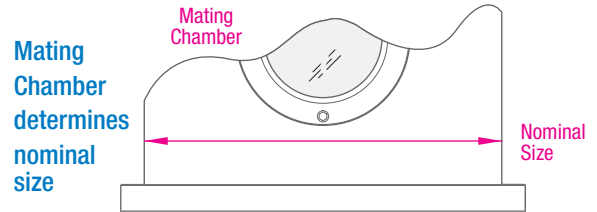
### Description

Installation of a Baseplate is made by positioning a Bell Jar or Feedthrough Collar directly on top of it. The bell jar-to-baseplate seal is made with either a FKM / FPM fluoroelastomer L-gasket or O-ring, depending on which Bell Jar or Feedthrough model is used.

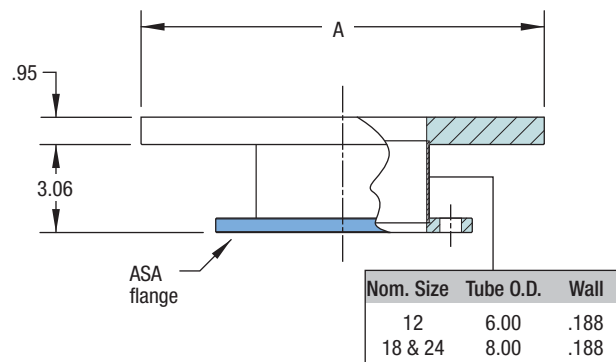
Standard MDC Base Wells are the integral combination of a Feedthrough Collar and a Baseplate, and eliminate one vacuum seal with a weld. Base Wells add four, eight, or eighteen convenient feedthrough ports to bell jar vacuum systems. These ports accept a variety of feedthrough devices and other components mounted on mating Del-Seal™ CF 2-3/4" flanges or Kwik-Flange™ KF NW40 sizes. If access ports are not required, Bell Jars can be mounted directly on Baseplates. Both Baseplates and Base Wells connect to the vacuum pumping system with a choice of standard smooth face ASA ANSI flange, or optional Del-Seal™ CF metal seal flange or Large-Flange™ LF bolt-style.

Seals for any flanges or ports are not included with Baseplates or Base Wells. For pump port flange or side port flanges, refer to individual flange specifications in Section 1.

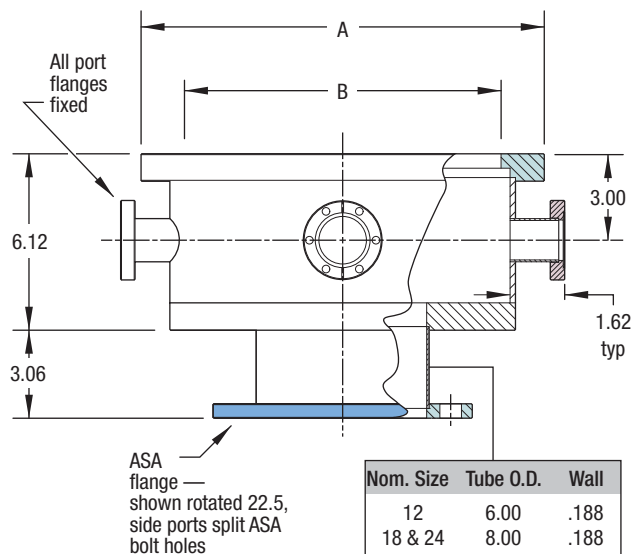
### HIGH VACUUM SERIES



#### Baseplate



#### Base Well



#### ASA Pump Port Flange

NOMINAL SIZE	ANSI REF.	ASA DIA.	ASA THK.	NO. HOLES	HOLE DIA.	BOLT CIRCLE
12	4	9.00	.50	8	.75	7.50
18 & 24	6	11.00	.75	8	.81	9.50

- ASA flanges are nonrotatable with a smooth face.
- O-ring grooves may be added as a special configuration.
- Base and port seals not included.





