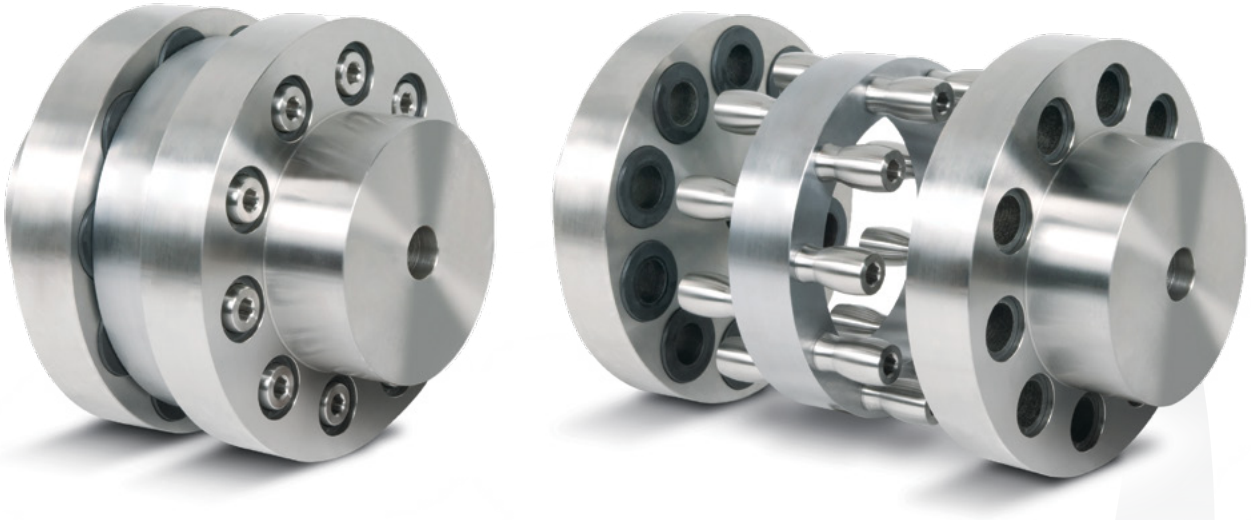
FRONTLINE
COUPLINGS

FOR THE PULP & PAPER INDUSTRY



ENGINEERED SOLUTIONS FOR YOUR **TOUGHEST APPLICATIONS**

FRONTLINE INDUSTRIES, INC

frontlinecouplings.com

ABOUT FRONTLINE INDUSTRIES, INC.

EXCEEDING INDUSTRY STANDARDS SINCE 1980

Frontline Industries, Inc. is an industrial service and manufacturing company, specializing in rotating equipment and located in Irvington, NJ.

Since its founding in 1980, Frontline has been marked by its quality service of Pumps, Motors, Fans and other related equipment for companies throughout the Northeast and across several different industries.

During that time, our organization has experienced firsthand the many shortcomings of couplings available to the market. Through combining this industry knowledge with innovative engineering and a strong desire to better serve our customers, we at Frontline have developed a unique coupling design that navigates past the most common coupling problems and provides unparalleled, cutting-edge efficiency.

FRONTLINE COUPLINGS

Since the early nineties, Frontline Couplings have been successfully employed by a number of different industries, including Power Generation, Chemical Processing, Food & Beverage, Pharmaceutical, Pulp & Paper, and Healthcare.

Industries Served

Although Frontline Couplings were designed mainly to tackle the various challenges of Paper Mills' Equipment, they are also widely used in other industries:

Chemical
Food & Beverage
Industrial
Marine
Municipalities
Petro Chemical
Pharmaceutical
Power Plants
Pulp & Paper
Universities' R&D Departments
Utilities
Hotels
Hospitals
High Rises

OUR MISSION

Reduce our customers' maintenance and operating costs while increasing the lifetime value and efficiency of their equipment.

FLEXIBLE SHAFT COUPLINGS
FOR THE PULP & PAPER INDUSTRY

CHALLENGE		SOLUTION
UNAVOIDABLE SHAFT MISALIGNMENT The Pulp & Paper Industry, with equipment such as Vacuum Pump Trains, Wire Dryers, Bark Bin Screws & Winders, has more challenges than any other industry regarding unavoidable misalignment.	1	**HIGH MISALIGNMENT TOLERANCE** The "Free Floating" Double Engagement design allows the Frontline Coupling to accommodate unavoidable misalignment while greatly reducing the adverse effect of lateral reactionary forces on the driver and driven equipment.
VERY SHORT PLANNED OUTAGES Due to the extremely high cost of outages, and the limited availability of maintenance personnel, the servicing of shaft couplings must occur at a very fast pace, over a short period of time and at the lowest frequency possible.	2	**MINIMAL MAINTENANCE REQUIREMENT** The replacement of Pins & Bushings can be accomplished in a fraction of the time it would take to re-lubricate a Gear or Grid Coupling. For example, a Series 2 Size "K" Double Engagement Coupling on an 800 HP Motor/ Vacuum Pump application could be serviced with new pins & bushings (16 on each side) in about one hour.
COSTLY UNSCHEDULED OUTAGES When a shaft coupling fails between planned outages, the cost of downtime is estimated at several thousands of dollars per hour.	3	**SCHEDULED MAINTENANCE ONLY** Due to its design, the Frontline Coupling will always maintain a positive engagement between the two Hubs and prevent a forced shut down. The only factor to consider is the degree of wear of the Pins & Bushings.
HIGH MAINTENANCE COST OF LUBRICATED COUPLINGS Due to their high power density, Grid & Gear Couplings are widely used and relied upon in the Pulp & Paper Industry. The periodically required inspection and re-lubrication, however, drastically increases the cost of ownership. After several re-lubrications, the entire coupling needs to be replaced.	4	**CONSIDERABLE LOWER OVERALL COST** A correctly sized and properly installed and aligned Frontline Coupling will provide several years of maintenance free service and considering that the hubs never need to be replaced the total cost of ownership of the Frontline Coupling is considerably lower than other competing lines.
UNPREDICTABILITY OF IMPENDING COUPLING FAILURE Generally, Grid & Gear style couplings fail abruptly without giving any sign of temperature rise, increased noise or higher vibration levels.	5	**VISUAL INDICATION OF RELATIVE WEAR** A strobe light can be used while the coupling is in service to monitor relative wear of pins & bushings by checking a line marked axially across both hubs' O.D. at the time of installation allowing for maintenance to be condition based not time based.

HIGH PERFORMANCE. LONG LIFE. MAINTENANCE FREE.

STAINLESS STEEL FLEXIBLE SHAFT COUPLINGS

Frontline Couplings transmit torque through precision machined barrel shaped pins, which ride within rubber coated self-lubricated fiber-reinforced polymer bushings. This patented "free-floating" double engagement design provides several major **benefits**.

High Misalignment Tolerance
The "free floating" double engagement design allows the Frontline Coupling to significantly reduce the adverse effect of lateral forces due to unavoidable misalignment. This feature greatly extends the bearing life of the driver and driven equipment.

Maintenance Free
No Lubrication required since the bushings are made out of a low coefficient of friction, high strength, self-lubricated polymer compound. In the event that the pins and bushings need to be replaced, this can be easily done in the field without disturbing the equipment.

Environmentally Tough
The hubs and power ring are made out of 303, 304 and 316 S.S. The bushings are rubber coated, fiber-reinforced polymer compound. The Pins are 17-4 PH Hard Chromed.

Low Inventory Cost
Only one-size bushing and pin are needed for each Coupling Series regardless of the coupling size. Also, the coupling hubs and power ring never see any wear and therefore never need to be replaced.

Limited End Float (L.E.F. Applications)
Due to the inherent design (axially floating centerpiece), The Frontline Coupling is ideally suited for L.E.F. applications.

Easy to Install & Align
No special tools are required for installation or removal. In the event that a laser or dial indicator is not readily available, a good alignment can still be achieved with the use of a straight edge placed across the outside of the precision machined hubs.

Electrically Isolated
Because of the rubber coated polymer bushings, the two hubs are electrically isolated from each other and therefore prevent stray currents from traveling across and damaging the bearings on the driven equipment.

Vibration Dampening
The rubber coated polymer bushings provide shock and vibration dampening leading to longer equipment life.

Dynamically Balanced
Finished bore couplings are furnished balanced to AGMA Class 10.

Easy to Inspect
A strobe light can be used while the coupling is in service to monitor relative wear of pins & bushings by checking a line marked axially across both hubs' O.D. at the time of installation, allowing for maintenance to be condition based, not time based.

Table of Contents

FRONTLINE COUPLING PRODUCTS

Series	Max. Shaft Diameter	Nominal Torque
1	3.75 in	137,141 in/lb
2	5.0 in	495,085 in/lb
3	8.5 in	1,654,498 in/lb
4	12.0 in	4,738,008 in/lb

Angular Misalignment

Axial Misalignment

Parallel Misalignment

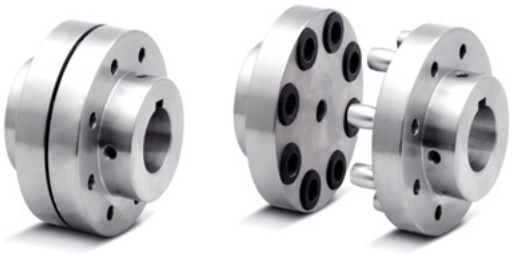
Applications

Paper Machines
Blenders
Calendars
Refiners
Dryers
Slitters
Vacuum Pump Trains/Wind & Unwind Stands
Wind Assist
Bark Bin Screws
Hydro Pulpers
Dump Conveyors
Fans

MODEL SE

Single Engagement Coupling

The Single Engagement Design is comprised of two hubs—one containing pins and one containing bushings. This arrangement can only accommodate Angular and Axial Misalignment.



SEE PAGE 8

MODEL DE

Double Engagement Coupling

The Double Engagement Design consists of Two Hubs with Bushings and a Free Floating Drive Ring with Pins on each side. This arrangement can accommodate Parallel, Axial and Angular Misalignment.

SEE PAGE 9

MODEL SP

Spacer Coupling

The Spacer Design consists of Two Hubs with Bushings and a Spacer Cylinder with Pins on each side. This arrangement can accommodate Parallel, Axial and Angular Misalignment.

SEE PAGE 10

MODEL SHP

Shear Pin Coupling

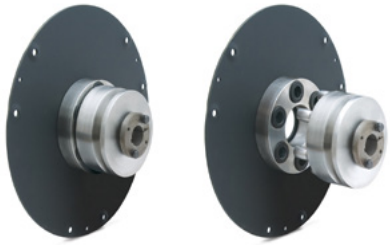
The Double Engagement Shear Pin Design consists of a drive ring made of two detachable sections held together by a predetermined size and number of Stainless Steel or Brass Pins, designed to shear at a certain torque. This arrangement can accommodate Parallel, Axial and Angular Misalignment.

SEE PAGE 11

MODEL FLW

Flywheel Coupling

A ring with bushings is fitted onto a flywheel and a hub with pins is fastened to the driven shaft.



