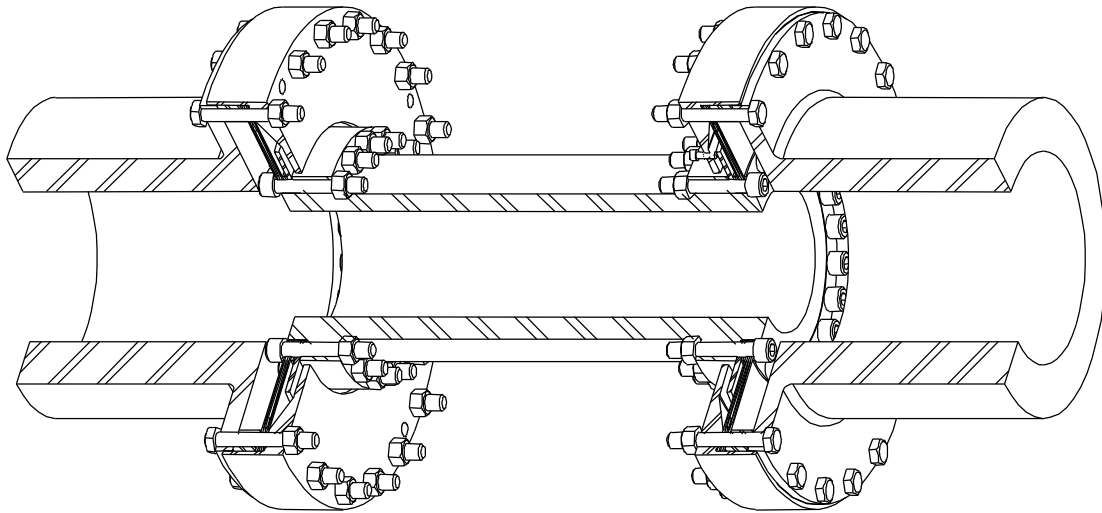




Ameriflex

NC Coupling Installation and Maintenance Manual



Ameridrives International
Coupling Products



Ameriflex NC/NCS Installation and Maintenance Manual

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WARNING

ACCIDENTS INVOLVING ROTATING EQUIPMENT MAY RESULT IN LOSS OF LIFE, SERIOUS BODILY INJURY OR PROPERTY DAMAGE. THE PURCHASER OF THIS EQUIPMENT MUST ASSURE THAT THE EQUIPMENT IS PROPERLY ASSEMBLED, INSTALLED, SHIELDED, OPERATED AND MAINTAINED. THIS EQUIPMENT MUST NOT BE OPERATED AT CONDITIONS THAT EXCEED MANUFACTURER'S SPECIFICATIONS.

PURCHASER MUST FOLLOW ALL FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS COVERING THE SAFE OPERATION AND MAINTENANCE OF THE EQUIPMENT, INCLUDING, WITHOUT LIMITATION, THE USDOL-OSHA "LOCKOUT/TAGOUT" PROCEDURE SET FORTH IN 29 CFR 1910.147.

IT IS THE PURCHASERS RESPONSIBILITY TO IMPLEMENT AND FOLLOW ITS OWN SAFETY, MAINTENANCE, AND EMPLOYEE TRAINING PROGRAM REGARDING THE SAFE AND PROPER OPERATION AND MAINTENANCE OF THE EQUIPMENT.

1. **INTRODUCTION**

This Installation Manual is intended to be used as a guide for the installation and maintenance of NC/NCS Ameriflex diaphragm couplings. For specific operating capacities and coupling data, refer to the Ameridrives Sales Drawing. The Sales Drawing Number along with other important information has been electro-etched on the coupling spacer at the factory.

2. **DESCRIPTION OF TERMINOLOGY**

This section is intended to assist anyone not familiar with the terms used to describe the components of an Ameriflex coupling. Refer to the following Figures for the coupling type specified on the Ameridrives Sales Drawing. These Figures identify components and terms referred to in this manual.

Figure 2-1 NC Coupling Assembly.

Figure 2-2 NC Diaphragm Pack Sub-Assembly.

Figure 2-3 NCS Coupling Assembly.

Figure 2-4 NCS Diaphragm Pack Sub-Assembly.

