F Series Gear Coupling
Installation Instructions

1. INTRODUCTION

Although a coupling may have been correctly specified at time of order, operational conditions can sometimes change before the coupling is installed. Lovejoy, Inc. has information available to advise on the selection and limitations of their power transmission products, but the purchaser is ultimately responsible for verifying the suitability of their choice of product for the actual service conditions.

Correct installation and alignment will insure long life and trouble free operation of your coupling. Please read through these instructions carefully before you set the coupling into operation. Make sure you follow all safety guidelines during the installation. These Instructions are part of your product, and should be retained for future reference.

⚠ WARNING

Failure to observe the following warnings could create a risk of death or serious injury.

Proper maintenance and handling practices are critical. Always follow installation instructions provided with the product and by equipment manufacturer.

2. SAFETY

Before beginning coupling installation make sure the machinery is made safe. Discount all power. Accidents involving rotating equipment may result in loss of life, serious bodily harm or property damage. The purchaser of this equipment must assure that the equipment is properly assembled, installed, safeguarded, operated and maintained. This equipment must not be operated at conditions that exceed manufacturer's specifications.

Consult all applicable Federal, State and local laws and regulations covering the safe operation and maintenance of equipment, including, without limitation, the USDOL-OSHA "Lockout/ Tagout" procedure set forth in 29 CFR 1910.147.

Because of the possible danger to persons or property from accidents which may result from the improper use or unapproved modification of the product, this product must be installed, maintained and operated in accordance with the procedures, standards and engineering specifications specified in the product literature. To assure safe operation, this product should be inspected in accordance with the instructions described in this document. Proper guards and any suitable safety equipment or procedures as may be necessary, or as may be specified in safety codes, should be installed by the user. Safety equipment and shields are not provided, nor are they the responsibility of Lovejoy LLC.

3. INSPECT PRODUCT

Before beginning installation, the coupling should be examined for any signs of damage that may have occurred during shipping and handling. Confirm that all components ordered are there.

For maximum protection, the coupling and components should be stored in the original packaging.

Measurements should be made to verify correctness of parts to meet application requirements, such as; hub bore diameter, shaft diameter, shaft separation, etc.

Note: Although F-Series gear couplings may be shipped with the hub inside the sleeve, the complete couplings are normally shipped unassembled. The O-Ring seals are typically packaged with the sleeves.

Note: F Series Gear Couplings are shipped unassembled .

Table 1		*Typical Components*			
Size	**Hubs**	**Sleeves**	**O-Rings**	**Shrouded Bolts & Locknuts Per Hub**	**Exposed Bolts & Locknuts Per Hub**
1	2	2	2	6	6
1.5	2	2	2	8	8
2	2	2	2	10	6
2.5	2	2	2	10	6
3	2	2	2	12	8
3.5	2	2	2	12	8
4	2	2	2	14	8
4.5	2	2	2	14	10
5	2	2	2	14	8
5.5	2	2	2	16	14
6	2	2	2	Exposed Bolts Only	14
7	2	2	2		16
8	2	2	2		16
9	2	2	2		18

Disclaimer: Lovejoy manufactured the coupling interfaced based on the shaft data supplied by the purchaser. Lovejoy 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. TOOLS REQUIRED

- Calipers
- Sockets and appropriate open end wrenches
- Calibrated Torque Wrench
- Alignment Equipment
- Oven or heating device for interference fit hubs

5. COMPONENT PREPARATION

Clean the exposed surfaces of all components, hubs, sub-assemblies, spacers, etc., to remove any protective coating applied at the factory. All parts must be clean and free of any foreign materials before attempting installation or assembly, use a clean cloth dampened with a nonflammable solvent.

Check Sleeves, Hub Bores, Keyways and Shafts for any raised metal, nicks, burrs, dents, gouges, etc., dress if necessary.

a. **Apply a light coat of grease to the O-Rings and insert the O**.

b. Prior to removing the existing gear coupling, **check the measurement of the Distance Between Shaft Ends (BSE)** between the driver and driven to verify fit. ***Note: When measuring the BSE, measure from or the ends of the shafts or the hub flange faces not from the hub's Pilots*** **.**

c. Remove the existing coupling.

