

# Power Take-Off Clutches

## Superior torque control for heavy duty diesel engines

Wichita has instituted quality assurance procedures aimed at achieving the ultimate in product reliability and its Power Take-Offs represent industry's most advanced PTO design.

Two mechanically activated PTO's are now available in addition to the performance-proven Air Tube Disc Clutch PTO's. Complete clutch engagement of the mechanical PTO units is assured with each release of the hand lever due to the incorporation of a heavy-duty Fuller® "Solo" truck clutch. With its many outstanding features, the Fuller clutch used in the Wichita PTO prevents torsional vibration from damaging engine or transmission components, or causing spline wear. The result is superior Power Take-Off performance and durability!



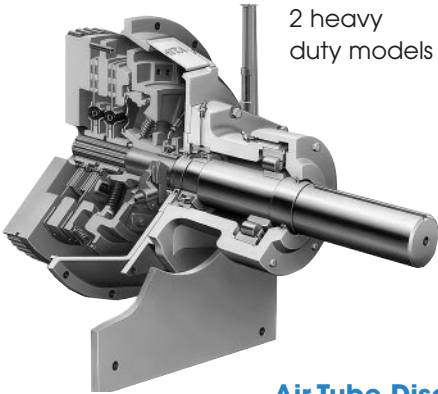
## Mechanical Power Take-Off Clutches

**NEW!**

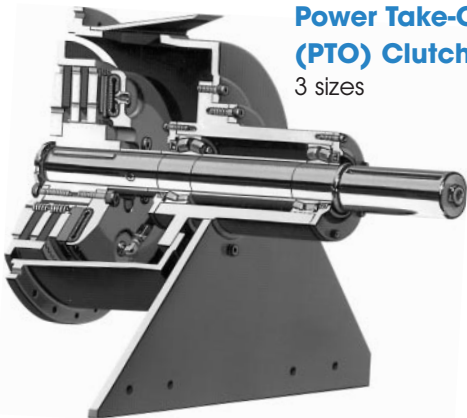
**In-Line PTO**  
 Now in 2 sizes



**Side Load PTO**  
 2 heavy duty models



**Air-Tube Disc Power Take-Off (PTO) Clutches**  
 3 sizes



## Typical Applications

The In-line PTO design provides direct drive operation with side load capability. It has an automatic self-adjusting feature and does not require a pilot bearing. Other features such as standard SAE flywheel mounting, interchangeable clutch and clutch housing, constant plate load and easy maintenance add up to superior performance.



Wichita 15-1/2" mechanical PTO provides long service life for Cummins 855 diesel on rock crusher.

Side Load PTO's utilize a pair of heavy-duty roller bearings fitted in to the shaft housing. The bearing support system eliminates the transmission of side loads that could reduce durability or even damage the engine's crankshaft. Its torque capacities range up to 420 hp @ 2100 rpm.



Wichita mechanical PTO handles shock and heavy loads for wood chippers.

Air-Tube Disc Power Take-Off Clutches provide dependable trouble-free performance on indirect drives with large overhung loads on engines of 250-700 hp. The Wichita design isolates the side load from the engine's crankshaft for long service life. Simple air controls can be utilized to remotely control the clutch as well as the throttle. Wichita PTO's have been successfully used for oil field, construction and marine applications.



Wichita PTO mounted on Caterpillar diesel engine.



## Mechanical design

### In-Line

Available with dampened driven discs.

No pilot bearing required.

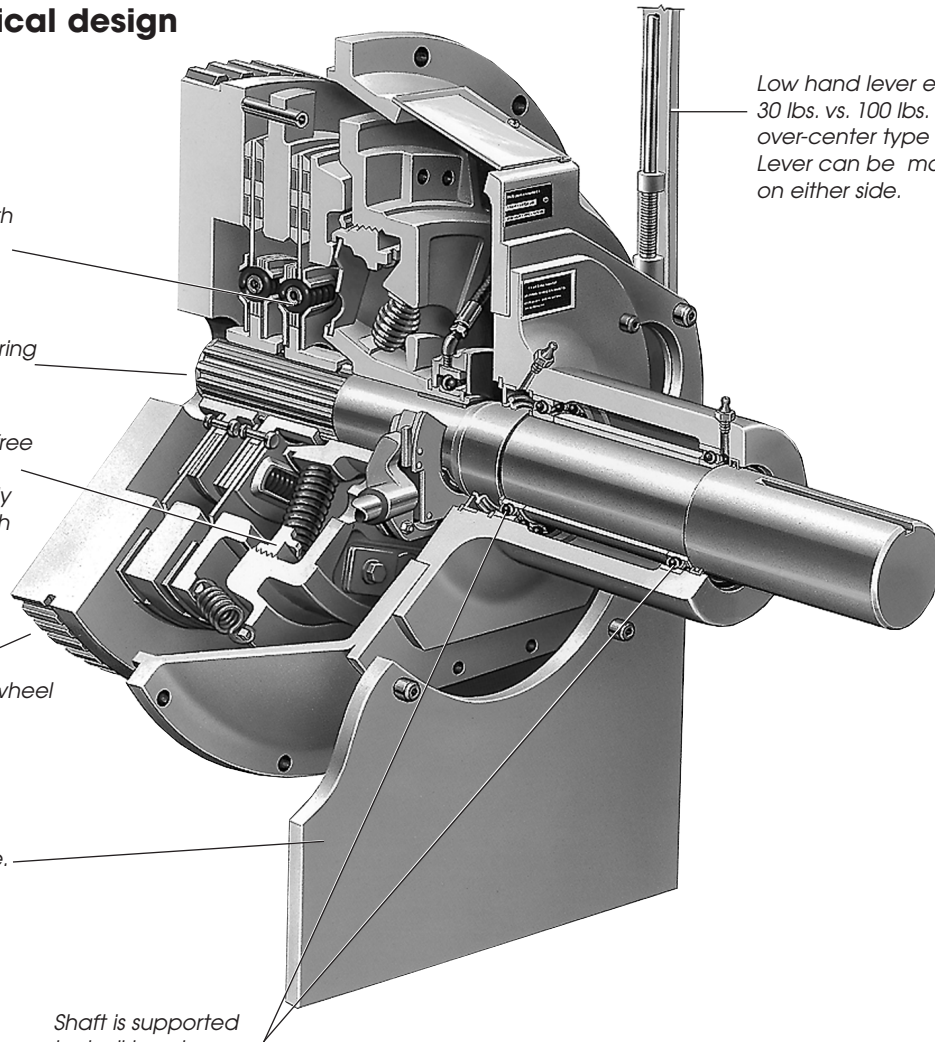
Adjustment free feature automatically adjusts clutch through normal use.