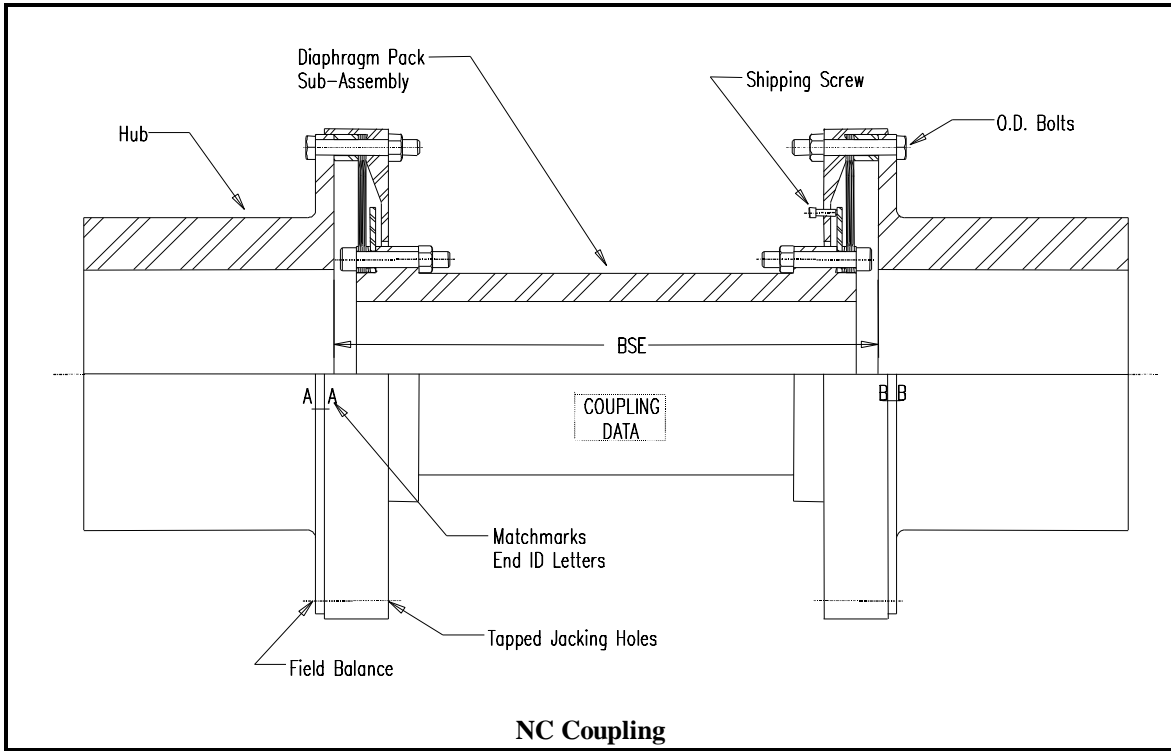


Figure 2-1

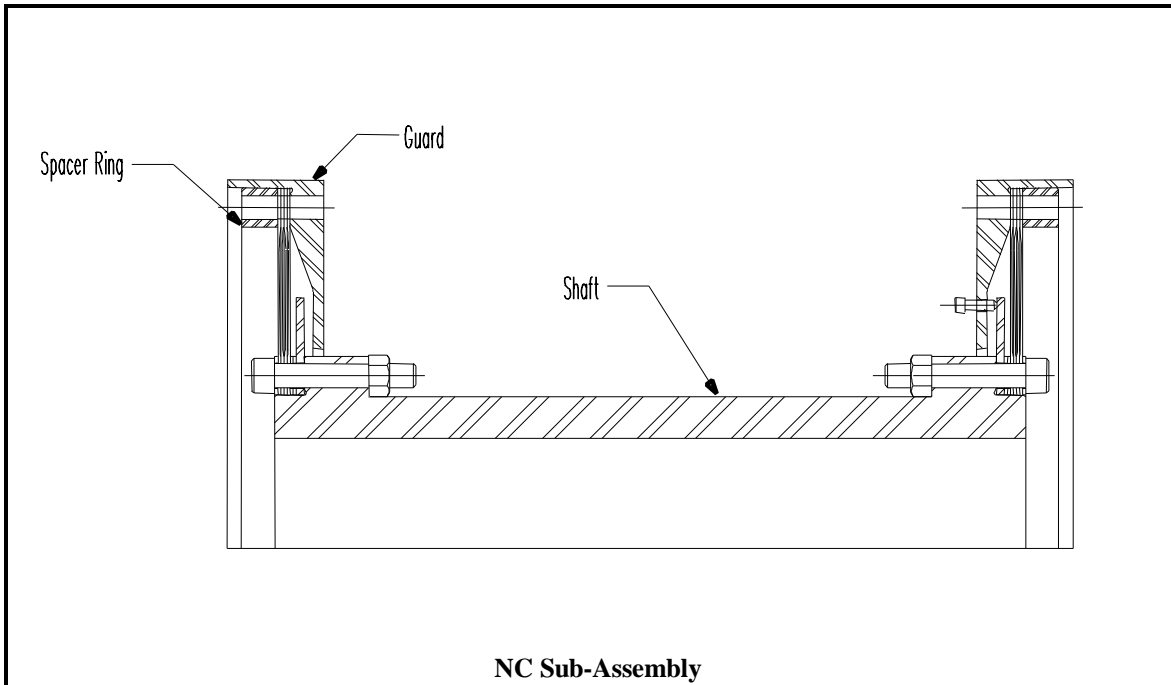


Figure 2-2

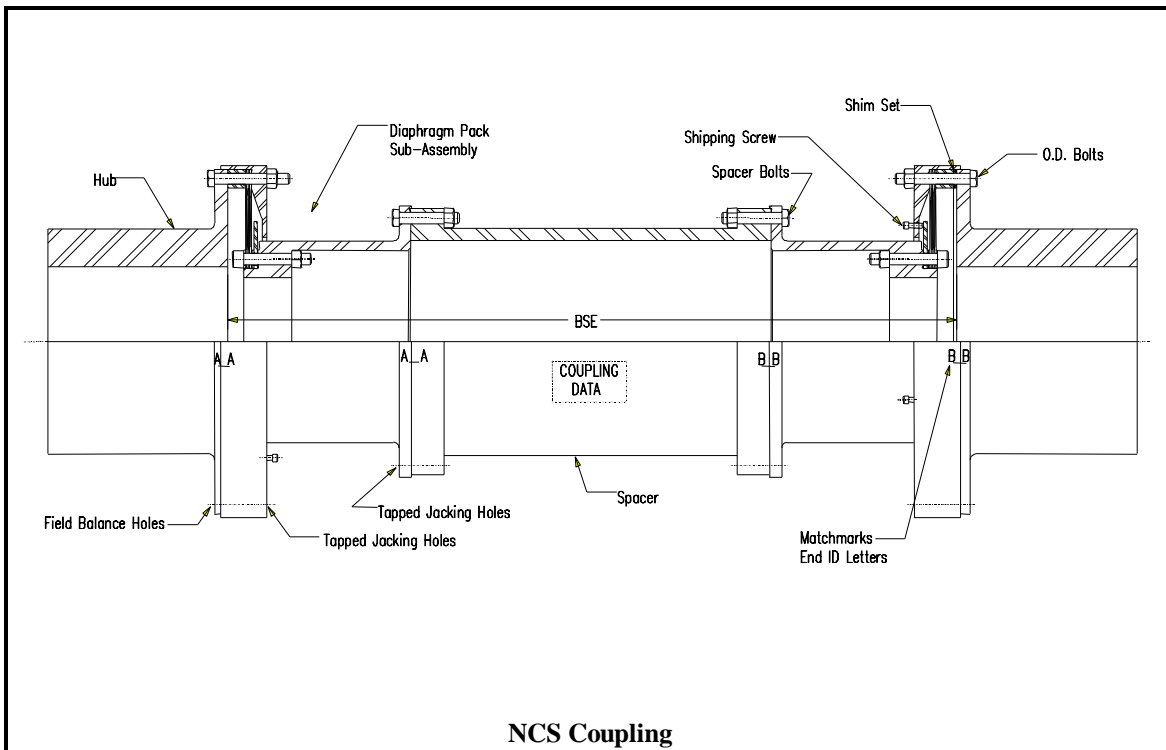


Figure 2-3

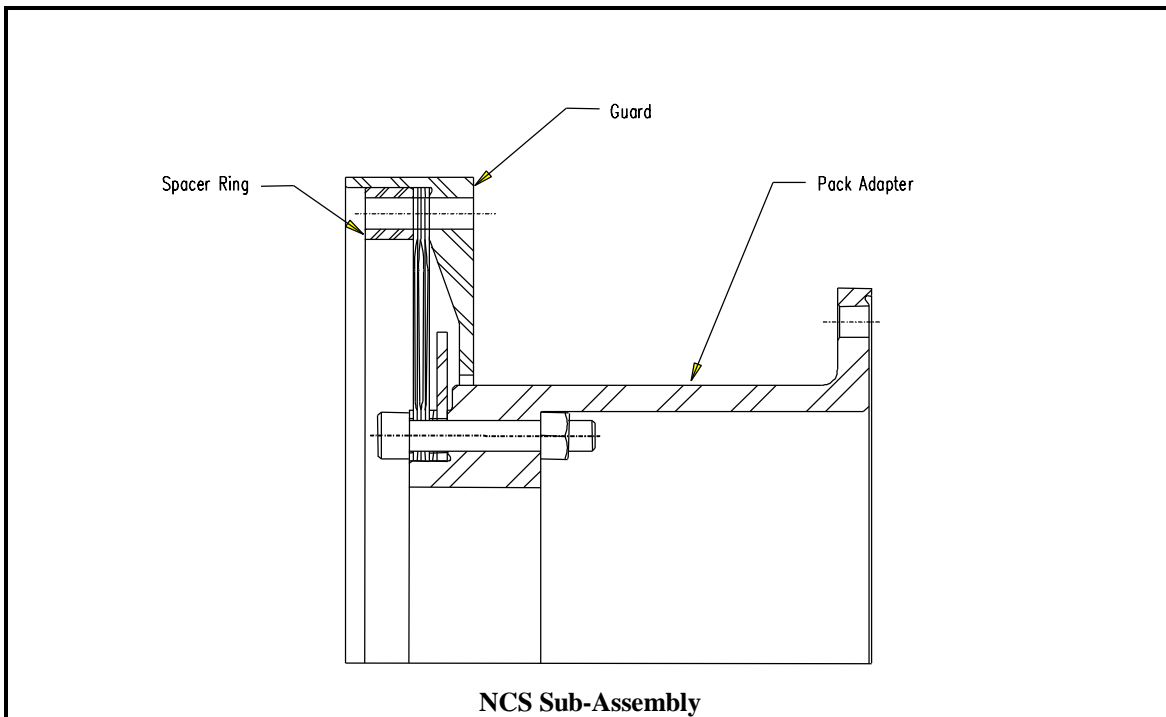


Figure 2-4

3. GENERAL INFORMATION

Ameriflex couplings are shipped from the factory assembled with one shim set installed and a minimal number of bolts and nuts in each flange. The remaining shim set and fasteners are shipped in the same crate as the coupling.

As soon as possible after receipt of a new Ameriflex coupling, check for damaged or missing parts. The "List of Materials" on the Ameridrives Sales Drawing should be used as a check list when taking inventory of the coupling parts.

Refer to the Ameridrives Sales Drawing for recommended spare parts and part interchangeability.

Each coupling is assigned a unique Serial Number at the factory. The Serial Number is etched on all major components of the coupling assembly. This number should be referenced whenever contacting the factory with any questions or problems. Refer to the Ameridrives Sales Drawing for serial number locations.

The end identification letters and matchmarks are marked on each mating flange and should be aligned at assembly to assure proper assembly and balance (all "A's" in line on one end and all "B's" in line on the other end).

Shipping hardware is provided to rigidize the coupling during shipping and handling and to prevent the coupling from being damaged. If removal of the spacer is required when installing an NCS style coupling, the shipping hardware is also used to compress the diaphragm packs during installation.

The standard bolt is a grade 8 ANSI/ASME B18.2.1 hex bolt. The equivalent strength Grade C all-metal prevailing torque hex locknuts should retain their locking feature after being tightened and loosened up to 5 times. The bolts and nuts are provided in weigh balanced sets as to size, length and weight. This allows any OD bolt to be placed in any OD hole and any OD nut to be placed on any OD bolt, similarly with the spacer bolts and nuts. Replacement fastener sets are also weigh balanced and are intended to be replaced in sets. These sets can not be interchanged with individual fasteners from a similar set or coupling.

Heli-coil inserts can be used on some designs. These inserts have a locking feature design which complies with MIL-I-8846. Heli-coil inserts should be reusable for up to 15 times.

Tapped holes located in the guard or hub flanges provide a location for field trim balance weights and are provided upon request. These series of holes are drilled and tapped in the axial direction between the OD bolt holes on the hub or guard.

Tapped jacking holes are provided (typically four) at every flange interface to allow for uniform disengagement of the pilot. The thread size used is that of a bolt that is provided with the coupling, usually an OD bolt or spacer bolt or in some cases the shipping hardware. .

CAUTION: STEEL STAMPING OF THE COUPLING SURFACE MAY WEAKEN THE COUPLING AND CREATE A STRESS RISER THAT COULD ULTIMATELY LEAD TO COUPLING FAILURE.

