

# FSR – General Purpose Overrunning Clutches Models FSR-3 thru 16

P-222-8

BULLETIN 2217

## Service & Installation Instructions



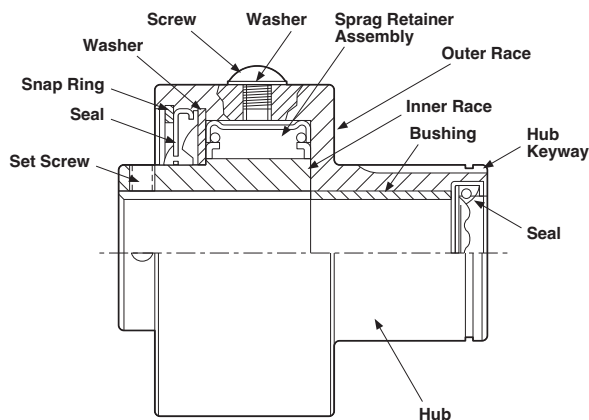
 **Formsprag**<sup>®</sup>  
Clutch

An Altra Industrial Motion Company

## Introduction

All Formsprag FSR Series clutches, except the FSR-3, utilize a free action retainer and a full complement of load carrying Formchrome®, sprags made of ball bearing steel. They are designed and built for general purpose use in a wide range of overrunning, indexing and backstopping applications. Follow the step by step installation and service instructions in this bulletin for optimum performance and life.

**⚠ WARNING** Failure to follow these instructions may result in product damage, equipment damage, and serious or fatal injury to personnel.



## Pre-instruction Check

Before installing, check:

1. Shaft to Bore fit:

Clutch Bore	Recommended Fit*
to 1 inch dia.	Line fit to .002 inches loose
1 to 2 inches dia.	Line fit to .0025 inches loose

\*If, under special circumstances, a press fit is necessary, do not exceed .001 inch tight in the area supporting the inner race only. A press fit is not recommended under any circumstances in the area under the bushing.

2. **Shaft Key and Keyway:** A hardened key, from 30 to 40 Rockwell "C" scale, is recommended. Use material AISI 1141, 1045 or 4130. The key should be installed with a push fit and must seat squarely. **Do not use a driving or force fit.** For INDEXING applications, fit key to prevent loosening in service. Make key fit .001 inch tight on width dimension. **Do not exceed .001 inch tight.**

**Note:** The FSR-3 is secured to the shaft with a pin which is shipped with the clutch.

3. **Outer Race Bushing: The customer's shaft must extend through the bushing in order to provide support for the outer race.** The journal diameter (the portion of the shaft in the bushing) should be the same as the shaft diameter (in the inner race) to provide proper oil film clearance. The journal surface should be 270 Brinell hardness, minimum, with a 32 RMS micro-inch, or better, finish. Taper should not exceed .0005 inches per inch of journal length. **The keyway in the shaft portion should not extend into the bushing.**
4. **Rotation:** Turn the inner race to check for proper direction of rotation. If hand effort does not cause clutch to over-run, tap outer race lightly with plastic or leather hammer while exerting a light torque load in overrunning direction. To change overrunning direction, return clutch to your Formsprag Clutch Distributor or directly to Formsprag.

## Installing

1. Mount clutch and key on the shaft:  
Model FSR-3 with a .375 bore may be secured to the shaft either with a .187" diameter roll pin (furnished) or with two .250"-28 U.N.F. set screws, 180° apart. Model FSR-3 with a .500" bore secures to the shaft only with .187" diameter roll pin. All other models, FSR-5 thru 16 use two set screws at 90° for mounting.

To use roll-pin mounting, drill 3/16" diameter hole through the shaft as required for axial location.

Key must have chamfered corners to fit keyway.

**⚠ CAUTION** Caution must be exercised when installing FSR clutches over keyways on shafts for two reasons: (A) To prevent damage to the seal located in the hub of the outer race (B) To prevent the seal lip from flipping during installation.

