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HF

ORIGINAL INSTRUCTIONS

INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS FOR

BIBBY TRANSMISSIONS

HF COUPLING

DESIGNED FOR HIGH PERFORMANCE APLICATIONS

GPM	03/04/17	E
GPM	12/01/17	D
SRB	17/06/12	C
SRB	09/08/11	B
JBA	27/06/11	A
AUTHOR	DATE	ISSUE
DOCUMENT NUMBER	**MANUAL HF STD**	**E**

Contents

1 General Notes

Reference to **Bibby** means Bibby Transmissions Ltd. Part of Altra Industrial Motion.

It is essential that a competent person carry out all the instructions contained in the following documents. Should any problems be anticipated or encountered then **Bibby** personnel are available for site visits or, alternatively, repairs and overhauls can be undertaken in our works.

Prior to performing any maintenance works (including inspections) it is essential that the power supply is isolated and that no accidental movement of rotating machinery is possible.

This product is designed for a specific purpose. It is vital that it is not used for any purpose other than that for which it is designed and supplied, and that the limits of its capacities, as detailed here or in any other document, are not exceeded.

No liability will be accepted and any warranty, either expressed or implied, will be null and void should any component of whatever kind, including nuts, bolts and washers, be used in the assembly, or modifications be made to all or part of the product which are not supplied, specified or agreed by **Bibby**.

1.1 Do's

The following instructions should be read and understood prior to starting any assembly or maintenance work on the HF disc coupling.

Prior to fitting any component, care should be taken to ensure that it is clean and free from any dirt. When tightening any bolts or screws, this should be done evenly, cylinder head fashion, to 50% torque then to 100% torque in the same sequence. Where specified it is essential that torque-tightening figures are not exceeded nor should it be allowed for them to be below specification.

Whilst installing and removing the transmission unit[1], the unit should be supported to ensure that the weight is not imposed on one side only.

Record the **Bibby** order number, coupling type and size and any relevant information for future use.

Contact **Bibby** for refurbishment works and spare components.

1.2 Don'ts

Do not use any component that is not supplied or approved by **Bibby** in the assembly of this product.

Do not attempt, where the weight of the unit is excessive, to lift the coupling without the use of lifting equipment.

The inherent balance of these couplings could be disturbed if they are allowed to be knocked either by striking or rolling. Care should be taken when transporting and fitting to avoid such knocks. This is particularly when a coupling is specifically balanced.

[1] Refer to section 1.3, 1 for definition of Transmissions Unit

1.3 Description of Coupling

The HF coupling is of the dry disc type. Flexibility is obtained by the deformation of the disc packs, within defined limits, which are separated by a tubular spacer.