### Baseplate



NOMINAL SIZE	PUMP PORT	ASA O.D.	A	WT LB	REFERENCE	PART NUMBER
12	ANSI-4	9.00	14	55	BP-12	523008
18	ANSI-6	11.00	20	110	BP-18	523009
24	ANSI-6	11.00	26	185	BP-24	523010

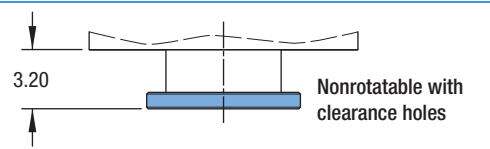
### Base Well



NOMINAL SIZE	PUMP PORT	NO. PORTS	PORT FLG. O.D.	ISO REF.	A	B	WT LB	REFERENCE	PART NUMBER
<b>DEL-SEAL™ CF SIDE PORTS</b>									
12	ANSI-4	4	2.73	-	14	11	80	BW-12	523005
18	ANSI-6	8	2.73	-	20	16	160	BW-18	523006
24	ANSI-6	18	2.73	-	26	23	250	BW-24	523007
<b>KWIK-FLANGE™ KF SIDE PORTS</b>									
12	ANSI-4	4	2.16	NW40	14	11	77	BW-K150-12	523050
18	ANSI-6	8	2.16	NW40	20	16	154	BW-K150-18	523053
24	ANSI-6	18	2.16	NW40	26	23	237	BW-K150-24	523056

### Pump Port Options

#### Del-Seal™ CF

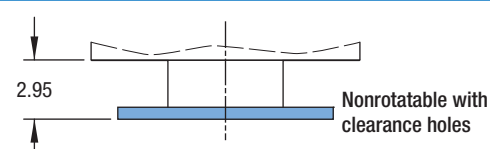



NOMINAL SIZE	MDC REF.	FLANGE DIA.	FLANGE THK.	NO. HOLES	HOLE DIA.	BOLT CIRCLE
12	F800600	7.97	.880	20	.332	7.128
18 & 24	F1000800	9.97	.970	24	.332	9.128

CHAMBER NOM. SIZE	OPTION NUMBER
12	-01
18 & 24	-03

Provides mating flange to metal-sealed port on vacuum pump. Optional elastomer seals available. See Section 1.1 for flange specifications and sealing methods. Add option number to standard part number. Example: 523008-01

#### Large-Flange™ LF

NOMINAL SIZE	ISO REF.	FLANGE DIA.	FLANGE THK.	NO. HOLES	HOLE DIA.	BOLT CIRCLE
12	NW160	8.86	.63	8	.43	7.87
18 & 24	NW200	11.22	.63	12	.43	10.24

CHAMBER NOM. SIZE	OPTION NUMBER
12	-02
18 & 24	-04

Provides mating flange to standard ISO port on vacuum pump. See Section 1.2 for flange specifications and sealing methods. Add option number to standard part number. Example: 523008-02



UHV Surface science chamber

### Features

- UHV surface analysis chamber
- Eighteen access ports
- Three focal points
- Laser aligned ports
- Del-Seal™ CF port flanges
- Type 304 stainless steel construction

### Surface Science Analysis Chambers

MDC SSAC-12 and -12D are versatile general purpose surface science analysis chambers which have proven to be suitable for a wide range of analytical studies or experimentation

MDC surface science chambers are constructed of type 304 stainless steel and with a total of 18 access ports. In addition to a vacuum pump port at the base, the chamber includes three 8", two 6", three 4-1/2" and nine 2-3/4 inch Del-Seal™ CF metal seal flanges with tube diameters of 6", 4", 2-1/2" and 1-3/4 inch, respectively. The chamber access ports accommodate a variety of experimental devices, analytical instruments, viewports, electrical and motion feedthroughs, vacuum measurement gauge tubes and other accessories.

The SSAC-12 chamber has a 14-5/8 inch female wire seal flange on the pump port while the SSAC-12D is supplied with a 14 inch Del-Seal™ CF metal seal flange. As previously noted, all 2-3/4 inch Del-Seal™ CF flanged ports are constructed with an oversized 1-3/4 inch outside diameter tubing to provide maximum apertures and allow the installation of larger devices. Access ports are precision aligned with a helium-neon laser during construction. Each port is directed at one of three internal reference or focal points A, B and C, or a vertical centerline. Angles and distances to these points are listed in a table alongside the diagram of the chamber.