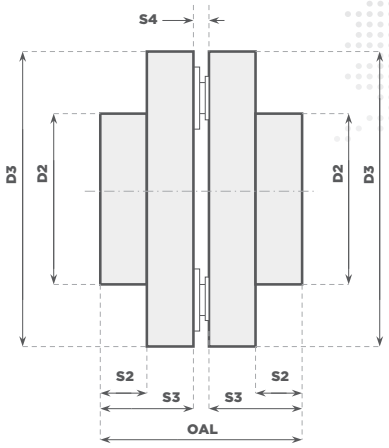
SEE PAGE 12

MODEL FDS

Floating Drive Shaft Design

Two single engagement couplings are placed one on each side of a tubular drive shaft.

SEE PAGE 13



SERIES	COUPLING SIZE	D2	D3	S2	S3	S4	OAL
1	FL-A1	2.130	4.500	0.687	1.625	0.187" +0.062" -0.000"	3.438
	FL-B1	2.870	5.250	0.687	1.625		3.438
	FL-C1	3.595	6.000	1.000	1.937		4.063
	FL-D1	4.345	6.750	1.250	2.187		4.563
	FL-E1	5.095	7.500	1.750	2.687		5.563
2	FL-F2	3.950	7.000	1.250	2.500	0.281" +0.062" -0.000"	5.281
	FL-G2	4.950	8.000	1.500	2.750		5.781
	FL-H2	5.950	9.000	2.125	3.375		7.031
	FL-I2	6.950	10.000	2.750	4.000		8.281
	FL-J2	7.950	11.000	3.250	4.500		9.281
3	FL-K3	6.775	11.000	1.875	3.750	0.375" +0.125" -0.000"	7.875
	FL-L3	8.775	13.000	2.625	4.500		9.375
	FL-M3	9.775	14.000	3.625	5.500		11.375
	FL-N3	11.775	16.000	4.500	6.375		13.125
	FL-O3	12.775	17.000	5.375	7.250		14.875
4	FL-P4	7.500	13.000	2.500	5.000	0.469" +0.125" -0.000"	10.469
	FL-Q4	8.500	14.000	3.000	5.500		11.469
	FL-R4	10.500	16.000	4.000	6.500		13.469
	FL-S4	11.500	17.000	4.755	7.250		14.969
	FL-T4	12.500	18.000	5.625	8.125		16.719
	FL-U4	13.500	19.000	6.500	9.000		18.469
	FL-V4	15.500	21.000	7.500	10.000		20.469
	FL-Z4	17.500	23.000	8.375	10.875		22.219

Ordering Example SE 1 C ST ST 2.25 .5 IF 2.125 .5 IF

- Design
- Series
- Size
- Bushing Type
- Pin Type
- Pinned Bore
- Pinned Key
- Pinned Fit
- Bushed Bore
- Bushed Key
- Bushed Fit

MODEL SE
Single Engagement Design

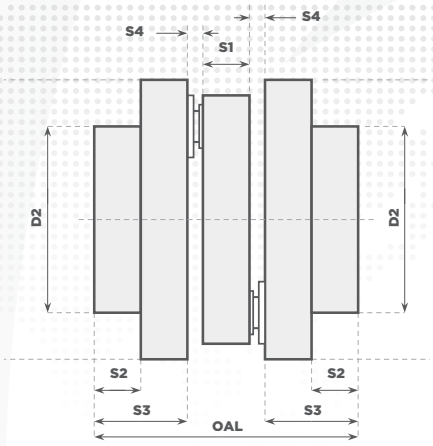
The Single Engagement Design is comprised of two hubs—one containing pins and one containing bushings. This arrangement can only accommodate Angular and Axial Misalignment.

COMMON APPLICATIONS
- Floating shafts
- "C" Face Motors with Rabet Fit

MATERIALS
- **Hubs**: 303 Stainless Steel
- **Pins**: 17-4 PH Hard Chromed
- **Bushings**: Standard Rubber Coated (ST) 350°F

COMPONENT OPTIONS
- **Pins**: Standard (ST), Limited End Float (LEF), Wire Secured (WS)
- **Bushings**: Standard Rubber Coated (ST)

For information on coupling bore clearances, please see page 24.



SERIES	COUPLING SIZE	D2	D3	S1	S2	S3	S4	OAL
1	FL-A1	2.130	4.500	1.000	0.685	1.625	0.187" +0.062" -0.000"	4.625
	FL-B1	2.870	5.250	1.125	0.685	1.625		4.750
	FL-C1	3.595	6.000	1.125	1.000	1.940		5.375
	FL-D1	4.345	6.750	1.250	1.250	2.190		6.000
	FL-E1	5.095	7.500	1.250	1.750	2.690		7.005
2	FL-F2	3.950	7.000	1.625	1.250	2.500	0.281" +0.062" -0.000"	7.187
	FL-G2	4.950	8.000	1.625	1.500	2.750		7.687
	FL-H2	5.950	9.000	1.625	2.125	3.375		8.937
	FL-I2	6.950	10.000	1.625	2.750	4.000		10.187
	FL-J2	7.950	11.000	1.625	3.250	4.500		11.187
3	FL-K3	6.775	11.000	2.000	1.875	3.750	0.375" +0.125" -0.000"	10.250
	FL-L3	8.775	13.000	2.000	2.625	4.500		11.750
	FL-M3	9.775	14.000	2.000	3.625	5.500		13.750
	FL-N3	11.775	16.000	2.000	4.500	6.375		15.500
	FL-O3	12.775	17.000	2.000	5.375	7.250		17.250
4	FL-P4	7.500	13.000	3.000	2.500	5.000	0.469" +0.125" -0.000"	13.938
	FL-Q4	8.500	14.000	3.000	3.000	5.500		14.938
	FL-R4	10.500	16.000	3.000	4.000	6.500		16.938
	FL-S4	11.500	17.000	3.000	4.755	7.250		18.438
	FL-T4	12.500	18.000	3.000	5.625	8.125		20.188
	FL-U4	13.500	19.000	3.000	6.500	9.000		21.938
	FL-V4	15.500	21.000	3.000	7.500	10.000		23.938
	FL-Z4	17.500	23.000	3.000	8.375	10.875		25.688

MODEL DE
Double Engagement Design

The Double Engagement Design consists of Two Hubs with Bushings and a Free Floating Drive Ring with Pins on each side. This arrangement can accommodate Parallel, Axial and Angular Misalignment.

COMMON APPLICATIONS

- All types of Fans
- Centrifugal Blowers
- Centrifugal Pumps
- Compressors
- Mixers
- Pulp Grinders
- Winders
- Generators
- Extruders

MATERIALS

- **Hubs & Drive Ring**: 303 Stainless Steel
- **Pins**: 17-4 PH Hard Chromed
- **Bushings**: Standard Rubber Coated (ST) 350°F

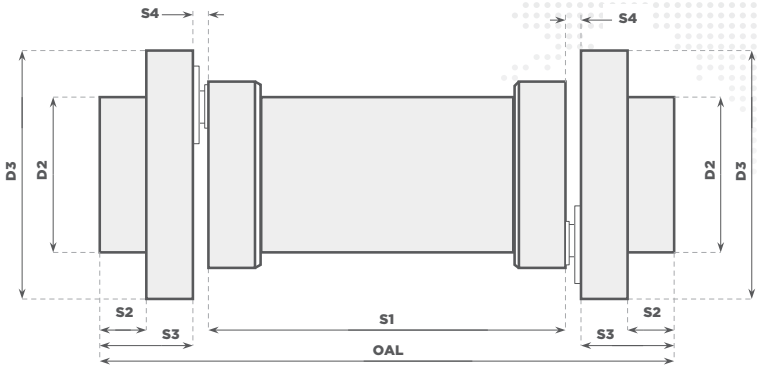
COMPONENT OPTIONS

- **Pins**: Standard (ST), Limited End Float (LEF), Wire Secured (WS)
- **Bushings**: Standard Rubber Coated (ST)

Ordering Example DE 2 J ST ST 5.25 .5 CF 5.125 .5 CF

DE	Design
2	Series
J	Size
ST	Bushing Type
ST	Pin Type
5.25	Bore 1
.5	Key 1
CF	Fit 1
5.125	Bore 2
.5	Key 2
CF	Fit 2

For information on coupling bore clearances, please see page 24.



SERIES	COUPLING SIZE	D2	D3	S1	S2	S3	S4	OAL
1	FL-A1	2.130	4.500	4.000	0.687	1.625	0.187" +0.062" -0.000"	7.625
	FL-B1	2.870	5.250	5.000	0.687	1.625		8.625
	FL-C1	3.595	6.000	6.000	1.000	1.937		10.250
	FL-D1	4.345	6.750	7.000	1.250	2.187		11.750
	FL-E1	5.095	7.500	8.000	1.750	2.687		13.750
2	FL-F2	3.950	7.000	9.000	1.250	2.500	0.281" +0.062" -0.000"	14.562
	FL-G2	4.950	8.000	10.000	1.500	2.750		16.062
	FL-H2	5.950	9.000	11.000	2.125	3.375		18.312
	FL-I2	6.950	10.000	12.000	2.750	4.000		20.562
	FL-J2	7.950	11.000	13.000	3.250	4.500		22.562
3	FL-K3	6.775	11.000	14.000	1.875	3.750	0.375" +0.125" -0.000"	22.250
	FL-L3	8.775	13.000	15.000	2.625	4.500		24.750
	FL-M3	9.775	14.000	16.000	3.625	5.500		27.750
	FL-N3	11.775	16.000	17.000	4.500	6.375		30.500
	FL-O3	12.775	17.000	18.000	5.375	7.250		33.250
4	FL-P4	7.500	13.000	19.000	2.500	5.000	0.469" +0.125" -0.000"	29.938
	FL-Q4	8.500	14.000	20.000	3.000	5.500		31.938
	FL-R4	10.500	16.000	21.000	4.000	6.500		34.938
	FL-S4	11.500	17.000	22.000	4.755	7.250		37.438
	FL-T4	12.500	18.000	23.000	5.625	8.125		40.188
	FL-U4	13.500	19.000	24.000	6.500	9.000		41.938
	FL-V4	15.500	21.000	25.000	7.500	10.000		45.938
	FL-Z4	17.500	23.000	26.000	8.375	10.875		48.688

Ordering Example SP 2 I CS ST ST 5.25 .5 CF 5.125 .5 CF

- Design
- Series
- Size
- Spacer Cylinder Material
- Bushing Material
- Pin Type
- Bore 1
- Key 1
- Fit 1
- Bore 2
- Key 2
- Fit 2

MODEL SP
Spacer Design

The Spacer Design consists of Two Hubs with Bushings and a Spacer Cylinder with Pins on each side. This arrangement can accommodate Parallel, Axial and Angular Misalignment.

COMMON APPLICATIONS

The Spacer Design is normally used with End Suction Pumps to facilitate the removal of the "pull out" section without having to move the motor or when there is a need to bridge a gap between shafts ends.

