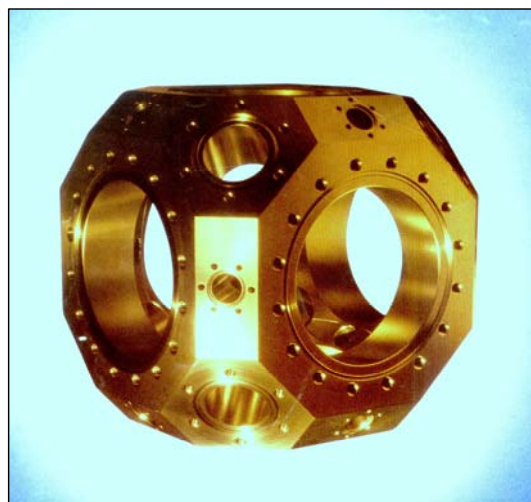


UHV COMPONENTS

INTEGRATED UHV FITTINGS
COMPACT UHV CHAMBERS
HIGH PRECISION GEOMETRY
HIGH COMPLEX DESIGN
LOW OUTGASSING MATERIAL
REDUCED ENGOMBREMENT
HIGH RIGIDITY
BAKEABLE TO 450°C



TIG welding has been the standard method of manufacturing vacuum chambers and components for years. These parts are then bolted together using metallic seals to reach the best vacuum. This way produces vacuum structures often large and bulky.

An other method to produce vacuum systems and reduce the number of components is to machine multiple sealing surface onto single pieces of material.

The two methods have been compared: cost saving is roughly separated in the 400mm sizes: below 400mm, the larger is the number of flanges, the more convenient is the machining onto a single piece of metal.

MATERIALS

To cover both the standard and the high performance requirements of the UHV utilizers we use two stainless steel grades as standard in our product range : AISI 304L and AISI 316LN ESR. These selected steels are carefully controlled chemically to ensure that chromium depletion of the affected zone which can lead to inter-granular corrosion is avoided after welding. Specialised forging process are adopted to improve the material microstructure to minimise any porosity and associate leakage problems. The 316LN steel is Electoslag Refined (ESR) to eliminate microinclusions and grain inhomogeneity resulting in an excellent uniform structure.

MATERIAL SPECIFICATIONS

Material	304L Stainless Steel	316LN ESR Stainless Steel
Micro-cleanliness	Typically 1.5 of ASTM E45	Typically 1 of ASTM E45
Magnetic Permeability	Typically <1.1	Typically <1.003
Hardness (Brinnell)	Typically 160	Typically 180
Temperature Range	-190°C to 450°C	-190°C to 450°C
Pressure Range	2 bar to 10 ⁻¹¹ mbar	2 bar to 10 ⁻¹² mbar

Microferrite is practically exempt and the magnetic permeability is very low (<1.003).

The 316LN retains higher hardness at elevated temperature to wear repeated bakeouts for degassing procedures.

TREATMENTS

The residual atmosphere in an UHV systems is composed by hydrogen (98%) coming from the bulk of the different components. To reduce this outgassing in stainless steel parts a vacuum firing at 950°C is suitable to achieve a better ultimate vacuum.

For special applications a getter surface coating is possible : the inside surface of the wall of the chamber, after activation, becomes a pumping surface both for the residual atmosphere and for the outgassing of the bulk. With such treatment ultimate vacuum better then 10⁻¹³mbar had been performed.

All the welded pieces are heat-treated to stress relieve the material and restore the original properties of the steel.

Every stage of production is carefully quality controlled with full traceability and each piece is code stamped with a cast number.