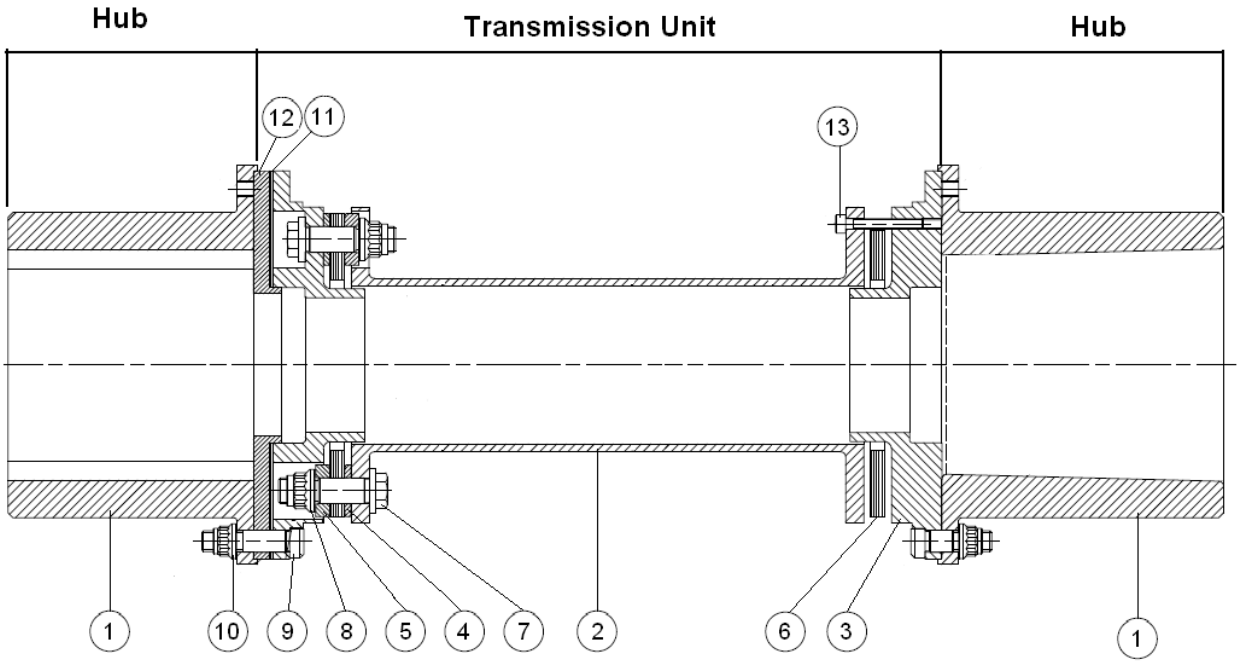

Figure 1

Component Parts

1. Hubs
2. Spacer
3. Adaptor
4. Element Washer
5. Element Washers
6. Element Blades
7. Coupling Bolt
8. Coupling Nuts
9. Attachment Bolts
10. Attachment Nuts
11. Shims (if fitted)
12. Packing Plate (if fitted)
13. Installation Screw

Individual laminations are of regular polygonal profiles, which are assembled into a stack of previously designated thickness, supported by washers on each side. Flexibility is accomplished by connecting through the holes, on a common pitch circle diameter, by means of bolts, alternately, to driving and driven components.

The bolts, washers and associated holes are machined to close limits associated with “fitted bolts”. Due to the need for reasonable ease of assembly, interference fits are undesirable and, consequently, tolerances are such as to allow for a close slide or slight transition fit. To compensate for these clearances and to ensure the best possible concentricity between components, the pitch circle diameter of the bolt holes in the flexible element is made smaller than that of the mating holes in the adjacent components. On assembly, all inherent clearances are, therefore, eliminated.

Coupling bolts are sized such that they are capable of inducing a load equivalent to 4 times the tensile load in the flexible element laminations, between driving and driven bolt, when transmitting the full rated continuous torque of the coupling. This assumes a coefficient of friction between the various components of 0.25 but experience has shown that, due to the high loads induced, minute compressive deformation is sufficient to raise this to about 0.3.

The reason for adopting this principle of using large, highly loaded, bolts is two-fold
a) to prevent interface slip, as already mentioned, and
b) to eliminate any chance of bolt bending due to the overhung radial loading imposed by the flexible element.
Avoiding either slip or bending helps to avoid fretting which occurs when bolts are designed only to drive in shear.

Pairs of coupling washers are used to "sandwich the element packs", one thin, the element washer, and one thick, the overload washer. The overload washers locate in close clearance holes in the coupling adaptor plates. In the unlikely event of a severe overload the overload washers will contact the side of the clearance hole, thus preventing rupture of the elements and ensuring drive is maintained.

In general, the design is identical to a large number of units supplied and fitted for many years by **Bibby**.

1.4 HF Coupling Data.

- Plug-in design allows installation and removal without disturbing the hubs.
- Standard couplings fully compliant with the requirements of API 671/ ISO 10441 incluidng anti-flail feature