4. COUPLING INSTALLATION

This manual is intended as a general guide only. Check with the equipment manufacturer for special instructions and recommended procedures. In the event of a conflict between the Sales Drawing and this manual, follow the Sales Drawing or call Ameridrives Customer Service.

Prior to installation, check that the following items are on hand:

- A. A print of the Ameridrives Sales Drawing.
- B. A copy of the drive and driven equipment manufacturer installation manual.
- C. All coupling components (Reference the Ameridrives Sales Drawing for quantities).
- D. Hub installation tooling (if required).
- E. Suitable means to uniformly heat the hubs, i.e., electric oven, induction heater, or both etc. (if required). Heating with a torch is not recommended.
- F. Alignment equipment.
- G. Measuring instruments.
- H. Torque wrench.
- I. Miscellaneous hand tools.
- J. Ameridrives Customer Service Telephone Number (814) 480-5000.

INSTALLATION PROCEDURE

- 4.1.1 Thoroughly clean and prepare the shaft ends. Remove any raised metal, nicks, burrs, dents, gouges, etc., prior to coupling installation.
- 4.1.2 Disassemble the coupling by removing all bolts and nuts from the OD (do not remove any heli-coils if provided). Using the tapped jacking holes provided in the guards remove the hubs, or flange adapters from the OD of the NC/NCS diaphragm pack sub-assemblies. Tighten the four (4) jacking bolts evenly and in a criss-cross pattern. Be careful to only jack the guard back approximately 1/16" from the hub/adaptor flange. **Do not, under any circumstance, draw the guard entirely off of the spacer ring.** If disassembly of the spacer is necessary for the installation of an NCS style coupling, remove the NCS sub-assemblies from each end of the spacer using the tapped jacking holes provided in the pack adapter flange.

CAUTION: ANY SCRATCH, DENT, OR ANY OTHER MARK ON THE DIAPHRAGM SURFACE MAY CAUSE COUPLING FAILURE.

- 4.1.3 Thoroughly clean the exposed surfaces of all components, hubs, flange adapters, spacer rings, sub-assemblies, and spacer to remove the protective coating applied at the factory. Do not immerse the diaphragm pack sub-assemblies in cleaning solvent. Use a damp cloth to wipe clean the protective coating from the exposed surfaces.

CAUTION: DO NOT IMMERSE THE DIAPHRAGM PACK SUB-ASSEMBLIES IN CLEANING SOLVENT OR ANY OTHER ABRASIVE CLEANER. THIS MAY CAUSE DETERIORATION OF THE DIAPHRAGM SURFACE AND MAY LEAD TO COUPLING FAILURE.

ONLY USE A CLEAN CLOTH DAMPENED WITH A CLEANING SOLVENT TO WIPE THE PROTECTIVE COATING FROM THE EXPOSED DIAPHRAGM SURFACES.

4.1.4 Set the distance between the shaft ends (BSE) to the dimension shown on the Ameridrives Sales Drawing. The between shaft end dimension (Figure 4-1) is the distance between the very ends of the drive and driven equipment shafts. In the case of a flanged connection it is the distance to the face at the bolt circle diameter.

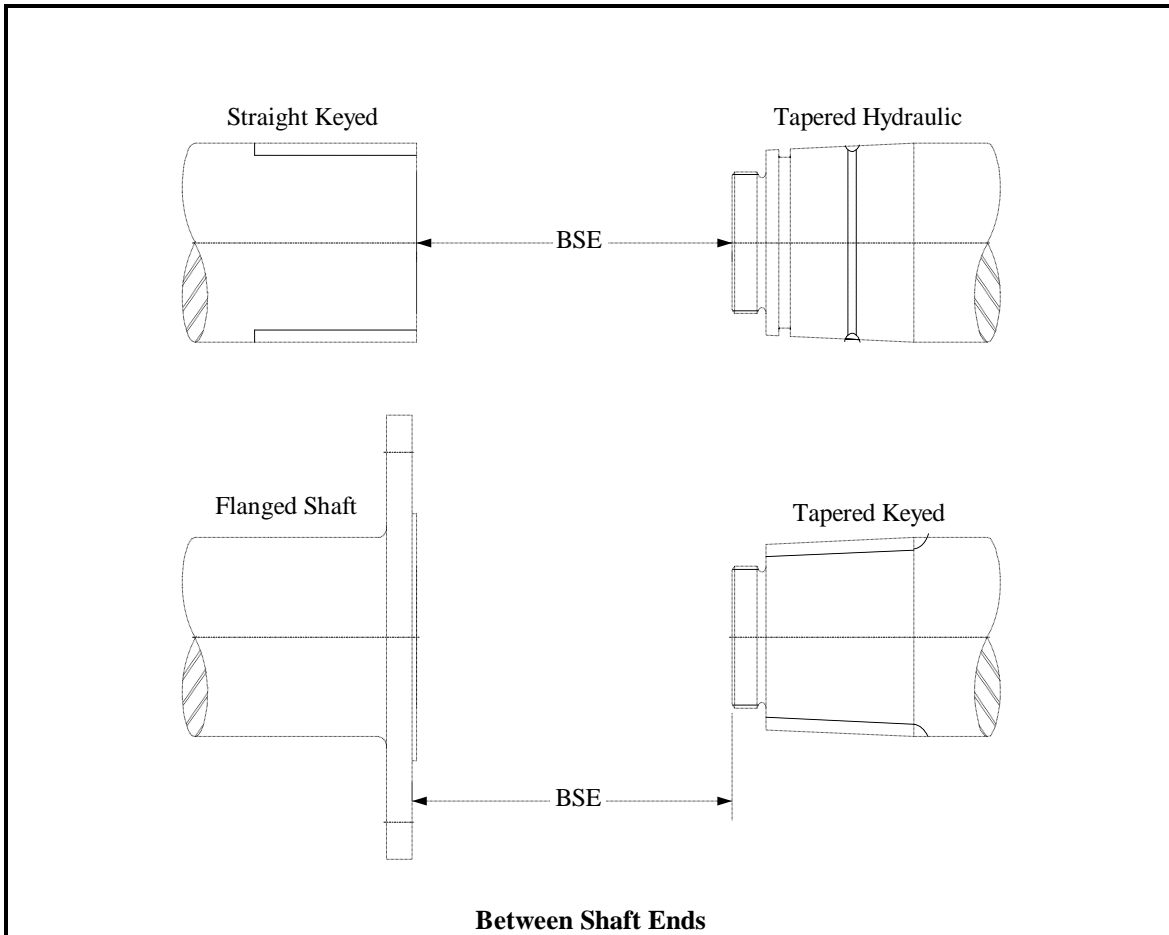


Figure 4-1

4.2 HUB MOUNTING PROCEDURE

4.2.1 Straight Bore with Keyway(s)

CAUTION: AMERIDRIVES MANUFACTURED THE COUPLING INTERFACE BASED ON THE SHAFT DATA SUPPLIED BY THE PURCHASER. AMERIDRIVES IS NOT RESPONSIBLE FOR INACCURATE OR INCOMPLETE INFORMATION SUPPLIED BY THE PURCHASER.

IT IS THE PURCHASERS RESPONSIBILITY TO ASSURE THAT THE INTERFACE CONNECTIONS (FLANGES, BOLTS, KEYS, HYDRAULIC FITS, ETC.) BETWEEN THE COUPLING AND THE CONNECTED EQUIPMENT ARE CAPABLE OF HANDLING THE ANTICIPATED LOADS.

4.2.1.1 Measure the shaft diameter and the bore diameter to determine the interference fit. If the measured interference differs from the value on the Ameridrives Sales Drawing, contact Ameridrives Customer Service or the equipment manufacturer.

4.2.1.2 Verify that the engagement length between the bore and shaft is correct.

4.2.1.3 Check the key(s) and keyway(s) for proper fit. Key(s) should be fitted to the keyway(s) to minimize their effect on balance. Refer to AGMA-9002-A86 or other industry standard for recommended key fits.

4.2.1.4 Install the key(s) into the shaft and measure the shaft to key or key to key dimension. Compare this measurement with the measurement of the bore to keyway or keyway to keyway dimension of the hub to assure proper fit. If an interference exists between key(s), and hub, correct the situation or contact the equipment manufacturer or Ameridrives Customer Service.

4.2.1.5 Expand the bore with a uniform heat source (oven, induction heater, etc.) taking care not to exceed 550° F (288° C). The following equations will help determine the temperature required to expand the bore to install the hub onto the shaft.