To prevent damage to the seal during installation use the following procedure:

- A. Before installing the clutch onto the shaft be sure that both the end of the shaft and the keyseat are free of all sharp edges, nicks and burrs. If not, put an appropriate chamfer on the shaft end and remove all sharp edges and burrs.
- B. Put a small amount of lubricant around the lip of the seal before installing the clutch. Make sure that the lubricant is not of an EP type. This will help minimize the seal lip from reversing (flipping) during assembly.
- C. Start the clutch onto the shaft.
- D. Gently slide the clutch farther on the shaft making sure that the seal lip is in its proper position. Pressure may be applied to the end face of either race when mounting the clutch on the shaft. **Do not use a press fit.**
- E. In the event the seal lip is reversed during the installation process, it will be necessary to correct this condition as follows:

Use a blunt thin instrument (tool) and insert it between the seal lip and the shaft. Work the lip back into position by rotating the tool around the shaft. Be careful not to puncture the seal.

**Note:** To simplify mounting, should a fit .001 inch tight be required (tightest allowable) immerse clutch in hot, clean oil (not to exceed 200°F/93°C) for ten or fifteen minutes before mounting.

- 2. Tighten inner race set screws on FRS-5 thru 16. Insert furnished pin thru inner race and shaft of Model FSR-3.
- 3. Mount components as required on outer race hub. Standard hub dimensions are tabulated. A snap ring (not supplied) should be installed in the hub groove to retain the component axially.

**Important:** Mounting arrangement must not cock the clutch races. Inner race and Outer race must run concentric within .002.

**Hub Specification:**

Model	O.D.	Length	Keyway	
FSR-3	.875/.874	.81	.125x.06,	.500 Long
FSR-5	1.250/1.249	1.00	.187x.09,	.562 Long
FSR-6	1.375/1.374	1.31	.187x.09,	.937 Long
FSR-8	1.750/1.749	1.44	.250x.13,	1.000 Long
FSR-10	2.250/2.249	1.44	.312x.16,	.940 Long
FSR-12	2.500/2.499	1.44	.375x.19,	1.380 Long
FSR-14	2.875/2.874	1.75	.437x.22,	1.560 Long
FSR-16	3.250/3.249	1.75	.500x.25,	1.690 Long

**Note:** For INDEXING applications, fit key to prevent loosening in service. Make key fit .001 inch tight on width dimension. DO NOT EXCEED .001 inch tight.

- 4. If the clutch is oil lubricated, use a suitable sealant, such as RTV around the bore and keyseat of the inner race. Make sure that the area is clean and dry before applying the sealant.
- 5. Check clutch lubrication.

Model FSR-3 is factory lubricated for life with grease.

Models FSR-5 thru 16 are factory lubricated with grease. FSR-5 thru 16 may be special ordered with oil. Letters (-GR) after the part number on a clutch designates grease lubrication.

**▲CAUTION FSR clutches that are oil lubricated are shipped dry and must be filled with oil before being put into service, see Oil Lubrication-Filling Procedure.**

**Grease Lubrication**

Grease lubrication clutches are packed at the factory with Lubriplate Brand “Low Temp” grease by Fiske Bros. Refining Co. The ambient temperature for operation of greased clutches is +20°F to +150°F (-7° to + 65°C).

**Grease Lubrication Maintenance**

For Models FSR-5 thru 16, use greases selected from the following table:

- Fiske Bros. Lubriplate Low-Temp
- Fiske Bros. Aero Lubriplate
- Exxon Beacon 325
- Shell Aeroshell No. 7
- Shell Aeroshell No. 16

**Important:** Do not mix above greases, they are not compatible. When switching from one brand to another, pump a sufficient amount of grease into the clutch to insure that all the previous grease has been purged out.

**CAUTION** Do not use lubricants of the EP type (extreme pressure characteristics) or those containing slippery additives.