Ideal for vehicular flywheel applications.

Optional Support Base.

Shaft is supported by ball bearings, eliminating transmission of damaging side loads.

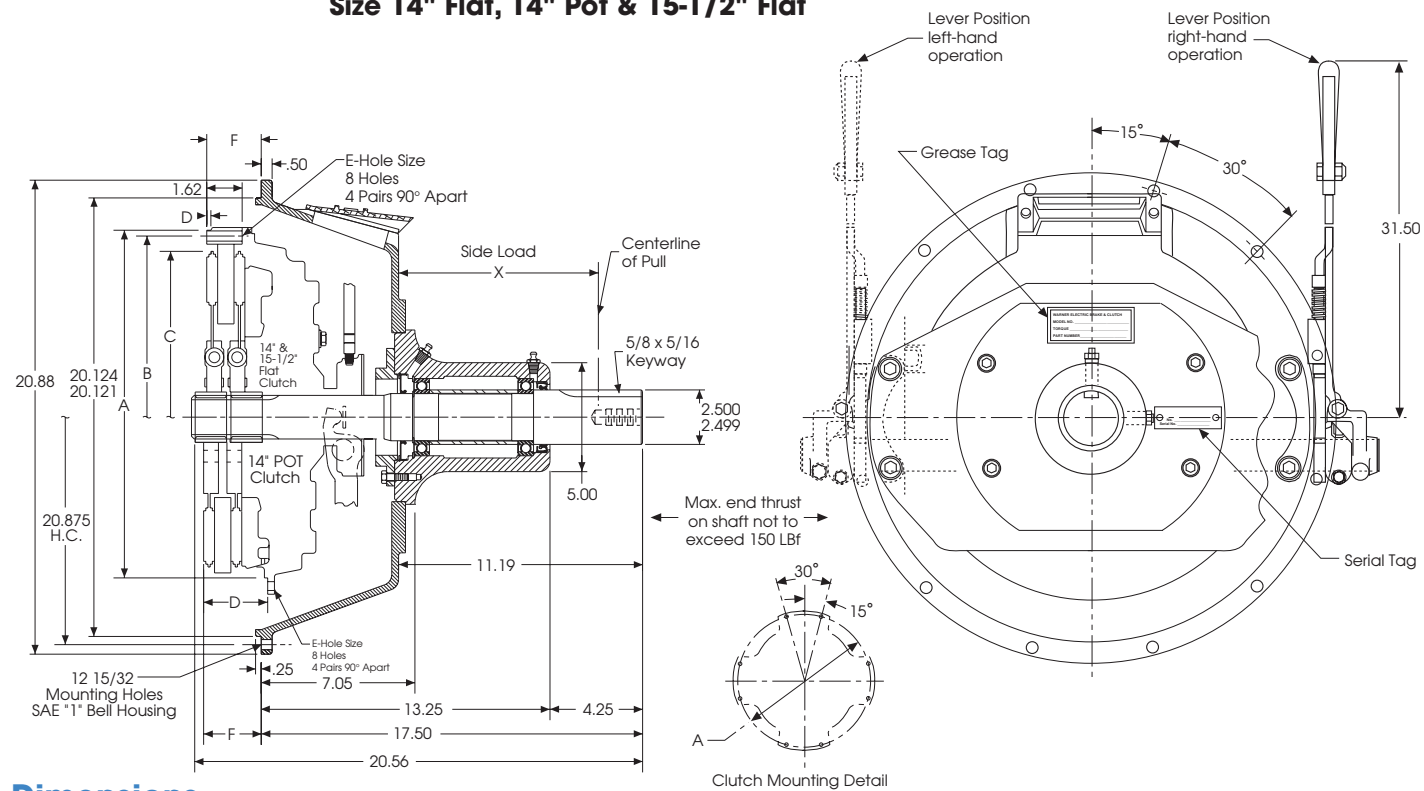
Low hand lever effort. 30 lbs. vs. 100 lbs. for over-center type PTO. Lever can be mounted on either side.