NOTE: Sleeve Positioning (prior to hub installation):

The sleeve will need to be slid onto the shaft with the O-ring installed prior to installing the hub allowing adequate room to mount the hub. Care should be taken to support the sleeve and prevent accidental damage if the sleeve were to slip while placing it on the shaft. Once the sleeve is on the shaft, allow room to install the hub. The sleeve will need to be supported to prevent damaging the seal. The flange face should be oriented toward the end of the shaft.

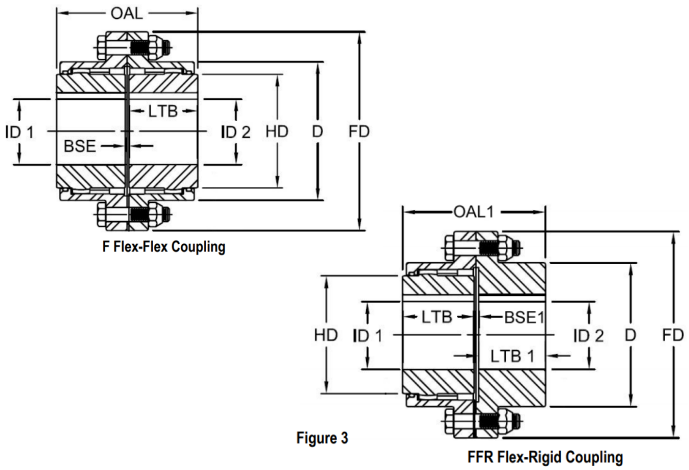


Figure 3

6. HUB INSTALLATION

CAUTION **Failure to follow this caution may result in property damage.**
Hubs must be supported during installation to avoid accidental damage should they slip.

a. Lovejoy supplies **inch** dimensioned straight disc hub bores with keyway to ANSI/AGMA 9002-B04 standard for interference fit unless other wise specified.

b. Lovejoy supplies **metric** dimensioned straight disc hub bores with keyway to ANSI/AGMA 9112-A04 standard for interference fit unless other wise specified.

c. **Straight Bore:** Install key(s) in the shaft. The key(s) should have a snug side-to-side fit with a small clearance over the top. To maintain dynamic balance, the key(s) should fit exactly and not be to short or long. Align hub and shaft key (s) then slide hub on the shaft.

d. **Straight Bore Interference Fit:** This type of installation is for straight shafts, with the exception that the hubs must be heated before they slide on to the shaft.

⚠ **WARNING** **Failure to observe the following warnings could create a risk of death or serious injury.**
Use extreme care when handling heated hubs to avoid injury to personnel.

It is important when mounting inference hubs to make sure that clearance exists over the top of keys: otherwise, when the hub cools, it will rest on the key and produce high stresses in the hub that could cause it to fail.

Expand the hub bore with a uniform heat source, Oil, Oven or Induction.

Oil bath heating is usually limited to approximately 350˚F (177°C), or less than the flash point of the oil used. Special handling devices are required such as tongs, threaded rods placed in puller holes in the hub, etc. If an oil bath is used, the oil must have a flash point of 350°F (177°C) or higher. Do not rest hubs on the bottom of the container.

Oven heating offers some advantages over oil. Parts can be heated to higher temperatures, usually not exceeding 600˚F (315˚C) and the parts can be handled with heat-resistant gloves. Do not rest hubs on oven; place them on a rack.

An Induction heater can be used as long as the temperature rise is controlled.

Open Flame Heating is **not recommended**. If an oxy-acetylene or blow torch is used, use an excess acetylene mixture. Mark the hub body at the top, center and bottom of their length in several places with heat sensitive crayons, one 350˚F (177°C) and one 450˚F (232°C) melt temperature.

Elevate the hub with refractory bricks to allow the flame to flow through the hub. With a "Blue flame" or "Rose bud torch" direct the flame towards the hub bore using constant motion to avoid overheating an area. Once the heat sensitive crayons melt the hub is ready for mounting.
Regardless of method used, heat MUST be applied evenly to avoid distortion. This is especially important when using open flame heating. In any event, extreme care must be exercised when handling heated hubs to avoid injury to personnel.

