

## Pressure Ranges

XHV Extreme ultrahigh vacuum		UHV Ultrahigh vacuum					HV High vacuum					Fine vacuum		Rough vacuum	
< 10 <sup>-11</sup> mbar		10 <sup>-11</sup> to 10 <sup>-7</sup> mbar					10 <sup>-7</sup> to 10 <sup>-3</sup> mbar					10 <sup>-3</sup> to 1 mbar		1 to 10 <sup>3</sup> mbar	
...	10 <sup>-12</sup>	10 <sup>-11</sup>	10 <sup>-10</sup>	10 <sup>-9</sup>	10 <sup>-8</sup>	10 <sup>-7</sup>	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>	10 <sup>-2</sup>	10 <sup>-1</sup>	10 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>
UCV Ultra clean vacuum															
													KF, ISO		
CF, COF, QCF															
													Elastomer gaskets		
Metal gaskets															

## Pressure Units

	Pa	bar	mbar	at	atm
1 Pa = 1 N/m <sup>2</sup>	1	10 <sup>-5</sup>	10 <sup>-2</sup>	1.0197 x 10 <sup>-5</sup>	9.8692 x 10 <sup>-6</sup>
1 bar = 0.1 MPa	10 <sup>5</sup>	1 (= 1000 mbar)	10 <sup>3</sup>	1.0197	0.98692
1 mbar = 10 <sup>2</sup> Pa	10 <sup>2</sup>	10 <sup>-3</sup>	1	1.0197 x 10 <sup>-3</sup>	0.98692 x 10 <sup>-3</sup>
1 at = 1 kp/cm <sup>2</sup>	98066.5	~0.981	980.68	1	0.96784
1 atm = 760 Torr	101325	1.013	1013.25	1.03323	1
1 Torr = 1 mm Hg	133.322	~0.00133	1.333	0.00136	1.3158 x 10 <sup>-3</sup>
1 PSI	6894.8	0.06895	68.95	0.0703	0.06804

## Units of Length

	mm	inch	ft
mm	1	0.0394	0.0033
inch	25.4	1	0.083
ft	304.8	12	1

## General Technical Information

Vacuum components are parts of vacuum systems which are necessary for the installation of vacuum lines e. g. flanges, gaskets, tubes (elbows, tees, crosses etc.), chambers, electrical and optical feedthroughs plus moving elements. The application in vacuum technology places great demands both on the material selection and on the manufacturing of these components.

There are connection standards for various fields of application which are based on different flange systems. Therefore, VACOM's vacuum components are available in all common standards. Many components are on-hand for use in cleanrooms. These vacuum components are characterized by low particle contamination and generation. For the application in UHV, XHV and UCV, low outgassing rates are required and verified.

Furthermore, we are specialized to manufacture vacuum components according to your requirements.

### Flange systems: KF, ISO, CF, QCF

There are four flange systems which are primarily used in vacuum technology. Which flange system fits best depends on the respective application. Please find further technical details at the beginning of the particular catalog chapter. VACOM flanges are available in the following standards:

Flange system	Small flange	Clamping flange	ConFlat® compatible	Quick CF
Short term	KF (ISO-KF)	ISO (ISO-K, ISO-F)	CF	QCF
Nominal diameter [mm]	DN10 to DN50	DN63 to DN630	DN10 to DN400	DN16 to DN100
Standard	DIN 28403/ISO 2861	DIN 28404/ISO1609	ISO 3669	ISO 3669

The designation of the nominal diameter is derived from the inner diameter of the tubes which are used for the component.

## Materials

Only vacuum compatible materials such as stainless steels, ceramics or crystals are processed at VACOM.

Forged corrosion resistant stainless steel 316LN ESR (1.4429-ESU) for demanding vacuum applications is at VACOM available. This material, produced in the electroslag remelting process (ESR/ESU), is characterized by special purity and homogeneity, great hardness and a very low magnetic permeability. The material is produced specifically according to the specifications by VACOM. Considering the technical development, VACOM has narrowed the tolerances regarding composition and purity beyond the standard. This ESR steel is subject to supervision and control by VACOM from the steel melt to the end product.

In addition to stainless steel VACOM processes a number of further vacuum compatible materials:

■ Aluminum ■ Copper ■ Titanium ■ Tantalum ■ Ceramics ■ Nickel-base alloys ■ Glasses ■ Crystals

We will be pleased to advise you concerning the availability of materials, the vacuum compatibility and the processing possibilities.

Characteristics of stainless steel available at VACOM

Material	ASTM	Rp 0.2 (0.2 % elastic limit) [N/mm <sup>2</sup> ]	Hardness [HB]	Max. recommended operating temp. [°C]	Magnetic permeability	Corrosion resistance class
1.4301	304	≥ 190	≤ 215	450	≤ 1.3	II
1.4307	304L	≥ 175	≤ 215	450	≤ 1.3	II
1.4404	316L	≥ 200	≤ 215	500	≤ 1.1	III
1.4429-ESU	316LN-ESR	≥ 280	≤ 250	500	≤ 1.005	III
1.4541	321	≥ 190	≤ 215	450	≤ 1.3	II
1.4571	316Ti	≥ 200	≤ 215	550	≤ 1.3	III

## Sealing materials

Different sealing materials are used in vacuum applications. The selection of the appropriate material depends on the required characteristics, especially with respect to:

- Ultimate pressure
- Temperature
- Outgassing behavior
- Gas permeation
- Chemical resistance
- Radiation resistance

KF and ISO components are usually sealed with O-rings of NBR and FKM. CF and QCF components, however, require flat gasket of oxygen-free copper by default. Other materials may be used for special applications.

## Elastomer gaskets

Material	NBR (nitrile butadiene rubber)	FKM (fluor rubber)	FFKM (perfluoro-rubber)	PTFE (polytetrafluoroethylene)	MVQ (methyl vinyl-silicone-rubber)
Flange system	KF, ISO	KF, ISO, CF, QCF	KF, ISO	KF	KF, ISO
Design	O-ring	O-ring or flat seal	O-ring	edge seal	O-ring
Comment	standard material for KF and ISO	standard material for KF and ISO	application mainly in semiconductor technology	high pressing forces, clamp chains or special clamps	standard material for KF and ISO

## Metal gaskets

Material	Aluminium	Copper (OFHC)
Flange system	KF, ISO, CF	CF, QCF
Design	edge seal, flat gasket	flat gasket

## Essential quality characteristics

- Standard leak test < 10<sup>-9</sup> mbar l/s
- 100 % leak test at welded components
- All components are oil and grease-free cleaned
- Optional special cleaning and cleanroom compatible cleaning and packaging
- Primary packaging ensures the preservation of the assured properties
  - e. g. - scratch protection of seal faces
  - absence of particles and low outgassing