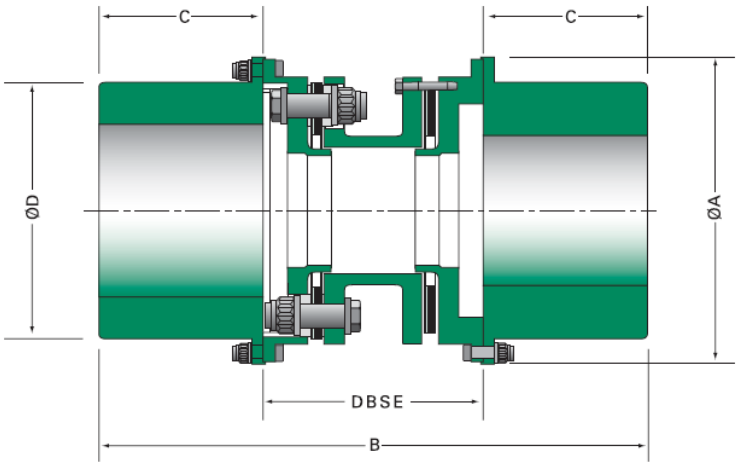

Figure 2

Coupling Size HF	kW/ RPM	Rating kNm	MAX SPEED RPM	COUPLING DIMENSIONS					MAX BORE mm	Coupling Weight (kg)*
				A mm	B mm	C mm	D mm	Min DBSE mm**		
250	0.3	2.5	19500	155	307	85	118	137	79	16.2
450	0.5	4.5	15600	180	364	105	140	154	93	25.4
720	0.8	7.2	13800	209	426	120	162	186	108	39.8
1480	1.5	14.8	11400	247	520	145	194	230	129	67.6
2700	2.8	27.0	11100	282	575	150	228	275	152	102.6
4600	4.8	46.0	10100	312	580	150	256	280	171	121.4
5900	6.2	59.0	9100	335	638	164	282	310	188	155.0
7600	8.0	76.0	8500	369	694	182	304	330	203	202.4
12900	13.5	129.0	6800	447	825	230	366	365	244	345.2
16300	17.1	163.0	6000	458	885	245	378	395	252	396.8
19300	20.2	193.0	5900	494	958	262	408	434	272	499.0
25800	27.0	258.0	5600	540	1056	292	444	472	296	645.2

Table 1

* Coupling weight based on 457.2mm (18") DBSE and maximum bores

** The Inclusion of additional features such as packing rings, shims, and/or electrical insulation etc, will increase the minimum dimensions by the appropriate amount.

2 Operating Conditions

In operation the flexible elements are subjected to both tensile and bending stresses, each having an influence on the allowable magnitude of the other. It is important, therefore, that the operating limits of the various deflections for which the coupling is designed to accommodate, are kept, as far as practicable, within those indicated on the “Allowable Misalignment Curve” shown on the accompanying General Arrangement Drawing.

In practice, the initial alignment of the coupling should be as close as possible and within the alignment limits given in the section 8.0 “Installation Instructions”. This will allow for changes during operation to remain within allowable limits.

Torque and speed should remain within the originally specified conditions.

3 Product identification/marking for non-electrical equipment.

Scope: HF Disc Coupling Assemblies, excluding component spares.

Equipment manufactured or supplied by **Bibby** is marked legibly and indelibly, in a variety of ways, with the following (subject to contractual obligations permitting): -

- Name and telephone number of manufacturer
- Designation of the series or type and size (Part Number)
- Contract/Order Number and if applicable the unique serial number

If applicable, for equipment intended for use in potentially explosive atmospheres, the following will be marked on the equipment in accordance with the ATEX Directive 2014/34/EU and EN 13463-1

- Name and address of manufacturer
- Designation of the series or type and size (Part Number)
- Contract/Order Number and if applicable the unique serial number
- CE Mark.
- Year of construction
- Document of Conformity identification to ATEX Directive

The specific marking of explosion protection  followed by the symbol of the equipment group and category

- The letter ‘G’ (concerning explosive atmospheres caused by gases, vapours or mists); and/or the letter ‘D’ (concerning explosive atmospheres caused by dust)
- The letter ’c’ for constructional safety
- The ambient temperature range when different to –40 C to 40 C

4 Limitations of product use

These products must only be used within the performance criteria detailed on the accompanying general arrangement drawing and within a continuous temperature range of between -40 °C to 280 °C. Care should also be taken to ensure that the permissible operating limits for angular, radial and axial misalignment, again as stated on the accompanying general arrangement drawing, are not exceeded.

5 Product servicing

Although with proper selection and careful installation a long working life and very high degree of operational safety can be expected we would recommend that for ATEX certified couplings the element assembly, coupling bolts and attachment screws are replaced at 50,000 operational hour intervals.

The operation of a damaged coupling in a hazardous area is contrary to ATEX and in doing so becomes an explosive hazard and is wholly the end users responsibility.

6 Maintenance Instructions

General maintenance of the coupling consists of a check of the following during normal machinery maintenance schedules:

6.1.1 Axial, Angular & Parallel misalignment to ensure that these are still within the acceptable limits and that no major movements have occurred.