Fastening and sealing hardware, including copper gaskets and bolt sets, are found under the individual size flange in the Flanges & Fittings section of this catalog. MDC employs advanced tungsten inert gas (TIG) welding techniques with high purity Argon as the inert gas medium. Manual as

well as automated orbital welding machines are at the heart of all welding operations. MDC adheres to stringent UHV welding standards and practices including that of nonfiller metal, all internal fusion weld joints. External weld joints are not used unless required for structural reinforcement and then, limited to skip or span weld configurations. In the event that a weld joint can not be made internally, a one hundred percent full penetration external weld will be used. All weld joints are leak tested using a mass spectrometer leak detector with a minimum Helium sensitivity of  $2 \times 10^{-10}$  standard cc/sec.

### Chamber Surface Finishes

Vacuum chamber finishes include internal and external glass bead blasting of all body and port tube surfaces. Flanges and machined components have a standard 64 micro-inch surface finish. Seal surfaces are machined with a 32 micro-inch concentric finish suitable for standard metal seals. All internal surfaces are electrochemically polished.

The electropolishing process is the reverse of electroplating where the work piece is made the anode and dissolves or gives up material in the electrolytic process. The electropolishing operating conditions are controlled so that atomic oxygen forms and reacts with the metal work piece surface. According to one theory, the high points of the metal surface are most readily oxidized and this oxidized material is thereupon dissolved in the electrolyte and otherwise removed. Selective solution of the high points of a surface tends to give a very smooth finish comparable or superior to a mechanically buffed surface. In contrast to mechanical polishing, electropolishing produces a strain free surface.



Surface science chamber front view page 482



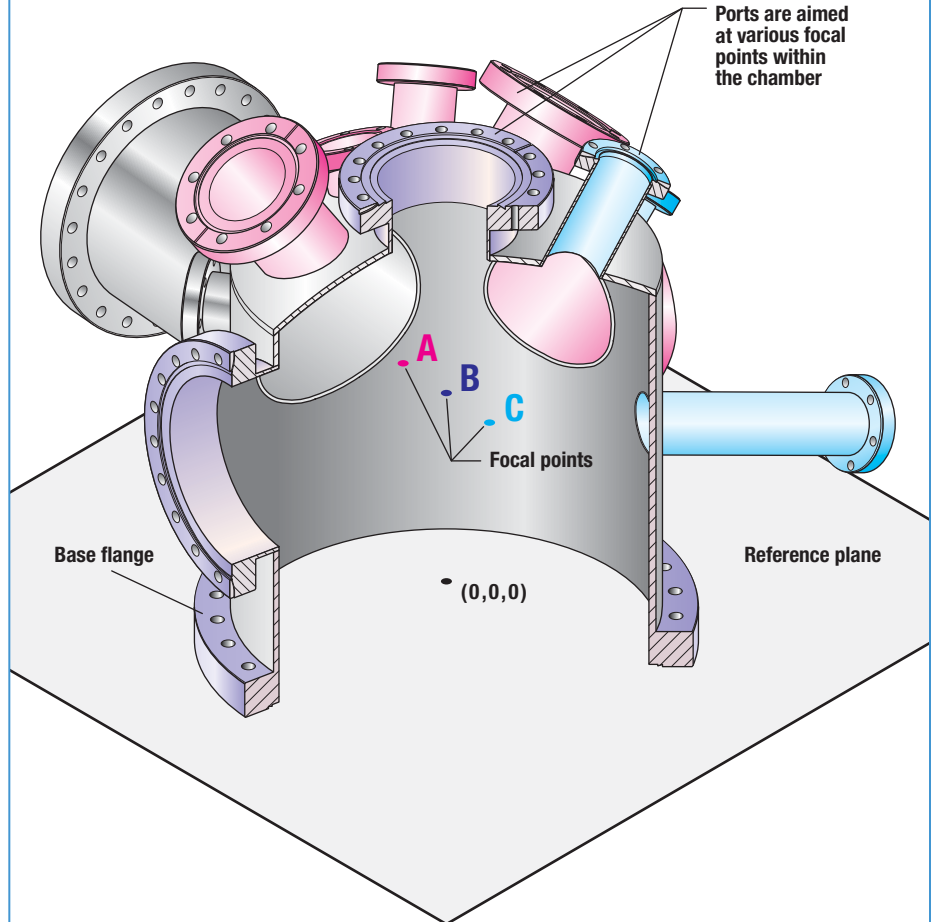
Surface science chamber rear view page 482