## Design Features

- Side Load version incorporates a rugged cylindrical roller bearing system which eliminates trouble-prone pilot bearings. Provides 100% external support of take-off shaft. Prevents transmission of side loads that fatigue or even damage the engine crankshaft.
- Precise alignment capabilities of the bearing system ensure flywheel/clutch concentricity to minimize effects of diesel engine torsional vibration.
- Performance-proven Fuller Solo Spring clutch provides easy engagement. Axial load is provided by three pairs of springs placed at an angle to the clutch centerline, reducing required axial force as the clutch is disengaged. The discs are raced with trapezoidal ceramic buttons, and are dampened with an assembly of coaxial springs mounted in the disc hub.
- Dampened clutch discs prevent torsional vibrations from damaging engine or components.
- Available in 2 sizes, from 14" to 15 1/2" for engines up to 420 HP @ 2100 rpm.

**Mechanical In-line PTO (Truck Flywheel)**  
**Size 14" Flat, 14" Pot & 15-1/2" Flat**



**Dimensions**

Clutch Size	SAE Bell Housing	A Pilot (+.000/-.002) in	B Hole Circle in	C Plate Dia. in	D in	E Hole Size - Qty in	F in
14" Flat	1	16.50*	15.500	13.56	N/A	13/32 8	2.62
14" Pot	1	14.750	15.500	13.75	2.94	13/32 8	2.50
15-1/2" Flat	1	17.155	16.625	15.22	0.19	15/32 8	2.50

\* Nominal diameter only, clutch is not piloted.

**Estimated Side Load Calculation**

$$\text{Est. Side Load (lbs.)} = \frac{\text{HP} \times 378,000}{\text{Speed} \times \text{PD}}$$

Est. Side Load = Estimated perpendicular side pull to support plate in pounds, (lbs).  
 Hp = Engine's horsepower at normal operating speed.  
 Speed = Normal operating speed in rpm.  
 PD = Pitch diameter of sheave on PTO

Note: It is recommended that the optional support plate be used in side load applications.

Clutch Size	Engine Manufacturers Common Truck Flywheels*		
	Caterpillar	Cummins	Detroit
14" Pot		FW1101	5129650 5101878
15-1/2" Flat	9N3136 4W6800	FW1134	5138863

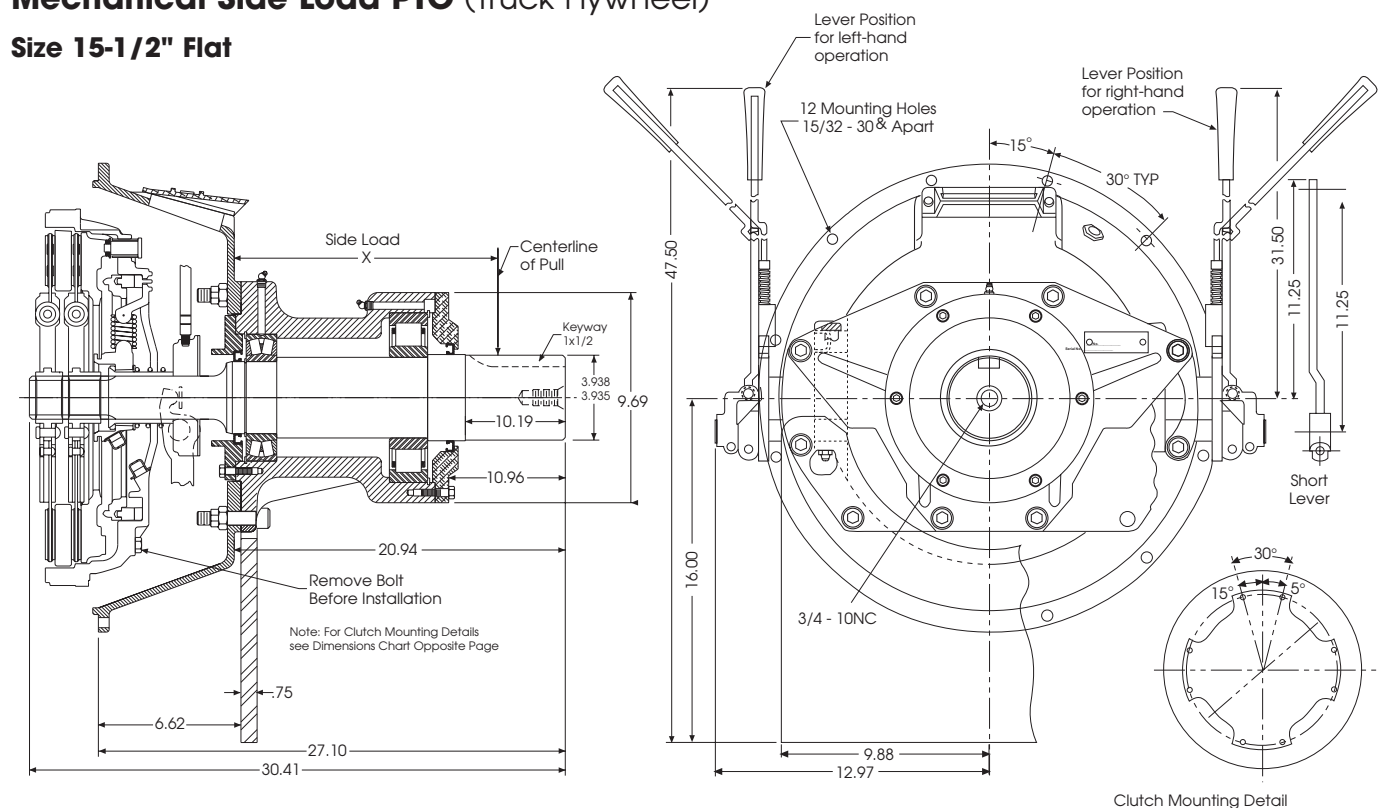
\* Check with engine manufacturer for flywheel compatibility.