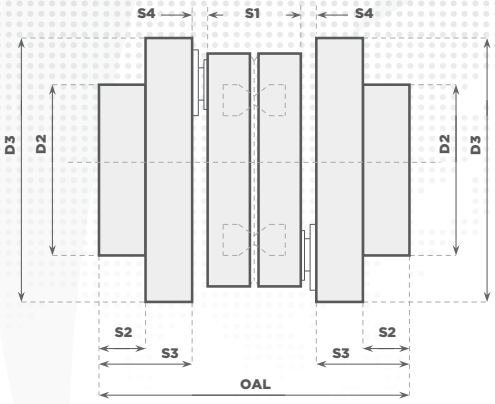
MATERIALS

- **Hubs**: 303 Stainless Steel
- **Pins**: 17-4 PH Hard Chromed
- **Bushings**: Standard Rubber Coated (ST) 350°F
- **Spacer Cylinder**: Stainless Steel or Carbon Steel Primed & Painted

COMPONENT OPTIONS

- **Pins**: Standard (ST), Limited End Float (LEF), Wire Secured (WS)
- **Bushings**: Standard Rubber Coated (ST)
- **Spacer Cylinder**: Stainless Steel (SS), Carbon Steel (CS)

For information on coupling bore clearances, please see page 24.



SERIES	COUPLING SIZE	D2	D3	S1	S2	S3	S4	OAL
1	FL-A1	2.130	4.500	1.750	0.687	1.625	0.187" +0.062" -0.000"	5.375
	FL-B1	2.870	5.250		0.687	1.625		5.375
	FL-C1	3.595	6.000		1.000	1.937		6.000
	FL-D1	4.345	6.750		1.250	2.187		6.500
	FL-E1	5.095	7.500		1.750	2.687		7.500
2	FL-F2	3.950	7.000	2.500	1.250	2.500	0.281" +0.062" -0.000"	8.062
	FL-G2	4.950	8.000		1.500	2.750		8.562
	FL-H2	5.950	9.000		2.125	3.375		9.812
	FL-I2	6.950	10.000		2.750	4.000		11.062
	FL-J2	7.950	11.000		3.250	4.500		12.062
3	FL-K3	6.775	11.000	3.250	1.875	3.750	0.375" +0.125" -0.000"	11.500
	FL-L3	8.775	13.000		2.625	4.500		13.000
	FL-M3	9.775	14.000		3.625	5.500		15.000
	FL-N3	11.775	16.000		4.500	6.375		16.750
	FL-O3	12.775	17.000		5.375	7.250		18.500
4	FL-P4	7.500	13.000	3.750	2.500	5.000	0.469" +0.125" -0.000"	14.688
	FL-Q4	8.500	14.000		3.000	5.500		15.688
	FL-R4	10.500	16.000		4.000	6.500		17.688
	FL-S4	11.500	17.000		4.755	7.250		19.188
	FL-T4	12.500	18.000		5.625	8.125		20.938
	FL-U4	13.500	19.000		6.500	9.000		22.698
	FL-V4	15.500	21.000		7.500	10.000		24.688
	FL-Z4	17.500	23.000		8.375	10.875		26.438

Ordering Example SHP 2 K ST LEF SS 6.25 .5 CF 6.125 .5 CF

- Design
- Series
- Size
- Bushing Material
- Pin Type
- Shear Pin Material
- Bore 1
- Key 1
- Fit 1
- Bore 2
- Key 2
- Fit 2

MODEL SHP
Shear Pin Design

The Double Engagement Shear Pin Design consists of a drive ring made of two detachable sections held together by a predetermined size and number of Stainless Steel or Brass Pins, designed to shear at a certain torque. This arrangement can accommodate Parallel, Axial and Angular Misalignment.

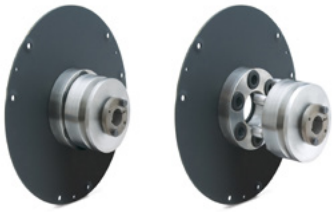
COMMON APPLICATIONS
This design is used mostly between the low speed side of a gearbox and a piece of equipment that could be damaged by a temporary jam.

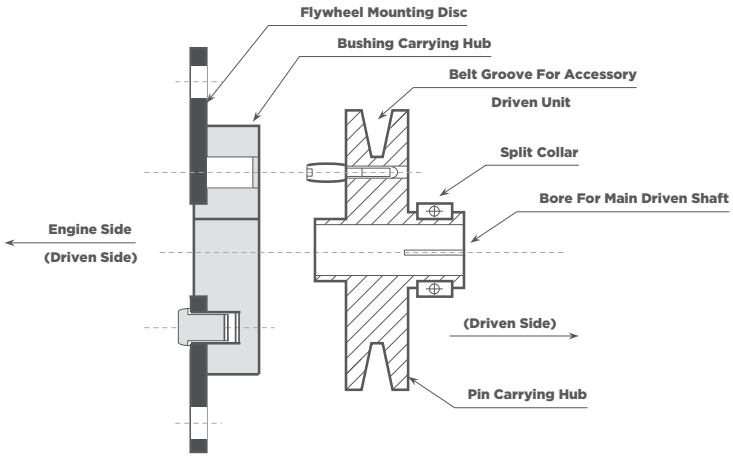
MATERIALS
- **Hubs & Drive Ring**: 303 Stainless Steel
- **Pins**: 17-4 PH Hard Chromed
- **Bushings**: Standard Rubber Coated (ST) 350°F
- **Shear Pins**: Stainless Steel or Brass

COMPONENT OPTIONS
- **Pins**: Standard (ST), Limited End Float (LEF), Wire Secured (WS)
- **Bushings**: Standard Rubber Coated (ST)
- **Shear Pins**: Stainless Steel (SS) or Brass (BR)

NOTES
When ordering this coupling design, please provide the peak torque at which the coupling is required to separate.

For information on coupling bore clearances, please see page 24.





NOTE
All Fly Wheel Mounted Couplings are quoted and manufactured on a "per application" basis. A typical delivery time for units up to 750 HP is two (2) weeks. For higher torque rating and/or faster delivery time, please consult factory.

MODEL FLW
Flywheel Mounted Design

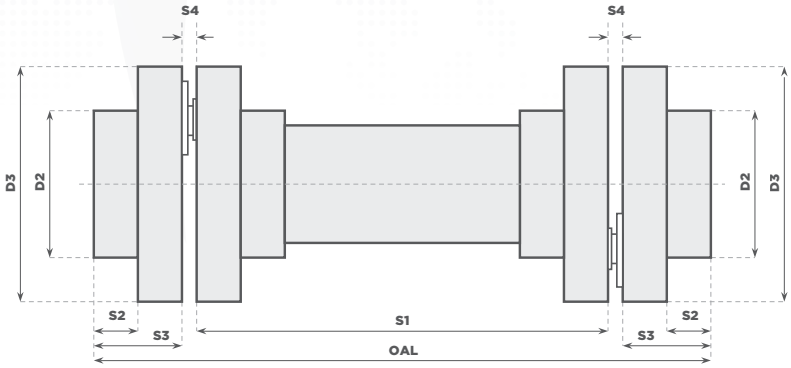
A ring with bushings is fastened to a flywheel and a hub with pins is fastened to the driven shaft.

COMMON APPLICATIONS
Pumps, Compressors, Generators and other applications that use reciprocating engines.

MATERIALS
- **Hubs**: 303 Stainless Steel
- **Pins**: 17-4 PH Hard Chromed
- **Bushings**: Standard Rubber Coated (ST) 350°F

COMPONENT OPTIONS
- **Pins**: Standard (ST), Limited End Float (LEF), Wire Secured (WS)
- **Bushings**: Standard Rubber Coated (ST)

For information on coupling bore clearances, please see page 24.



MODEL FDS
Floating Drive Shaft Design

Two single engagement couplings are placed on each end of a drive shaft. It is optional to have the pinned hubs on the shaft or on the ends of the driver and driven equipment although the hubs with bushings are usually on each end of the shaft as this design allows for the easiest removal of the pins.

Frontline Drive Shafts can replace any drive shaft either by using all Frontline components (Option A) or by using the existing rigid hubs with Frontline Adapters (Option B).
Please see following 2 pages for details and crossover options.

- **Can accommodate up to 1" axial float**
- **No lubrication required**
- **Ideally suited for Limited End Float Applications**

NOTES
All "Carbon Fiber", and "Stainless Steel Tube" Floating Shaft Couplings for Cooling Tower Fans are quoted and manufactured on a "per application" basis. A typical delivery time for units up to 300 HP, 1750 RPM and 11' (eleven feet) span is two (2) weeks. For higher torque rating and/or faster delivery time, please consult factory.

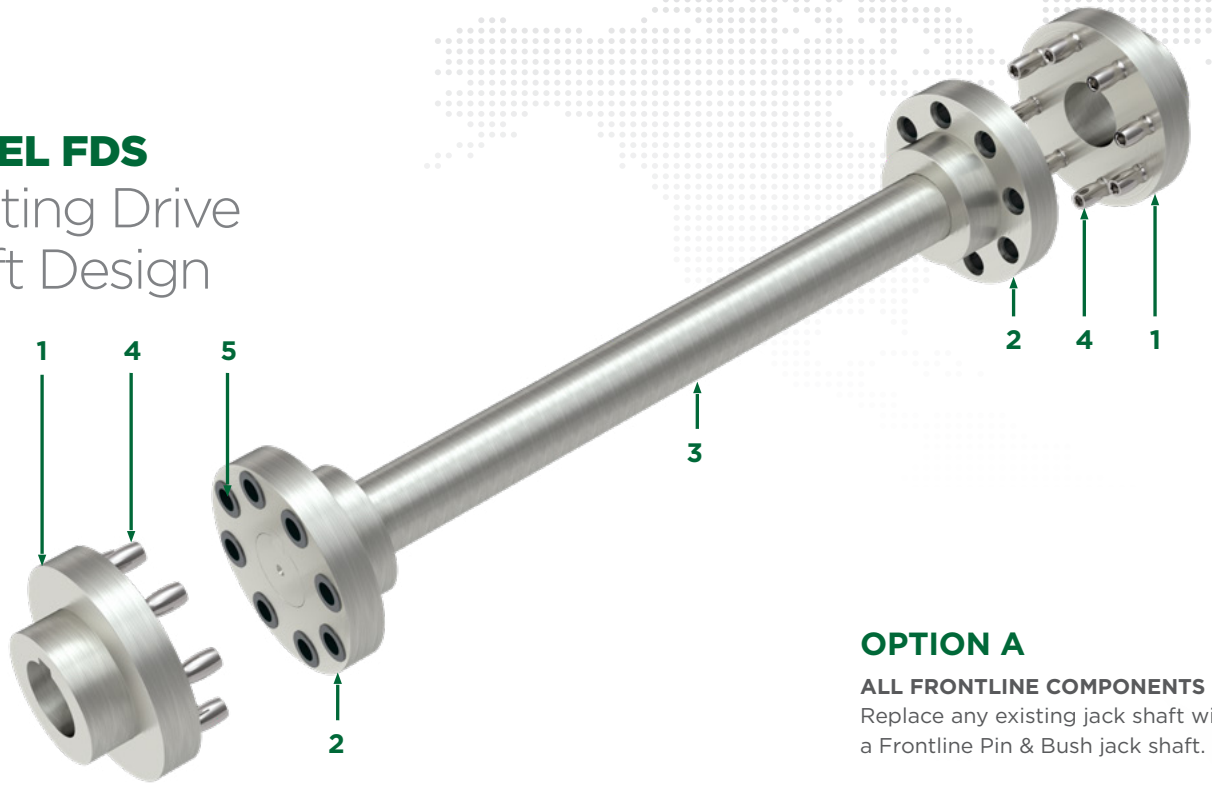
COMMON APPLICATIONS
- Paper Machines
- Blenders
- Calendars
- Refiners
- Dryers
- Slitters
- Vacuum Pump Trains
- Wind & Unwind Stands
- Wind Assist
- Bark Bin Screws
- Fans
- Hydro Pulpers

