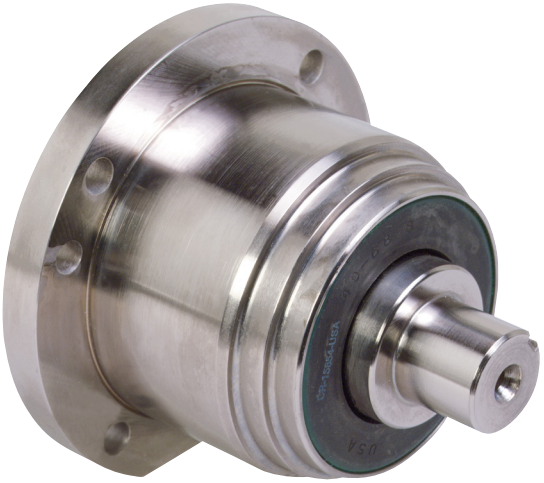
RegalRexnord™

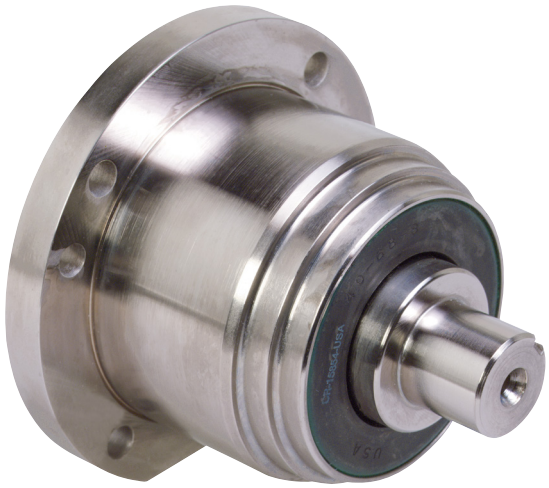
Form-Lock® Bi-Directional Driving and Backstopping



FORMSPRAG CLUTCH™

FORMSPRAG™
FORM-LOCK (FL)

A bi-directional driving and backstopping clutch, also known as a “No-Back.” It is engineered for high-precision, high-performance applications where controlled motion and holding capability are critical. The FL clutch allows torque transmission in both directions while preventing reverse motion under load.



KEY-FEATURES & BENEFITS

- **Bi-Directional Backstopping:** Prevents reverse torque in both directions.
- **No Chatter with Overhauling Loads:** Smooth operation even under aiding loads.
- **Energy Absorbing Shoes:** Decelerates output gradually, reducing shock and wear.
- **No Trapped Torque:** Breakaway torque is nearly equal to running torque.
- **Durable Construction:** Hardened alloy steel ensures long life and low wear.
- **Precision Engineering:** Uniform loading reduces wear and eliminates brinelling.
- **Maintenance-Free:** Lubricated for life with Mobil SHC 32.

WHY CHOOSE FORM-LOCK?

- Ideal for manual or slow-speed systems where precision and safety are paramount.
- Eliminates the need for auxiliary locking devices.
- Supports custom shaft and housing configurations for specialized applications.
- Proven performance in mission-critical environments like aerospace and defense.

Applications

MILITARY & DEFENSE

Artillery gun platforms (position holding)
Tank turrets
Howitzers
Gun turret and artillery elevation/azimuth drives
Missile launch stands
Ordnance systems

AEROSPACE

Aircraft cargo door freight (position holding)
Aircraft flap actuator backstop
Ground spoiler actuator backstop
Aircraft weapons rack actuator
Aircraft engine throttle systems
Throttle control for aircraft
Servo-manual and override controls

INDUSTRIAL & MATERIAL HANDLING

Vertical lifting systems
Winch drives
Ball screw actuators
Linear and rotary actuators

Form-Lock™ Features

FORMSPRAG'S FORM-LOCK CLUTCH IS A BI-DIRECTIONAL DRIVING AND BACKSTOPPING DEVICE (I.E. BI-DIRECTIONAL NO-BACK).

