Flange Insulation Sets

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Flange Insulation Sets

Insulation sets are used to limit corrosion in pipeline systems. Where dissimilar metals are present, the sets remove the possibility of the system acting as a galvanic cell and reduce the risk of galvanic corrosion of the pipe work. Insulation sets are also used to isolate cathodically protected piping systems where they prevent the flow of electro-static charge.

Each flange insulation set comprises one central flat or oval section gasket, one insulation, sleeve, two insulating and two plated steel washers per bolt. The sets are individually packed and clearly labelled with the flange rating, size, type and material combination.

**Key function of Insulating gaskets:**

- Used to electrically isolate sections of pipe work
- Designed to minimise electro-chemical erosion
- Comprising materials with high dielectric strength
- Manufactured to suit flanged joints to ASME, BS, DIN and customer designs

**Typical Flange Insulation Set components**

**Standard Sleeve & Washer Materials in the Set are:**

- Mylar Sleeves
- G10 Insulation Washers
- Stainless Steel Metal Washers
- Others on request
Flange Insulation Sets

**Type E – Full Face Gasket**

Suitable for flat and raised face flanges. This style minimises the ingress of conductive foreign matter and reduces the risk of bridging. Typically used on oil and hydrocarbons where flange insulation is a requirement. Manufactured from materials with high dielectric strength to ensure minimum electrical contact between flanges.

**Type F – Ring Gasket**

Utilises a RF gasket which centrally locates within the bolts. Typically used on oil and hydrocarbons where flange insulation is a requirement. Manufactured from materials with high dielectric strength to ensure minimum electrical contact between flanges.

**Type D – Ring Joint Gasket**

Type D insulation gaskets use the same basic materials as the standard insulation sets but are designed for RTJ flanges. The gasket is manufactured from reinforced phenolic resin. Type D gaskets have an oval cross-section and are suitable for low pressure up to class 600# rating applications. Care must be taken during installation of this gasket so that it is not overstressed during bolt up.
The choice of insulation gasket for a given duty is dependent on the application conditions under which they will be operating. In addition to the temperature limitations, selection of the gasket must take into account the intended flange pressure class. Table below presents Klinger recommendations for safe sealing of ANSI flanges requiring insulating properties. The recommendations are based on both product knowledge and feedback from the field. For applications with specific service conditions, please refer to Klinger for a recommendation.

Gasket recommendations for ANSI B16.5 Raised Face Flange Class
✓ -recommended ; × -not recommended

<table>
<thead>
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<th>Gasket</th>
<th>150</th>
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<td>✓</td>
<td>✓</td>
<td>×</td>
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<td>×</td>
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<tr>
<td>VCS-High Pressure Spring Energised PTFE</td>
<td>✓</td>
<td>✓</td>
<td>✓*</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*subject to a technical evaluation – please contact Klinger

The above table is applicable to Raised Face Flanges. For ANSI B16.5 & API 6A Ring Joint Flanges (RTJ), insulating oval shape Type D gaskets are available but are not recommended due to their susceptibility to crack under load especially in high pressure applications. Klinger would recommend to use other styles as per above table for high pressure (600# and above) RTJ flanges.

Low Temperature Duty
Some applications require the use of insulating gaskets at low temperatures. In this case, care must be taken with materials that contain an elastomeric component since elastomers will harden as they pass through the glass transition temperature losing their resilience. The temperature at which this occurs is dependent on the elastomer, eg. for Neoprene faced Phenolic Gaskets, the transition occurs at around -40 Deg C and should be avoided below this temperature. For low temperature applications, at lower pressures Klinger recommend either Topchem 2003 or Topchem 2000, and for higher pressure applications, a VCS -Spring Energised PTFE (Teflon) seal is recommended.