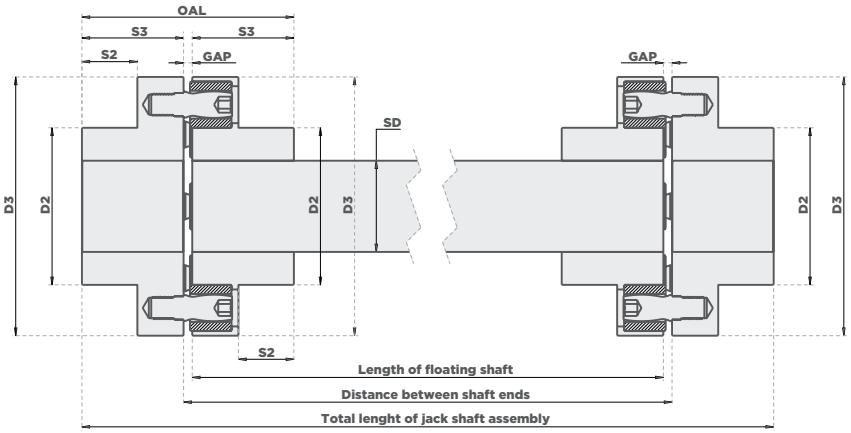
MATERIALS
- **Hubs**: 303 Stainless Steel
- **Pins**: 17-4 PH Hard Chromed
- **Bushings**: Standard Rubber Coated (ST) 350°F
- **Floating Tube Shaft**: Fiberglass, Carbon Fiber, Carbon Steel, Stainless Steel
- **Floating Solid Shaft**: 4140 Steel, Stainless Steel

COMPONENT OPTIONS
- **Pins**: Standard (ST), Limited End Float (LEF), Wire Secured (WS)
- **Bushings**: Standard Rubber Coated (ST)
- **Solid Shaft Options**: Stainless Steel (SS) or Carbon Steel (CS)
- **Tube Shaft Options**: Stainless Steel (SS), Carbon Fiber (CF), Carbon Steel (CS), Fiberglass (FG)

For information on coupling bore clearances, please see page 24.

MODEL FDS
Floating Drive Shaft Design





OPTION A

ALL FRONTLINE COMPONENTS
Replace any existing jack shaft with a Frontline Pin & Bush jack shaft.

OPTION A		
ITEM NO.	DESCRIPTION	MATERIAL
1	HUB WITH PINS	304 SS
2	HUB WITH BUSHINGS	304 SS
3	SHAFT	304 SS
4	PINS	17-4 PH HARD CHROMED
5	BUSHING	RUBBER COATED

KOPFLEX GEAR COUPLINGS			
COUPLING SIZE	HUB O.D.	MAX. BORE	NOMINAL TORQUE
1-1/2	6″	2-11/16″	17,000
2	7″	3-3/8″	31,500
2-1/2	8-3/8″	4″	56,700
3	9-7/16″	4-3/4″	101,000
3-1/2	11″	5-1/2″	148,000
4	12-1/2″	6-3/8″	236,000
4-1/2	13-5/8″	7-1/4″	318,000
5	15-5/16″	8-1/2″	441,000
5-1/2	16-3/4″	8″	580,000
6	18	8-3/4″	759,000
7	20-3/4″	10″	1,160,000

KOPFLEX DISC COUPLINGS			
COUPLING SIZE	HUB O.D.	MAX. BORE	NOMINAL TORQUE
153	5.38″	2.50″	13,600
204	6.38″	3.00″	36,000
254	7.62″	3.75″	52,000
304	9.00″	4.50″	89,000
354	10.50″	5.00″	150,000
404	11.75″	5.50″	215,000
454	12.75″	6.38″	255,000
504	13.88″	7.00″	360,000
554	15.12″	7.75″	505,000
604	16.50″	8.50″	660,000
705	20.50″	10.75″	1,510,000

FRONTLINE COUPLINGS PIN & BUSH COUPLINGS			
COUPLING SIZE	HUB O.D.	MAX. BORE	NOMINAL TORQUE
FL-F2	7″	2-3/8″	139,681
FL-G2	8″	3″	222,195
FL-H2	9″	3-3/4″	258,149
FL-I2	10″	4-3/8″	367,629
FL-J2	11″	5″	495,086
FL-Q4	14″	6″	1,151,259
FL-R4	16″	7″	1,704,219
FL-S4	17″	8″	1,836,791
FL-T4	18″	9″	2,363,257
FL-U4	19″	10″	2,942,628
FL-V4	21″	11″	3,787,331

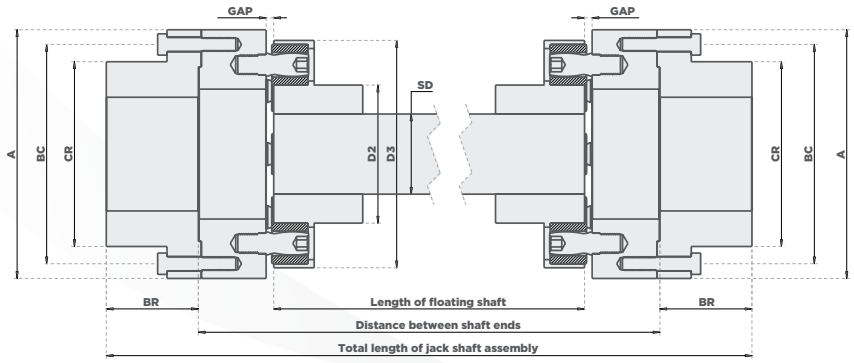
PINS TORQUE DOWN VALUES
- Series 1: 35 ft-lb
- Series 2: 120 ft-lb
- Series 3: 220 ft-lb
- Series 4: 350 ft-lb

AXIAL FLOAT OF CENTER PIECE
- Series 1: 0.300 in
- Series 2: 0.500 in
- Series 3: 0.650 in
- Series 4: 0.900 in

GAP BETWEEN HUBS
- Series 1: 0.187″ +0.062″ -0.000″
- Series 2: 0.281″ +0.062″ -0.000″
- Series 3: 0.375″ +0.125″ -0.000″
- Series 4: 0.469″ +0.125″ -0.000″

NOTE: The above charts are for general reference only. Due to the high power density of Frontline Couplings, in most cases you can select the right coupling, based solely on max. shaft diameter of your application. Always consult Frontline if you are unsure about your choice.

MODEL FDS
Floating Drive Shaft Design



OPTION B

USE EXISTING RIGID HUBS

Replace existing gear jack shaft using Frontline adapters to retrofit to the Frontline Pin & Bush jack shaft.

Adapters for most popular size rigid hub gear couplings in stock.

OPTION B		
ITEM NO.	DESCRIPTION	MATERIAL
1	EXISTING HUBS	STEEL
2	PIN ADAPTER	304 SS
3	HUB WITH BUSHINGS	304 SS
4	SHAFT	304 SS
5	BUSHING	RUBBER COATED
6	PIN	17-4 PH HARD CHROMED
7	BOLT	STEEL

KOPFLEX GEAR COUPLINGS			
COUPLING SIZE	HUB O.D.	MAX. BORE	NOMINAL TORQUE
1-1/2	6″	2-11/16″	17,000
2	7″	3-3/8″	31,500
2-1/2	8-3/8″	4″	56,700
3	9-7/16″	4-3/4″	101,000
3-1/2	11″	5-1/2″	148,000
4	12-1/2″	6-3/8″	236,000
4-1/2	13-5/8″	7-1/4″	318,000
5	15-5/16″	8-1/2″	441,000
5-1/2	16-3/4″	8″	580,000
6	18	8-3/4″	759,000
7	20-3/4″	10″	1,160,000

KOPFLEX DISC COUPLINGS			
COUPLING SIZE	HUB O.D.	MAX. BORE	NOMINAL TORQUE
153	5.38″	2.50″	13,600
204	6.38″	3.00″	36,000
254	7.62″	3.75″	52,000
304	9.00″	4.50″	89,000
354	10.50″	5.00″	150,000
404	11.75″	5.50″	215,000
454	12.75″	6.38″	255,000
504	13.88″	7.00″	360,000
554	15.12″	7.75″	505,000
604	16.50″	8.50″	660,000
705	20.50″	10.75″	1,510,000

FRONTLINE COUPLINGS PIN & BUSH COUPLINGS			
COUPLING SIZE	HUB O.D.	MAX. BORE	NOMINAL TORQUE
FL-F2	7″	2-3/8″	139,681
FL-G2	8″	3″	222,195
FL-H2	9″	3-3/4″	258,149
FL-I2	10″	4-3/8″	367,629
FL-J2	11″	5″	495,086
FL-Q4	14″	6″	1,151,259
FL-R4	16″	7″	1,704,219
FL-S4	17″	8″	1,836,791
FL-T4	18″	9″	2,363,257
FL-U4	19″	10″	2,942,628
FL-V4	21″	11″	3,787,331

PINS TORQUE DOWN VALUES

- Series 1: 35 ft-lb
- Series 2: 120 ft-lb
- Series 3: 220 ft-lb
- Series 4: 350 ft-lb

AXIAL FLOAT OF CENTER PIECE

- Series 1: 0.300 in
- Series 2: 0.500 in
- Series 3: 0.650 in
- Series 4: 0.900 in

GAP BETWEEN HUBS

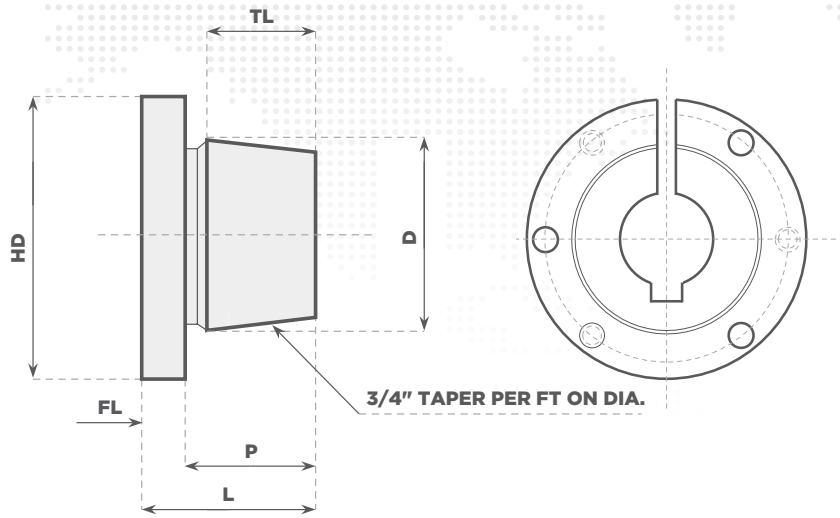
- Series 1: 0.187″ +0.062″ -0.000″
- Series 2: 0.281″ +0.062″ -0.000″
- Series 3: 0.375″ +0.125″ -0.000″
- Series 4: 0.469″ +0.125″ -0.000″

NOTE: The above charts are for general reference only. Due to the high power density of Frontline Couplings, in most cases you can select the right coupling, based solely on max. shaft diameter of your application. Always consult Frontline if you are unsure about your choice.