**Allowable Side Load (lbs.) at 1,800 RPM**

X Distance from Bell Housing	Side Load (lbs.) B <sub>10</sub> Bearing Life
3.62	1,600
4.62	1,100
5.62	850
6.62	680
7.62	565
8.62	450
9.62	400
10.26	370
11.25	340

At 2100 rpm, derate side load by 20%.

**Mechanical Side Load PTO (Truck Flywheel)**  
**Size 15-1/2" Flat**



**Estimated Side Load Calculation**

$$\text{Est. Side Load (lbs.)} = \frac{\text{HP} \times 378,000}{\text{Speed} \times \text{PD}}$$

Est. Side Load = Estimated perpendicular side pull to support plate in pounds, (lbs).  
 Hp = Engine's horsepower at normal operating speed.  
 Speed = Normal operating speed in rpm.  
 PD = Pitch diameter of sheave on PTO

**Allowable Side Load (lbs.)**

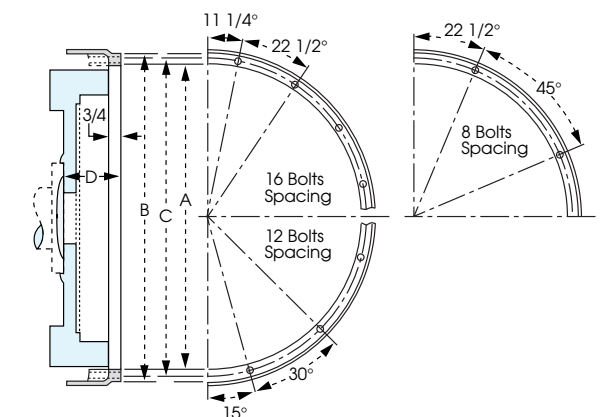
X Dimension	1000	1200	RPM 1800	2200	2400
11 in.	11,100	10,700	9,500	8,900	8,200
12 in.	10,000	9,500	8,500	8,000	7,400
13 in.	9,000	8,600	7,600	7,200	6,600
14 in.	8,200	7,800	7,000	6,500	6,100
15 in.	7,500	7,000	6,300	6,000	5,600
16 in.	7,000	6,600	5,800	5,500	5,300
17 in.	6,400	6,100	5,400	5,100	4,800
18 in.	6,000	5,700	5,000	4,700	4,400
19 in.	5,600	5,300	4,700	4,400	4,200
20 in.	5,400	5,200	4,500	4,200	4,000

**Engine Flywheel Housing SAE Standards**

SAE Size No.	A In.	B In.	C In.	D In.	Tapped Holes No.	Size
00	31.000/31.010	34-3/4	33-1/2	3-15/16	16	1/2-13
0	25.500/25.510	28	26-3/4	3-15/16	16	1/2-13
1/2	23.000/23.008	25-1/2	24-3/8	3-15/16	12	7/16-14
1	20.125/20.130	21-3/4	20-7/8	3-15/16	12	3/8-16
2	17.625/17.630	19-1/4	18-3/8	3-15/16	12	3/8-16
3	16.125/16.130	17-3/4	16-7/8	3-15/16	12	3/8-16
4	14.250/14.255	15-7/8	15	3-15/16	12	3/8-16
5	12.375/12.380	14	13-1/8	2-13/16	8	3/8-16
6	10.500/10.505	12-1/8	11-1/4	2-13/16	8	3/8-16

For flywheel standards consult the SAE standards manual.

Note: For mounting, use socket head cap screws conforming to the ASTM-574-97a. Support plate must be perpendicular to side load pull.



# Power Take-Off Clutches

## Specifications

Clutch Size	Torque*	Flywheel Bore Opening in/(cm)	Spline Dia. and Number of Splines in - qty	Duty A to B <sup>1</sup> Light and Normal HP/100 RPM	Duty C to D <sup>1</sup> Heavy and Extra Heavy HP/100 RPM	Max. Speed	Max. Slip
	lb.in. (Nm)					RPM	Sec.
14" Flat (109504-10) Solo	10,800 (1,220)	7 (17.8)	2" - 10	17	13	2100	3
14" Pot 3 (108050-59) EP	16,800 (1,898)	7 (17.8)	2" - 10	27	20	2100	3
15-1/2" Flat (109701-74) Solo	19,800 (2,237)	8.5 (21.6)	2" - 10	32	20	2100	3
15-1/2" Flat HC** (109925-15) Solo	24,600 (2,779)	10 (25.4)	2" - 10	39	20	2100	3
15-1/2" Flat SHC*** (109706-22Y) Solo	27,000 (3,051)	10 (25.4)	2" - 14	43	22	2100	3

\* On C & D duty applications, Clutch Torque must exceed Engine's Peak torque.

\*\* 15-1/2" Flat, high capacity clutch model – available upon request.