BORE EXPANSION:

E = BORE EXPANSION (IN.)
e = BORE EXPANSION (MM)
B = BORE DIAMETER (IN.)
b = BORE DIAMETER (MM)
T = TEMPERATURE RISE
ABOVE AMBIENT (° F)
t = TEMPERATURE RISE
ABOVE AMBIENT (° C)

$$T = \frac{E}{B \times 0.000064}$$

$$t = \frac{e}{b \times 0.000115}$$

CAUTION: DO NOT EXCEED 550° F (288° C) DURING THE HEATING OR INSTALLATION OF THE HUB. EXCESSIVE HEAT MAY SOFTEN THE HUB AND REDUCE THE STRENGTH OF THE STEEL. EXCESSIVE HEAT MAY ALSO AFFECT THE PERFORMANCE CHARACTERISTICS OF THE HUB.

4.2.1.6 Position the hub and key as shown on the Ameridrives Sales Drawing, typically flush with the shaft end (see Figure 4-2).

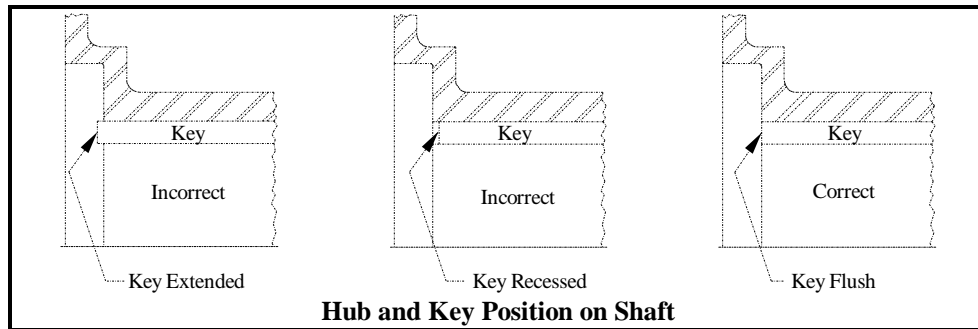


Figure 4-2

4.2.2 Tapered Bore With Keyway(s)

CAUTION: AMERIDRIVES MANUFACTURED THE COUPLING INTERFACE BASED ON THE SHAFT DATA SUPPLIED BY THE PURCHASER. AMERIDRIVES IS NOT RESPONSIBLE FOR INACCURATE OR INCOMPLETE INFORMATION SUPPLIED BY THE PURCHASER.

IT IS THE PURCHASERS RESPONSIBILITY TO ASSURE THAT THE INTERFACE CONNECTIONS (FLANGES, BOLTS, KEYS, HYDRAULIC FITS, ETC.) BETWEEN THE COUPLING AND THE CONNECTED EQUIPMENT ARE CAPABLE OF HANDLING THE ANTICIPATED LOADS.

- 4.2.2.1 Verify that the engagement length between the bore and tapered shaft end is correct.
- 4.2.2.2 Check the key(s) and keyway(s) for proper fit. Key(s) should be fitted to the keyway(s) to minimize their affect on balance. Refer to AGMA-9002-A86 or other industry standard for recommended key fits.
- 4.2.2.3 Install the key(s) into the shaft and measure the shaft to key or key to key dimension. Compare this measurement with the measurement of the bore to keyway or keyway to keyway dimension of the hub to assure proper fit. If an interference exists between key(s), and hub, correct the situation or contact the equipment manufacturer or Ameridrives Customer Service.
- 4.2.2.4 With the key(s) installed in the shaft, perform a blue contact check between the bore and tapered shaft end. Refer to the Ameridrives Sales Drawing for the recommended contact area per API-671.
- 4.2.2.5 Remove the bluing from the shaft and bore.

4.2.2.6 Install the hub, hand tight, onto the shaft. Using feeler gages, install a positive stop onto the shaft corresponding to the draw-up specified on the Ameridrives Sales Drawing (see Figure 4-3).

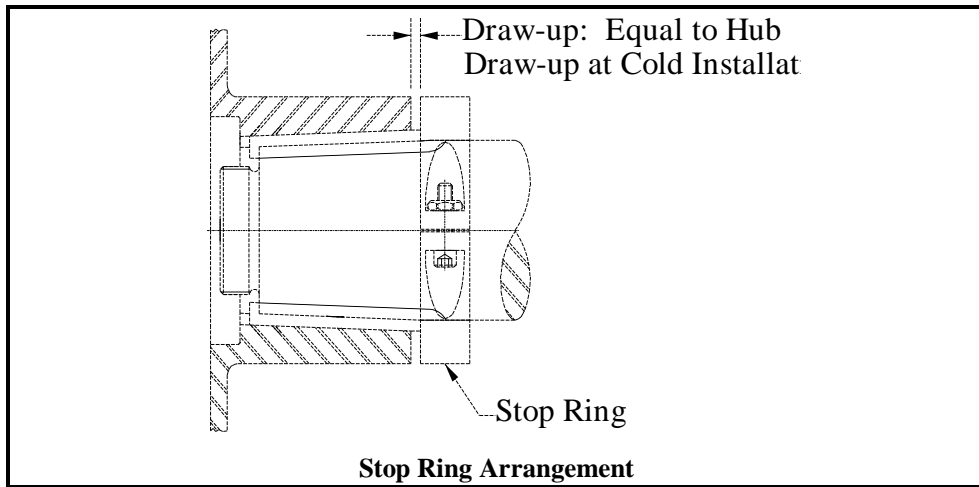


Figure 4-3

4.2.2.7 Remove the hub from the shaft and expand the bore with a uniform heat source (oven, induction heater, etc.) taking care not to exceed 550° F (288° C). The following equations will help determine the temperature required to expand the bore to install the hub on the shaft.

BORE EXPANSION:

- E = BORE EXPANSION (IN.)
- e = BORE EXPANSION (MM)
- B = BORE DIAMETER (IN.)
- b = BORE DIAMETER (MM)
- T = TEMPERATURE RISE ABOVE AMBIENT (° F)
- t = TEMPERATURE RISE ABOVE AMBIENT (° C)

$$T = \frac{E}{B \times 0.000064}$$

$$t = \frac{e}{b \times 0.000115}$$

CAUTION: DO NOT EXCEED 550° F (288° C) DURING THE HEATING OR INSTALLATION OF THE HUB. EXCESSIVE HEAT MAY SOFTEN THE HUB AND REDUCE THE STRENGTH OF THE STEEL. EXCESSIVE HEAT MAY ALSO AFFECT THE PERFORMANCE CHARACTERISTICS OF THE HUB.

4.2.2.8 Install the hub flush against the positive stop and install the shaft nut hand tight to retain the hub in this position.

4.2.2.9 After the hub has cooled, tighten the shaft nut and lock it in place. Remove the stop ring.

4.2.3 Hydraulic Bore

CAUTION: AMERIDRIVES MANUFACTURED THE COUPLING INTERFACE BASED ON THE SHAFT DATA SUPPLIED BY THE PURCHASER. AMERIDRIVES IS NOT RESPONSIBLE FOR INACCURATE OR INCOMPLETE INFORMATION SUPPLIED BY THE PURCHASER.

IT IS THE PURCHASERS RESPONSIBILITY TO ASSURE THAT THE INTERFACE CONNECTIONS (FLANGES, BOLTS, KEYS, HYDRAULIC FITS, ETC.) BETWEEN THE COUPLING AND THE CONNECTED EQUIPMENT ARE CAPABLE OF HANDLING THE ANTICIPATED LOADS.

- 4.2.3.1 Verify that the engagement length between the bore and tapered shaft end is correct.
- 4.2.3.2 Without o-rings or back-up rings, perform a blue contact check between the bore and the tapered shaft end. Refer to the Ameridrives Sales Drawing for the recommended contact area.
- 4.2.3.3 Clean the bluing from the shaft and bore.
- 4.2.3.4 Install the hub, hand tight, onto the shaft without o-rings and back-up rings. Using feeler gages, position a positive stop onto the shaft corresponding to the draw-up dimension specified on the Ameridrives Sales Drawing (see Figure 4-4).

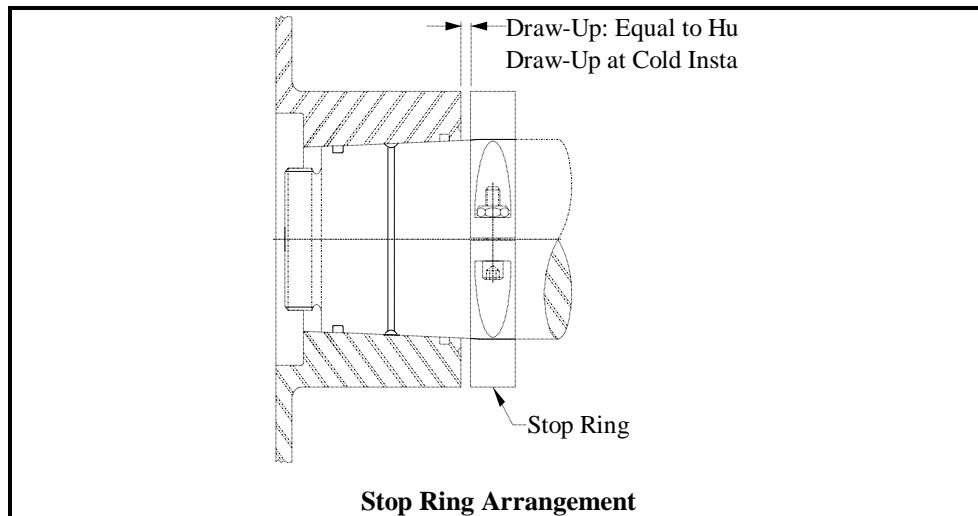


Figure 4-4

- 4.2.3.5 Lubricate the o-rings and back-up rings with hydraulic fluid or other light oil. Install the o-rings and back-up rings into the hub and onto the shaft.