- Do not attempt to substitute oil lubrication in a standard grease lubricated clutch. The use of oil lubricant in a clutch intended for grease could cause a malfunction.
- Formsprag Clutch can convert in-service clutches from grease to oil lubrication. Changes in internal construction are usually required. Consult Formsprag Clutch Service Department, giving complete model number.
- Use no other grease unless a specific recommendation has been made by Formsprag Clutch.
- For indexing rates in excess of 250 strokes per minute, where grease lubrication is required, consult Formsprag Clutch for lubricant recommendations.

### Overrunning and Backstopping

Lubricate clutch every three months. Under severe abrasive dust conditions or especially rugged operation, lubricate monthly. Use recommended grease only.

### Indexing

Grease clutch every month. Under severe abrasive dust conditions or especially rugged operation grease twice a month. Use recommended grease only.

**Note:** Periodic flushing of greased clutches is usually not necessary since old grease is purged out when new grease is pumped in.

### Grease Lubrication Procedure

1. Clean the grease fittings located on the clutch outer race.
2. Pump grease into the clutch with a grease gun until new grease flows freely from around the shields.

### Oil Lubrication

If the clutch has been specially ordered with oil lubrication, use oil selected from the following tables according to the clutch ambient temperature and the application.

Overrunning & Backstopping Applications:

Temperature Range	Recommended Lubricant
+20°F to +150°F (-7°C to +65°C) (Max. permissible ambient temperature)	Chevron GST Oil 68 Mobil DTE Heavy Medium Any Automatic Transmission Fluid (ATF) Texaco Regal Oil R&O 68 Shell Turbo Oil 68 AMOCO Industrial Oil 68 Exxon Teresstic Oil 68 Sunoco Sunvis 931
-10°F to +20°F (-23°C to -7°C)	Chevron GST Oil 46 Mobil Gargoyle Arctic C Heavy Texaco Regal Oil R&O 46 Any Automatic Transmission Fluid (ATF) AMOCO Oil Industrial 46 Sunoco Sunvis 921
-40°F to +150°F (-40°C to +65°C) (Max. permissible ambient temperature)	Mobil Jet Oil 2 Shell Turbine Oil 500 Exxon Turbo Oil 2389 Standard Esso Turbo Oil 2389 Military Oils MIL-L-7808 or MIL-L-23699

Indexing Applications:

Temperature Range	Recommended Lubricant
+20°F to 150°F (-7°C to +65°C) (Max. permissible ambient temperature or 150 strokes per minute or less)	Mobil DTE Light Oil Any Automatic Transmission Fluid (ATF) Texaco Regal Oil 46 Shell Turbo Oil 33 AMOCO Industrial Oil 15 Exxon Teresstic Oil 32
-10°F to +20°F (-23°C to -7°C) (ambient or 150 strokes per minute or less)	Sunoco Sunvis 916 Exxon Zerice 46 Any Automatic Transmission Fluid (ATF)
-10°F or below (-23°C)	Consult Formsprag Clutch Service Department

**⚠ CAUTION** Do not use lubricants of the EP type (extreme pressure characteristics) or those containing slippery additives.

**⚠ WARNING** The use of lubricants in clutch assemblies, other than those shown, can result in improper sprag engagement. Improper sprag engagement may cause personal injury or property damage.

**Formsprag Clutch is not responsible for any changes made by the manufacturers in their lubricants.**

**The use of any lubricants, other than those listed in this bulletin, will automatically void any warranty.**

**Important:** Do not mix the above oils, they are not compatible. When switching from one brand to another, drain old oil and flush clutch with mineral spirits. Do not use CARBON TETRACHLORIDE before adding new oil.

### Oil Lubrication Maintenance

1. Lubrication is the most important clutch maintenance factor for longer service life.
2. Fill the clutch with oil once each month. For indexing applications, fill with oil every two weeks or after one hundred (100) hours of operation, whichever comes first. When clutch indexes at more than 150 strokes per minute or overruns at high speed in rugged duty cycle, oiling may be required at shorter intervals.