\*\*\* 15-1/2" Flat, super high capacity clutch model – available upon request and with a minimum quantity of 4.

## Power Take Off Chart

PTO Clutch	Flywheel Type	Type	SAE Bell Housing	Parts List Number	Drawing Number
14" Flat	Truck*	Inline	1	Available	Consult Factory
14" Flat	Truck*	Inline	2	6-714-299-210-0	6-714-202-915-9
14" Flat	Truck*	Side Load	1	6-714-299-211-0	6-714-202-916-9
14" Flat	Truck*	Side Load	2	6-714-299-209-0	6-714-202-914-9
14" Pot	Truck*	Inline	1	6-714-299-104-0	6-714-200-911-9
14" Pot	Truck*	Inline	2	6-714-299-105-0	6-714-200-910-9
15-1/2" Flat	Truck*	Inline	1	6-715-299-206-0	6-715-202-909-9
15-1/2" Flat	Truck*	Inline	2	6-715-299-207-0	6-715-202-910-9
15-1/2" Flat	Truck*	Side Load	1	6-715-299-208-0	6-715-202-912-9
15-1/2" Flat	14" Industrial	Side Load	1	6-715-299-221-0	6-715-202-918-9
15-1/2" Flat	18" Industrial	Side Load	0	See Note 2	Consult Factory

\* Alternately referred to as a "Vehicular" flywheel.

Conversion Kits	Flywheels	SAE Bell Housing
8-560-320-017-0	15-1/2" Truck to 14" Industrial	1 to 1
8-560-320-073-1	15-1/2" Truck to 18" Industrial	1 to 0

Note 1: See chart "A", on page 107.

Note 2: 15-1/2" Flat, Side Load PTO uses conversion kit 8-560-320-073-1.

Note 3: Old style flywheel, often not available on new engines.

See Engine manufacturer for flywheel availability.



## Selection Example:

To properly select a Power Take Off, (PTO), the following information is needed:

1. Power transmission type: Inline or Side Load.
  2. Application engine horsepower @ speed.
  3. Peak engine torque.
  4. SAE bell housing size.
  5. New engine installation or retrofit to an existing engine.
  6. Duty selection: See chart "A", page 107.  
Chart "A" gives application requirements ranging from "Light" to "Normal" duties, (A to B) and "Heavy" to "Extra Heavy" duties, (C to D).
  7. Inertia of machine/load
  8. Pitch diameters of drive and driven sheaves.\*\*\*\*
  9. Width of drive sheave on Power Take Off shaft.\*\*\*\*
- \*\*\*\* Not applicable to inline drives.

## Machine Requirement:

Machine Required:	Mud Pump – Triplex piston type
Installation:	New engine installation
Power Transmission Type:	Side load
HP & Speed:	300 HP @ 1,800 RPM
Engine Peak Torque:	1,120 lb.ft.
SAE Bell Housing Size:	SAE bell housing 1
PD* Driver Sheave on PTO:	12.5 in.
PD* Driven Sheave on Mud Pump:	15.0 in.
Width of Driver Sheave on PTO:	9-3/8 in. (8 grooves – 8V section Belt Sheave**)
WR <sup>2</sup> – Inertia of Machine:	108 lb.ft. <sup>2</sup>

\* PD is Pitch Diameter of sheave/pulley.

\*\* See manufacturer for sheave details.

## Calculations:

1. Application Torque =  $HP \times 63,000/RPM = lb.in.$   
 $300 \times 63,000/1800 = 10,500 lb.in.$
2. Engine Peak Torque =  $lb.ft. \times 12 = lb.in.$   
 $1,120 \times 12 = 13,440 lb.in.$
3. Mud Pump's Speed =  $\frac{Engine\ Speed \times PD\ of\ PTO's\ sheave}{PD\ of\ Mud\ Pump's\ sheave} = RPM$   
 $1,800 \times 12.5/15 = 1,500 RPM$
4. Reflect Pump's inertia up to PTO's shaft =  $Pump's\ Inertia \times \left(\frac{Pump's\ speed}{Pto's\ speed}\right)^2 = lb.ft.^2$   
 $108 \times \left(\frac{1,500}{1,800}\right)^2 = 90 lb.ft.^2 @ 1,800 RPM$
5. PTO's clutch slip time, (sec.) =  $\frac{WR^2 \times PTO's\ speed}{25.6 \times Application\ Torque}$   
 $= \frac{90 \times 1,800}{25.6 \times 10,500} = 6/10 sec.$
6. Estimate Side Load, (lbs) =  $\frac{HP \times 378,000}{Engines\ Speed \times PTO's\ sheave\ PD}$   
 $\frac{300 \times 378,000}{1,800 \times 12-1/2} = 5,040 lbs.$

## How to Select:

### Part 1. PTO Clutch Calculation Follows:

1. Select clutch duty from field of application = Reference chart "A", page 107 Petroleum production shows Mud Pump under duty "D"
2. Determine required HP/100 RPM duty capacity =  $Application\ torque/630 = HP/100\ RPM$   
 $10,500/630 = 16-2/3 HP/100\ RPM$
3. Select clutches based on duty = On clutch capacity chart, page 128, shows the following clutches have sufficient capacity.  
14" Pot, 15-1/2" Flat & 15-1/2" Flat HC  
a.) This is a new engine installation and note 3 states that there may be an availability problem with the 14" Pot style clutch.  
b.) There is not an advantage in capacity to warrant the use of the 15-1/2" Flat HC style clutch. Therefore, preliminary selection of clutch is the 15-1/2" Flat style clutch.
4. Peak torque verses clutch torque = On "C" and "D" duty applications, it is required that the clutch torque is greater than engine's peak torque.  
15-1/2" Flat clutch torque from clutch specifications chart on page 128 is 19,800 lb.in.  
Engine's peak torque is 13,440 lb.in.  
Clutch torque > Engine's peak torque  
19,800 lb.in. > 13,440 lb.in.
5. Speed = Clutch capacity chart shows that it has a speed limit of 2,100 RPM which is greater than the required speed of 1,800 RPM.
6. Clutch slip time, (sec.) = Clutch capacity chart, show maximum clutch slip time as 3 sec. which is greater than the calculated 6/10 seconds.