- 4.2.3.6 Mount the hub onto the shaft using a hydraulic mounting device until the hub bottoms against the positive stop. Refer to AGMA 9003-A91 or other industry standard for more information about hydraulic mounting (see Figure 4-5).

WARNING: DO NOT APPLY EXCESSIVE HYDRAULIC PRESSURE DURING THE INSTALLATION OF THE HUB ON THE SHAFT. ACCIDENTS RESULTING FROM THE APPLICATION OF EXCESSIVE HYDRAULIC PRESSURE COULD RESULT IN LOSS OF LIFE, SERIOUS BODILY INJURY OR PROPERTY DAMAGE. THE APPLICATION OF EXCESSIVE HYDRAULIC PRESSURE DURING HUB INSTALLATION COULD FORCE THE HUB FROM THE SHAFT, DESTROY SEALS, AND HYDRAULIC LINES, AND/OR SPLIT THE HUB.

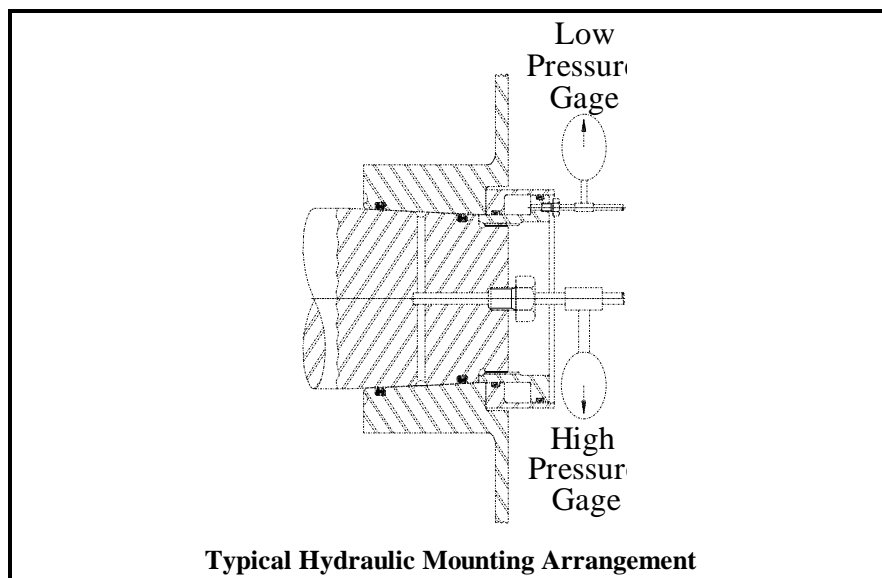


Figure 4-5

- 4.2.3.7 Heat mounting may also be used. However, if o-rings are used, care must be taken not to exceed the maximum temperatures allowed by the o-ring manufacturer. If o-rings are not used, do not exceed 550° F (288° C).
- 4.2.3.8 After a sufficient waiting period to allow the hydraulic oil to drain from the interface (a minimum of one (1) to two (2) hours), remove the hydraulic mounting equipment and stop ring. Install the shaft nut and lock it in place. Adequate time must elapse before applying torque to the coupling to permit any remaining trapped oil to drain.

4.2.4 FLANGE ADAPTERS

CAUTION: AMERIDRIVES MANUFACTURED THE COUPLING INTERFACE BASED ON THE SHAFT DATA SUPPLIED BY THE PURCHASER. AMERIDRIVES IS NOT RESPONSIBLE FOR INACCURATE OR INCOMPLETE INFORMATION SUPPLIED BY THE PURCHASER.

IT IS THE PURCHASERS RESPONSIBILITY TO ASSURE THAT THE INTERFACE CONNECTIONS (FLANGES, BOLTS, KEYS, HYDRAULIC FITS, ETC.) BETWEEN THE COUPLING AND THE CONNECTED EQUIPMENT ARE CAPABLE OF HANDLING THE ANTICIPATED LOADS.

- 4.2.4.1 Measure the mating pilots to verify the proper interference fit according to the original equipment manufacturers recommendation.
- 4.2.4.2 Check both the equipment flange and the mating adapter flange. Remove any dirt, dents, raised metal or any other condition that might prevent the mating faces and pilot from seating properly.
- 4.2.4.3 Install a minimum of four (4) bolts approximately 90° apart through both flanges and tighten the bolts evenly in a criss-cross pattern to seat the pilot. Refer to the Ameridrives Sales Drawing for proper bolt and nut orientation and also to check if the bolts are supplied by Ameridrives.
- 4.2.4.4 Install the remaining fasteners and torque all fasteners in a criss-cross pattern to the value specified on the Ameridrives Sales Drawing. If the flange interface fasteners are not supplied by Ameridrives, consult the fastener supplier for the proper tightening torque.

4.3 ALIGNMENT

- 4.3.1 All Ameriflex couplings are designed to transmit 100% of the ratings stated on the Ameridrives Sales Drawing for normal torque, axial and angular misalignment simultaneously. However, if the exact amount of axial and angular movement from "cold" to "hot" running condition is not known, we recommend not exceeding 25% of the combined axial and angular capacities at installation.
- 4.3.2 All measurements taken during alignment should be made with the equipment shafts in their normal running position (i.e., thrust bearings against their active faces, motor rotors on their magnetic centers, etc.).

CAUTION: FAILURE TO TAKE MEASUREMENTS DURING ALIGNMENT WITH THE EQUIPMENT SHAFTS IN THEIR NORMAL RUNNING POSITION MAY RESULT IN COUPLING DAMAGE OR FAILURE DUE TO OVER EXTENSION OR COMPRESSION OF THE DIAPHRAGMS (SEE PARAGRAPH 4.3.2).

- 4.3.3 Equipment alignment should be accomplished in the manner specified by the equipment manufacturer.
- 4.3.4 The Ameriflex coupling is capable of operating at 100% of the axial and angular capacity stated on the Ameridrives Sales Drawing. If installed such that during normal "hot" operation the axial and angular misalignments are at or near zero, the loads induced by the coupling are further reduced, thereby increasing equipment bearing life.

4.4 MEASURING FOR INSTALLATION AND SETTING SHIM THICKNESS

Shims are provided to adjust the length of the coupling at installation to accommodate variations in flange-to-flange dimensions ("I" dimension as shown in Figure 4-7) within the limits specified on the Ameridrives sales drawing. The coupling spacer is intentionally made short by the thickness of one shim set. This allows for flange-to-flange adjustability equivalent to the thickness of one shim set in either direction. Two shim sets are normally provided (see Figure 4-6). Refer to the Ameridrives Sales Drawing for location and quantity of shims.