Assembly of Insulating Gaskets
Assembly of insulating gaskets requires the same good fitting practice used to assemble standard gaskets. When installing a gasket, the correct installation procedures should be followed, and the flange surface finish (Ra) should be between 3.2 and 6.3 micro meters.
However it is important to note that for Neoprene faced Phenolic (Neophenolic) gaskets the following guidelines apply:
1. The bolt stress must be limited to 30,000 psi
2. Bolts should be tightened with a torque wrench only. Hydraulic tensioning is not recommended for these gaskets.
VCS Flange Insulation Set

The VCS gasket is a high reliability flange gasket designed for electrical insulation & sealing in very critical service. The gasket comprises a composite seal retainer material bonded to a high integrity metal core. Spring energized radial face seal offers excellent sealability at low loads.

- The VCS gasket is a high reliability gasket used for both insulating and general sealing purposes in very critical services. The gasket has a proven track record of integrity in aggressive sealing situations. The VCS is suitable in all services up to and including ANSI 2500# and API 15,000# classes.
- Each VCS gasket can be supplied independently or part of a flange insulation set that comprises one central insulating gasket, one insulation sleeve per bolt and two insulating and two plated steel washers per bolt.

General Properties
- Flange insulation in conjunction with cathodic protection
- Mitigates galvanic corrosion in dissimilar metal flange joints
- Mating mismatched ring-joint to raised-face flanges (VCS will seal in ring joint, raised-face and flat face/slip-on flanges)
- Withstands corrosive environments including high CO₂, H₂S and produced water
- Matched bore construction protects flange faces from media-induced corrosion and flow-induced erosion
- Pressure energised seal reduces the flange makeup stress
- Easy installation and removal
- Reusable seal retainer and seals
- Suitable for all ANSI and API rated flanges
- High strength laminate material resists failure due to over compression

Materials
- Metallic Core: 316 Stainless Steel
- (Duplex & Inconel available)
- Gasket Insulating Material: G-10 Glass Reinforced Epoxy (GRE) as standard (G-11 available)
- Seal Material: Spring-energized Teflon as standard
- (Viton available)
- Insulating Sleeve Material: GRE as standard
- (Mylar available)
- Insulating Washers Material GRE (standard)
- Steel Washer Material Zinc Plated Steel as standard (stainless steel available).

VCS Design
The unique and patented design of VCS gaskets incorporates high-strength, glass-reinforced epoxy laminate bonded to a stainless steel core. This provides the strength of a traditional metallic gasket while maintaining complete electrical insulation between the flange faces. Seal grooves are machined through the laminate insulating material and into the stainless steel core. This provides a strong base for the seal to sit into and breaks the potential leak/weep path that is inherent in glass laminate materials. Spring-energised Teflon internal face seals are installed in the dovetail-shaped seal grooves to provide the trademark pressure-activated sealing performance distinguishes the VCS from all other high pressure insulating gaskets. (Viton o-rings also available if specified)

Electrical Insulation
In addition to its superior sealing characteristics, the VCS distinguishes itself by providing electrical flange insulation in a high-strength gasket. The VCS significantly decreases electrical potential between two flange faces by providing a non-conducting, non-metallic interface. This effectively eliminates corrosion resulting from dissimilar metals contact or ground current induced corrosion of metal piping components. When used with insulating sleeves and washers, the VCS is particularly effective in breaking electrical conductivity in piping systems with cathodic protection systems.

What makes VCS unique among insulating gaskets is its strength and durability. Traditionally insulating gaskets have been fragile and prone to failure because they are often made from brittle non-metallic materials (e.g. phenolic resin) and are not capable of withstanding imperfect installation practices. The VCS’s steel core and patented construction enables the gasket to withstand much more system pressure, pressure cycling, bending moments, over torquing and overall abuse than conventional insulating gaskets with zero risk of product failure.

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Sealing Characteristics
The primary job that any gasket must perform is to seal the pressure differential between the internal and external environment. The VCS performs this task through the use of its spring-energised, pressure-activated sealing elements. At low system pressure, the spring acts to deflect the lips of the seal, thus enabling low pressure sealing. As the pressure increases and comes in direct contact with the sealing element, the system pressure energises the lips of the seal against the flange face and stainless steel core. The greater the pressure, the more sealing force is applied against the flanges. This high pressure sealing is accomplished while maintaining complete electrical flange insulation. This high makes the VCS the gasket to use when failure cannot be tolerated.

