

Troubles While Mounting Gaskets and Countermeasures

1. Introduction

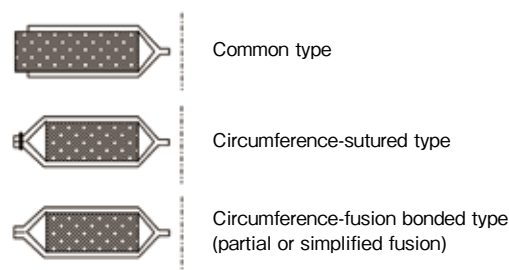
The term *seal* means to prevent a fluid from leaking from inside to outside or from outside to inside in piping, devices, and equipment at various plants and the members for such purposes. To achieve sealing as intended, not only the seals themselves but also the proper selection and application of seals are important. Among sealing-related information, we previously introduced gasket-tightening troubles and countermeasures¹⁾. This report introduces additional troubles that may occur while mounting gaskets and countermeasures.

2. Examples of Mounting Troubles and Countermeasures

2-1) Jacket's fold-over in fluorocarbon resin envelope gaskets

The fluorocarbon resin envelope gaskets, No.N7030 series, have the jacket sideways V- or U-shaped cross section, all of which have openings on the side of outside diameter. Due to such jacket's structure, when a gasket is mounted, especially when it is mounted into a narrow space inside a flange, the gasket's fluorocarbon resin jacket sometimes folds over and is tightened while the jacket is left bent toward the inside. This bent part causes a level difference which becomes a channel for leakage, resulting in poor sealing. Therefore, care should be taken not to cause a fluorocarbon resin jacket to fold over when mounting. Fold-over can be prevented by using the following countermeasure products whose outer sides are adhered and closed. In such products, the whole

circumference does not need to be welded completely; partial side spot welding or simple welding is sufficient.



※) Note: The circumference-sutured type can be used only in gaskets with diameters of $\phi 400$ or narrower. When circumference-sutured types are not applicable, circumference-fusion bonded types can be used.

Figure1 Jackets of fluorocarbon resin envelope gaskets

2-2) Wetting of a felt sheet of a fluorocarbon resin envelope gasket

Some No.N7030-series fluorocarbon resin envelope gaskets use felt sheets as their cores; however, a felt sheet is vulnerable to compression fracture when it is wet. Therefore, they should not be mounted and tightened in rainy weather.

2-3) Scratching on the surface of expanded graphite gaskets

Expanded graphite material has ideal properties as a seal material including excellent chemical resistance and minimal creep relaxation; on the other hand, it has handling disadvantages including vulnerability and fragility. If expanded graphite gaskets are roughly handled during transportation or mounting, it could be easily to develop leakage channels on the surface and the risk of poor sealing.

Therefore, the following products should be stored and transported in the packaged condition to prevent surface scratching: the expanded graphite sheet

gasket; No.VF-35E, the expanded graphite spiral wound gasket; No.6590 series, the serrated metal gasket with expanded graphite sheet; No.6540H, the metallic flat gasket with expanded graphite attached; No.6560, and the metal jacketed gasket with expanded graphite attached; No.N6520. Also, care should be taken when mounting them, such as avoiding scratching the gaskets with sharp objects including nails and tools and not placing them directly on the ground.

2-4) Breakage of large-diameter spiral wound gaskets in pre-utilization conditions including transportation

Small-diameter spiral wound gaskets do not break easily, but large-diameter spiral wound gaskets with or without inner / outer rings have a risk of breakage (so-called loosening) when excessive force is applied during storage, unpacking, transportation, and mounting. Especially, spiral wound gaskets with a diameter of over 2000 mm have higher risks. If the gaskets break, they cannot be used anymore. Therefore, take care not to apply excessive force including twisting and strain to these products.

- Avoid placing a gasket in the standing position; the horizontal position is desirable.
- Do not forcibly dismount fixtures when unpacking (a written unpacking procedure is enclosed with a large-diameter spiral wound gasket; read and follow the dismounting steps).
- The number of staff required for transportation and mounting varies depending on the product's size. The following table shows the ideal number of staff for the operation.

Table1 Approximate number of staff required to handle gaskets of a given size

Gasket's inner diameter	Number of handling staff
1000 ~ 1500 mm	2 or 3
1500 ~ 2000 mm	3 or 4
2000 ~ 3000 mm	4 to 6
3000 ~ 4000 mm	6 to 8

2-5) Misaligned mounting of large-diameter spiral wound gaskets

In a male-female flange and groove flange which have a large roughness clearance, especially in a vertically placed spiral wound gasket, the main body of the gasket is dislocated from the flange face, and the flange face edge sometimes contacts the inside area of seal body. In this case, a spiral wound gasket might protrude beyond the gap, resulting in breakage or leaking.

Therefore, for a spiral wound gasket used in a heat exchanger, the number of the inner metal strip without filler and the number of spot welding applied to each winding are increased; in addition, the gasket's outer diameter is manufactured to ensure over-tolerance. These approaches reduce the risk of protrusion, breakage, and leakage even when the main body is dislocated from the flange face.