Bi-Directional Driving and Backstopping Devices for High Performance and High Precision:

- No Chatter from Overhauling Loads
- Energy Absorbing
- Highest Quality
- No Trapped Torque
- Precision Manufacture
- Hardened Alloy Steel Construction Provides Long Life and Low Wear
- Will Not Be Damaged in Intermittent Overload Conditions

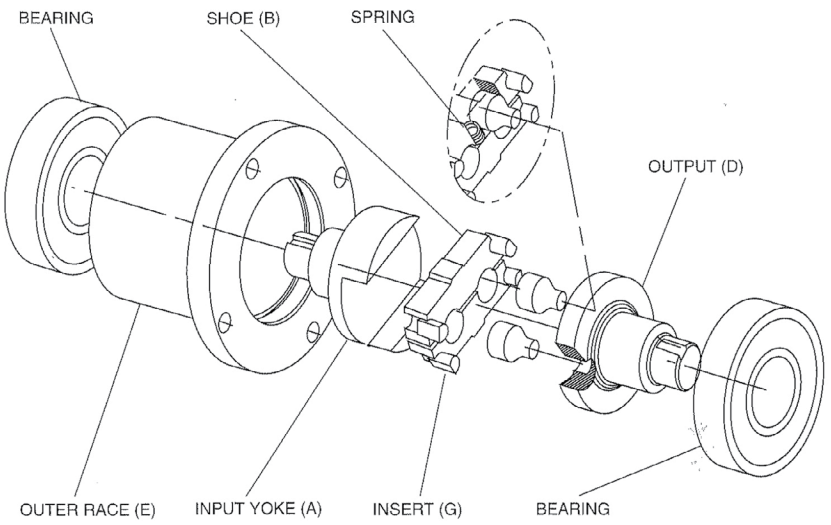


FIG. 1. Form-Lock Clutch

Form-Lock

The Form-Lock, shown schematically in Figure 1, has many advantages that make it adaptable to a wide variety of applications. The basic design can perform such functions as bi-directional overrunning or backstopping.

As a bi-directional no-back device, the Form-Lock allows transmission of torque in either direction of rotation of the input. Torque passes through the input yoke (A), to the shoes (B), to the output pins (C), and to the output (D).

Reverse torques energize the output pins. Through lever mechanical advantage, these pins force the shoes into contact with the stationary outer race (E) preventing reverse torques from being transmitted in either direction through the Form-Lock clutch to the input.

Unique advanced wear resistant inserts (G) in the shoes pivot inside the shoe cavity insuring lower uniform loading and less wear on the insert as well as a more uniform loading of the outer race. This design minimizes the potential for any brinell to the outer race.

Controlled friction in the energy absorbing shoes allows the output to decelerate rather than stop suddenly. This enables the clutch to operate without "chatter" when there is an aiding (overhauling) load present. The controlled friction feature also prevents freewheeling rotation of the clutch if the input member is inadvertently rotated. This eliminates the need for auxiliary locking devices.

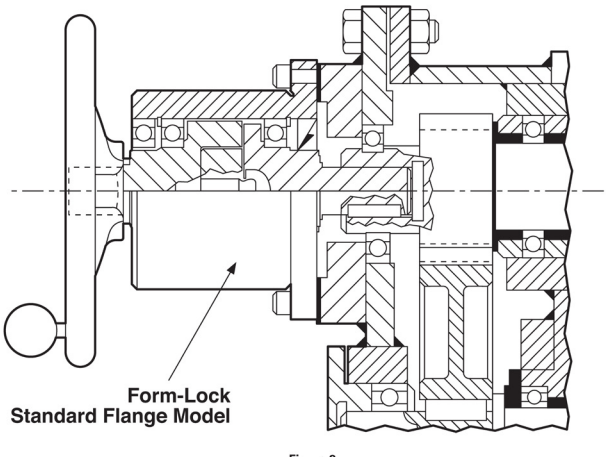
Since the Form-Lock clutch absorbs energy, it does not trap torque. Break away effort after backstopping and removing the load is the same as no-load drag, regardless of the level of the backstopped load. Therefore, starting torque (breakaway torque) and running torque are nearly equal. Torque capacity is limited only by the space provided. The operating speed range is determined by the clutch size, bearing life, and lubrication.