The fact that the VCS uses pressure-activated sealing elements which are located inboard of the ring groove on RTJ flanged has the additional benefits of allowing the VCS to seal mismatched RTJ to raised face or flat faced flanges. This feature is very useful when replacing valves using stock inventory that may have a different flange face than the mating flanges.

VCS Flange Insulation Kit Components
The VCS gasket is a high reliability flange kit designed for electrical insulation & sealing in very critical service. The gasket comprises a composite seal retainer material bonded to a high integrity metal core. Spring energized radial face seal offers excellent sealability at low loads.

Insulation Kit Contents:

**Insulating facing:** G-10 glass reinforced epoxy resin

**Seal:** Spring energised PTFE (Viton also available)

**Core:** Stainless steel 316

**Thickness:** 1/2” to 5” 6.2mm, 6” to 72” 7.8mm, API 10,000 6.22mm.

**Insulating Washers:** G-10 glass reinforced epoxy resin (other materials are available) 3.2mm thickness 2 washers per bolt

**Steel Washers:** Zinc-plated steel, 3.2mm thickness (stainless steel washers also available) 2 washers per bolt

**Insulating Sleeves:** G-10 glass reinforced epoxy resin, wall thickness 0.75mm (Mylar and Nomex also available) 1 insulating sleeve per bolt

**Insulation Kit Contents:**

**Material type:** G-10 Glass-reinforced epoxy resin G-11 High temperature resin

**Compressive strength:** 65,000psi 50,000psi

**Dielectric strength:** 29.5-31.5 kV/mm 19.7 kV/mm

**Maximum temperature:** 150°C 200°C

**Water absorption:** 0.05% 0.085%

**Flexural strength:** 65,000psi 57,700psi

**Tensile strength:** 50,000psi 41,000psi

**Temperature range:** -130°C to 150°C (-46°C to 200°C) (limited by gasket material) (limited by gasket material)

**Seal:** Spring-energised PTFE (Viton rubber also available)
The VCFS insulation gasket is a development of the VCS design to make a fire-safe insulation set. The VCFS includes an additional coated metallic seal to retain the internal pressure along with the spring energised PTFE seal used in the VCS. VCFS uses coated metallic insulating washers to maintain compressive strength after being exposed to fire. The development of the high-strength coated steel washers removes the need for the use of an additional insulating washer.

*VCFS is fire safe tested to API 6FB.

The VCFS is also offered in a High Temperature design that utilizes G-11 instead of G-10. This allows the seal to service higher operating temperatures up to 392°F (200°C).

**Core Material : G10 (Standard)**

65,000psi Compressive Strength gives the seal the ability to withstand the bolting and flange stresses.

750-800 VPM (29.5-31.5 kv/mm) Dielectric Strength shows that the kit has the capacity to meet the isolation demands.

0.05% Water Absorption assures that the product will not suffer from the effects of ingress from media.

50,000psi Tensile Strength gives the user the confidence that the seal has the ability to withstand the internal pressures.
PGE Flange Insulation Set

The PGE gasket is designed for electrical flange isolation & general sealing applications offering significant advantages over neoprene-faced phenolic resin gaskets. The gasket comprises overlapping and offset seal grooves are machined into the high strength G10 laminate. Spring energized Teflon or Viton o-ring seal offers excellent sealability at low loads. The PGE gasket is a low pressure (Class 150, 300 & 600) gasket used for both isolating and general sealing purposes. The gasket has a proven track record of long lasting sealing solutions. The PGE is available in all full face (Type E) and ring style (Type F).