QD BUSHING

QD bushings are fitted on Series 1 hubs only. Taper lock bushings available upon request.

Contact Frontline for details.



BUSHING	COUPLING	HD	FL	D	P	TL	L	MIN.	MAX. BORE		SIZE OF CAP	TORQUE	WT.
SIZE	SIZE							BORE	STD. KEY	SHALLOW KEY	SCREW REQD	FT-LB	LBS
JA	A	2	5/16	1 3/8	11/16	5/8	1	0.500	1.000	1.190	(3) 10-24 X 1	5.000	0.4
SH	B	2-11/16	3/8	1-7/8	7/8	3/4	1-1/4	0.500	1.380	1.630	(3) 1/4 X 1-3/8	9.000	0.9
SD	C	3-3/16	7/16	2-3/16	1-3/8	1-1/4	1-13/16	0.500	1.630	1.940	(3) 1/4 X 1-7/8	9.000	1.6
SK	D	3-7/8	1/2	2-13/16	1-3/8	1-1/4	1-7/8	0.500	2.130	2.500	(3) 5/16 X 2	15.000	2.7
SF	E	4-5/8	1/2	3-1/8	1-1/2	1-1/4	2	0.500	2.310	2.810	(3) 3/8 X 2	30.000	3.9
F	F	6-5/8	13/16	4-7/16	2-13/16	2-1/2	3-5/8	1.000	3.250	3.940	(3) 9/16 X 3-5/8	75.000	13.3
J	G & H	7-1/4	1	5 5/32	3-1/2	3-3/16	4-1/2	1.440	3.750	4.500	(3) 5/8 X 4-1/2	135.000	20.8

FIELD
Bushing Installation & Removal Tool Kits

Although common tools can be used to remove and install bushings, using our custom tools will greatly speed up the process.

FOR SERIES 1&2
Part No. BUSH-RI-1-2-KIT

FOR SERIES 3&4
Part No. BUSH-RI-3-4-KIT

SPARE PARTS

Bushings

STANDARD RUBBER COATED (ST) 350°F

- Coated with Nitrile Rubber
- Greatly reduces torsional vibration
- Ideal for applications where torsional vibration is an issue

Ordering Example BUSH 2 ST

Part
Series
Type

NOTE
The Rubber Coated Bushings for all (4) Four Series are rated for 350°F.

Pins

STANDARD PIN (ST)

- Barrel shaped engagement area allows for constant transfer of power at a broader range of angles.
- Standard Pins are made out of 17-4 PH Hard Chromed

LIMITED END FLOAT PIN (LEF)

- Small flange on the drive side of the pin restrains the hubs from moving axially.
- Made out of 17-4 PH Hard Chromed

WIRE SECURED PIN (WS)

- Hexagonally shaped head has a hole on each side for wire to be threaded through each pin to keep them secured in place.
- Made out of 17-4 PH Hard Chromed

Ordering Example PIN 1 LEF

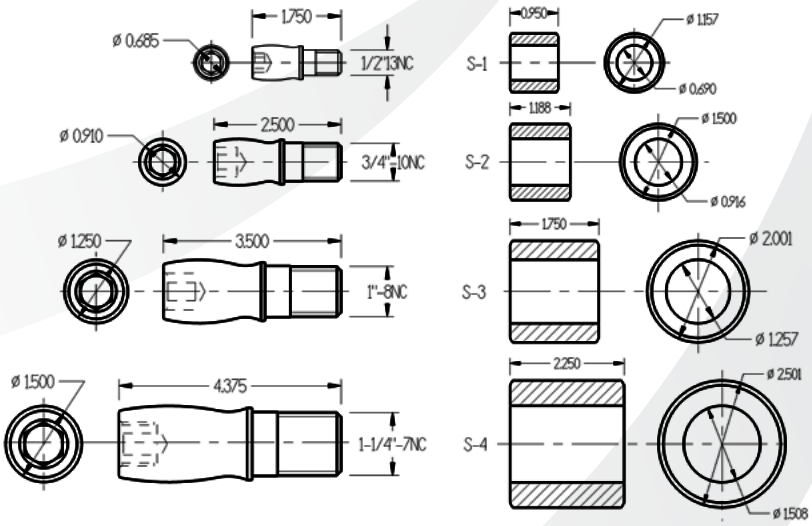
Part
Series
Type

AXIAL FLOAT OF CENTER PIECE

- Series 1: 0.300 in
- Series 2: 0.500 in
- Series 3: 0.650 in
- Series 4: 0.900 in

NOTE
The contact area of the pins are flash hard chromed.

ST LEF WS



SERVICE FACTORS

	ELECTRIC MOTOR W/ STANDARD TORQUE	ELECTRIC MOTOR W/ HIGH TORQUE	STEAM TURBINES & ENGINES W/ 4 OR MORE CYL*	RECIPROCATING ENGINES*	
				1-CYL.	2-CYL.
AGITATORS	1.00	1.30	1.00	1.70	1.30
BAND RESAW (LUMBER)	1.50	1.75	1.50	2.20	1.80
BARGE HAUL PULLER	2.00	2.25	2.00	2.70	2.30
BEATERS	1.50	1.75	1.50	2.20	1.80
BLOWERS					
CENTRIFUGAL	1.00	1.25	1.00	1.70	1.30
LOBE, VANE	1.25	1.50	1.25	2.00	1.60
BOTTLING MACHINERY	1.25	1.50	1.25	2.00	1.60
BREW KETTLES (DISTILLED)	1.25	1.50	1.25	2.00	1.60
CAN FILLING MACHINE	1.00	1.25	1.00	1.70	1.30
CAR DUMPERS	2.50	2.75	2.50	3.20	2.80
CAR PULLERS	1.50	1.75	1.50	2.20	1.80
CARD MACHINE	1.75	2.00	1.75	2.50	2.00
CHILLER (OIL)	1.50	2.00	1.25	2.00	2.00
COMPRESSORS					
CENTRIFUGAL	1.00	1.25	1.00	1.70	1.30
SCREW, LOBE	1.25	1.50	1.25	2.00	1.60
CONVEYERS, UNIFORMLY FED					
ASSEMBLY, BELT, SCROLL	1.00	1.25	1.00	1.70	1.30
BUCKET, SAWDUST	1.25	1.50	1.25	2.00	1.60
LIVE ROLL, SHAKER, RECIPROCATING	3.00	3.25	3.00	3.70	3.30
CONVEYORS, NOT UNIFORMLY FED					
ASSEMBLY, BELT, SCREW, OVEN, SCREW	1.20	1.45	1.20	1.90	1.50
RECIPROCATING	2.50	2.75	2.50	3.20	2.80
SHAKER	3.00	3.25	3.00	3.70	3.30
COOKERS—BREWING, DISTILLING, FOOD	1.25	1.50	1.25	2.00	1.60
CRANES & HOIST	2.00	2.25	2.00	2.70	2.30
CRUSHERS--CANE (SUGAR, STONE, OR ORE)	3.00	3.25	3.00	2.70	3.30
DREDGES					
CABLE REELS	2.00	2.25	2.00	2.70	2.30
CONVEYORS, PUMPS, MANEUVERING WIN	1.50	1.75	1.50	2.20	1.80
CUTTER HEAD DRIVES	2.50	2.75	2.50	3.20	2.80
DYNAMOMETER	1.50	1.75	1.50	2.20	1.80
EVAPORATORS	1.00	1.25	1.00	1.70	1.30
FANS					
CENTRIFUGAL	1.00	1.25	1.00	1.70	1.30
COOLING TOWER	2.00	2.25	2.00	2.70	2.30
FORCED DRAFT, PROPELLER	1.50	1.75	1.50	2.20	1.80
INDUCED DRAFT W/DAMPER CONTROL	2.00	2.25	2.00	2.70	2.30
INDUCED DRAFT W/O DAMPER CONTROL	2.00	1.50	1.25	2.00	1.60

	ELECTRIC MOTOR W/ STANDARD TORQUE	ELECTRIC MOTOR W/ HIGH TORQUE	STEAM TURBINES & ENGINES W/ 4 OR MORE CYL*	RECIPROCATING ENGINES*	
				1-CYL.	2-CYL.
FEEDERS					
BELT, SCREW	1.00	1.25	1.00	1.70	1.30
RECIPROCATING	2.50	2.75	2.50	3.20	2.80
FILTER, PRESS-OIL GENERATORS	1.50	1.75	1.50	2.20	1.80
NOT WELDING	1.00	1.25	1.00	1.70	1.30
WELDING	2.00	2.25	2.00	2.70	2.30
HOIST	1.50	1.75	1.50	2.20	1.80
HAMMERMILLS	2.00	2.25	2.00	2.70	2.30
KILNS	1.50	1.75	1.50	2.20	1.80
LAUNDRY WASHERS					
REVERSING	2.00	2.25	2.00	2.70	2.30
LUMBER MACHINERY					
BARKERS, EDGER FEEDER, LIVE ROLL	2.00	2.25	2.00	2.70	2.30
PLANER, SLAB CONVEY	2.00	2.25	2.00	2.70	2.30
MACHINE TOOLS					
PUNCH PRESS-GEAR DRIVEN, PLATE PLANER	2.00	2.25	2.00	2.70	2.30
TAPPING MACHINERY BENDING ROLL	2.00	2.25	2.00	2.70	2.30
MAIN DRIVE	1.50	1.75	1.50	2.20	1.80
AUXILIARY DRIVES	1.00	1.25	1.00	1.70	1.30
METAL FORMING MACHINES					
DRAW BENCH-CARRIAGE & MAIN DRIVE EXTRUDER, FORMING MACHINE, WIRE DRAWING	2.00	2.25	2.00	2.70	2.30
TABLE CONVEYORS	2.50	2.75	2.50	3.20	2.80
WIRE WINDING, COILERS, SLITTERS	1.50	1.75	1.50	2.20	1.80
MILLS ROTARY TYPE					
BALL, KILNS, PEBBLE, ROLLING, TUBE	2.00	2.25	2.00	2.70	2.30
CEMENT KILNS DRYERS, COOLERS	2.00	2.25	2.00	2.70	2.30
TUMBLING	1.50	1.75	1.50	2.20	1.80
MIXERS					
CONCRETE, CONTINUOUS	1.75	2.00	1.75	2.50	2.00
MULLER	1.50	1.75	1.50	2.20	1.80
PAPER MILLS					
AGITATOR (MIXERS) REEL, WINDER	1.20	1.45	1.20	1.90	1.50
WINDER	1.20	1.45	1.20	1.90	1.50
BARKER (MECHANICAL) LOG HAUL, CHIPPER	2.00	2.25	2.00	2.70	2.30
BARKING DRUM (SPUR GEAR)	2.50	2.75	2.50	3.20	2.80