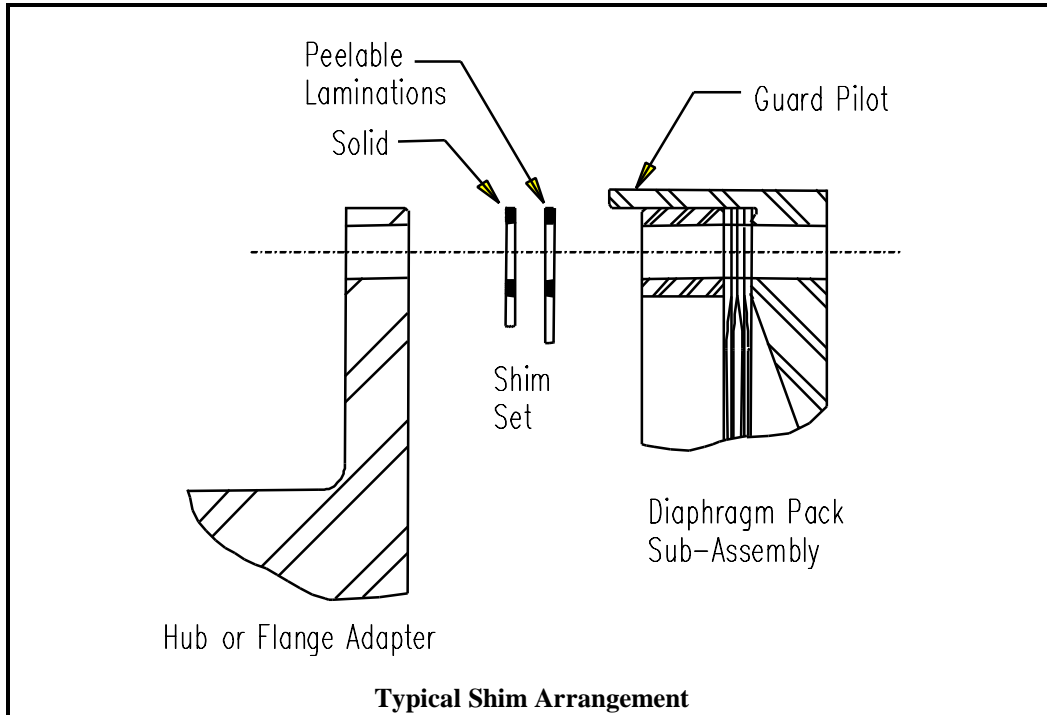


Figure 4-6

NOTE WORKSHEETS ARE PROVIDED IN THIS MANUAL FOR RECORDING THE DIMENSIONS AND PERFORMING THE CALCULATIONS REQUIRED TO DETERMINE THE PROPER THICKNESS OF SHIM REQUIRED (REFERENCE PARAGRAPH 4.4.3). A SAMPLE HAS ALSO BEEN INCLUDED FOR YOUR CONVENIENCE (REFERENCE PARAGRAPH 4.4.4). WHEN A COMPLETE COUPLING IS SHIPPED FROM THE FACTORY, THE "G" DIMENSION (THE DISTANCE FROM THE OUTSIDE FACE OF THE END "A" SPACER RING TO THE OUTSIDE FACE OF THE END "B" SPACER RING) IS MEASURED AND RECORDED ON A TAG ATTACHED TO THE COUPLING. SPARE COMPONENTS WILL NOT BE MARKED IN THIS MANNER AND MUST BE MEASURED AS DESCRIBED IN THIS SECTION.

4.4.1 NC/NCS Series Couplings.

(Note: use this method for installation of the NCS style coupling only if removal of the spacer is not required for installation of the coupling.)

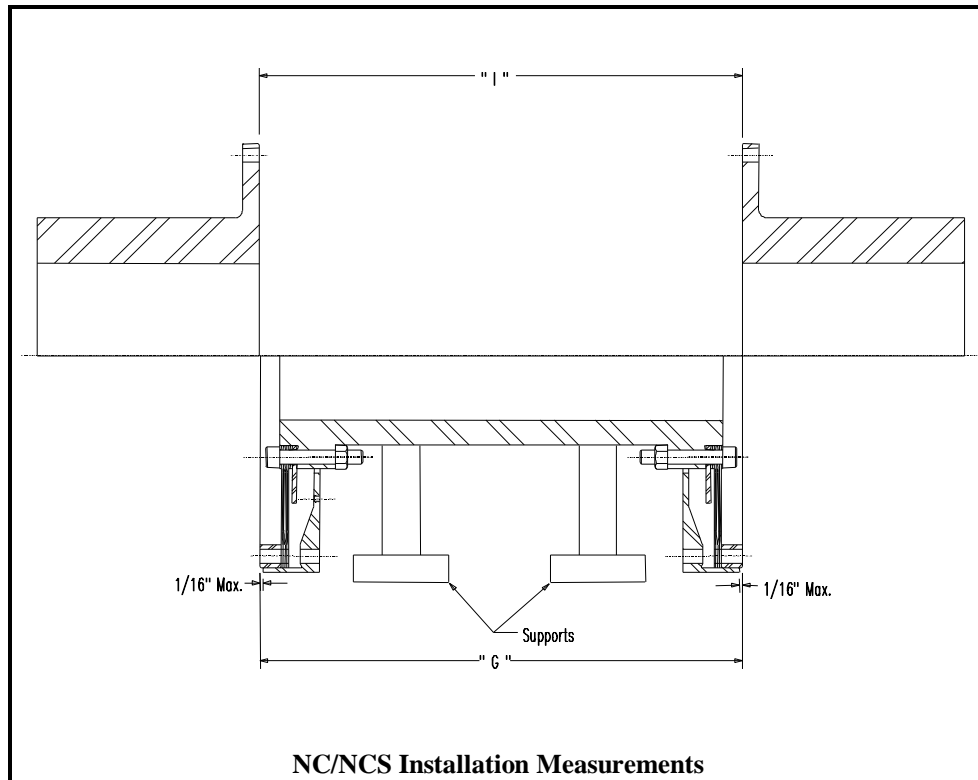


Figure 4-7

- 4.4.1.1 Remove all shipping screws. Do not discard, save for future removal and installation.
- 4.4.1.2 Measure and record , on the worksheet provided in Paragraph 4.4.3, the installation length "I" (distance between mounted flange faces) at four (4) places approximately 90° apart (see Figure 4-7).
- 4.4.1.3 Install four (4) bolts into the jacking holes located on the guard. Tighten the bolts evenly in a criss-cross pattern to pull the guard pilot back across the spacer ring until there is approximately 1/16" between the end of the guard pilot and the outer face of the spacer ring. Be careful not to pull the guard pilot beyond this point. **Under no circumstance should the guard pilot be drawn entirely off of the spacer ring.**
- 4.4.1.4 Measure and record, on the worksheet in Paragraph 4.4.3, the coupling free length "G" (distance between end "A" spacer ring outer face and end "B" spacer ring outer face) at four (4) places approximately 90° apart.
- 4.4.1.5 Refer to the Ameridrives Sales Drawing for one shim set thickness "S" and the amount of prestretch "P". Record these values on the worksheet provided in Paragraph 4.4.3.

- 4.4.1.6 Calculate the thickness of shim required using the worksheet in Paragraph 4.4.3.
- 4.4.1.7 Inspect the mating flange faces and pilots. Remove any dirt, dents, raised metal or any other condition that might prevent mating faces and pilots from seating properly.
- 4.4.1.8 Position and support the diaphragm pack sub-assembly (NC design) or coupling spacer assembly (NCS design) between the two (2) mounted flanges. Align the matchmarks and end identification letters. This may require rotation of the equipment shafts. Do not use coupling components as a leverage point for equipment rotation.

CAUTION: WHEN SHIMS, ARE USED, THEY MUST BE INSTALLED BETWEEN THE HUB/ADAPTER FLANGE AND THE OUTSIDE FACE OF THE SUB-ASSEMBLY SPACER RING. REFER TO THE AMERIDRIVES SALES DRAWING FOR THE MAXIMUM SHIM THICKNESS.

- 4.4.1.9 Install but do not tighten a minimum of four (4) bolts approximately 90° apart through the hub/adaptor flange, shim(s) (if required) and the diaphragm pack sub-assembly at each end of the coupling.
- 4.4.1.10 Pilots are an interference fit. Tighten the bolts evenly in a criss-cross pattern to seat the pilots properly.
- 4.4.1.11 Install all remaining bolts and torque evenly in a criss-cross pattern to the value specified on the Ameridrives Sales Drawing.
- 4.4.1.12 Remove the sub-assembly/coupling support.
- 4.4.1.13 Proceed to Paragraph 4.5.

4.4.2 NCS Series Couplings – Spacer Removal Method
 (Note: use this method only if removal of the spacer is required for installation of the NCS style coupling.)

4.4.2.1 Loosen, but do not remove, the shipping screws on both sub-assemblies.

NOTE: DOUBLE CHECK TO ASSURE THAT THE SHIPPING HARDWARE IS NOT COMPRESSING OR EXTENDING THE DIAPHRAGM PACK SUBASSEMBLIES.

4.4.2.2 Refer to paragraphs 4.4.1.2 thru 4.4.1.6 to determine coupling installation length and the amount of shim required.

4.4.2.3 Inspect the mating flange faces and pilots. Remove any dirt, dents, raised metal or any other condition that might prevent the mating faces and pilot from seating properly.

4.4.2.4 Make the appropriate shim adjustment and install the diaphragm pack sub-assemblies by aligning the end identification letters and matchmarks. Install a minimum of four (4) bolts approximately 90° apart through the flange, shim(s) (if required) and diaphragm pack sub-assembly. Refer to the Ameridrives Sales Drawing for proper bolt and nut orientation. Pilots are an interference fit. Tighten the bolts evenly in a criss-cross pattern to seat the pilots properly.

4.4.2.5 Install all remaining OD fasteners and torque evenly in a criss-cross pattern to the value specified on the Ameridrives Sales Drawing. Repeat the bolt tightening procedure to verify that all fasteners are torqued to the proper value.