### Leak Testing

MDC Precision is dedicated to providing high and ultrahigh vacuum components of the highest quality and performance. To this end all vacuum rated components manufactured by MDC and its divisions are leak tested repeatedly, as required, throughout the manufacturing process to insure these goals are met. All weld joints and flange seals are leak tested using a mass spectrometer leak detectors with a minimum Helium sensitivity of  $2 \times 10^{-10}$  standard cc/sec.

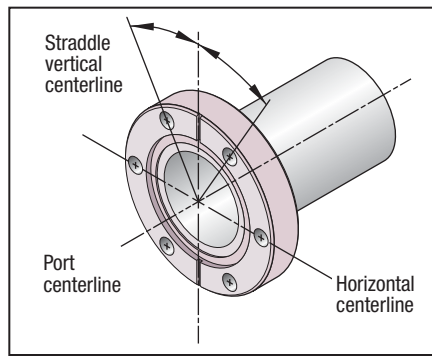
### Surface Science Chamber Cross Section



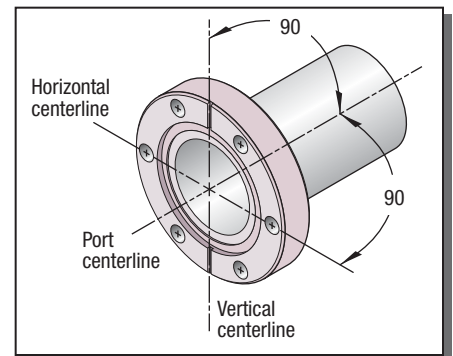
- In general, the central reference point is an arbitrary point on a reference plane.
- A base flange, reference plane and the zero point are selected for symmetry and simplicity
- The central reference point, or zero point, is given XYZ coordinates of (0,0,0)
- All focal point dimensions are measured from the zero point
- Port lengths and angles are measured from focal points



Surface science chamber base view page 482



Port flange bolt hole orientation



Port flange seal plane position



Surface Science Analysis Chamber

### Description

The SSAC-12 is a versatile, general purpose surface science analysis chamber. It has proven to be suitable for a wide range of studies and experiment. Standardization of the chamber design has enabled MDC to offer the SSAC-12 at this price.

The chamber has a total of 18 access ports. In addition to the pump port in the base, there are three 8", two 6", three 4-1/2" and nine 2-3/4" ports with Del-Seal™ CF metal seal flanges. The SSAC-12 has a 14-5/8" female wire seal flange on the pump port; the SSAC-12D is supplied with a 14" Del-Seal™ CF flange.

The chamber access ports accommodate a variety of experimental devices, analytical instruments, viewports, feedthroughs and other accessories. Note that the 2-3/4" flanges connect to the chamber with oversize 1.75" O.D. tubing to accommodate larger devices.

Access ports are precision aligned with a helium-neon laser during construction. Each is oriented toward one of three internal reference points A, B and C, or a vertical centerline. Angles and distances to these points are listed in the table.

Chamber construction is of type 304 stainless steel. All flange and tube connections are TIG fusion welds. All internal surfaces are electropolished to ultrahigh vacuum standards. Connection hardware, including copper gaskets and bolt sets, are found under the individual size flange in Section 1.1.