	ELECTRIC MOTOR W/ STANDARD TORQUE	ELECTRIC MOTOR W/ HIGH TORQUE	STEAM TURBINES & ENGINES W/ 4 OR MORE CYL*	RECIPROCATING ENGINES*	
				1-CYL.	2-CYL.
BEATER, PULPER, JORDANS, DRESSES	2.00	2.25	2.00	2.70	2.30
CALANDERS, DRYERS, WASHERS, THICKENER	1.50	1.75	1.50	2.20	1.80
CONVERTING MACHINES, CONVEYORS	1.20	1.45	1.20	1.90	1.50
PRINTING PRESSES	1.50	1.75	1.50	1.70	1.30
PUG MILL	1.75	2.00	1.75	2.00	1.60
PUMPS					
CENTRIFUGAL	1.00	1.25	1.00	1.70	1.30
GEAR, ROTARY, VANE	1.25	1.50	1.25	2.00	1.60
RECIPROCATING*					
1-CYL. SINGLE OR DOUBLE ACTING	2.00	2.25	2.00	2.70	2.70
2-CYL. SINGLE ACTING	2.00	2.25	2.00	2.70	2.30
2-CYL. DOUBLE ACTING	1.75	2.00	1.75	2.50	2.00
3 OR MORE CYL.	1.50	1.80	1.50	2.20	1.80
RUBBER MACHINERY					
MIXERS	2.50	2.75	2.50	3.20	2.80
RUBBER CALENDER	2.00	2.25	2.00	2.70	2.30
SCREENS					
AIR WASHING, WATER	1.00	1.25	1.00	1.70	1.30
ROTARY—STONE OR GRAVEL, DEWATERING	1.50	1.75	1.50	2.20	1.80
VIBRATING	2.5	2.75	2.5	3.2	2.8
GRIZZLY	2.00	2.25	2.00	2.70	2.30
SHREDDERS	1.50	1.75	1.50	2.20	1.80
STEERING GEARS	1.00	1.25	1.00	1.70	1.30
STOKERS	1.00	1.25	1.00	1.70	1.30
SUCTION ROLL (PAPER)	1.50	1.75	1.50	2.20	1.80
TEXTILE MACHINERY					
DRYERS, DYEING MACHINERY, MANGLE	1.20	1.45	1.20	2.00	1.60
LOOM, SPINNER, TENTER FRAMES	1.50	1.75	1.50	2.20	1.80
TUMBLING BARRELS	1.75	2.00	1.75	2.50	2.00
WINDLASS	2.00	2.25	2.00	2.70	2.30
WOODWORKING MACHINE	1.00	1.25	1.00	1.70	1.30

SELECTION GUIDE & RATING CHART

RATING CHART

SERIES	COUPLING SIZE	NOMINAL TORQUE (IN-LB)	MAX. BORE	BUSHINGS PER HUB	HUB OD	HP @ 1200 RPM	HP @ 1800 RPM	HP @ 3600 RPM
1	FL-A1	17,632	1.375"	3	4.500"	335	503	1,007
	FL-B1	43,661	2.000"	6	5.250"	831	1246	2,493
	FL-C1	69,037	2.500"	8	6.000"	1,314	1,971	3,943
	FL-D1	100,290	3.000"	10	6.750"	1,909	2,864	5,728
	FL-E1	137,141	3.750"	12	7.500"	2,611	3,916	7,833
2	FL-F2	139,681	2.375"	6	7.000"	2,659	3,989	7,978
	FL-G2	222,195	3.000"	8	8.000"	4,230	6,345	12,691
	FL-H2	258,149	3.750"	8	9.000"	4,915	7,372	14,745
	FL-I2	367,629	4.375"	10	10.000"	6,999	10,499	20,999
	FL-J2	495,086	5.000"	12	11.000"	9,426	14,193	28,279
3	FL-K3	557,566	4.000"	8	11.000"	10,616	15,924	31,848
	FL-L3	860,947	5.000"	10	13.000"	16,392	24,588	49,177
	FL-M3	1,131,531	6.000"	12	14.000"	21,544	32,316	64,633
	FL-N3	1,549,705	7.000"	14	16.000"	29,506	44,259	88,519
	FL-O3	1,664,498	8.000"	14	17.000"	31,692	47,538	95,076
4	FL-P4	783,901	5.000"	6	13.000"	14,925	22,388	44,776
	FL-Q4	1,151,259	6.000"	8	14.000"	21,920	32,880	65,760
	FL-R4	1,704,219	7.000"	10	16.000"	32,448	48,672	97,345
	FL-S4	1,836,791	8.000"	10	17.000"	34,972	52,458	104,917
	FL-T4	2,363,237	9.000"	12	18.000"	44,996	67,494	134,988
	FL-U4	2,942,628	10.000"	14	19.000"	56,027	84,041	168,083
	FL-V4	3,787,331	11.000"	16	21.000"	72,111	108,166	216,333
	FL-Z4	4,738,008	12.000"	18	23.000"	90,211	135,317	270,635

NOTE: Due to the high power density of Frontline Couplings, in most cases you can select the right coupling, based solely on max. shaft diameter of your application. Always consult Frontline if you are unsure about your choice.

SELECTION GUIDE

1. Determine the nominal torque (Tn) in "in-lb" as follows:

NOMINAL TORQUE =
(HP x 63025) / RPM

2. Service Factor Chart" on the previous page and select the appropriate service factor for your application.
3. Calculate the "Design Torque" as follows:

DESIGN TORQUE =
NOMINAL TORQUE x SERVICE FACTOR

4. Using the "Coupling Rating Chart" in the Design Torque column, locate the nearest higher rating and find the corresponding coupling size to the left.
5. Compare the driver/driven shaft size to the maximum bore available for the coupling selected. If it is smaller than the driver/driven shaft sizes, then go further down the "max.bore" column to select the coupling that can accommodate these shaft sizes.

For information on coupling bore clearances, please see page 24.

INSTALLATION INSTRUCTIONS

Double Engagement Design (3 pc.) with Clearance Fit

FOR SERIES 1 THROUGH 4

1. Inspect and clean the driver and driven shafts of any burrs, rust, deposits or sharp edges.
2. Check the dimensions of the shafts and the keys.
3. Mount pins on the ring using a few drops of Loctite 242 or any equivalent thread locking compound. Torque down pins as per chart below.
4. Mount the hubs on the respective shafts. Carefully adjust both hubs until there is a metal to metal, gap between each hub and the center ring that corresponds to the appropriate coupling series:

Series 1	0.187"	+0.062" -0.000"
Series 2	0.281"	+0.062" -0.000"
Series 3	0.375"	+0.125" -0.000"
Series 4	0.469"	+0.125" -0.000"

   To facilitate this process please use the plastic setting clips provided with every coupling.

5. Rough align and tighten the foundation bolts on the drive equipment.
6. Re-adjust the hubs on the shafts such that the gap on each side of the ring is proper for the given series.
7. Tighten the set screws on the hubs. Use any removable strength thread locking compound such as Loctite® 242.
8. Align the driver and driven shafts to the specifications provided by the equipment manufacturer. Laser alignment is recommended to get the best coupling performance. If no specifications are available then the following values may be used for general-purpose machines like centrifugal pumps and motors.

SPEED	PARALLEL MISALIGNMENT	ANGULAR MISALIGNMENT
RPM		Per 10" Dia. Of Coupling
600	within 0.005" to 0.009"	within 0.010" to 0.015"
900	within 0.003" to 0.006"	within 0.007" to 0.010"
1200	within 0.0025" to 0.004"	within 0.005" to 0.008"
1800	within 0.002" to 0.003"	within 0.003" to 0.005"
3600	within 0.001" to 0.0015"	within 0.002" to 0.003"
7200	within 0.0005" to 0.001"	within 0.001" to 0.002"

9. Apply a few drops of Loctite® 242 or equivalent thread locking compound on the threaded portion of the pins and insert them from the back of the hubs, torquing them down to about the appropriate value.

   PINS TORQUE DOWN VALUES

Series 1	35 ft-lb
Series 2	120 ft-lb
Series 3	220 ft-lb
Series 4	350 ft-lb

10. Check the coupling setting dimensions once again to ensure that the gap between each hub and the ring is correct for the given series.
11. Put the Coupling guard in place.
12. Start and check for any unusual sound or vibration.
13. Take vibration readings and record the same for future reference.

NOTE: For couplings with interference fit, it is essential that accurate field measurements be taken to establish the exact position of the hubs on the shaft. Also, the bushings are provided separately, so that they can be "pressed in" after the hubs have cooled down.

INSTALLATION INSTRUCTIONS

Single Engagement Design (2 pc.) with Clearance Fit

FOR SERIES 1 THROUGH 4

1. Inspect and clean the driver and driven shafts of any burrs, rust, deposits or sharp edges.
2. Check the dimensions of the shafts and the keys.
3. Mount pins on the ring using a few drops of Loctite 242 or any equivalent thread locking compound. Torque down pins as per chart below.
4. Mount the hubs on the respective shafts. Carefully adjust both hubs until there is a metal to metal, gap between each hub and the center ring that corresponds to the appropriate coupling series:

Series 1	0.187"	+0.062" -0.000"
Series 2	0.281"	+0.062" -0.000"
Series 3	0.375"	+0.125" -0.000"
Series 4	0.469"	+0.125" -0.000"

To facilitate this process please use the plastic setting clips provided with every coupling.

5. Rough align and tighten the foundation bolts on the drive equipment.
6. Tighten the set screws on the hubs. Use any removable strength thread locking compound such as Loctite® 242.
7. Align the driver and driven shafts to the specifications provided by the equipment manufacturer. Laser alignment is recommended to get the best coupling performance. If no specifications are available then the following values may be used for general-purpose machines like centrifugal pumps and motors.

SPEED	PARALLEL MISALIGNMENT	ANGULAR MISALIGNMENT
RPM		Per 10" Dia. Of Coupling
600	within 0.005" to 0.009"	within 0.010" to 0.015"
900	within 0.003" to 0.006"	within 0.007" to 0.010"
1200	within 0.0025" to 0.004"	within 0.005" to 0.008"
1800	within 0.002" to 0.003"	within 0.003" to 0.005"
3600	within 0.001" to 0.0015"	within 0.002" to 0.003"
7200	within 0.0005" to 0.001"	within 0.001" to 0.002"

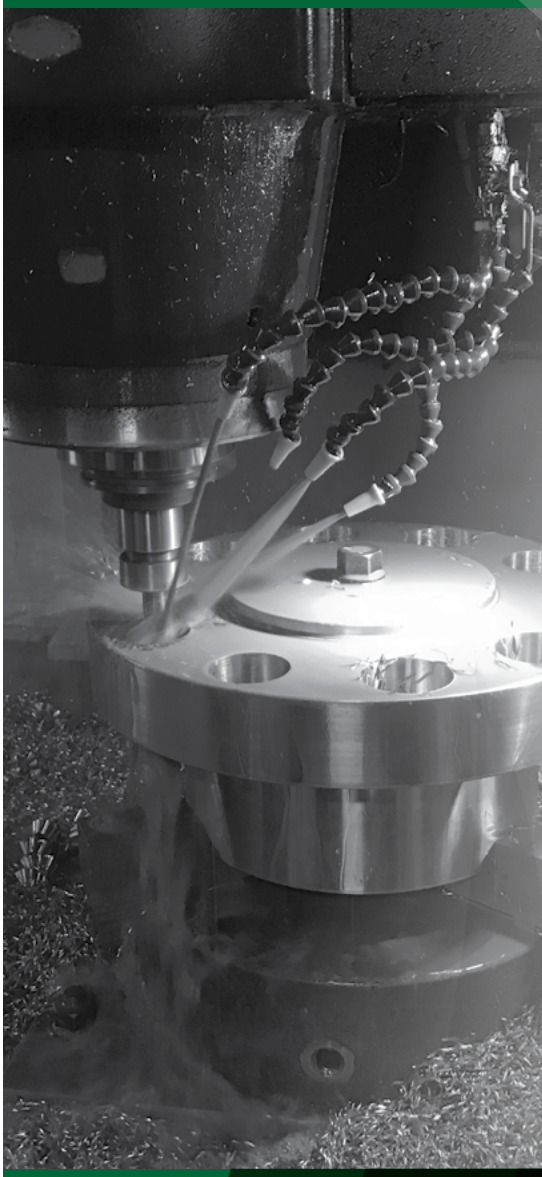
8. Apply a few drops of Loctite® 242 or equivalent thread locking compound on the threaded portion of the pins and insert them from the back of the hubs, torquing them down to about the appropriate value.