### Part 2. Side Load Calculation Follows:

- Center of sheave's side pull =  $Sheave\ width/2 = (9-3/8)/2 = 5-11/16 in.$
- Locate dimension from Bell housing to shaft's end = 16-3/8" Reference specific PTO drawing 15-1/2" Flat PTO side load, page 127.
- Determine "X" distance on PTO = (Bell hsg. to shaft's end dim.) - (Center of sheave's side pull)  
 $(20-15/16) - (5-11/16) = 15-1/4"$   
Round "X" distance to the nearest whole number = 15"
- Look up side load = Check side load at PTO's speed and "X" distance Page 127, allowable side load  
At "X" distance of 11 in. and 1,800 RPM, chart yields a side load capacity of 6,300 lbs.
- Comparison on side load = Side load capacity > Required side load  
6,300 lbs. > 5,040 lbs.

## Final Selection:

- 15-1/2" Flat power take off,  
Side load version with SAE "1" Bell Housing
- Power take off chart, page 128, lists the associated parts lists and drawings.
- Parts Lists Number = 6-715-299-208-0  
Drawing Number = 6-715-202-912-9

## Power Take-Off Clutches

### Air-Tube Disc design (Industrial)

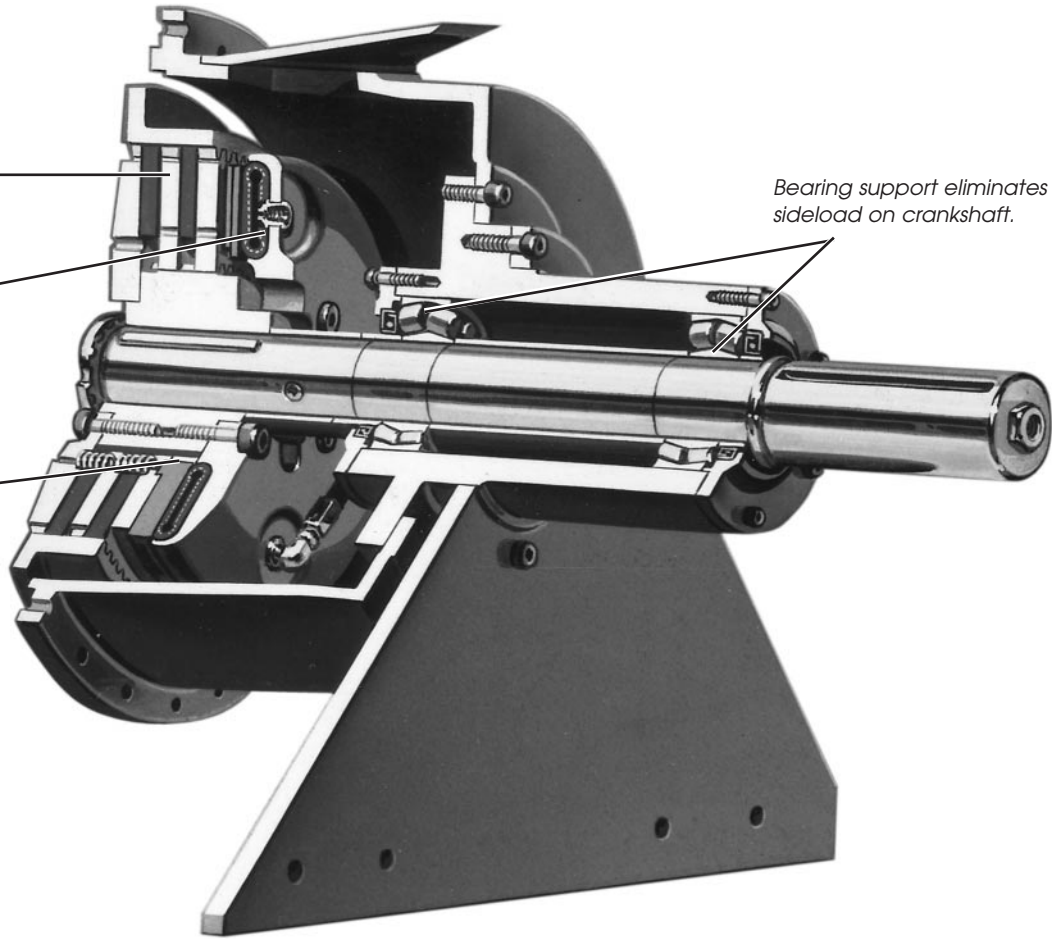
*Ideal for automatic controls.*

*Disc design provides smooth shock-free start-ups.*

*High-speed air tube not affected by centrifugal force.*

*No O-rings or diaphragms to wear out.*

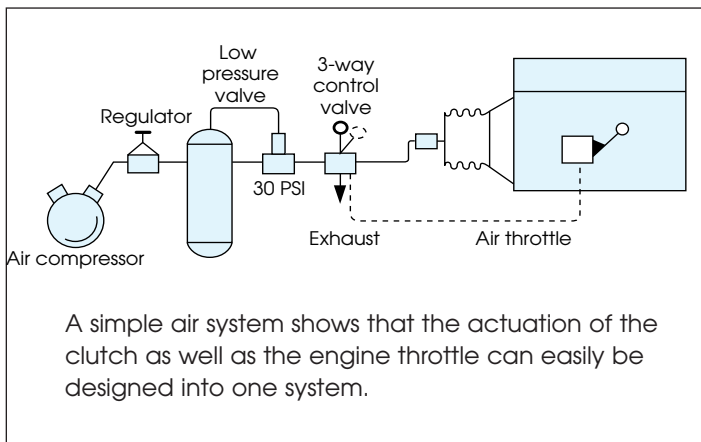
*Bearing support eliminates side load on crankshaft.*



## Design Features

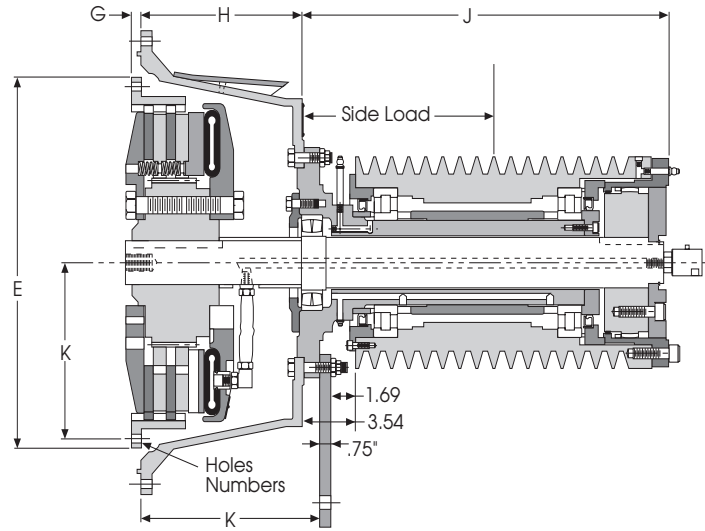
- Disc design provides smooth, shock free start-ups.
- Air activated-ideal for automatic or remote controls.
- Bearing support eliminates sideload on crankshaft.
- High speed air tube not affected by centrifugal force.
- No O-rings or diaphragms to wear out.
- Dynamically balanced for high speed operation.
- Models available for all popular diesel engines. Up to 700 HP capacity.

