ALTRA INDUSTRIAL MOTION

Engine, Pump and Compressor Power Take-Off Clutches

Warner Electric

Engine, Pump and Compressor Clutches

Contents

Application Examples 1

Selection 2

Types of Shafts and Drives 4

Electrical Ratings 5

Clutch Mounting 5

Tapered Bore Clutches:

- Flange Mount, Single Row Bearing 6
- Flange or Yoke Direct Drive, Double Row Bearing 7
- Flange Mount, Double Row Bearing 8-13
- Special Construction, Flange Mount, Double Row Bearing 14

Straight Bore Clutches:

- Bearing Mount 15-17
- Special Construction 18-21
- Shaft Mount 22-23

Glossary 24

Technical Considerations 25

Part Number Index 26

Mobile Power Application Data Form 28

Principles of Operation

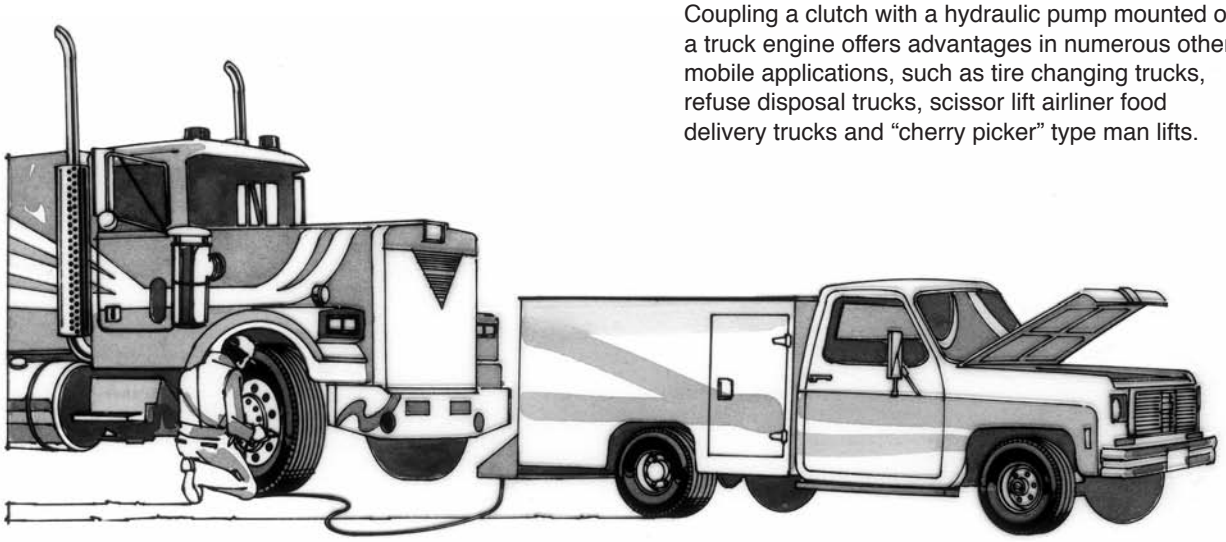
An electric clutch operates on the basic principle of magnetic attraction. Closing a switch sends electric current to an electromagnet or “field”, producing a strong magnetic attraction which concentrates around the magnetic poles of the field. The magnetic attraction jumps the small air gap between the field and the rotor, effectively making the rotor a spinning magnet. This “magnet” attracts the armature, grips it tightly and causes it to turn with the rotor. Opening the switch turns off the magnet, disengaging the clutch.

