Instrument presentation

Vacuum flanges

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What is Vacuum flange?

A flange is an external or internal ridge, or rim, for strength, or for attachment to another object on the end of a pipe, steam cylinder, etc.

A vacuum flange is an entity at the end of a tube used to connect vacuum chambers, tubing and vacuum pumps to each other. Vacuum flanges are used for scientific and industrial applications and for vacuum maintenance, monitoring, and manipulation from outside a vacuum's chamber.

Different types of Vacuum flanges:

There are several flanges exist with differences in ultimate attainable pressure, size, and ease of attachment. It is shown here below-

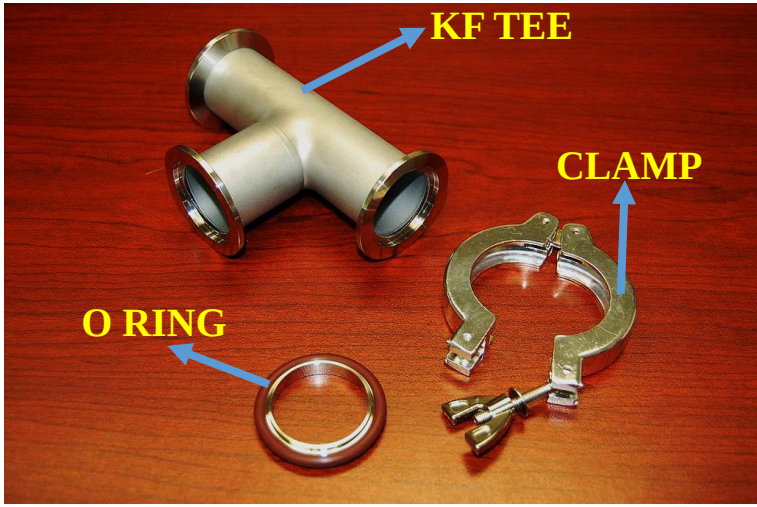
- **KF/QF**
- **CF**
- **ASA**

Here I have discussed only about KF/QF and CF as these two things have been mainly used in our ice-instrument.

KF/QF Vacuum Flange:

- **KF/QF** is known by the names Klein Flange (KF), Quick Flange (QF).
- But nowadays **KF** is mostly used as the KF designation has been adopted by ISO.
- Here this flange joint consist of an O-ring supported by a centering ring, two flanges, and a clamp.
- Systems can be baked to 204° C. However, sustained baking above 150° C may result in deterioration of the O-ring.

Vacuum Range: $\geq 10^{-8}$ Torr / 1.33×10^{-8} mbar

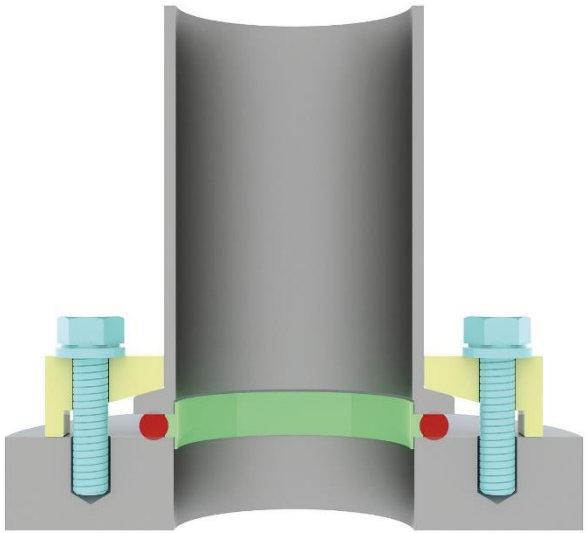


Principle of KF/QF Vacuum Flange:

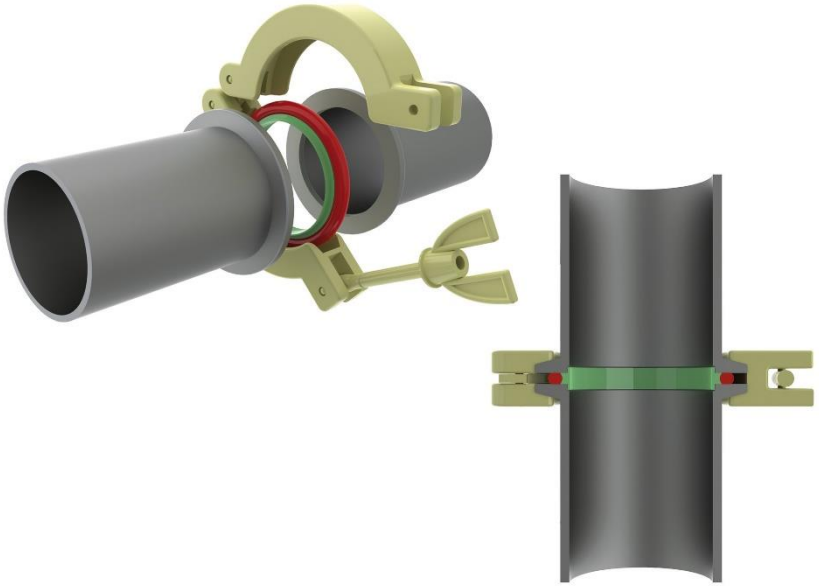
- A KF connection consists of two symmetrical flanges and one O-ring seal, which is positioned and supported with an internal or external centering ring.

- The necessary pressing force for the sealing is created by a clamping ring, which is placed over the conical tightening area and is tightened with a wing screw. This allows for a fast, efficient assembly and disassembly without any tools.

- The flanges can be aligned around its main axis in any direction.



KF flange mounted on base plate with centering ring and claw clamps



KF connection with centering ring and clamping ring

Applications of KF Vacuum flange:

- It is used for roughing lines.
- KF is used for vacuum systems requiring frequent disassembly for cleaning or modification.
- It is also used in the experimental systems found in research laboratories.

Various parts of KF vacuum Flange

CF or Conflat Vacuum Flange:

- CF or Conflat Flange is another type of flange used in vacuum technology.
- Conflat flanges use a copper gasket and knife-edge flange to achieve an ultrahigh vacuum seal.
- CF flanges are available in rotatable and non-rotatable models.
- The CF flange joint consists of an OFHC (oxygen-free high-conductivity) copper gasket compressed between two flanges secured with stainless steel fasteners.
- Seal results from the deformation of the Cu gasket caused by its compression between the knife edges of the flanges.
- Systems with copper gaskets may be baked 500° C but sustained baking above 250° C may result in deterioration of the gasket.

Vacuum Range: $\geq 10^{-12}$ Torr / 1.33×10^{-12} mbar for Cu gasket.

Applications of CF Vacuum flange:

- It is used for Analytical instrumentation, such as electron microscopes, mass spectrometers, and Auger electron spectrometers.

- It is used for Materials creation or processing.

- It is used for High energy physics.

A CF vacuum flange with a Cu gasket

Flange Sizes:

In North America, flange sizes are given by flange outer diameter in inches, while in Europe and Asia, sizes are given by tube inner diameter in millimeters. Despite the different naming conventions, the actual flanges are the same.

Here the different sizes of various flanges have been shown in the table.

European Size	American Size (Inches)
DN10	1
DN16	1⅓ ("mini")
DN25	2⅛
DN40 or 35	2¾
DN50	3⅜
DN63	4½
DN75	4⅝
DN100	6
DN125	6¾
DN160 or150	8
DN200	10
DN250	12

Thank You