6.1.2 All bolts to ensure that they are correctly tightened.

6.1.3 Inspect the flexible elements visually for signs of fatigue cracking local to the washer anchoring points or general signs of fretting corrosion. Slight bowing or “S” like distortion is not detrimental to the operation of the unit. Note that any cracking will begin at the outermost edge of the outside blade. This means that this inspection is still possible without disturbing the element bolting. The element packs should be replaced at the earliest opportunity should cracking / damage be detected.

Notes:

API617 references this time period as 3 years for compressor applications.

Self locking nuts used on the bolts which secure the coupling hubs to the transmission unit should alwaysd be inpected before retightening and should be replaced if any sing of damage is detected. In any case a maximum of two tightenings and removals is recommended.

Sets of match weighed replacements nuts from Bibby Transmssions should only be used for replacement.

7 Alignment Instructions

HF will accept substantial amounts of misalignment, the configuration of each individual unit defining the actual acceptable level. The allowable misalignment capacities ofn the coupling are shown graphically on the accompanying general arrrangment drawing.

Please note these curves show the maximum permitted level of misalignment for operation and are NOT intended to define set up limits.

7.1 Alignment Method

Each company has its own method for aligning machinery all of which are well documented in both internal and freely available documents and books. Hence it is not our intention to describe methods for setting machines. Instead, the following gives guidelines for quick checks for alignment suitable after initial installation and for general maintenance checks.

7.2 Axial Alignment

The suggested limits for axial set up distance between the machinery shafts are as shown in Table 2.

Sizes	Tolerance on DBSE
HF0250 - HF2700	± 0.3 mm
HF4600 - HF25800	± 0.25 mm

Table 2

7.3 Parallel / Radial / Angular Alignment;

Having aligned the machinery shafts using one of the established techniques one of the following methods of checking is recommended:

Attach a dial indicator securely to the back of one of the coupling flanges, with the needle in contact with the flange face the other side of the flexible element as near the outside periphery as possible. Rotate the machinery & coupling and locate the minimum reading position. At this position, set the dial reading to zero. Rotate the machinery again and record the maximum reading over 360 degrees. Divide this maximum value by the coupling flange diameter to gain a value in mm/mm, which should be no greater than that shown in the following list. (This should be repeated at both flexible elements in a spacer coupling).

An alternative method is, where possible, to accurately measure the distance across the flanges that sandwich the flexible element (element gap) to obtain a maximum and minimum value. The difference between these two values should be divided by the flange outside diameter to obtain a value in mm/mm, which should be no greater than that shown in the following list. (This should be repeated at both flexible elements in a spacer coupling).

Sizes	Tolerance Element Gap
HF0250 - HF2700	± 0.003 mm/mm
HF4600 - HF25800	± 0.002 mm/mm

Table 3

NOTE:. IF IN DOUBT, CONTACT BIBBY TRANSMISSIONS LTD.

7.4 Installation and Operating Misalignment Limits

The allowable running misalignment limits are shown graphically on the accompanying general arrangement drawing, e.g.

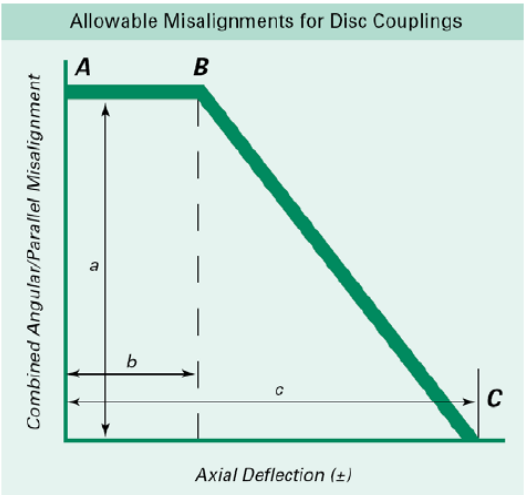

Figure 1

The coupling is designed to run within this envelope (below the allowable misalignment curve) and providing these limits are not exceeded at any time, the coupling should enjoy a trouble free life.