Magnetic Circuit

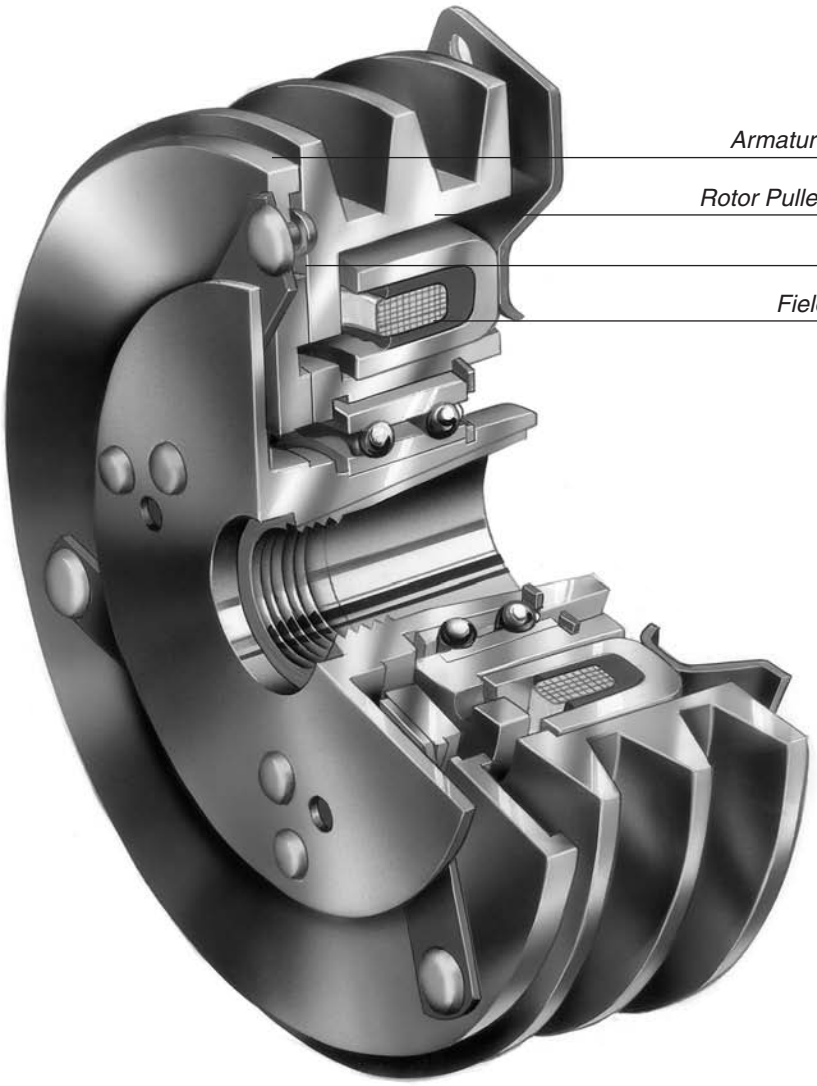
The heart of an electric clutch is its field assembly, with an electric coil to produce magnetism and iron magnet housing to direct that magnetism through the rotor to most effectively attract the armature. The illustration on the right shows how the rotor and armature surfaces of Warner Electric clutches are slotted and grooved. Magnetism, also called magnetic “flux”, concentrates at the poles of the field housing and jumps to the outer rims of the rotor. The flux passes through areas where contact is most intimate between the armature and rotor faces. Concentrating the magnetic attraction at these poles rather than over the entire face creates a strong attraction between the armature and rotor. The result is a great deal of torque in a small clutch.

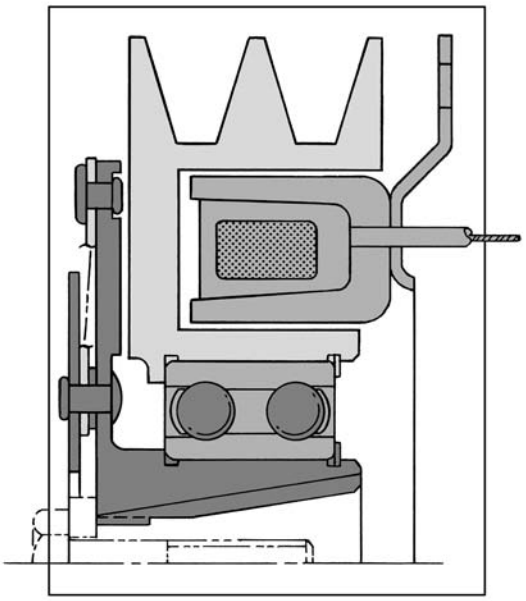
Application Examples

Coupling a clutch with a hydraulic pump mounted on a truck engine offers advantages in numerous other mobile applications, such as tire changing trucks, refuse disposal trucks, scissor lift airliner food delivery trucks and “cherry picker” type man lifts.