When such problems occur despite these approaches, additional metal strip without filler for a 3.2-mm main body can be applied to the outside and inside of the regular 4.5-mm main body. This process can prevent the main body from becoming dislocated from the flange face. Also, for the same purpose, a metallic round bar can be placed inside.

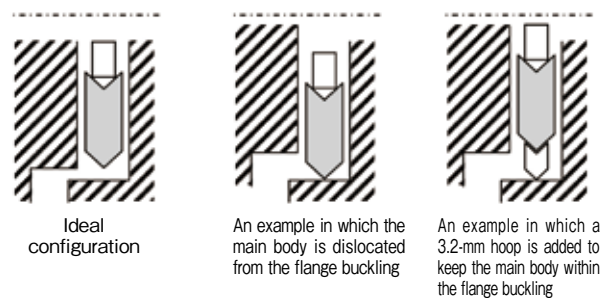


Figure2 Positional relation of spiral wound gaskets to flange face

Other than the above-mentioned approaches, the following mounting method can be used: for tentative holding, a retainer plate and bolts specialized for the retainer plate are used to hold the gasket in an appropriate position; guide bolts are used to appropriately adjust the flange; the gasket is tentatively held with bolts which are used in actual equipment; then, the retainer plate is removed and final tightening is applied to the gasket.

2-6) Mounting a metal jacketed gasket in the wrong direction

When a metal jacketed gasket is used in a male-female flange or groove flange and the metal jacket is mounted in such a direction that the folded part of the metal jacket contacts with the convex part of the flange, the flange's convex edge sometimes breaks the folded part of the metal jacket during tightening. Therefore, a metal jacketed gasket needs to be mounted in such a manner that the folded part becomes the groove bottom. In addition, since the gasket has an inside and an outside, in the case of non-symmetrical branching gaskets, mounting instructions clarifying the direction of the metal folded part must be included on the drawing.

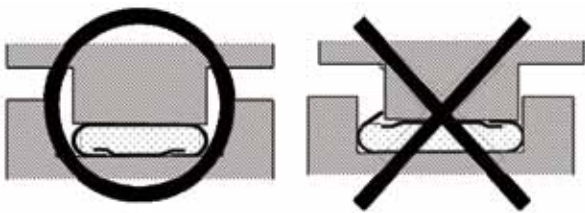


Figure3 Mounting direction of a metal jacketed gasket

2-7) Incomplete contact of a metal ring joint gasket to a flange

When both a flange and a gasket are new, no contact problems would occur; however, when a ring joint gasket is used in a flange that has been used for a long time, incomplete contact between the flange and gasket sometimes results in inadequate sealing.

Therefore, firstly it is necessary to confirm whether the whole circumference of the gasket contacts with the flange (hereafter, contact). To confirm this, pigments including red lead primer are applied to the gasket, the gasket is tightened to approximately 20% of the target torque, and then it is opened to check how the pigments remain on the surfaces. Confirmation can be conducted either on the outside or inside contact (when the pressure is high, the outside is desirable), to check whether contact is present on the whole circumference (line contact is acceptable). After whole-circumference contact is confirmed, the gasket is appropriately tightened, and

then the gasket can be used.

When contact is not confirmed on the whole circumference, grinding is needed. Also, grinding is used to remove scratches and corrosion of a flange's groove. In the grinding process, polishing powders are applied to the gasket and then the gasket is rotated in the flange's groove. Red lead primer or other pigments are used to confirm whether whole-circumference contact is achieved. In the case of an octagonal type, grinding can be performed by using an octagonal gasket itself which is to be mounted. However, in the case of an oval type, grinding using an oval gasket itself reduces the excellent sealing properties attained through line contact, so, an octagonal gasket or tool specialized for grinding is used for the process.

In addition, in the case of gas seal and in case of using hard materials such as stainless steel, the gasket paste should be thinly applied.

When sealing functions are inadequate despite applying gasket paste, the following other countermeasures can be taken: replacing the gasket with a ring joint gasket loaded with a cover made of a soft material including expanded graphite or copper, or arranging a gasket in a special dimension fitted for a flange.

2-8) Common checks for all gaskets

Common checks for all gaskets while mounting are as follows:

- Whether a flange has rust, scratches, or dents which adversely affect the flange's sealing properties
- Whether part of a gasket which was previously used adheres to the flange
- Whether the gasket's surface has scratches or adhesion of foreign substances
(Especially, if a bolt hole has foreign substances inside while an upper bolt is being inserted in a horizontal pipe, the substance can fall off and adhere to a gasket.)
- Whether the gasket's dimensions are correct
(Even when a gasket has the same outside

diameter as the specifications, sometimes, the inner diameter is different from the specifications. In such cases, smaller inner diameters can cause leakage into a channel.)

- Whether the gasket type is correct

3. Conclusion

This report introduced troubles occurring while mounting gaskets and countermeasures against them,

for various types of gasket. Since customers conduct sealing themselves, we hope this report will help them to avoid leakage troubles and achieve sealing as intended.

4. Reference

- 1) Takahiro Fujihara, *VALQUA Technology News* No. 31, pp. 8-11; 2016



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