3. To assure continued efficiency of operation, flush the clutch every six (6) months with mineral spirits. **Do not use carbon tetrachloride.**

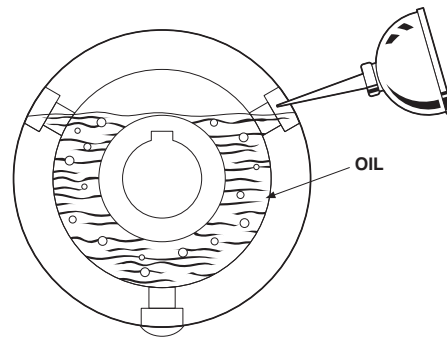
**Important:** Under severe operating conditions such as heavy dust or twenty-four hours per day operation, flushing may be required at shorter intervals.

4. Flush with mineral spirits and relubricate before use if clutch has been stored or out of use for six (6) months or more. Flushing will remove waxes or gums formed by vaporization of the oil. (See Flushing Procedure.)

### Oil Lubrication – Filling Procedure

1. Three holes, 120 degrees apart, are located in the clutch outer race, (see Figure 1).
2. Rotate clutch so that one oil hole is at bottom.
3. Remove the upper two oil hole plugs.
4. Add oil through one of top oil holes until oil comes out of the other. The clutch is then sufficiently full of oil. A squirt can works well for the purpose of adding oil.
5. Install all oil hole plugs.

Oil Hole Plugs: 1/4-28-UNF 3A socket button head screws with tanned leather washers are used to plug oil holes. Spare parts may be ordered from Formsprag. When ordering, specify the clutch model number.



**Figure 1**

### Flushing Procedure

1. Rotate clutch outer race to locate one oil port at lowest point of outer race.
2. Remove lowest plug and drain clutch of oil. Remove upper plugs for venting and better drainage.
3. Install bottom drain plug and fill clutch with mineral spirits. Install filling plugs.
4. Rotate clutch slowly for several minutes to break up and dissolve oily residue and waxes which may have formed. Indexing clutches may be operated for five to ten minutes to do this.
5. Remove lower plug and drain all mineral spirits from the clutch assembly. Remove upper plugs for venting for better drainage.
6. Replace all oil hole plugs.
7. Relubricate clutch according to Oil Lubrication Filling Procedure.

## Clutch Rebuilding Service

### Disassembly and repair of Formsprag clutches in the field is not recommended.

Formsprag clutches are precision devices manufactured under careful controls to meet exacting standards. When reconditioning is required, clutches should be returned to Formsprag Clutch directly, through the Distributor, or through the Original Equipment Manufacturer.

## Packaging

Your Formsprag clutch, carefully wrapped in Vapor Inhibitor type activated paper for corrosion protection and packed in a shipping box conforming to the requirements of Rule 41, Uniform Freight Classification, may be stored for up to two (2) years and reshipped without added packaging.

These instructions cannot cover all details or variations in equipment and applications nor provide for every possible contingency which may be met in installation, operation or maintenance. Should further information be needed, contact Formsprag Clutch.

For additional technical and dimensional information on FSR Series clutches refer to Formsprag Overrunning Clutch Catalog P-956 or call Formsprag Application Assistance at 1-800-927-3262.

## Rotating Equipment

Rotating equipment is potentially dangerous and should be properly guarded. The user should check for all applicable safety codes (in local area) and provide a suitable guard.

## Warranty

Formsprag LLC warrants that it will repair or replace (whichever in its sole discretion it deems advisable) any product it manufactured and sold which proves to be defective in material or workmanship within a period of one (1) year from date of original purchase for consumer, commercial or industrial use. This warranty extends only to the original purchaser and is not transferable or assignable without Formsprag LLC's prior consent.

This warranty covers normal use and does not cover damage or defect which results from alterations, accident, neglect, disassembly, or improper installation, operation, or maintenance.

Formsprag LLC's obligation under this warranty is limited to the repair or replacement of the defective product. In no event shall Formsprag LLC be liable for consequential, indirect or incidental damages of any kind incurred by reason of manufacture, sale or use of any defective product. Formsprag LLC neither assumes nor authorizes any other person to give any other warranty or to assume any other obligation or liability on its behalf.



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