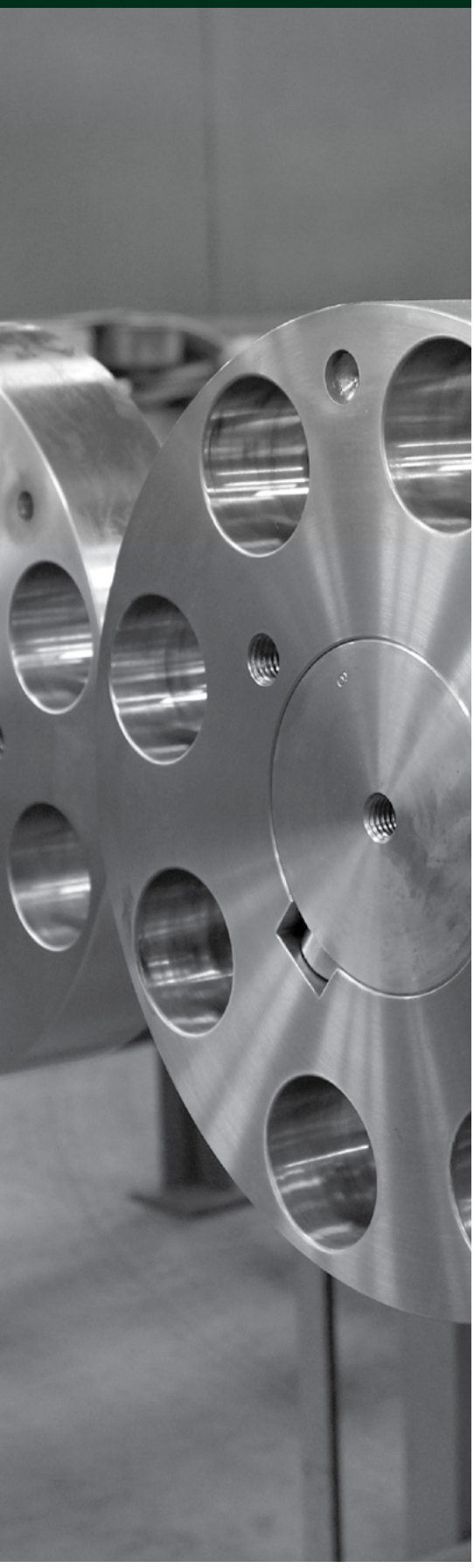
PINS TORQUE DOWN VALUES

Series 1	35 ft-lb
Series 2	120 ft-lb
Series 3	220 ft-lb
Series 4	350 ft-lb

9. Check the coupling setting dimensions once again to ensure that the gap between hubs is correct for the given series.
10. Put the Coupling guard in place.
11. Start and check for any unusual sound or vibration.
12. Take vibration readings and record the same for future reference.

NOTE: For couplings with interference fit, it is essential that accurate field measurements be taken to establish the exact position of the hubs on the shaft. Also the bushings are provided separately, so that they can be "pressed in" after the hubs have cooled down.





INSTALLATION INSTRUCTIONS

Floating Shaft (Jack shaft) Design with Clearance Fit

1. Mount the two hubs with provision for pins on each end of the steel floating shaft. The hub faces should be flush with the ends of the jackshaft.**
2. Mount the two hubs with the bushings on the shafts of the driver and the driven equipment such that after the assembly is complete, the gap between metal to metal on each pair of hubs would be between:

Series 1	0.187"	+0.062" -0.000"
Series 2	0.281"	+0.062" -0.000"
Series 3	0.375"	+0.125" -0.000"
Series 4	0.469"	+0.125" -0.000"

   To facilitate this process please use the plastic setting clips provided with every coupling.
3. Tighten the setscrews on the hubs.
4. Position the jackshaft so that the threaded holes of the hubs line up with the bores of the bushings on the opposite hubs.
5. Apply a few drops of Loctite® 242 or equivalent thread locking compound on the threaded portion of the pins and insert them from the back of the hubs, torquing them down to about the appropriate value.

   PINS TORQUE DOWN VALUES

Series 1	35 ft-lb
Series 2	120 ft-lb
Series 3	220 ft-lb
Series 4	350 ft-lb

6. Align the driver and driven shafts to specifications provided by the equipment manufacturer. Laser or Dial Indicator alignment is recommended to get the best coupling performance.

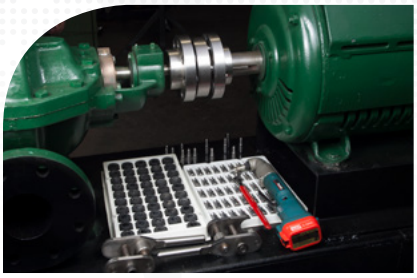
SPEED	PARALLEL MISALIGNMENT	ANGULAR MISALIGNMENT
RPM		Per 10" Dia. Of Coupling
600	within 0.005" to 0.009"	within 0.010" to 0.015"
900	within 0.003" to 0.006"	within 0.007" to 0.010"
1200	within 0.0025" to 0.004"	within 0.005" to 0.008"
1800	within 0.002" to 0.003"	within 0.003" to 0.005"
3600	within 0.001" to 0.0015"	within 0.002" to 0.003"
7200	within 0.0005" to 0.001"	within 0.001" to 0.002"

7. Check the setting dimensions again to insure that the metal to metal gap on each side of the floating shaft is correct for the given series.
8. Put the Coupling/Drive shaft guard back in place.
9. Start unit and check for any unusual sound or vibration
10. Take vibration readings and record the same for future reference.

NOTES: For couplings with interference fit, it is essential that accurate field measurements be taken to establish the exact position of the hubs on the shaft. Also the bushings are provided separately, so that they can be "pressed in" after the hubs have cooled down.

**In the event that there is limited space in the back of the driver and driven hubs,

FIELD REPLACEMENT
PINS & BUSHINGS

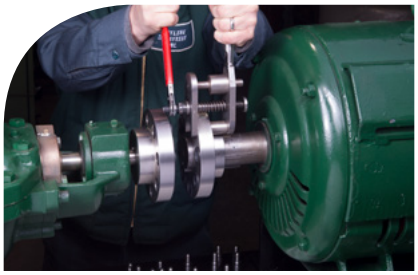


Preparation of field replacement of pins and bushings.

Removal of pins with ratchet

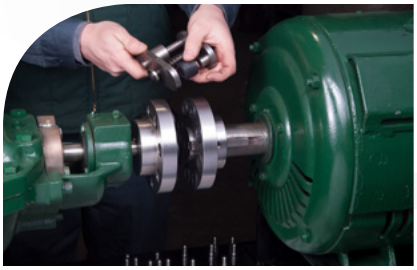
Removal of pins with cordless angle ratchet wrench.

Lowering of power ring.*

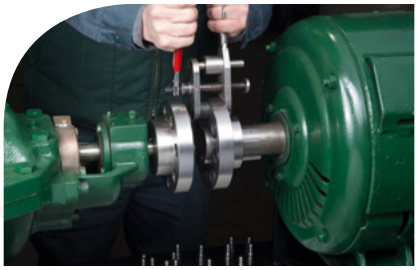


Removal of bushings using tool and ratchet wrench.

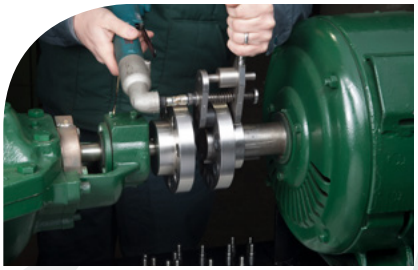
Removal of bushing using tool and angle ratchet wrench.



Loading of a bushing in tool.

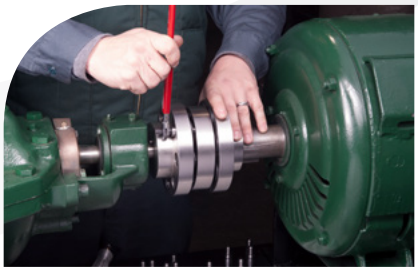


Installation of bushings using tool and ratchet wrench.



Installation of bushings using tool and battery operated angle ratchet wrench.

Raising of ring and engaging all pins from both sides by hand.
(Thread locker already applied)



Installation of pins using ratchet wrench.

Final torquing of pins.

*In the event that there is not enough clearance between the shafts to completely remove the power ring, simply “rest it” on the shafts. There should be enough room to remove the bushings without having to move the hubs or the motor.

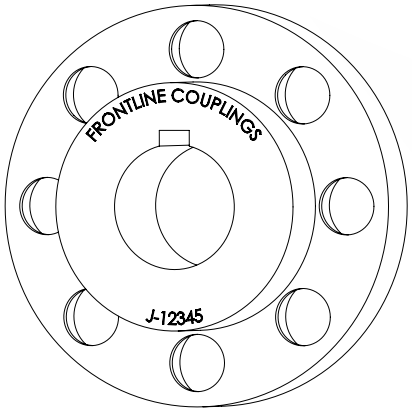
STOCK BORES & CLEARANCES
FRONTLINE COUPLINGS

Coupling Bore Clearances

SHAFT DIA.	CLEARANCE FIT (CF)		INTERFERENCE FIT (IF)	SHAFT DIA.	CLEARANCE FIT (CF)		INTERFERENCE FIT (IF)
	CLASS I	CLASS II			CLASS I	CLASS II	
0.500	0.500-0.501	0.500-0.502	0.4490-0.4995	4.000	4.0000-4.0015	4.000-4.003	3.9970-3.9985
0.625	0.625-0.626	0.625-0.627	0.6240-0.6245	4.500	4.500-4.502	4.500-4.504	4.4965-4.4980
0.750	0.750-0.751	0.750-0.752	0.7490-0.7495	5.000	5.000-5.002	5.000-5.004	4.9965-4.998
0.875	0.875-0.876	0.875-0.877	0.8740-0.8745	5.500	5.500-5.502	5.500-5.504	5.4960-5.4975
1.000	1.000-1.001	1.000-1.002	0.9990-0.9995	6.000	6.000-6.002	6.000-6.004	5.9960-5.9975
1.125	1.125-1.126	1.125-1.127	1.1240-1.1245	6.500	6.500-6.502	6.000-6.504	6.4960-6.4975
1.250	1.250-1.251	1.250-1.252	1.2490-1.2495	7.000			6.9960-6.9975
1.375	1.375-1.376	1.375-1.377	1.3740-1.3745	7.500			7.4950-7.4970
1.500	1.500-1.501	1.500-1.502	1.4990-1.4995	8.000			7.9950-7.9970
1.625	1.625-1.626	1.625-1.627	1.623-1.624	8.500			8.4945-8.4965
1.750	1.750-1.751	1.750-1.752	1.748-1.749	9.000			8.9945-8.9965
1.875	1.875-1.876	1.875-1.877	1.873-1.874	9.500			9.4940-9.4960
2.000	2.000-2.001	2.000-2.002	1.998-1.999	10.000			9.9940-9.9960
2.125	2.125-2.1265	2.125-2.127	2.123-2.124	10.500			10.4935-10.4950
2.250	2.2500-2.2515	2.250-2.252	2.248-2.249	11.000			10.9935-10.9955
2.375	2.3750-2.3765	2.375-2.377	2.373-2.374	11.500			11.4930-11.4950
2.500	2.5000-2.5015	2.500-2.502	2.498-2.499	12.000			11.9930-11.9950
2.625	2.6250-2.6265	2.625-2.627	2.623-2.624				
2.750	2.7500-2.7515	2.750-2.752	2.748-2.749				
2.875	2.8750-2.8765	2.875-2.877	2.873-2.874				
3.000	3.0000-3.0015	3.000-3.002	2.998-2.999				
3.250	3.2500-3.2515	3.250-3.253	3.2470-3.2485				
3.500	3.5000-3.5015	3.500-3.503	3.4970-3.4985				
3.625	3.6250-3.6265	3.625-3.628	3.6220-3.6235				
3.750	3.7500-3.7515	3.750-3.753	3.7470-3.7485				