Form-Lock™ Bi-Directional Driving and Backstopping

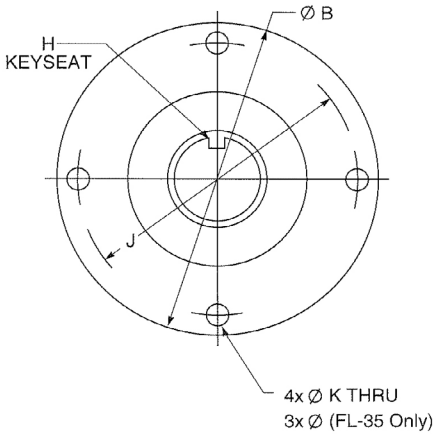
MANUAL DRIVES

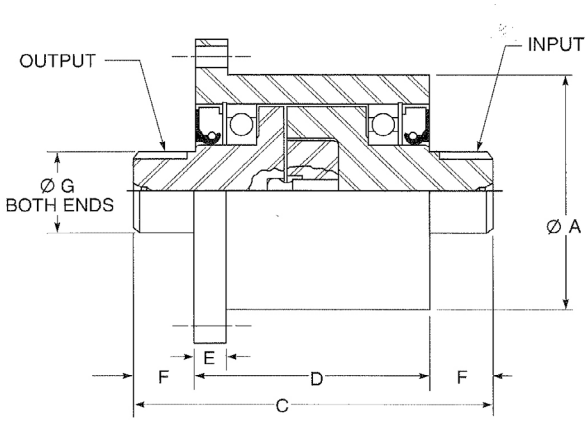
The Form-Lock is an excellent device for manual drives where a second power source is needed. Typical applications include:

- Turret Drives
- Servo-Manual and Over-Ride Controls
- Aircraft and Marine Engine Throttle Controls



STANDARD FLANGE MODELS





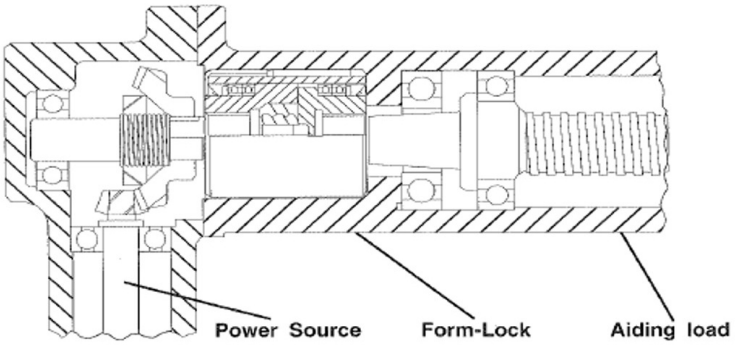
Model No.	Torque in.-lb. (Nm)	A in.	A (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)	G in.	G (mm)	H in. (mm)	J in. (mm)	K in. (mm)	Wt. Lbs. (kg)
FL-35	100 (11.5)	1.388 1.378	(35,26 35,00)	2.00 (50,8)	2.35 (59,7)	1.35 (34,3)	.13 (3,3)	.50 (12,7)	.3745 .3740	(9,51 h8)	.094 dia (2,39) pin hole	1.750 (44,45)	.148 (3,76)	.5 (0,24)
FL-42	250 (28.5)	1.663 1.653	(42,24 42,00)	2.50 (63,5)	3.00 (76,2)	2.00 (50,8)	.25 (6,4)	.50 (12,7)	.500 .499	(12,7 h8)	.125 x .06 (3,18 x 1,52)	2.125 (53,98)	.190 (4,83)	1.2 (0,54)
FL-55	600 (68)	2.175 2.165	(55,25 55,00)	2.88 (73,2)	3.31 (84,1)	2.31 (58,7)	.36 (9,1)	.50 (12,7)	.500 .499	(12,7 h8)	.125 x .06 (3,18 x 1,52)	2.560 (65,02)	.219 (5,56)	2.2 (1,01)
FL-75	1200 (136)	2.963 2.953	(75,26 75,00)	3.88 (98,6)	4.34 (110,2)	2.84 (72,1)	.40 (10,2)	.75 (19,1)	1.000 .999	(25,4 h8)	.187 x .09 (4,75 x 2,3)	3.380 (85,85)	.250 (6,35)	5.2 (2,36)
FL-90	2400 (271)	3.553 3.543	(90,25 90,00)	4.50 (114,3)	4.98 (126,5)	2.98 (75,7)	.44 (11,2)	1.00 (25,4)	1.125 1.124	(28,58 h6)	.250 x .13 (6,35 x 3,3)	4.000 (101,60)	.281 (7,14)	7.9 (3,57)
FL-115	4800 (542)	4.538 4.528	(115,27 115,00)	6.00 (152,4)	5.31 (134,9)	3.31 (84,1)	.50 (12,7)	1.00 (25,4)	1.250 1.249	(31,75 h6)	.250 x .13 (6,35 x 3,3)	5.250 (133,35)	.328 (8,33)	14.3 (6,47)