## Typical air control system

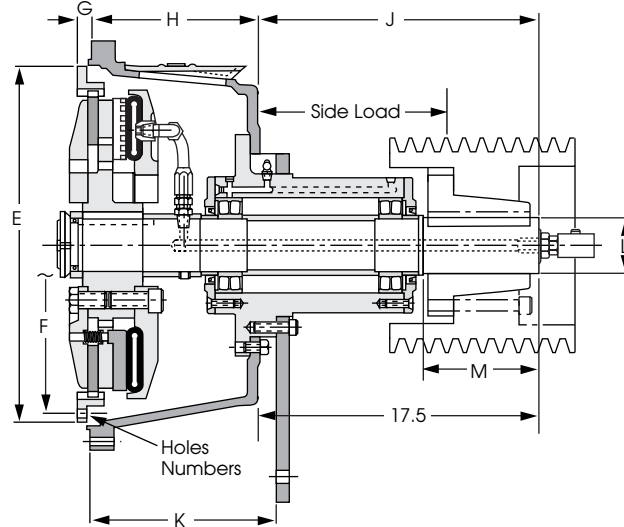


Air Tube Disc Side Load PTOs

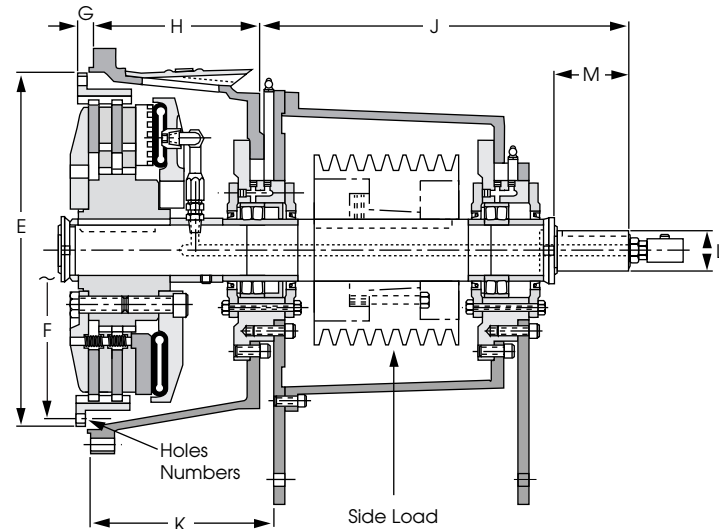
Type A



Type B



Type C



Dimensions and Specifications

Parts List No.	Clutch Size	SAE No.	Type	E +-.000 -.005	F	G	H	J	K	L +.000 -.002	M	Holes No.	Keyway	No. & Type of Grooves	P.D. of Sheave	
6-715-204-302-0	214H	1	B	18.375	17-1/4	1.000	10-13/16	17-17/32	11-25/32	3.625	7-1/4	17/32	8	7/8 X 7/16	—	—
6-715-204-303-0	214H	1/2	B	18.375	17-1/4	1.750	10-13/16	17-17/32	11-1/32	3.625	7-1/4	21/32	6	7/8 X 7/16	—	—
6-715-204-304-0	214H	0	B	18.375	17-1/4	1.000	10-13/16	17-17/32	11-25/32	3.625	7-1/4	21/32	6	7/8 X 7/16	—	—
6-715-204-306-0	214H	1	C	18.375	17-1/4	1.000	10-13/16	23-15/16	11-13/16	2.500	4-5/8	17/32	8	5/8 X 5/16	8-8V"	12.3
6-718-104-307-0	118	1/2	B	22.498	21-3/8	1.000	10-5/8	17-17/32	11-25/32	3.625	7-1/4	21/32	6	7/8 X 7/16	—	—
6-718-104-302-0	118	0	B	22.498	21-3/8	.625	10-13/16	17-17/32	11-25/32	3.625	7-1/4	21/32	6	7/8 X 7/16	—	—
6-718-104-306-0	118	0	A	22.498	21-3/8	.625	8-51/64	20-1/2	10-7/64	—	—	21/32	6	—	10-8V"	15.2
6-718-104-304-0	118	0	A	22.498	21-3/8	.625	8-51/64	20-1/2	10-7/64	—	—	21/32	6	—	10-D"	15.2
6-718-104-303-0	118	1/2	A	22.498	21-3/8	1.000	10-5/8	23-15/16	11-25/32	—	—	21/32	6	—	16-8V"	12.5
6-718-104-305-0	118	0	A	22.498	21-3/8	.625	10-13/16	23-15/16	11-25/32	—	—	21/32	6	—	16-8V"	12.5
6-718-104-301-0	118	1/2	A	22.498	21-3/8	1.000	10-5/8	23-15/16	11-25/32	—	—	21/32	6	—	20-5V"	12.5
6-718-204-307-0	218	1/2	B	22.498	21-3/8	1.000	10-5/8	17-17/32	11-25/32	3.625	7-1/4	21/32	6	7/8 X 7/16	—	—
6-718-204-308-0	218	0	B	22.498	21-3/8	.625	11-3/16	17-17/32	12-5/32	3.625	7-1/4	21/32	6	7/8 X 7/16	—	—
6-718-204-303-0	218	1/2	A	22.498	21-3/8	1.000	10-5/8	23-15/16	11-25/32	—	—	21/32	6	—	16-8V"	12.5