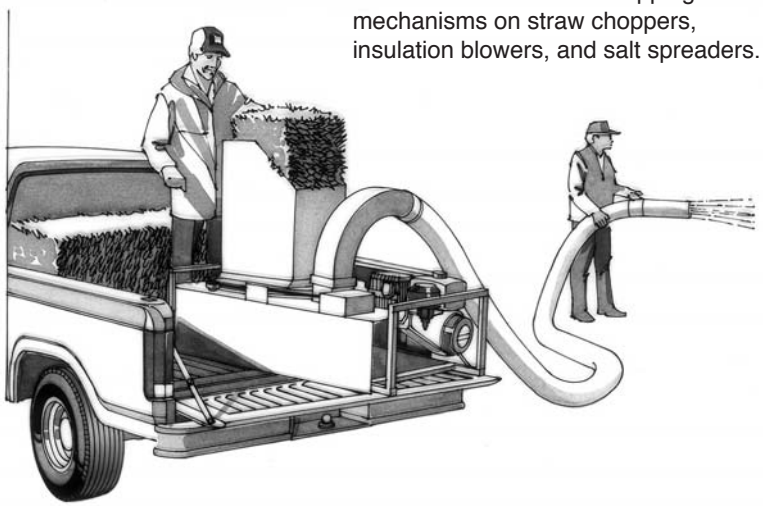


Engine, Pump and Compressor Clutches—Selection

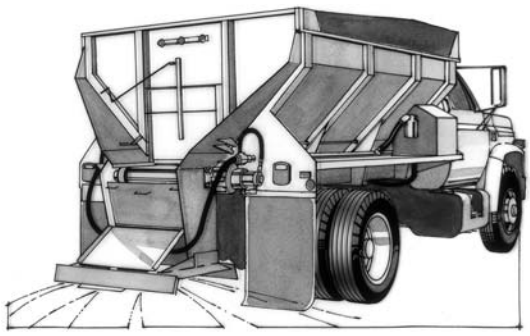




Electric clutches provide for remote control of the feed and chopping mechanisms on straw choppers, insulation blowers, and salt spreaders.



An engine mounted pump on this highway maintenance truck supplies hydraulic pressure for the sand spreader. Mounting an electric clutch on the pump will increase equipment life, improve machine efficiency, and allow the operator to engage and disengage the hydraulic system on demand.



Engine, Pump and Compressor Clutches—Selection

The right clutch for your application

Several specifications must be determined to select the right Warner Electric clutch for a particular application. Compile these from the selection factors discussed on the next four pages and compare them to the clutch specifications found on pages 6 through 23 to find the correct clutch for your application.

Clutch Dimensions

Overall or envelope dimensions of a clutch being considered for an application must be noted to ensure that the clutch will fit into the space allotted.

Choosing the correct size clutch

Torque and horsepower calculations are important in choosing the right clutch for your application.

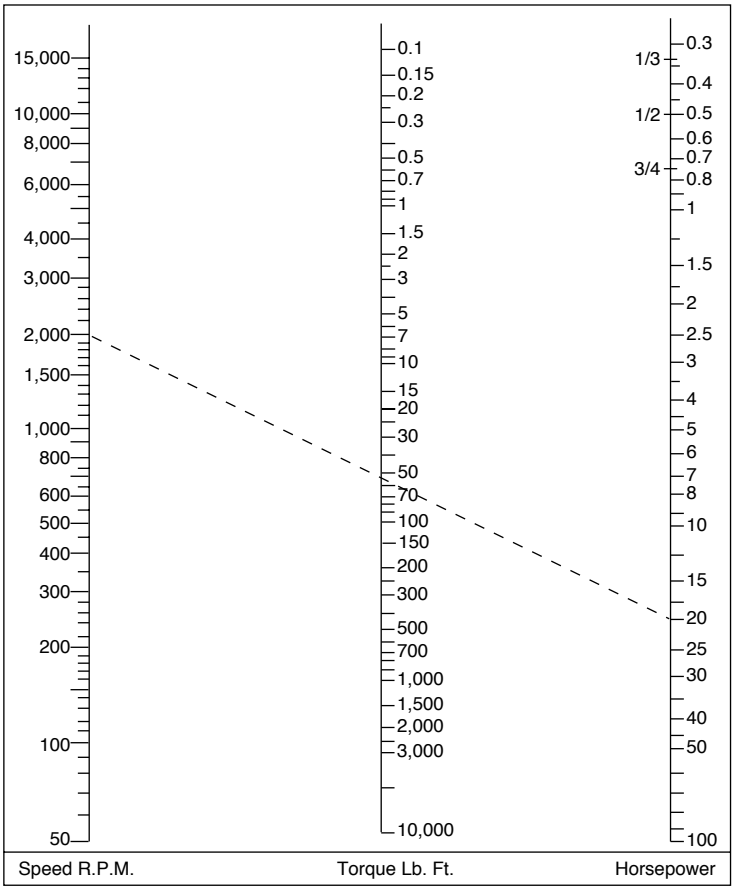
Two important factors needed to determine the static torque required for an application are the driven machine's horsepower and clutch operating speed. Locate horsepower and clutch RPM on their respective columns in the accompanying chart. Draw a straight line between the two points. The torque is the numerical value read from where this line intersects the TORQUE column. This number must be multiplied by a known service factor "K" from the data below to obtain the correct torque requirement for the clutch.

