

Precautions when considering usage and troubleshooting (Flector™)

1. Introduction

Expansion joints, a type of pipe joint, have been widely used in various plants since the past. An expansion joint is a component that absorbs the effects of mutual displacement between structures, and is indispensable for the safe operation of various plants. Therefore, it is crucial to carefully select them, because installing and operating an incorrectly designed product can lead to equipment damage and possibly a major accident. There are metallic and non-metallic expansion joints. The non-metallic expansion joint manufactured by our company is called Flector™.

This report provides a brief product overview of Flector™, precautions to be taken when considering its usage, as well as usage troubles and their countermeasures.

2. Product overview

2-1) No.FLEX (Flex)

This product is a combination of metallic parts (flanges, etc.) and a non-metallic cover (Figure1). The cover part is made of integrally molded rubber and reinforcing fabric, therefore eliminating any joints and providing excellent airtightness, long-term flexibility, and radiation resistance.

Major applications: Ventilation equipment in nuclear power plants.

2-2) No.XP-221

This product is a combination of a cover and metallic parts (flanges, etc.) formed by sewing and bonding organic and inorganic cloth, film, etc. (Figure2). It is used in a wide range of industries due to its high



Figure1 Photograph of external view of No.FLEX



Figure2 Photograph of section view of No.XP-221



Figure3 Photograph of external view of No.PRBT

degree of freedom in design and high versatility. Major applications: Exhaust gas, boiler and dust collector lines in various plants, etc.

2-3) No.PRBT (Rubber boots)

This product is made of the same cover material as No.FLEX, and is installed by wrapping a fan-shaped cover with fasteners sewn on both ends around the pipe penetration area, closing the fasteners, sealing the area with an amorphous sealing material, and then fixing both ends with metallic bands (Figure3). This product is specially designed to seal the gap between the pipe at the pipe penetration area and to absorb pipe displacement.

Major applications: Pipe penetrations in walls and floors of power plants.

have a significant impact on the performance and longevity of the product and therefore caution is required. In this section, the reasons why this is necessary will be explained in detail for each item.

3-1) Nominal dimensions (Mounting dimensions)

It is critical that the mounting dimensions are correct, otherwise the product cannot be installed. There might occur a problem of discrepancy between the drawings and the actual site due to lack of management of revision and abolition. Therefore, it is important to confirm the current status.

3-2) Installation location and fluids

If installed outdoors, it is necessary to implement appropriate measures because the surrounding environment is harsher than indoors, including rain, ultraviolet rays, and temperature differences. As for fluids, the presence or absence of corrosiveness and dust will lead to determining whether a cover configuration or inner cylinder will be necessary, and this is important because it has a significant impact on longevity.

3-3) Design conditions, flow velocity, flow rate, and distance between mounting surfaces

Temperature and pressure are important criteria for cover selection. Optimum design can be achieved by checking both design parameters and operating conditions. Since there exists a correlation between the amount of displacement and the space between the mounting surfaces, there is a possibility that one or the other cannot be addressed depending on the combination.

3-4) Flow direction and mounting position

The cross-section of the design may change depending on the flow direction and mounting position. Since the flow direction will also be printed on the product, it is necessary to provide this information.

3. Precautions when considering usage

Figure4 shows a product specification sheet. The items colored in pink are the minimum necessary information. If there is insufficient or incorrect information, it will

Summer 2021

No.41

Valqua Flector Specifications				Date	
Dealers	Sales Office Name of Contact Person				
Customer Name	Quantity				
Sales channels	Usage Examples		Yes - No /Date of previous use		
(Required for export)			[Previously use o/#]		
Inclusion of venues					
Nominal size	If there are specific dimensions, please indicate them separately on the drawing.				
Terms of Use	Purpose of use				
	Name of facility or equipment				
	Installation point	Installation Location	Indoor / Outdoor		
	Fluid name (Ingredients)	Dust: Yes (amount) · No		Corrosiveness: Yes · No	
	Design conditions	Temperature (°C)	In operation		Temperature (°C)
		Pressure (kPa)			Pressure (kPa)
		Displacement	Axis direction (°)	Axis vertical (°)	Axis level (°)
	Flow rate	Mounting length			
	Flow direction	Horizontal/vertical (top to bottom, bottom to top) Other			
	Materials	Flange (non-contact gas part)	Inner tube (gas contacting part)		
Bolts for mounting		Gasket			
Restricted materials	Other				
Coating	Pretreatment				
	Undercoat				
	Middle coat				
	Top Coat				
	Finish color				
Other matters					

Figure4 Product specification sheet

4. Examples of troubles and their countermeasures

Examples of troubles due to insufficient information, incorrect installation, etc. will be outlined, as mentioned above.

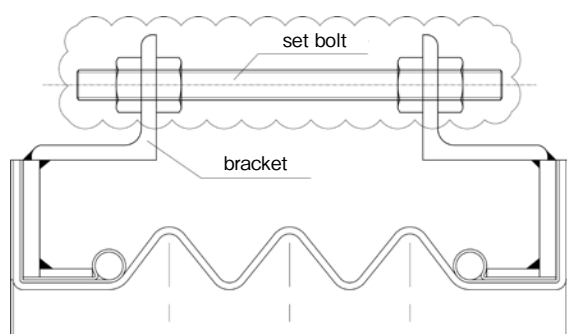


Figure5 Half-sectional view of XP-221 equipped with a set bolt

4-1) Omitting removal of set bolts

A half-sectional view of the XP-221 equipped with a set bolt is shown in Figure5. Set bolts are installed to maintain the structure of the product during transportation and storage. Although instructions are given to remove the set bolts when the product is installed, it may happen that the product is operated without removing them. Since the primary role of expansion joints is to absorb displacement through expansion and contraction, it is pointless to leave the rigid set bolts in place.