CAUTION **Failure to follow this caution may result in property damage.**
Do Not Spot Heat the Hub or Distortion May Occur. **Do Not Exceed 600˚F** (315˚C) During the Heating of the Hub. Excessive Heat may soften the Hub, Reducing the Strength of the Steel and may affect the Performance Characteristics of the Hub.

Note: The coupling sleeves must be slid onto the equipment shaft prior to mounting the hubs.

e. Mount the hubs on the proper shafts and ensure the face of the hub is even with the end of the shaft. The hub should be oriented with the long end of the hub facing the end of the shaft unless this is a "Slide – FSL" style coupling (Contact Lovejoy Technical Support with questions). The key should be lined up with the end of the shaft and face of the hub. Once mounted on the shaft, allow the hubs to cool completely before continuing.

7. GEAR COUPLING ALIGNMENT

a. Although the shafts may be accurately aligned at installation, they will need to be realigned after the coupling hubs have been mounted. Position the equipment in approximate alignment with the appropriate and specified hub separation (BSE) dimension per Table-2 at the end of this document. Allowable angular and parallel misalignment values are shown in Table-4. Methods for performing an industry accepted coupling alignment will be covered in the next two steps.

b. Angular Alignment – Attach a dial indicator base to one of the hubs and position the indicator needle against the face of the other hub. Ensure the needle is placed on a clean smooth surface as close to the outside diameter of the hub face as possible. Rotate the hub 360º and record indicator readings at four points, 90º apart. Adjust the equipment until all four readings are identical. The difference between the maximum and minimum measurements must not exceed the Installation Limits for "Angular Max" as found in Table-4. Relocate the indicator to the opposite hub and repeat this procedure.

c. Parallel Offset Alignment – Although laser alignment equipment is available in the market today, it is not always readily available. For that reason, the dial indicator method can be used for measuring and correcting parallel misalignment. Attach the dial indicator base to one of the hubs and set the dial indicator needle in contact with the outside diameter of the opposite hub. Rotate the hub that the indicator needle is resting against 360º and record indicator readings at four points, 90º apart. Adjust the equipment until all four readings are identical. The difference between the maximum and minimum measurements must not exceed the Installation Limits for "Offset Max" as found in Table-4. Relocate the indicator to the opposite hub and repeat this procedure.

d. Tighten all equipment mounting and foundation bolts; then repeat steps 2 and 3 to ensure the coupling hubs are still in proper alignment. The BSE should not have changed and should match the specified value for the coupling as purchased (see Table-2).

8. COUPLING ASSEMBLY:

a. Per instructions earlier in this document, the sleeves should already be mounted on the shafts with the O-rings in place prior to mounting the hubs.

b. Hand apply an ample amount of coupling grease around the gear teeth on one hub and the gear teeth inside the mating sleeve. Then carefully slide the sleeve over the hub. Maintain careful support for the sleeve to protect the O-Ring seal and ensure the sleeve does not impact against the hub causing damage. The gear teeth in the sleeve should mesh with the gear teeth on the hub. Slide the sleeve over the hub until the hub protrudes through the O-Ring seal. The teeth and seal should support the weight of the sleeve at this time. Repeat this process for the opposite hub and sleeve.

c. Prior to sliding the sleeves together, remove the flange gasket from the accessory kit and position the gasket between the two flanges then slide two or more of the bolts from the accessory kit through the top bolt holes to hold the gasket in place. Use care not to crimp or damage the gasket.