Service Factor "K"

The power pulses of a gasoline or diesel engine result in momentary torque output which is several times higher than the engine's rated torque. Many electric motors can also deliver up to three times their rated output for a short period. A clutch coupled to these power systems must be able to transmit the required torque for these short periods without slipping. Using the chart at right, estimate the "K" service factor which is appropriate for your application.

Torque Determination Chart

Horsepower / Nomograph



Type of Application	"K" Range
Conveyor and augers where a static load must be started by the dynamic torque of the clutch.	K = 3 to 5
Hydraulic pumps where the clutch may have to work against pressure at time of engagement	K = 2.5 to 5
Gasoline or diesel engines where the clutch should be able to stall the engine.	K = 2 to 5
Air compressors	K = 2 to 4
Electric motors where the clutch should be able to stall the motor. Use the overload factor from the motor catalog or use	K = 2 to 3
Light machines where the load is applied after the clutch is engaged. (e.g. a lathe)	K = 1.5 to 2.5

Example

A 10 horsepower pump driven by an electric motor operates at 1500 RPM. Using 3 as the value of the "K" factor, determine the required clutch torque capacity.

10 HP at 1500 RPM = 35 lb.ft. torque
"K" factor 3 x 40 lb.ft. = 105 lb.ft. torque.

This application will require a clutch with a static torque rating of 105 lb.ft.

Static torque can also be calculated by using the following formula:

$$T = \frac{5250 \times HP \times K}{RPM}$$

Example

A truck mounted hydraulic pump requires 8 horsepower to operate at 2000 RPM. What is the required clutch torque rating?

Using a service factor of 5:

$$T = \frac{5250 \times 8 \times 5}{2000}$$

T = 105 lb.ft.

A clutch with a static torque capacity of 105 lb.ft. is required for this application.

Fluid Power Formulae

$$T = \frac{HP \times 5250 \times K}{RPM}$$

$$T = \frac{CIR \times PSI}{75.4}$$

Where:

T= Torque (lb.ft.)
HP = Horsepower
RPM = Speed of Clutch (revolutions per minute)
CIR = Cubic inch per revolution (hydraulic pump)
PSI = Pounds per square inch
"K" = Service factor (see chart on page 2)

If HP is unknown:

$$HP = \frac{GPM \times PSI \times .000583}{\text{Pump efficiency}}$$

Where:

GPM = Fluid flow in gallons per minute
PSI = Pressure in pounds per square inch
Pump efficiency = normally 85%

Rule of Thumb:

1 HP per gallon @ 1500psi
.7 HP per gallon @ 1000psi

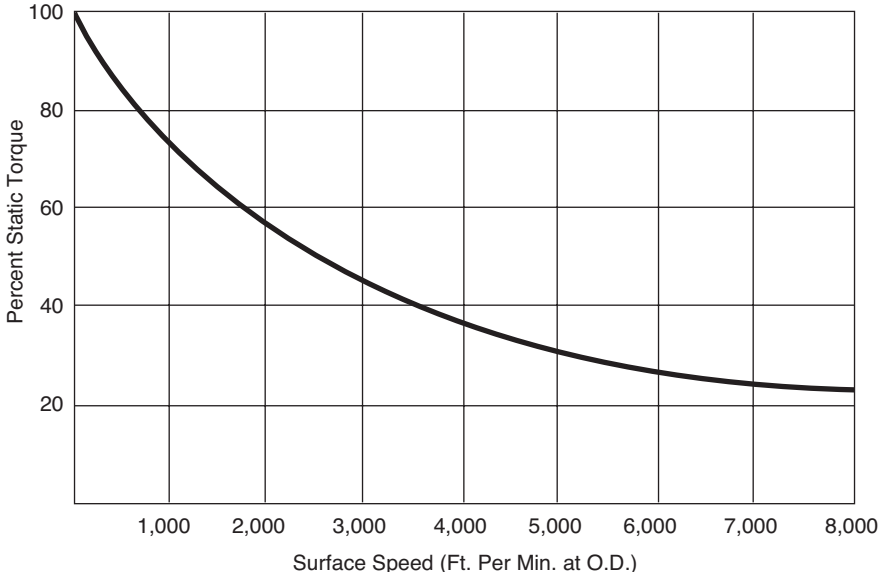
If PSI is unknown:

1 cubic inch per revolution equals 16 lb.in. of torque per 100 psi.
1 gallon equals 231 cubic inches.

TYPICAL DYNAMIC TORQUE

Dynamic Torque as Percent of Static Torque

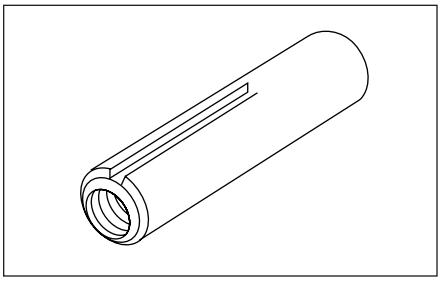
$$FPM = RPM \times \frac{3.14}{12} \times \text{Diameter (of clutch)}$$



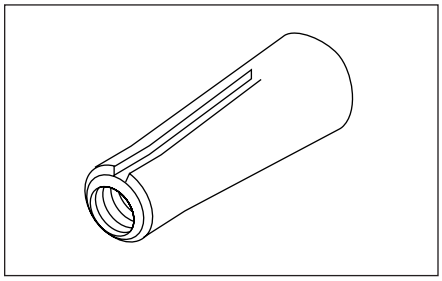
Engine, Pump and Compressor Clutches—Selection

Shafts

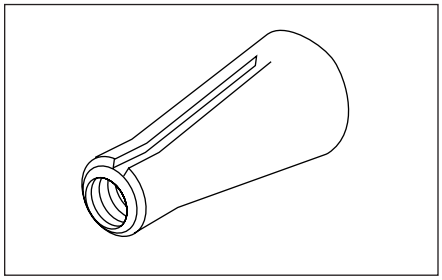
Warner Electric standard clutches are available to adapt to three different shaft configurations:



Straight bore - for through shaft or end of shaft mounting.



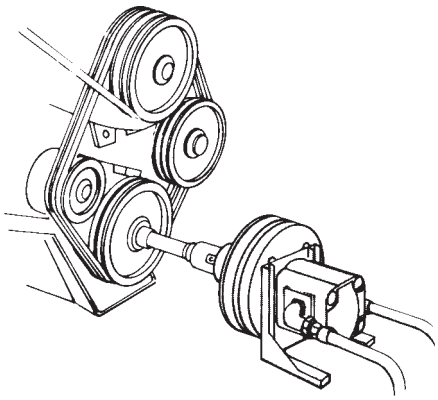
Tapered bore (8:1) - shaft tapers $1^{1}/_{2}$ inches per foot, for end of shaft mounting.



Tapered bore (4:1) - shaft tapers three inches per foot, for end of shaft mounting.

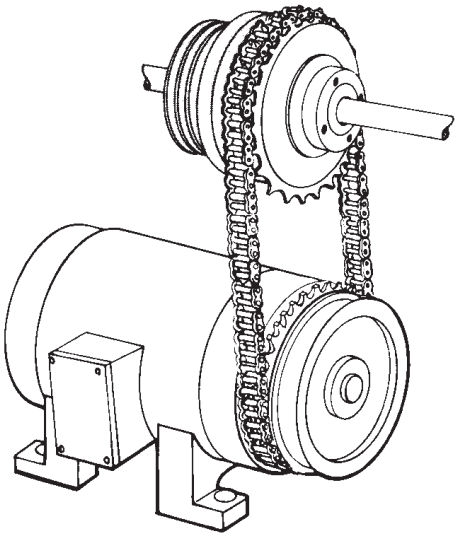
Types of Drives

Warner Electric offers clutches which are compatible with the three basic types of drives.