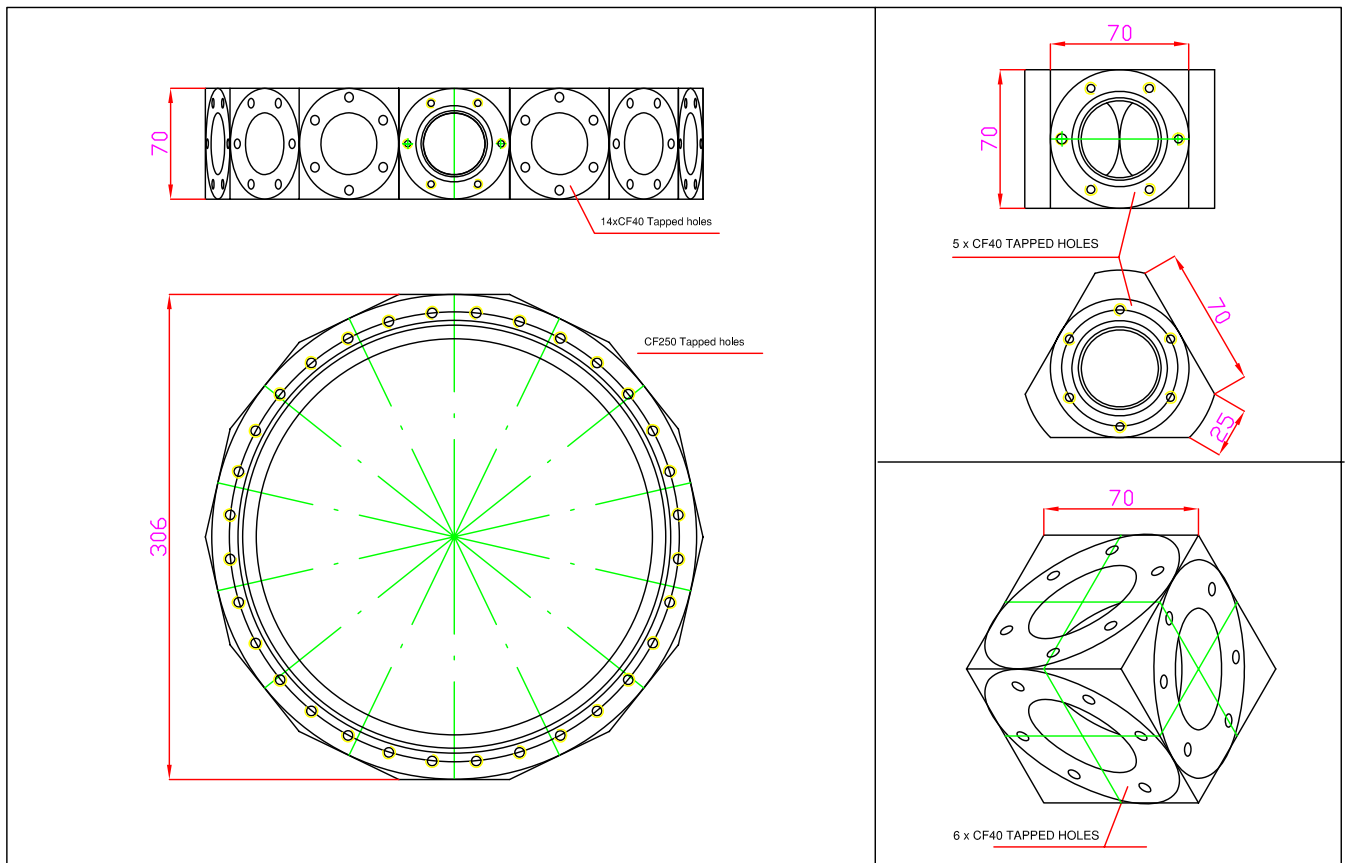
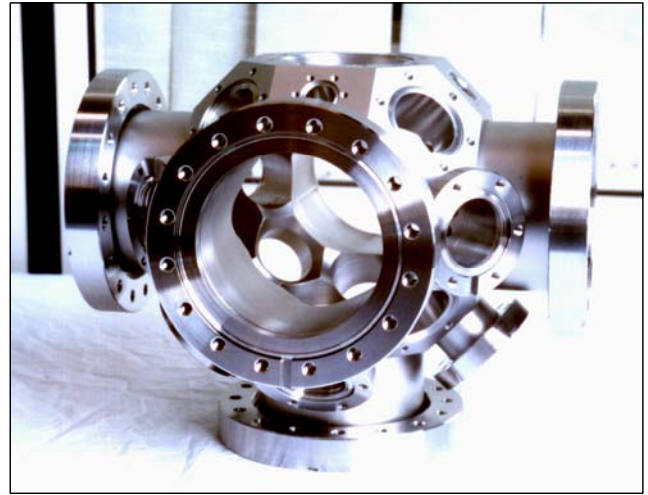
Each piece is processed through a chemical and aqueous cleaning procedure and individually sealed and packed so that the product is in perfect condition for use in UHV.