General Properties

- High reliability, low pressure sealing system.
- Provides excellent electrical insulation for cathodic protection systems.
- Overlapping seals eliminate potential leak/weep path in the laminate material.
- Can be suitable for most all hydrocarbons, depending on sealing element selected.
- Mitigates galvanic corrosion in dissimilar metal flanges.
- Protects flange faces from media-induced corrosion and flow-induced erosion.
- Decrease flange/bolt makeup stress.
- Easy installation and removal.
- Reusable seal retainer and seals.
- Suitable for all ANSI and API rated flanges

Materials

Gasket Insulating Material & Washers: G-10 Glass Reinforced Epoxy (GRE) as standard (G-11 high-temperature grade also available).
Spring energized Teflon or O-Ring pressure activated seal: Teflon (spring energized) as standard (Viton also available).
Insulation sleeves: GRE (standard) or Nomex for high temperature service.
**Flange Insulation Sets**

**PGE Flange Gasket Advantages & Benefits**

- Superior sealing for low pressure (ANSI class 150, 300 and 600) service.
- Pressure activated seals provide high confidence sealing.
- High strength laminate material resists failure due to excess compression.
- Overlapping seal grooves eliminate potential leak/weep path in laminate material and provide stronger structural integrity versus 'opposing seal' designs.
- Reinforced laminate retainer material provides excellent insulation for cathodic protection systems.
- Gasket is sized to the bore to protect flange faces from media-induced corrosion and flow induced erosion.
- Mitigates galvanic corrosion in dissimilar metal flanges.
- Spring energized Teflon seal provides radial load and encapsulation in the seal groove which eliminates cold flow. This seal truly distinguishes the PGE from all other systems.
- Also available with a variety of elastomeric seals.
- Easy installation, make-up and removal:
  - Flanges do not have to be spread as with ring gaskets. The PGE easily slips in place.
  - Sealing system results in low required bolt loads. Less make-up force required resulting in less flange and bolt stress.
  - Gasket is self-aligning and centering, quick to install, no special tools are required.
- Maintenance-free, corrosion resistant design.

**Insulation Kit Contents:**

- **Insulating facing:** G-10 glass reinforced epoxy resin
- **Seal:** Spring energised Viton (PTFE also available)
- **Thickness:** 3.2mm.
- **Insulating Washers:** G-10 glass reinforced epoxy resin (other materials are available)
  - 3.2mm thickness
  - 2 washers per bolt
- **Steel Washers:** Zinc-plated steel,
  - 3.2mm thickness (stainless steel washers also available)
  - 2 washers per bolt
- **Insulating Sleeves:** G-10 glass reinforced epoxy resin, wall thickness 0.75mm
  - (Mylar and Nomex also available)
  - 1 insulating sleeve per bolt

**Core Materials:**

- **Material type:**
  - G-10 Glass-reinforced epoxy resin
  - G-11 High temperature resin
- **Compressive strength:**
  - 65,000 psi
  - 50,000 psi
- **Dielectric strength:**
  - 29.5-31.5 kV/mm
  - 19.7 kV/mm
- **Maximum temperature:**
  - 150°C
  - 200°C
- **Water absorption:**
  - 0.05%
  - 0.085%
- **Flexural strength:**
  - 65,000 psi
  - 57,700 psi
- **Tensile strength:**
  - 50,000 psi
  - 41,000 psi
- **Temperature range:**
  - -130°C to 150°C
  - -46°C to 200°C
  - (limited by gasket material)
  - (limited by gasket material)
- **Seal:** Spring-energised PTFE (Viton rubber also available)
# Flange Insulation Sets

## Properties:

<table>
<thead>
<tr>
<th>Component</th>
<th>Dielectric Strength (Kv/mm)</th>
<th>Water Absorption (%)</th>
<th>Maximum Temperature (°C)</th>
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<tbody>
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<td>1.6</td>
<td>107</td>
</tr>
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Note: The above values are based upon limited test data. Whilst every effort is made to ensure the information in this data sheet is accurate, it must be stressed that it is the users responsibility to ensure suitability for the intended end use. The values quoted above may be subject to modification at a later date.

## Flange Protection

It is recommended that a Klinger Flange Band Protector is also used to cover the outside of the flange to prevent the ingress of conductive matter.

Klinger Limited guarantees the quality, materials and workmanship of all its products either manufactured or distributed, but cannot be held responsible for the manner in which they are used, fitted or stored.

**For sales and technical advice, please contact:**

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