8. COUPLING ASSEMBLY (continued)

d. Slide the two flanges together with the gasket between them. Be careful not to crimp or damage the gasket. Then insert the remainder of the bolts from the accessory kit. The grease fitting holes should be located 180º apart. Insert the remainder of the bolts and hand tighten the nuts on each bolt.

e. Partially tighten each of the nuts in a star, or criss-cross, pattern, again using care to ensure the gasket is not being crimped or damaged.

f. Use a calibrated torque wrench to tighten the bolts and nuts following a star, or criss-cross, pattern until each bolt has been tightened to the specified torque value as defined in Table-3.

g. Insert a grease fitting in one of the grease fitting ports and leave the second hole unplugged. Rotate the coupling until the grease fittings are horizontal. Use only coupling grease and inject the grease through the fitting until the recommended amount specified in Table-4 has been loaded into the coupling. Place the grease plugs in both fitting holes prior to placing the coupling in service.

9. MAINTENANCE:

a. It is typical to inspect the coupling after running a few hours or less to ensure there are no issues with alignment, heat, or other concerns that could be detrimental to the operation of the coupling.

b. After roughly one month of operation, the coupling should be disassembled and inspected for abnormal wear, problems with grease, and possible issues with equipment alignment.

c. Periodic inspections should take place at least on an annual basis to ensure the coupling is performing as designed and the grease is not breaking down. Specifications for coupling grease can be found at http://www.lovejoy-inc.com under Technical Resources.

Note: During maintenance, when the coupling is not being disassembled or the bolts are not removed, insert a grease fitting in one of the grease fitting ports and leave the second hole unplugged. Rotate the coupling until the grease fittings are horizontal. Inject grease through the fitting until clean grease oozes out of the other port. Again, Place the grease plugs in both fitting holes prior to placing the coupling back in service.

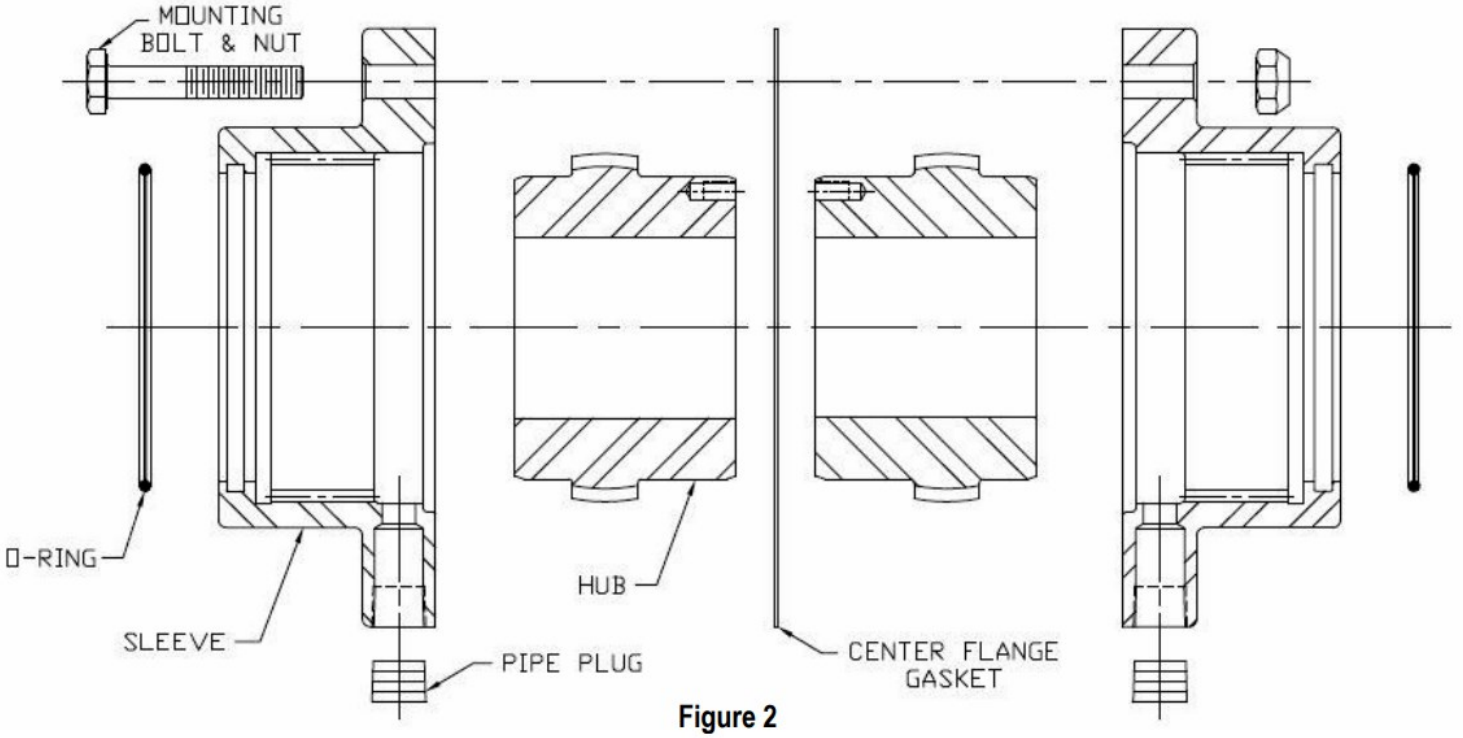
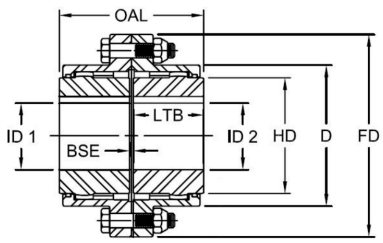