MULTIFACE CF FITTINGS

UHV chambers and fitting are thought by Physicists following their needs, we would like suggest some lines to start.

Polygonal chambers.

Starting from three faces you can design a polygonal section chamber. For convenience the top and the bottom flanges should be standard. For diameters over 250mm I.D. to 1300mm I.D. we use 2mm diam copper seals. Some examples of polygonal chambers are shown below.



Lubrication

With tapped holes the use of lubricated studs is assumed.

Lubrication is essential. Silver-plating on studs is the preferred clean, bakeable method of insuring adequate lubrication. The use of bisulfide of molibdenum or tungsten is also satisfactory. Screws lubrication is a critical issue with all CF flange, but is especially important with multiface CF fittings because of the large number of tapped holes.

In any case used bolts, studs and nuts should be discarded to evitate the risk of galling.

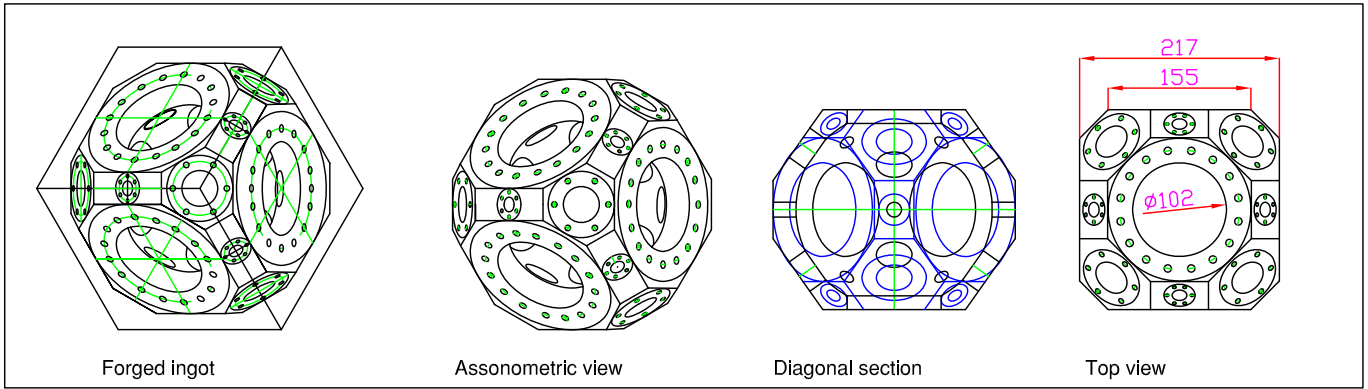
Polyhedric chambers

Using CF flange surface as a polygon is possible to realise polyhedric chamber from a suitable forged block.

The most economical way to manufacture these chambers is the simmetry. For special pourpose we can discuss special production.

In the next page an optical chamber is shown: the number of CF flanges are:

- 12 x CF16
- 8 x CF40
- 6 x CF100



The polyhedric chambers are normally very compact. This compactness often permits improved instrument performance, high stiffness, space saving, reduction of pumping and

almost always cheaper total cost. To support the chamber is also very easy machining some supplementary holes in the bulk to have precise references.