COUPLING IDENTIFICATION
IDENTIFY AN EXISTING COUPLING

Due to the large number of custom sizes produced and to help customers identify the size and models of their existing couplings, starting June 2019 Frontline has been engraving a Job # on the back of each hub. This Job # will enable Frontline to trace all details of the application and the drawing # of that specific coupling



NEMA
Shaft Details

NEMA FRAME	SHAFT DIAMETER	KEY WAY	NEMA FRAME	SHAFT DIAMETER	KEY WAY
42	3/8"	FLAT	324T	2-1/8"	1/2"
48	1/2"	FLAT	326T	2-1/8"	1/2"
56	5/8"	3/16"	324TS	1-7/8"	1/2"
56H	5/8"	3/16"	326TS	1-7/8"	1/2"
143T	7/8"	3/16"	364U	2-1/8"	1/2"
145T	7/8"	3/16"	365U	2-1/8"	1/2"
182	7/8"	3/16"	364T	2-3/8"	5/8"
184	7/8"	3/16"	365T	2-3/8"	5/8"
182T	1-1/8"	1/4"	364TS	1-7/8"	1/2"
184T	1-1/8"	1/4"	365TS	1-7/8"	1/2"
213	1-1/8"	1/4"	404U	2-3/8"	5/8"
215	1-1/8"	1/4"	405U	2-3/8"	5/8"
213T	1-3/8"	5/16"	404T	2-7/8"	3/4"
215T	1-3/8"	5/16"	405T	2-7/8"	3/4"
254U	1-3/8"	5/16"	404TS	2-1/8"	1/2"
256U	1-3/8"	5/16"	405TS	2-1/8"	1/2"
254T	1-5/8"	3/8"	444U	2-7/8"	3/4"
256T	1-5/8"	3/8"	445U	2-7/8"	3/4"
284U	1-5/8"	3/8"	444T	3-3/8"	7/8"
286U	1-5/8"	3/8"	445T	3-3/8"	7/8"
284T	1-7/8"	1/2"	447T	3-3/8"	7/8"
286T	1-7/8"	1/2"	449T	3-3/8"	7/8"
284TS	1-5/8"	3/8"	444TS	2-3/8"	5/8"
286TS	1-5/8"	3/8"	445TS	2-3/8"	5/8"
324U	1-7/8"	1/2"	447TS	2-3/8"	5/8"
326U	1-7/8"	1/2"	449TS	2-3/8"	5/8"

FRAMES PRIOR TO 1963

FRAME	SHAFT DIAMETER	KEY WAY	FRAME	SHAFT DIAMETER	KEY WAY
66	3/4"	3/16"	364	1-7/8"	1/2"
203	3/4"	3/16"	365	1-7/8"	1/2"
204	3/4"	3/16"	404	2-1/8"	1/2"
224	1"	1/4"	405	2-1/8"	1/2"
225	1"	1/4"	444	2-3/8"	5/8"
254	1-1/8"	1/4"	445	2-3/8"	5/8"
284	1-1/4"	1/4"	504	2-7/8"	3/4"
324	1-5/8"	3/8"	505	2-7/8"	3/4"
326	1-5/8"	3/8"			

TECHNICAL INFORMATION
FORMULAE

Fan & Blower Motor Application

Horsepower = $\frac{\text{CFM x Pressure (lb /sq. ft.)}}{\text{33000 x Efficiency}}$

Power / AC Circuits

Efficiency = $\frac{\text{746 x Output Horsepower}}{\text{Input Watts}}$

Three-Phase Kilowatts = $\frac{\text{Volts x Amperes x Power Factor x 1.732}}{\text{1000}}$

Three-Phase Volt-Amperes = Volts x Amperes x 1.732

Three-Phase Amperes = $\frac{\text{746 x Horsepower}}{\text{1.732 x Volts x Efficiency x Power Factor}}$

Three-Phase Efficiency = $\frac{\text{746 x Horsepower}}{\text{Volts x Amperes x Power Factor x 1.732}}$

Three-Phase Power Factor = $\frac{\text{Input Watts}}{\text{Volts x Amperes x 1.732}}$

Single-Phase Kilowatts = $\frac{\text{Volts x Amperes x Power Factor}}{\text{1000}}$

Single-Phase Amperes = $\frac{\text{746 x Horsepower}}{\text{Volts x Efficiency x Power Factor}}$

Single-Phase Efficiency = $\frac{\text{746 x Horsepower}}{\text{Volts x Amperes x Power Factor}}$

Single-Phase Power Factor = $\frac{\text{Input Watts}}{\text{Volts x Amperes}}$

Horsepower (3 Phase) = $\frac{\text{Volts x Amperes x Power Factor x 1.732 x Efficiency}}{\text{746}}$

Horsepower (1 Phase) = $\frac{\text{Volts x Amperes x Power Factor x Efficiency}}{\text{746}}$

Power / DC Circuits

Watts = Volts x Amperes (W = E • I)

Amperes = $\frac{\text{Watts}}{\text{Volts}}$ (I = W/E)

Horsepower = $\frac{\text{Volts x Amperes x Efficiency}}{\text{746}}$

Pump Motor Application

Horsepower = $\frac{\text{GPM x Head in Feet x Specific Gravity}}{\text{3960 x Efficiency of Pump}}$

Head in Feet = 2.31 PSIG

Motor Application

Torque (lb-lb) = $\frac{\text{Horsepower x 5250}}{\text{RPM}}$

Horsepower = $\frac{\text{Torque (lb-ft) x RPM}}{\text{5250}}$

Shaft Stress

(PSI) = $\frac{\text{HP x 321,000}}{\text{RPM x Shaft Diam.}^3}$

OHMs Law

Ohm = Volts/Amperes (R = E/I)

Amperes = Volts/Ohms (I = E/R)

Volts = Amperes x Ohms (E= IR)

Temperature Conversion

Deg C = (Deg. F – 32) x 5/9

Deg F = (Deg. C x 9/5) + 32

Conversions

HP x 0.745 = KW

KW x 1.341 = HP

NM x 0.7376 = FT-LB

NM x 8.850 = IN-LB

FT-LB x 1.356 = NM

IN-LB x 0.113 = NM

HP x 550 = FT-LB/sec

Torque (in-lb) = $\frac{\text{63,025 x HP}}{\text{RPM}}$

Torque (ft-lb) = $\frac{\text{5,252 x HP}}{\text{RPM}}$

Torque NM = $\frac{\text{KW x 9,550}}{\text{RPM}}$

TECHNICAL INFORMATION
DEFINITIONS

COLD ALIGNMENT
Intentional and calculated misalignment of the shafts of two machines to compensate for the anticipated thermal growth.

DAMPING
The ability of a material to absorb vibrational energy.

ENDURANCE LIMIT
The maximum level of stress at which failure due to fatigue will not occur.

FATIGUE
Failure of metal parts by progressive cracking caused by cyclic application of stress.

FRETTING
A process by which small amounts of surface particles are removed by an opposing rubbing component through fatigue.

POTENTIAL UNBALANCE
The variation of unbalance measured after every disassembly and reassembly of a coupling.

POWER DENSITY
The ratio between the rated torque of a coupling and its size or weight.

SAFETY FACTOR
The ratio between the rated torque of a coupling and the value at which failure would occur.

SERVICE FACTOR
The ratio between the design torque and the nominal torque.

TORSIONAL STIFFNESS
The torque required to produce angular displacement of the coupling hubs with respect to each other.

UNBALANCE
The net unbalance of a coupling after installation.

TORQUE
The effectiveness of a force in setting a body into rotation.

DESIGN TORQUE
The torque required for a specific application, calculated by multiplying nominal torque by the service factor.

NOMINAL TORQUE
The torque continuously transmitted by a gear head over a long period of time, i.e. in continuous operation.

PEAK TORQUE
The maximium torque a machine can exert, achieved at a certain RPM.

SHEAR TORQUE
The point of mechanical failure.

WARRANTY
PRODUCT WARRANTY

Frontline warrants all products it manufactures to be of good material and workmanship and to be free of defects if properly installed and operated. Remedy for breach of this warranty is expressly limited to replacement of defective parts, as hereinafter set forth, Frontline expressly disclaims all claims for incidental and consequential damages arising from any breach of this warranty.

Any product which, under normal use and service, is proven to breach the warranty contained herein within ONE YEAR from the date of sale will, upon examination by Frontline, be replaced free F.O.B Irvington, New Jersey. In all cases, transportation costs and charges for return goods shall be paid for by the purchaser. Frontline hereby disclaims all responsibility for such transportation costs and charges. This warranty will not be breached, and Frontline will give no credit for products it manufactures that shall have received normal wear and tear, been damaged, improperly installed, repaired or altered outside Frontline's factory.

The above-described warranty is expressly in lieu of all other warranties expressed or implied, and all other warranties are hereby expressly disclaimed, including without limitation the implied warranty of merchantability and the implied warranty of fitness for a particular purpose. Frontline expressly disclaims all liability for special, consequential or incidental damages, whether arising in tort or by contract. Frontline further disclaims all liability from personal injury relating to its products to the extent permitted by law.

By accepting any of Frontline's equipment or products, the purchaser assumes all liability for the consequences arising from their use or misuse. No person, firm or corporation is authorized to assume for Frontline any other liability in connection with the sale of its products. Furthermore, no person, firm or corporation is authorized to modify or waive the terms of this paragraph, unless done in writing and signed by a duly authorized agent of Frontline.

NOTE: Specifications are subject to change without Notice, and without liability there off. The information in this catalog was accurate to the best of our knowledge, at the time of printing. For current updated information please visit our website **frontlinecouplings.com**.

FRONTLINE INDUSTRIES, INC

990 Chancellor Ave
Irvington, NJ 07111

p: 973.373.7211
f: 973.374.0365

sales@frontlinecouplings.com
frontlinecouplings.com