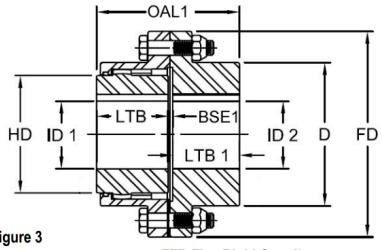
Figure 2

F Series Gear Coupling
Installation Instructions



F Flex-Flex Coupling

Figure 3



FFR Flex-Rigid Coupling

Table 2—Dimensional Data Inches

Size	OAL	OAL 1	FD	D	HD	BSE	BSE 1	LTB	LTB 1
1	3.5	3.41	4.56	3.06	2.31	0.13	0.16	1.69	1.56
1.5	4.00	3.94	6.00	3.97	3.00	0.13	0.16	1.94	1.84
2	5.00	4.88	7.00	4.86	4.00	0.13	0.16	2.44	2.28
2.5	6.25	6.13	8.38	5.84	4.63	0.19	0.19	3.03	2.91
3	7.38	7.19	9.44	6.84	5.63	0.19	0.19	3.59	3.41
3.5	8.63	8.38	11.00	7.91	6.50	0.25	0.22	4.19	3.97
4	9.75	9.50	12.50	9.25	7.50	0.25	0.31	4.75	4.44
4.5	10.94	10.69	13.63	10.38	8.50	0.31	0.34	5.31	5.03
5	12.38	12.06	15.31	11.56	9.50	0.31	0.34	6.03	5.69
5.5	14.13	13.41	16.75	12.72	10.50	0.31	0.34	6.91	6.16
6	15.13	15.22	18.00	14.00	11.50	0.31	0.41	7.41	7.41
7	17.75	17.88	20.75	15.75	13.00	0.38	0.50	8.69	8.69
8	22.38	22.50	23.25	18.34	15.50	0.38	0.50	11.00	11.00
9	23.50	23.56	26.00	20.38	17.00	0.50	0.56	11.50	11.50

Notes: For OAL, BSE, and LTB, standard options are flex-flex. OAL 1, BSE 1, and LTB 1 options are for flex-rigid.