VACUUM DISTRIBUTED CHANNEL (VDC)

When the space is an essential question, to pump through a flange thickness should be a solution. In the accelerators where the gaps between magnets are narrow, in growth chamber where the strokes of manipulators are critical, in growth chambers where the space is scanty, these vacuum distributed channels are suitable. VDC were designed to have the conductance optimised to the port flange. The inside pumping channels are polished and the edges are rounded to facilitate the gas flux.

VDC can be mounted in any attitude.

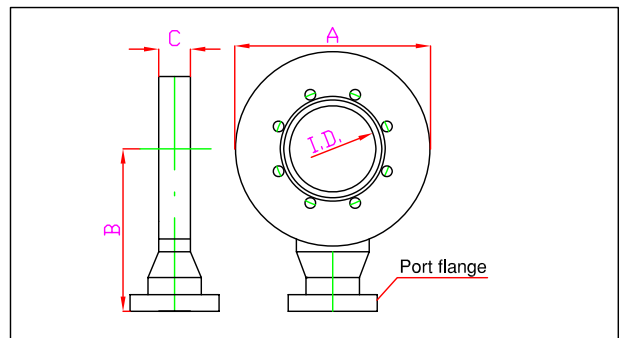
Bake out <math><450^{\circ}\text{C}</math>.

VDC are manufactured in two types of stainless steel: AISI 316L and AISI 316LN. The standard line is from CF16 to CF200 flange.

On request, special models can be produced.

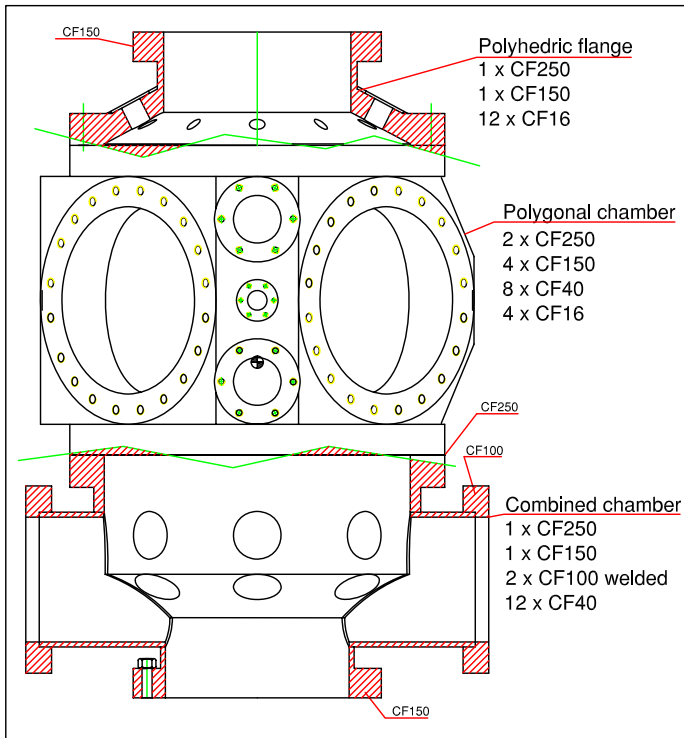


CF64 Vacuum distributed channel with CF40 port



Model	Flange	I.D.	Port flange	Conductance l/sec	A	B	C	AISI316L		AISI316LN	
								CODE	EURO	CODE	EURO
VDC-16	CF16	16	CF16	20	60	50	13	ZZ 102	180	ZZ 109	300
VDC-40	CF40	39	CF40	86	105	90	20	ZZ 103	200	ZZ 110	400
VDC-64	CF64	68	CF40	86	153	128	25	ZZ 104	240	ZZ 111	490
VDC-100	CF100	102	CF40	86	193	160	27	ZZ 105	280	ZZ 112	600
VDC-150	CF150	153	CF64	160	250	210	30	ZZ 106	350	ZZ 113	700
VDC200	CF200	202	CF64	160	310	260	30	ZZ 107	390	ZZ 114	770