Form-Lock™ Bi-Directional Driving and Backstopping

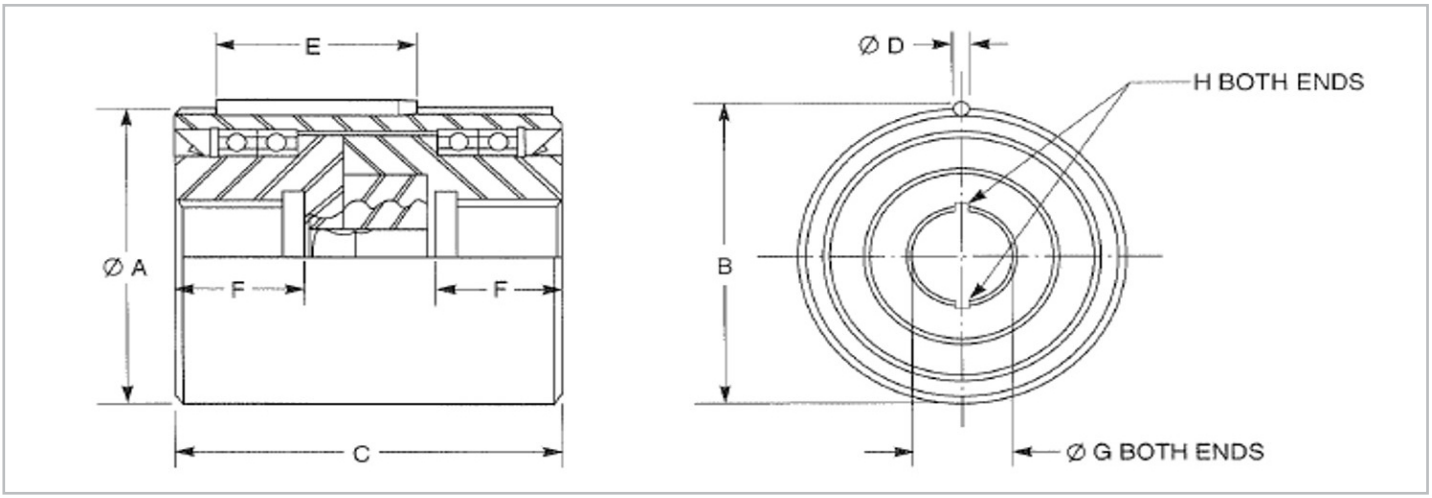
AIDING TOOLS

The Form-Lock's energy absorbing capability makes it ideally suited for use in position holding where aiding loads are present. The energy absorbing shoe concept of Form-Lock eliminates chatter and trapped torque typical with aiding or overhauling loads. Typical applications include:

- Turret Drives
- Ordnance and Aircraft Systems
- Ballscrew Drives
- Linear or Rotary Actuators
- Vertical Material Handling



STANDARD CYLINDRICAL MODELS (A)



Model No.	Torque in.-lb. (Nm)	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)	G in. (mm)	H Woodruff Key	Wt. Lbs. (kg)
FL-47A	310 (35)	1.8504 1.8494 (47 h6)	1.8971 (48,19)	2.438 (61,93)	.0937 (2,38)	1.25 (31,75)	.835 (21,21)	.5635 .5625 (14,3 H6)	405	1.5 (0,68)
FL-52A	400 (45)	2.0472 2.0467 (52 h6)	2.0941 (53,19)	2.620 (66,55)	.0937 (2,38)	1.25 (31,75)	.890 (22,61)	.626 .625 (15,9 H6)	405	1.9 (0,86)
FL-62A	800 (90)	2.4409 2.4404 (62 h6)	2.5034 (63,59)	2.870 (72,90)	.1250 (3,18)	1.50 (38,1)	.937 (23,80)	.751 .750 (19,05 H6)	406	3.0 (1,36)
FL-72A	1325 (150)	2.8346 2.8341 (72 h6)	2.8971 (73,59)	3.245 (82,42)	.1250 (3,18)	1.75 (44,45)	1.045 (26,54)	.876 .875 (22,23 H6)	507	4.6 (2,1)
FL-80A	2200 (249)	3.1496 3.1491 (80 h6)	3.2270 (81,97)	3.620 (91,95)	.1562 (3,97)	2.00 (50,8)	1.156 (29,36)	1.001 1.000 (25,4 H7)	608	6.3 (2,86)
FL-90A	2650 (300)	3.5433 3.5428 (90 h6)	3.6214 (91,98)	3.870 (98,30)	.1562 (3,97)	2.25 (57,15)	1.189 (30,20)	1.126 1.125 (28,58 H7)	609	8.5 (3,86)
FL-110A	4425 (500)	4.3307 4.3297 (110 h6)	4.4244 (112,38)	4.495 (114,17)	.1876 (4,77)	2.25 (57,15)	1.322 (33,58)	1.376 1.375 (34,92 H7)	810	14.8 (6,71)