Definitions of Misalignment

Angular & Radial Misalignments in "Combination"

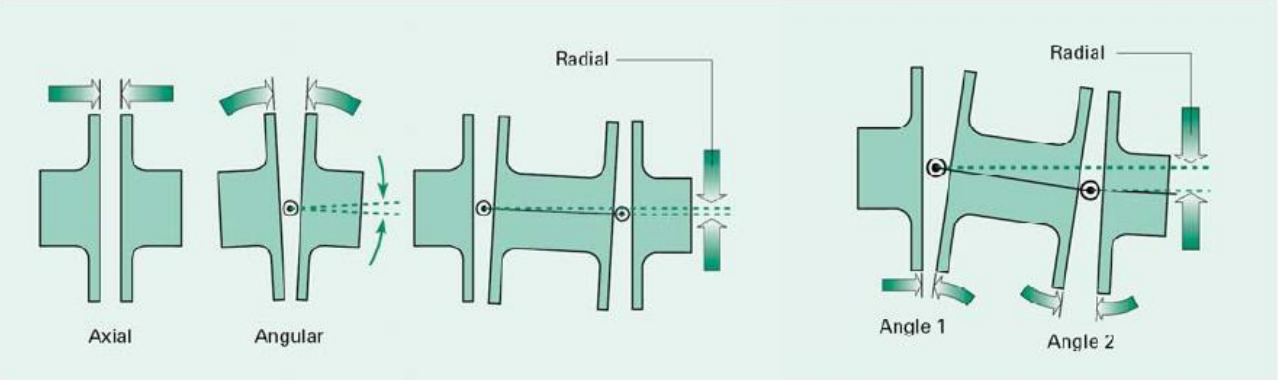

Figure 2

7.5 Limited End Float Couplings

N.B. In the case of special limited end float (LEF) versions the amount of axial movement is physically restricted.

8 Installation Instructions

No liability will be accepted, and any warranty, either expressed or implied, will be null and void should any components of whatsoever kind, including nuts, bolts and washers, be used in the assembly or any modifications be made to all or part of the unit which are not supplied, specified or agreed by **Bibby**.

For general Safety, Alignment and Maintenance Instructions see other sections of this manual. **IMPORTANT:** The main Coupling Bolts/Nuts at both ends are tightened by **Bibby**, and should **NOT BE TOUCHED**.

Tightening of the attachement nuts to their corresponding bolts should be done evenly, i.e. cylinder head fashion, to 50% torque then to 100% torque in the same sequence. Threads should be lubricated with Molybdenum Disulphide grease or equivalent. Refer to accompanying general arrrangment drawing for tightening torques.

Check that the parallel & and axial misalignments of the shafts are within the limits defined in the alignment curves shown on the accompanying general arrangement drawing.

8.1 General

8.1.1 Reference all applicable drawings for sizes and dimensions. Ensure that all required tools and equipment are available.

8.1.2 The coupling is supplied in an assembled state with its misalignment capabilities locked by installation screws near the element packs. The coupling is packed appropriately for transportation and storage. Inspect the coupling for:

- Indication of deviation from specification to ensure that it conforms to requirements.

- Potential damage due to transportation.

8.1.3 For balanced couplings, note any match markings, which must be aligned when the coupling is installed.

8.2 One Piece Spacer

8.2.1 The HF coupling hubs must be removed from the transmission unit to allow installation. Remove the connecting nuts and bolts from the hub/adaptor flanges and using jacking screws force the flanges apart. Store the nuts and bolts along with the packing ring and shims (if supplied) for future stages of intallation.

8.2.2 The hubs may now be fitted to the driver and driven shafts. The method of fitting will be dependant on the type of fit specified for the particular installation. In all cases the hub face should be in line with the shaft end.

8.2.3 Where hub/shaft connections require a standard interference fit the hubs may be heated in an oil bath or oven at 200-250 °Celsius and rapidly positioned on the shaft. It is essential that this heat is evenly applied over the whole hub and that spot heating is avoided. Ensure that one shaft rotates so that the coupling match marks can be aligned.

8.2.4 Check the shafts misalignments and DBSE (distance between shaft ends) are within allowable limits.

8.2.5 The main bolts in the transmission unit are factory assembled and must not be disturbed. Undo the installation screws; the coupling should now be in a relaxed state.

If no packing ring or shims are supplied, go to step 8.2.10

8.2.6 Measure the free length of the transmission unit. Add to this the thickness of the packing plate. Record this value as X.

8.2.7 Now measure the distance between the shaft ends (DBSE). Adjust this length by either subtracting pre-stretch or adding pre-compression (if specified on the general arrangement drawing). Record this value as Y

8.2.8 Calculate the required number of shims from the following equation

Number of shims = (Y-X) ÷ shim thickness

Divide this figure by the shim thickness is 0.381mm and roung the answer to a single whole number.