Occasionally, mounting is done with the bolts slightly loosened, but the maximum displacement cannot be absorbed with the set bolts in place, so they must be removed after the product is installed.

In principle, we make sure that the removal of the set bolts is clearly indicated on the delivery drawings provided by our company.

4-2) Dust accumulation problem due to insufficient information regarding mounting position

Normally, if there is no specific instruction, the product is designed to be installed parallel to the ground. In this example, the design included an inner cylinder because the fluid was powder. Figure6 shows an image of the

XP-221 with the inner cylinder during shutdown. Since it was installed perpendicular to the ground, powder accumulated between the cover and the inner cylinder during shutdown. This happened because there was no information about the mounting direction and negative pressure. If powder accumulates between the cover and inner cylinder, it will affect the absorption of displacement of the cover, and the powder will scrape against the cover during displacement, leading to damage to the cover.

Countermeasures include filling the gap between the inner cylinder and the cover with heat insulating material or installing both inner cylinders in order to eliminate the gap where fluid can enter.

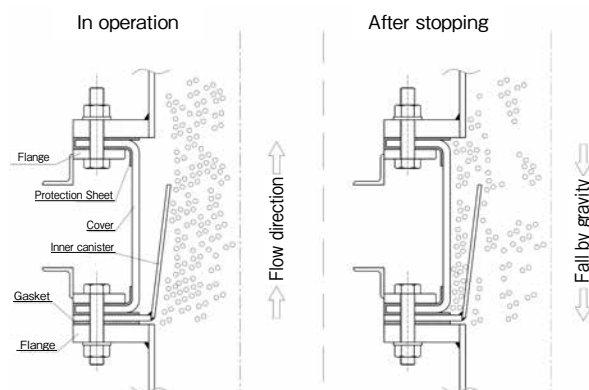


Figure6 Image of the XP-221 with inner cylinder during shutdown

4-3) Installation of thermal insulation on the outside of the product

Although we do not recommend the application of thermal insulation to the product, there have been cases where it was wrapped around the expansion joint as well, in order to maintain thermal efficiency of the equipment. Figure7 shows a half-sectional view of the XP-221 equipped with thermal insulation. When insulation is applied, heat from the fluid is trapped without hardly being dissipated to the outside air. Wrapping insulation around can lead to a loss of elasticity and heat-induced deterioration of the cover, eventually damaging the product. If thermal efficiency is a priority, shortened product lifetime and damage must be considered in advance.

As a countermeasure, considering outside installation, CR tarpaulin, which has good weather resistance, was selected as the most outmost layer, but since its heat resistance is low, in this case, we applied a cover made of heat-resistant inorganic cloth and PTFE film.

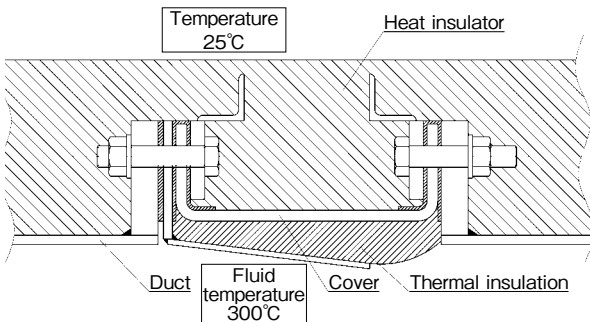


Figure 7 Half-sectional view of XP-221 equipped with thermal insulation

4-4) Malfunction due to insufficient information on current condition of installed equipment

There has been a case where, due to long-term use of the equipment, earthquakes, and aging, there were deviations between the information in the documentation when the equipment was first installed and the current situation, leading to mounting defects and damage after operation. In addition, sometimes the distance between the surfaces becomes longer, or the bolt positions are shifted by several degrees. Since such deviations are not taken into account in the design, there are high chances that the equipment will be damaged after operation even if it can be installed, and thus it is crucial to verify the current conditions.

5. Precautions for usage

As mentioned above, it is possible to design the product if the pink sections in Figure 4 are provided. However, since troubles such as those mentioned above may occur due to insufficient information, it is important that we proactively confirm and obtain detailed information from our customers. Even so, installation problems are more common than other products, and since the installation is done by the customer, particular attention should be paid to the following:

- 1) Set bolts are to be removed after the product is installed.
- 2) If the product is equipped with an inner cylinder, consider the flow direction, and do not reverse the installation.
- 3) Do not wrap with thermal insulation.

6. Conclusion

The Flector™ introduced in this report is a product directly related to the safe and secure operation of a plant, so it is necessary to design the product carefully. In order to do so, sufficient information is indispensable, and we intend to make use of our long years of knowledge to proactively conduct extensive hearings and propose solutions.

※ "Flector" is a trademark of VALQUA, LTD.



Takanori Sakamoto
H&S Sales Div.
Technical Solutions Group
Technical Paper