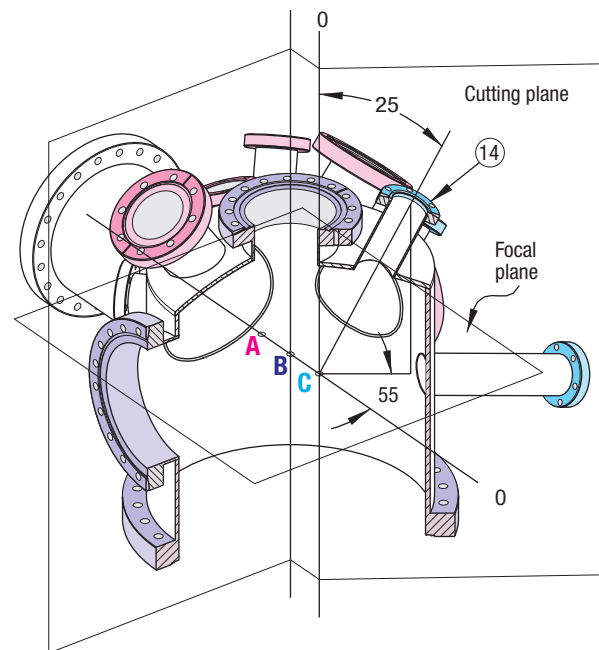
Ports with colored flanges are unique to a single focal point. Ports to focal point A are shown in magenta; ports to focal point B are shown in purple; and ports to focal point C are shown in cyan. Ports which have more than one focal point or no listed focal point are shown without color. Focal length dimensions for ports with more than one focal point are given to the first focal point intersection.

### ULTRAHIGH VACUUM SERIES

#### Features

- Proven design
- 18 Access Ports
- Del-Seal™ CF metal seal flanges
- Precision component alignment
- All type 304 stainless steel construction
- Bakeable to 450°C
- UHV compatible to  $1 \times 10^{-11}$  Torr

#### Port Angles

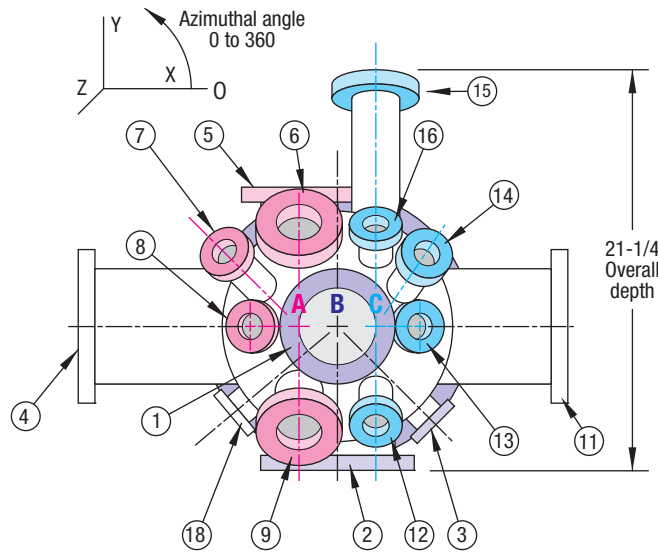


- The **polar angle** of a port is measured in a vertical plane that includes the focal point of the port and the centerline of the port
- The **azimuthal angle** of a port is measured as a projection of the port centerline onto a horizontal plane that includes the focal point of the port
- Example: Port 14 is aimed at focal point C
  - The cutting plane is vertical and passes through C
  - The cutting plane is rotated about a vertical line through C to include the centerline of Port 14
  - The **polar angle** of 25° is measured in the cutting plane
  - The **azimuthal angle** of 55° is measured in the focal plane