8.2.9 Fit the shims between packing ring and the transmission unit. Ensure match marks are aligned.

8.2.10 Install the compression screws Ref 13, and tighten in cylinder head fashion, maintaining parallelism between the flange faces of the adaptor and spacer, until both elements packs are compressed by a minimum required amount to allow the transmission unit to be put into position. Do not compress the elements beyond the value stated in Table 4.

Coupling Size HF	Maximum Compression per Element Pack (mm)
HF250	2.0
HF450	2.3
HF720	2.3
HF1480	2.5
HF2700	3.0
HF4600	3.0
HF5900	3.0
HF7600	3.0
HF12900	3.5
HF16300	3.5
HF19300	3.5
HF25800	4.0

Table 4

8.2.11 Position the transmission unit between the shaft ends (hub faces), ensuring match marks are aligned.

8.2.12 Fit and tighten in cylinder head fashion the connecting bolts and nuts ref 9 &13 that pass through the packing ring and shims. Refer to General Arrangement Drawing for tightening torques.

8.2.13 Release and remove the compression screws.

8.2.14 Fit and tighten in cylinder head fashion the connecting bolts that pass through the remaining flange. If a pre-stretch is present, it may be necessary to pull the flanges together using the connecting bolts. Again refer to General Arrangement Drawing for tightening torques.

8.2.15 Ensure all match marks are aligned, all tooling is removed and inspect the coupling before operation.

9 Removal Instructions.

Coupling removal is a reverse of the above installation process ensuring that, upon re-installation, the above process is again followed in careful sequence.

IMPORTANT: The main Coupling Bolts/Nuts at both ends are tightened by **Bibby**, and should, under normal circumstances, NOT BE TOUCHED unless specified in the installation instructions.

When tightening any other bolt or screw, this should be done evenly, i.e. cylinder head fashion, to 50% torque then to 100% torque in the same sequence to the values or stretch stated in the accompanying general arrangement drawing Threads should be lubricated with Molybdenum Disulphide grease or equivalent.

10 Proposition 65 Compliance Warning.

WARNING: This product contains chemicals known to the State of California to cause cancer and/or birth defects or other reproductive harm.

11 Appendix A: Some alternative arrangements.

Please refer to Bibby for specific installation instructions for these options.

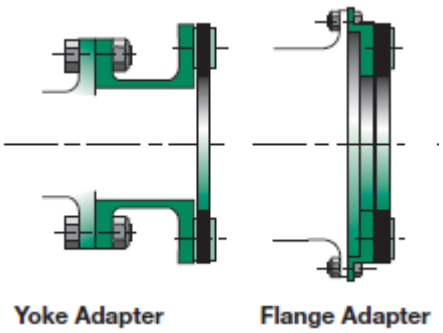

Figure 3

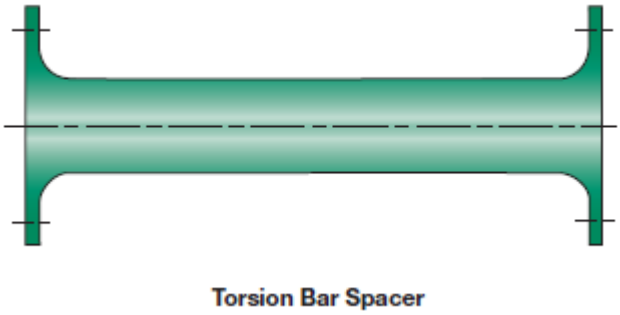

Figure 4

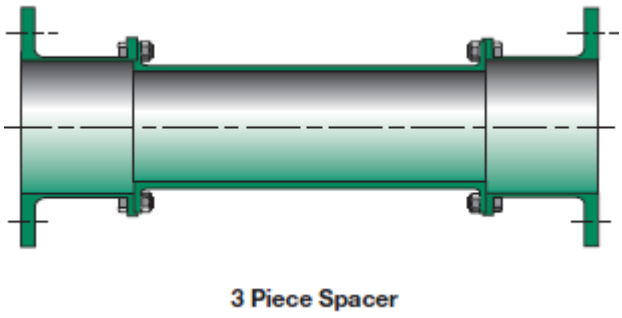

Figure 5