4.4.2.6 Tighten the shipping screws evenly to draw-up both diaphragm pack sub-assemblies to the dimension specified on the Ameridrives Sales Drawing. The use of two dial indicators at 180° apart or determining the number of screw turns required based on thread pitch (refer to Table 4-1) are common ways of measuring draw-up. If the original screws are lost, refer to the Ameridrives Sales Drawing for the correct size and length or call Ameridrives customer service for assistance.

DRAW-UP FOR ONE (1) FULL TURN OF SHIPPING HARDWARE							
THREAD SIZE	#5-40	#8-32	#10-32	1/4-28	5/16-24	3/8-24	1/2-20
DRAW-UP (IN.)	0.025	0.031	0.031	0.036	0.042	0.042	0.050
DRAW-UP (MM.)	0.635	0.794	0.794	0.907	1.058	1.058	1.270

Table 4-1

CAUTION: DO NOT EXCEED THE RECOMMENDED DRAW-UP STATED ON THE AMERIDRIVES SALES DRAWING. EXCEEDING THE RECOMMENDED DRAW-UP MAY DAMAGE THE DIAPHRAGM PACK.

4.4.2.7 Position and support the spacer between the two diaphragm pack sub-assemblies. Align the matchmarks and end identification letters. This may require rotation of the equipment shafts. Do not use coupling components as a leverage point for equipment rotation.

- 4.4.2.8 Install, but do not tighten, a minimum of four (4) bolts approximately 90° apart through the spacer and diaphragm pack sub-assembly flanges at each end of the coupling. Refer to the Ameridrives Sales Drawing for proper bolt and nut orientation.
- 4.4.2.9 Loosen and remove the shipping hardware. **Do not discard - save for future coupling removal and installation.**
- 4.4.2.10 Pilots are an interference fit. Tighten the bolts evenly in a criss-cross pattern to seat the pilots properly.
- 4.4.2.11 Install all remaining spacer hardware and torque evenly in a criss-cross pattern to the value specified on the Ameridrives Sales Drawing. Repeat the bolt tightening procedure to verify that all fasteners are torqued to the proper value.
- 4.4.2.12 Remove the spacer support.
- 4.4.2.13 Proceed to Paragraph 4.5.

4.4.3 Work Sheet for Determining Shim Requirements

1. Installation Dimension "I". Measured four (4) places at 90° apart.

I₁ _____

I₂ _____

I₃ _____

I₄ _____

TOTAL _____ = "I" = _____
4

2. Coupling Free Length "G". Measured four (4) places at 90° apart.

G₁ _____

G₂ _____

G₃ _____

G₄ _____

TOTAL _____ = "G" = _____
4

3. Calculate the coupling installation length "F" by adding the following:

NOTE: Refer to the Installation
Section of the Ameridrives Sales
Drawing for Shim Set Thickness
"S" and Prestretch "P" Dimensions.

"G" _____
+ "S" _____
+ "P" _____

"F" = _____

4. Solve for "I" minus "F":

NOTE: Refer to the Installation
Section of the Ameridrives Sales
Drawing for Acceptable
Values for "I" minus "F".

"I" _____
- "F" _____

shim adjustment = _____

5. If "I" minus "F" is negative, remove that thickness of shim from the peelable shim of one shim set and install only the remainder of that shim with the coupling. If "I" minus "F" is positive, install that thickness of shim along with one full shim set with the coupling. Refer to the Installation Section of the Ameridrives Sales Drawing for the maximum allowable shim set thickness for each end of the coupling.

4.4.4 Sample Work Sheet for Determining Shim Requirements

1. Installation Dimension "I". Measured four (4) places at 90° apart.

$$I_1 \underline{16.458 \text{ IN.}}$$

$$I_2 \underline{16.461 \text{ IN.}}$$

$$I_3 \underline{16.458 \text{ IN.}}$$

$$I_4 \underline{16.463 \text{ IN.}}$$

$$\text{TOTAL } \frac{65.840 \text{ IN.}}{4} = \text{"I"} = \underline{16.460 \text{ IN.}}$$

2. Coupling Free Length "G". Measured four (4) places at 90° apart.

$$G_1 \underline{16.289 \text{ IN.}}$$

$$G_2 \underline{16.237 \text{ IN.}}$$

$$G_3 \underline{16.294 \text{ IN.}}$$

$$G_4 \underline{16.224 \text{ IN.}}$$

$$\text{TOTAL } \frac{65.044 \text{ IN.}}{4} = \text{"G"} = \underline{16.261 \text{ IN.}}$$

3. Calculate the coupling installation length "F" by adding the following:

NOTE: Refer to the Installation Section of the Ameridrives Sales Drawing for Shim Set Thickness "S" and Prestretch "P" Dimensions.

$$\begin{aligned} &\text{"G"} \underline{16.261 \text{ IN.}} \\ &+ \text{"S"} \underline{.125 \text{ IN.}} \\ &+ \text{"P"} \underline{.035 \text{ IN.}} \end{aligned}$$

$$\text{"F"} = \underline{16.421 \text{ IN.}}$$

4. Solve for "I" minus "F":

NOTE: Refer to the Installation Section of the Ameridrives Sales Drawing for Acceptable Values for "I" Minus "F".

$$\begin{aligned} &\text{"I"} \underline{16.460 \text{ IN.}} \\ &- \text{"F"} \underline{16.421 \text{ IN.}} \end{aligned}$$

$$\text{shim adjustment} = \underline{.039 \text{ IN.}}$$

5. "I" minus "F" equals positive .039 IN. so an additional shim .039 IN. thick along with a full shim set (.125 IN. thick) is required.

4.5. ASSEMBLY CHECK LIST

A thorough inspection of the coupling and its connected equipment is recommended prior to operation.

- 4.5.1 Check the drive and driven equipment to be sure they are ready for operation. Refer to the original equipment manufacturers operating manual.
- 4.5.2 Recheck and verify that the alignment values for axial, angular, and parallel offset are within the limits specified on the Ameridrives Sales Drawing.
- 4.5.3 Check that all fasteners are tightened to the proper values specified on the Ameridrives Sales Drawing.
- 4.5.5 Check that all shipping hardware has been removed from both ends of the coupling.
- 4.5.6 Check that all tools, mounting equipment, and supports used during installation are removed and the coupling and equipment are free to turn. A coupling guard should be in place to prevent personnel from accessing the rotating coupling and shafts during operation.

CAUTION: EXCESSIVE VIBRATION DURING INITIAL START-UP IS AN INDICATION THAT THERE IS A POTENTIAL PROBLEM WITH INSTALLATION OF THE COUPLING OR THE CONNECTED EQUIPMENT. SHUT THE SYSTEM DOWN IMMEDIATELY AND DETERMINE THE SOURCE OF THE VIBRATION.

4.6. COUPLING DISASSEMBLY

Successful removal depends heavily on the care and good judgment of those performing the work. Ameridrives will not be held liable for any personal injury or equipment damage that may occur during or as a result of removing a coupling or hub.

- 4.6.1 NC/NCS Series Couplings
(Note: Use this method for NCS type couplings when disassembly of the spacer is not required for coupling removal.)
 - 4.6.1.1 Support the coupling assembly and remove the OD fasteners.
 - 4.6.1.2 Place four (4) O.D. bolts into the tapped jacking holes provided in the guard. Tighten the jacking bolts evenly in a criss-cross pattern to pull the guard pilot off of the hub/adaptor flange. Be careful to only jack the guard back approximately 1/16" from the hub/adaptor flange. **Do not under any circumstance draw the guard entirely off of the spacer ring.**
 - 4.6.1.3 Remove the diaphragm pack sub-assembly (NC style coupling) or coupling spacer assembly (NCS style coupling).
 - 4.6.1.4 If inspection of the diaphragm pack is required, inspect the exposed diaphragm at each end of the coupling for any cracks, dents, distress areas or other abnormalities.

CAUTION: IF THE CONDITION OF THE EXPOSED DIAPHRAGM IS QUESTIONABLE - DO NOT USE THAT DIAPHRAGM PACK SUB-ASSEMBLY. REPLACE THE QUESTIONABLE UNIT WITH A NEW ONE AND RETURN THE QUESTIONABLE DIAPHRAGM PACK SUB-ASSEMBLY TO AMERIDRIVES FOR EVALUATION.

4.6.1.7 Hub Removal

4.6.1.7.1 Hydraulic hubs may be removed by using hydraulic mounting equipment to expand the bore. The shaft nut or some other similar device should be used to retain the hub once it breaks free from the shaft. Refer to AGMA 9003-A91 or other industry standard for further information. Support the hub prior to removal.