COMBINED UHV FITTINGS



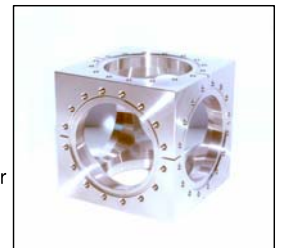
Molecular Beam Epitaxy Chamber

When forged structure is too complex, a mixed technics (welding and block machining) is chosen. For example when it is necessary to connect a slide valve with tapped holes, a flange with neck with holes passing through is necessary. This solution is less expensive than using an adapting nipple and space saving is evident.

The UHV treatment during the production gets the same performances of full forged components.

In this way we have realized UHV systems up to 1300mm diam.

Do not hesitate to contact our engineers to find out the most convenient solution for your UHV systems.



Cubic Chamber

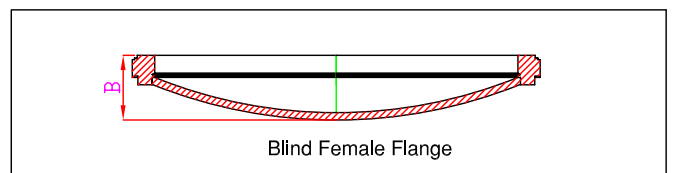
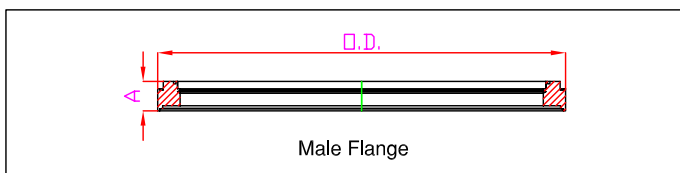
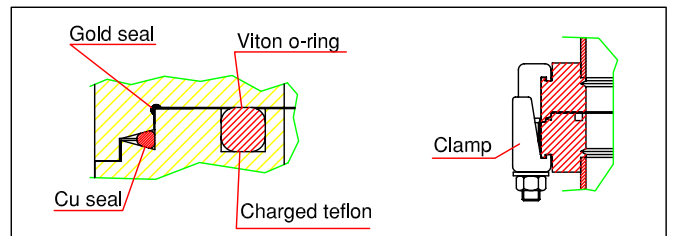
HIGH SIZE FLANGES

CF flanges over 250mm I.D. are not standard till now and the seals are very expensive.

Tecna has adopted a new type of flange with different sealing possibility:

- viton o-ring bakeable to 150°C vacuum 1.10⁻⁹mbar
- charged teflon bakeable to 250°C vacuum <1.10⁻¹⁰mbar
- 2mm Cu wire bakeable to 450°C vacuum <1.10⁻¹¹mbar
- 1mm Au wire bakeable to 500°C vacuum <1.10⁻¹²mbar

To make the seal, the gasket is compressed between mating male and female flanges. With metallic seals the flanges can be repeatedly baked at 450°C without loss of vacuum integrity.



Model	Flange O.D.	Tube O.D.	Tube I.D.	Type	A	B	Order Code	Gasket code				Clamp Q.ty	Clamp Code
								Viton o-ring	Charged Teflon	2mm Cu ring	1mm Gold ring		
MIX300	371	300	294	Bored	28	80	AB303	AB323	AB333	AB343	AB353	36	AA103
				Blind			AB313						
MIX300	562	450	444	Bored	36	80	AB305	AB325	AB335	AB345	AB355	40	AA103
				Blind			AB315						
MIX300	689	600	590	Bored	44	100	AB307	AB327	AB337	AB347	AB357	48	AA103
				Blind			AB317						
MIX300	1110	1016	1000	Bored	52	110	AB309	AB329	AB339	AB349	AB359	74	AA103
				Blind			AB319						