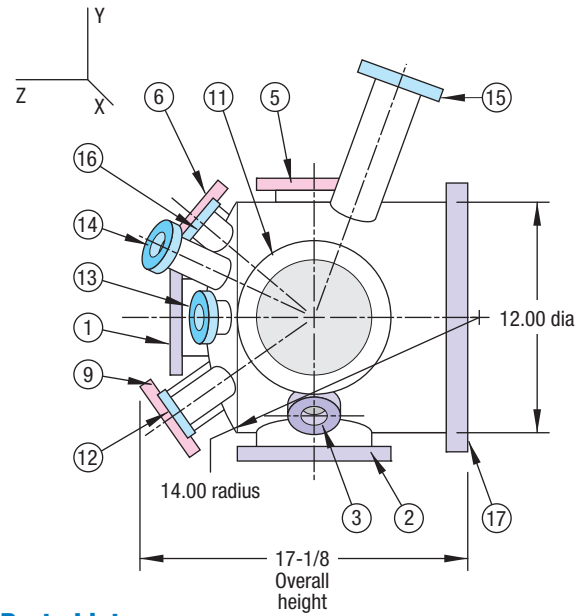




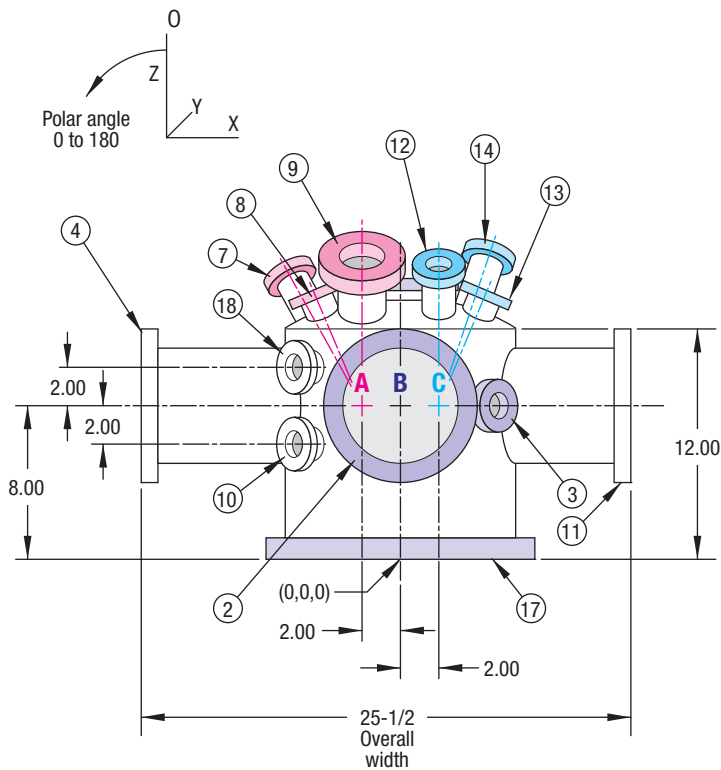
Top View



Side View



Front View



Ports List

PORT NO.	FLANGE SIZE	TUBE O.D.	FOCAL POINT	FOCAL LENGTH	AZIMUTHAL ANGLE	POLAR ANGLE
1	6	4.00	B	7.50	0	0
2	8	6.00	B	7.50	270	90
3	2-3/4	1.75	B	7.25	315	90
4	8	6.00	A	11.50	180	90
5	6	4.00	A	7.25	90	90
6	4-1/2	2.50	A	8.50	90	40
7	2-3/4	1.75	A	8.25	135	35
8	2-3/4	1.75	A	6.50	180	23
9	4-1/2	2.50	A	9.50	270	35
10	2-3/4	1.75	B1	7.25	220	90
11	8	6.00	C	10.00	0	90
12	2-3/4	1.75	C	9.00	270	35
13	2-3/4	1.75	C	6.50	0	23
14	2-3/4	1.75	C	9.00	55	25
15	4-1/2	2.50	C	13.75	90	110
16	2-3/4	1.75	C	7.75	90	40
17 <sup>1</sup>	14	12.00	B	8.00	0	180
18	2-3/4	1.75	B2	7.25	220	90

Focal Points (x,y,z)

A	-2.00, 0.00, 8.00	B1	0.00, 0.00, 6.00
B	0.00, 0.00, 8.00	B2	0.00, 0.00, 10.00
C	2.00, 0.00, 8.00		(Note: B1 & B2 not shown)

<sup>1</sup> Also available with 14-5/8" O.D. Female Wire Seal Flange.

DESCRIPTION	WT LB	REFERENCE	PART NUMBER
SURFACE SCIENCE ANALYSIS CHAMBER WITH 14-5/8" FEMALE WIRE SEAL FLANGE ON PORT 17	80	SSAC-12	200000
SURFACE SCIENCE ANALYSIS CHAMBER WITH 14" DEL-SEAL FLANGE ON PORT 17	80	SSAC-12D	200001