6-718-204-304-0	218	1/2	C	22.498	21-3/8	1.000	10-5/8	23-15/16	11-13/16	2.500	4-5/8	21/32	6	5/8 X 5/16	8-8V"	12.3
6-718-204-301-0	218	0	A	22.498	21-3/8	.625	10-13/16	23-15/16	11-25/32	—	—	21/32	6	—	16-8V"	12.5
6-718-204-306-0	218	0	C	22.498	21-3/8	.625	10-13/16	23-15/16	11-13/16	2.500	4-5/8	21/32	6	5/8 X 5/16	8-8V"	12.3
6-718-304-300-0	318	0	B	22.498	21-3/8	.625	12-3/8	17-17/32	13-19/32	3.625	7-1/4	21/32	6	7/8 X 7/16	—	—

Note: All measurements are in inches. For standard SAE engine flywheel dimensions see page 127.

Allowable Side Load (lbs.) at 1800 RPM

Type A	Distance X from base mount-in.	Load lb.	Distance X from base mount-in.	Load lb.
	0	-	14	8,900
	4	5,400	16	7,100
	6	6,300	18	6,000
	8	7,500	20	5,100
	10	9,200	22	4,400
	12	12,000	24	4,300

Type B	Distance X from base mount-in.	side load lb.	Distance X from base mount-in.	Load lb.
	-	-	12	4,400
	4	11,500	13	4,100
	5	9,600	14	3,800
	6	8,200	15	3,600
	7	7,200	16	3,400
	8	6,400	17	3,200
	9	5,800	18	3,000
	10	5,200	19	2,900
	11	4,800	20	2,800

Type C 6,500 lb. Max. side load.

Clutch Specification Table

Clutch Model	Recommended Maximum PTO HP/100 RPM	Clutch Slip Torque lb.in. at 100 PSI .3 CF.*	Recommended Maximum PTO HP/100 RPM With Heavy Duty Friction Disc
214H	18	71,600	23
118	21	64,500	27
218	42	129,000	54

\* Recommend only 25% of rated torque on PTO's (in.lbs.) - 30% with heavy duty disc.

Note: For mounting, use socket head cap screws conforming to the ASTM-574-97a. Support plate must be perpendicular to side load pull.

Estimated Side Load Calculation:

$$\text{Est. Side Load (lbs.)} = \frac{\text{HP} \times 378,000}{\text{Speed} \times \text{PD}}$$

Est. Side Load = Estimated perpendicular side pull to support plate in pounds, (lbs).

Hp = Engine's horsepower at normal operating speed.

Speed = Normal operating speed in rpm.

PD = Pitch diameter of sheave