Table 3—Performance Data

Size	Nominal Torque		Maximum Bore Size				Approximate Weight (based on RSB)		WR 2 x 10^{-6}	Flange Bolts		
			Flex-Hubs		Rigid Hubs							
	in-lbs	Nm	in	mm	in	mm	lbs	kg		Qty	Size	Tightening Torque
1	7,600	850	1.625	42	2.125	56	9	4	19	6	1/4-28	130
1.5	18,900	2140	2.125	56	2.813	76	19	9	65	8	3/8-24	425
2	31,500	3560	2.750	73	3.500	95	34	15	150	6	1/2-20	940
2.5	56,700	6410	3.250	85	4.250	114	54	25	340	6	5/8-18	1750
3	94,500	10700	4.000	107	4.875	134	80	36	655	8	5/8-18	1750
3.5	151,200	17100	4.625	125	5.625	150	130	59	1,485	8	3/4-16	2650
4	220,500	24900	5.375	145	6.500	176	190	86	2,725	8	3/4-16	2650
4.5	302,400	34200	6.000	165	7.625	202	250	114	4,280	10	3/4-16	2650
5	434,700	49100	6.500	180	8.750	230	380	173	8,280	8	7/8-14	3650
5.5	573,300	64800	7.500	200	9.500	260	520	236	12,795	14	7/8-14	3650
6	749,700	84700	8.250	225	10.500	285	650	295	17,290	14	7/8-14	3650
7	1,008,000	113900	9.500	255	12.000	320	950	431	32,180	16	1-14	4850
8	1,323,000	149500	11.500	310	14.000	375	1,560	708	64,610	16	1-1/8-12	6300
9	1,827,000	206400	12.500	340	15.500	415	2,015	915	110,940	18	1-1/4-12	8300

Notes: Bolt sizes for exposed bolts only (Lovejoy standardized on exposed bolts, shrouded bolts are available). Bore and keyway tolerances for inch dimensions are based on the ANSI/AGMA 9002-B04 Standard. Bore and keyway tolerances for metric dimensions are based on the ISO 286-2 Standard.

Table 4—Alignment and Lubrication

Size		1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	7	8	9
Hub Separation Flex Flex		0.1250	0.1250	0.1250	0.1875	0.1875	0.2500	0.2500	0.3125	0.3125	0.3125	0.3125	0.3750	0.3750	0.5000
Hub Separation Flex Rigid		0.1563	0.1563	0.1563	0.1875	0.1875	0.2188	0.3125	0.3438	0.3438	0.3438	0.4063	0.5000	0.5000	0.5600
Installation Limits	Offset Max	0.0111	0.0121	0.0170	0.0209	0.0233	0.0262	0.0298	0.0350	0.0403	0.0442	0.0239	0.0272	0.0317	0.0334
	Angular Max	0.0070	0.0090	0.0116	0.0135	0.0164	0.0186	0.0215	0.0248	0.0272	0.0304	0.0165	0.0186	0.0223	0.0242
Operating Limits	Offset Max	0.0556	0.0603	0.0850	0.1047	0.1164	0.1312	0.1490	0.1749	0.2014	0.2210	0.1195	0.1358	0.1587	0.1669
	Angular Max	0.0348	0.0449	0.0578	0.0676	0.0818	0.0928	0.1074	0.1240	0.1360	0.1519	0.0823	0.0928	0.1114	0.1212
Tooth Center to Tooth Center		2.125	2.305	3.245	3.998	4.448	5.010	5.690	6.683	7.693	8.443	9.133	10.375	12.125	12.750
Max Speed (RPM) Unbalanced		6,000	5,500	5,000	4,400	4,000	3,500	3,000	2,700	2,500	2,200	2,100	2,000	1,900	1,800
Flex-Flex Lube Capacity	Weight	2oz	4oz	6oz	11oz	1.0lbs	1.3lbs	2.0lbs	3.5lbs	4.5lbs	6.5lbs	7.3lbs	9.3lbs	18lbs	20lbs
	Volume	2oz	4oz	6oz	12oz	18oz	24oz	1.1qt	2.0qt	2.5qt	3.5qt	1.0gal	1.3gal	2.3gal	2.8gal
Flex-Rigid Lube Capacity	Weight	1oz	2oz	3oz	5oz	8oz	10oz	1.0lbs	1.8lbs	2.3lbs	3.3lbs	3.6lbs	4.6lbs	8.8lbs	10lbs
	Volume	1oz	2oz	3oz	6oz	9oz	12oz	18oz	1.0qt	1.3qt	1.8qt	2.0qt	2.4qt	1.1gal	1.4gal

Lovejoy LLC
2655 Wisconsin Avenue
Downers Grove, IL 60515
630-852-0500
630-852-2120 Fax
info@lovejoy-inc.com