WARNING: DO NOT APPLY EXCESSIVE HYDRAULIC PRESSURE DURING THE REMOVAL OF THE HUB FROM THE SHAFT. ACCIDENTS RESULTING FROM THE APPLICATION OF EXCESSIVE HYDRAULIC PRESSURE COULD RESULT IN LOSS OF LIFE, SERIOUS BODILY INJURY OR PROPERTY DAMAGE. THE APPLICATION OF EXCESSIVE HYDRAULIC PRESSURE DURING HUB REMOVAL COULD UNEXPECTEDLY FORCE THE HUB FROM THE SHAFT, DESTROY SEALS, AND HYDRAULIC LINES, AND/OR SPLIT THE HUB.

PURCHASER SHOULD REFER TO THE OPERATOR'S MANUAL SUPPLIED BY THE HYDRAULIC DEVICE MANUFACTURER FOR INSTRUCTIONS ON THE SAFE OPERATION OF THE HYDRAULIC EQUIPMENT.

4.6.1.7.2 Keyed hubs may be removed by uniformly heating the hub barrel to expand the bore and using a hub puller or similar device to pull the hub off the shaft. Support the hub prior to removal. An induction heater of sufficient capacity to heat the hub rapidly is the preferred method. However, if not available, two (2) torches at 180° apart with flame spreader (rose bud) tips may be used. If using torches, a hub puller should be attached prior to heating the hub and the torches or hub must be continuously rotated to avoid localized hot spots. Do not exceed 550° F (288° C) surface temperature.

CAUTION: DO NOT USE A TORCH FOR HUB REMOVAL UNLESS THE ENTIRE DIAPHRAGM PACK HAS BEEN COVERED WITH A HEAT RESISTANT COVER (WELDERS BLANKET, KOA-WOOL OR EQUIVALENT). DIAPHRAGMS WILL HEAT UP RAPIDLY WHEN EXPOSED TO AN OPEN FLAME AND THIS MAY CAUSE DAMAGE AND/OR PREVENT PROPER HUB EXPANSION.

4.6.2. NCS Series Couplings

(Note: Use this method only when disassembly of the spacer is required for NCS coupling removal.)

- 4.6.2.1 Install but do not tighten the shipping hardware. Refer to the Ameridrives Sales Drawing for size and location.

CAUTION: USE ONLY THE ORIGINAL SHIPPING HARDWARE SHIPPED WITH THE COUPLING OR EXACT REPLACEMENTS. USE OF INCORRECT HARDWARE MAY DAMAGE THE DIAPHRAGM PACK. REFER TO THE AMERIDRIVES SALES DRAWING FOR THE CORRECT SIZE AND LENGTH OR CALL AMERIDRIVES CUSTOMER SERVICE FOR ASSISTANCE.

- 4.6.2.2. Remove the spacer flange bolts at one end of the spacer. Support the spacer and, using the tapped jacking holes provided, disengage the pilot at that end to obtain a clearance of .005 - .010 IN. (.127 - .254 mm) between the spacer and the splined adapter pilots (see Figure 4-8).

- 4.6.2.3 Use the shipping hardware at that end of the coupling to retain the compression of the diaphragm pack sub-assembly obtained in Paragraph 4.6.2.2.

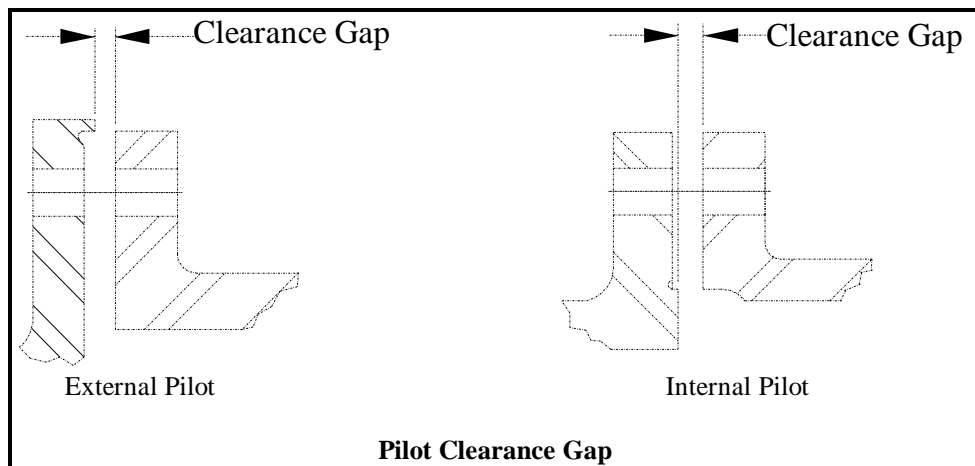


Figure 4-8

- 4.6.2.4. Repeat Paragraphs 4.6.2.1 thru 4.6.2.3 for the opposite end.

- 4.6.2.5 Remove the spacer.

- 4.6.2.6 Remove the OD fasteners. Support the diaphragm pack sub-assembly. Place (4) O.D. bolts into the tapped jacking holes provided in the guard. Tighten the jacking bolts evenly in a criss-cross pattern to pull the guard pilot back off of the hub/adapter flange. Be careful to only pull the guard back approximately 1/16" from the hub/adapter flange. **Do not under any circumstance pull the guard entirely off of the spacer ring.**

- 4.6.2.7 Repeat Paragraph 4.6.2.6 for the opposite end.

- 4.6.2.8 If diaphragm pack inspection is required, inspect the exposed diaphragm at each end of the coupling for any cracks, dents, distress areas or other abnormalities.

CAUTION: DO NOT DISASSEMBLE THE DIAPHRAGM PACK SUB-ASSEMBLY BEYOND WHAT IS DESCRIBED IN PARAGRAPH 4.6.2.6. THE SAFE OPERATION OF THE DIAPHRAGM PACK SUB-ASSEMBLY IS DEPENDENT UPON SPECIFIC CLAMP FORCES OBTAINED AT THE FACTORY DURING ASSEMBLY. ANY REDUCTION IN THESE CLAMP FORCES MAY CAUSE COUPLING FAILURE.

CAUTION: IF THE CONDITION OF THE EXPOSED DIAPHRAGM IS QUESTIONABLE, DO NOT USE THAT DIAPHRAGM PACK SUB-ASSEMBLY. REPLACE THE QUESTIONABLE UNIT WITH A NEW ONE AND RETURN THE QUESTIONABLE DIAPHRAGM PACK SUB-ASSEMBLY TO AMERIDRIVES FOR EVALUATION.

- 4.6.2.9 Hub Removal. – See section 4.6.1.7

5. **OVERSPEED TEST / SOLO OPERATION**

5.1 NC/NCS Series Coupling

- 5.1.1 Remove the spacer and diaphragm pack sub-assemblies as described in Section 4.
- 5.1.2 Check the hub, key(s), shaft nut, etc. to assure they are secure. If any loose parts are found, they must be secured before solo operation.
- 5.1.3 Equipment is now ready for solo operation.

6. **MAINTENANCE**

The Ameriflex NC/NCS coupling has been designed to be maintenance free. However, inspection of the following items during normal equipment maintenance is recommended.

- 6.1 Inspect for loose fasteners, keys, hubs, flange adapters and pilot joints.
- 6.2 Inspect the tightening torque of the fasteners. Refer to the Ameridrives Sales Drawing for the proper fastener tightening torque.
- 6.3 An alignment check is recommended to determine any shift in equipment foundations or if bearing wear is excessive.
- 6.4 Slowly rotate the equipment and listen for any abnormal noises. Cracked diaphragms have an audible clicking sound.

CAUTION: IF ANY OF THE CHECKS LISTED ABOVE IDENTIFY A PROBLEM, THEN DO NOT OPERATE THE EQUIPMENT UNTIL THE CONDITION HAS BEEN CORRECTED.

- 6.5 Fastener sets should be replaced after repeated use (5 times for bolts and nuts, 15 times for bolts and heli-coils).
- 6.6 Component balanced and assembly check balanced couplings permit field replacement of components without adversely affecting the final coupling unbalance. Assembly balanced couplings do not. Refer to the Ameridrives Sales Drawing or contact Ameridrives Customer Service for part interchangeability.

7. **FIELD SERVICE TECHNICIAN**

Should you desire assistance during installation of our couplings, Field Service Technicians are available for on-site technical support. For further information contact Ameridrives Customer Service at 814/480-5000.

8. **ORDERING INFORMATION**

- 8.1 When ordering replacement or spare parts for your Ameriflex coupling, please include the following:
 - 8.1.1 Coupling size and series.
 - 8.1.2 Serial Number (etched on all major components).
 - 8.1.3 Part Number and name of part (Refer to Ameridrives Sales Drawing).
 - 8.1.4 Sales Drawing Number (etched on the spacer).
- 8.2 Mail all correspondence to:

***Ameridrives International
Coupling Products***
P.O. Box 4000
1802 Pittsburgh Avenue
Erie, PA 16512-4000
Phone: 814/480-5000
Fax: 814/453-5891

Info@ameridrives.com
www.ameridrives.com