Form-Lock™ Bi-Directional Driving and Backstopping

HOW TO SELECT

Steps to follow in Form-Lock selection:
Selection of the proper Form-Lock requires that all of the possible torques to which the clutch may be subjected are taken into consideration.

1. Determine the static holding torque required at the output.
2. Determine the operating torque at the clutch.
   a. Torque due to the load
   b. Torque from friction, brakes, machine functions, etc.
   c. Inertia torque due to the acceleration of the load during starting up.
   d. Sum of a, b, and c is the operating torque.
3. Determine the maximum available driving torque at the input yoke.
4. Select the proper service factor from the description below.
5. Determine the design holding torque by multiplying the static holding torque by the service factor.
6. Use the greatest torque value from either steps 1, 2, 3 or 5 to select a clutch from the engineering data table.
7. Check the shaft sizes and the dimensional data of the clutch from the engineering data table.
8. Check the supplemental selection information for overhauling loads. If the overhauling load torque exceeds .25 × (rated catalog torque) contact Formsprag.

Supplemental Selection Information
Overhauling Loads
Determine the system inertia on the input side of the clutch. If the output inertia exceeds the input inertia, then the clutch will be subjected to overhauling loading when the machine is decelerating with the motor off. If the input inertia exceeds the output inertia, the clutch and the system can decelerate without inducing an overhauling load to the clutch.

SERVICE FACTORS

- .0 to 1.5 – Gradually applied loads where the inertia torque is less than 25% of the driving torque.
- 1.5 to 2.0 – Gradually applied loads with light shock.
- 2.0 to 2.5 – Suddenly applied loads with moderate shock.
- 3.0 to 5.0 – Suddenly applied loads with heavy shock.

GENERAL ENGINEERING INFORMATION

Radial and thrust loads
When radial or thrust loads are present due to misalignment, gearing, sprockets, etc., external bearing support must be utilized to accommodate these loads so that they will not be transferred to the clutch.

Alignment
In shaft-to-shaft connections, the angular alignment of the shafts must be within .001" per inch (.025 mm per 25.4 mm) of shaft length. Parallel alignment must be within .001" per inch of nominal shaft diameter. These figures must not be exceeded.

Overhauling loads
When operating a Form-Lock clutch under overhauling conditions (i.e., turning a ball-screw in the same direction it is loaded) the energy absorbing shoes will decelerate the output rather than stop it suddenly. This enables the clutch to operate without a "chatter" condition. An additional suitable friction device (i.e., brake) which absorbs and diverts the dynamic torque and energy may be added between the load and the Form-Lock clutch when very large overhauling loads are present.

Prototyping is recommended to determine the magnitude of the overhauling load and the best use of a friction device.

Breakaway torque
The Form-Lock clutch design does not trap any torque and therefore, no breakaway torque is required except the torque required to overcome the friction of the lubricant.

Input backlash
The total input shaft backlash under a no-load condition is eight (8) degrees maximum.

Output backlash
The total output shaft backlash under a no-load condition is 3 to 6 degrees maximum.

Lubrication
Clutches are lubricated for life with Mobil SHC 32 suitable for ambient temperature of -65°F (-54°C) to +180°F (+82°C).

Speed
Form-Lock Clutches are primarily used in slow speed or manually driven systems. Contact Formsprag for applications that require a higher speed.

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