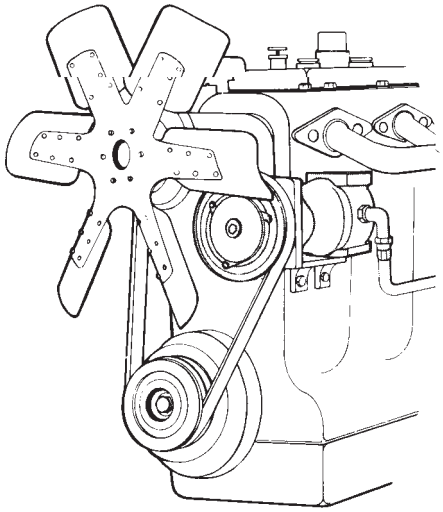
Direct Drive

In direct drive arrangements, a drive shaft with a universal joint or other flexible coupling is attached to the engine crankshaft or transmission PTO on one end and the pump or compressor on the other. The clutch usually mounts on the pump or compressor. The "yoke drive" clutches in this section are equipped with flanges designed to bolt directly to a universal joint assembly. **Drive shaft alignment must be within 3°**.



Parallel Shaft

In parallel shaft applications, torque is transmitted from a drive or line shaft to the pump, compressor or other accessory which is mounted parallel to it. The straight bore clutches with bearing mounted fields are often used in this drive arrangement. Belt or chain drives are most frequently used in parallel shaft applications.



Belt Drive

The most common method of driving mobile accessories is through automotive or industrial belts. The driven accessory is parallel to and driven by a pulley mounted on the engine crankshaft. The relative diameters of the drive and driven pulleys, speed range of the engine, and required pump or compressor performance are all factors to be considered when selecting a belt driven clutch. Warner Electric clutches have AB grooved pulleys, which permit the use of either an A or B V-belt.

Electrical

Electrical Ratings

All current and resistance ratings are taken at ambient temperatures of 70°F (20°C).

Voltage Requirements

Warner Electric clutches are normally furnished with 12 VDC coils. Clutches can be designed to accommodate other voltages.

Current Draw

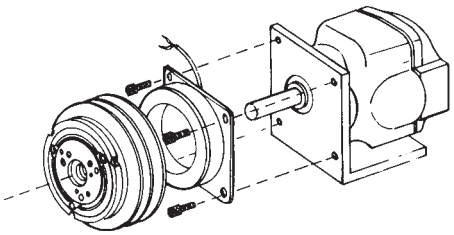
Current draw for each clutch model is listed in the product specifications section of this section.

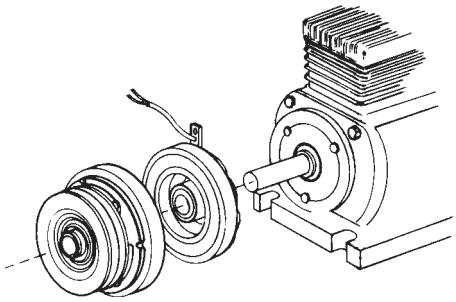
Resistance/Heat Dissipation

Electrical resistance increases with coil temperature. Since the increase in electrical resistance reduces coil current, the torque transmitted by the clutch will be reduced. In applications where heat dissipation from the clutch is not adequate, air from an external source should be forced over the clutch to ensure proper operation. Most Warner Electric clutches shown in this section have been designed to operate in typical under hood temperatures.

Clutch Mounting

Warner Electric clutches are offered with flange or bearing mounts. Select the type best suited for your application based on the information below.





Flange Mounted Clutches

In a flange mount clutch application, the field is bolted directly to a fixed member on either the output (engine crankcase or electric motor) or the driven accessory (input). Mounting brackets and fixtures for a specific application must be designed in accordance with the clutch dimensions found in the specifications section to ensure proper perpendicularity and concentricity.

Bearing Mounted Clutches

Bearing mounted clutches are pre-assembled into a complete operating unit which is mounted directly to the shaft. In this design, the field is mounted on its own bearing as an internal part of the clutch and has an antirotation tang to prevent it from turning in operation. This antirotation tang is to be pinned LOOSELY to a member or held with a torque arm.

Clutch Location

Wherever possible, the clutch should be located on the higher speed shaft.

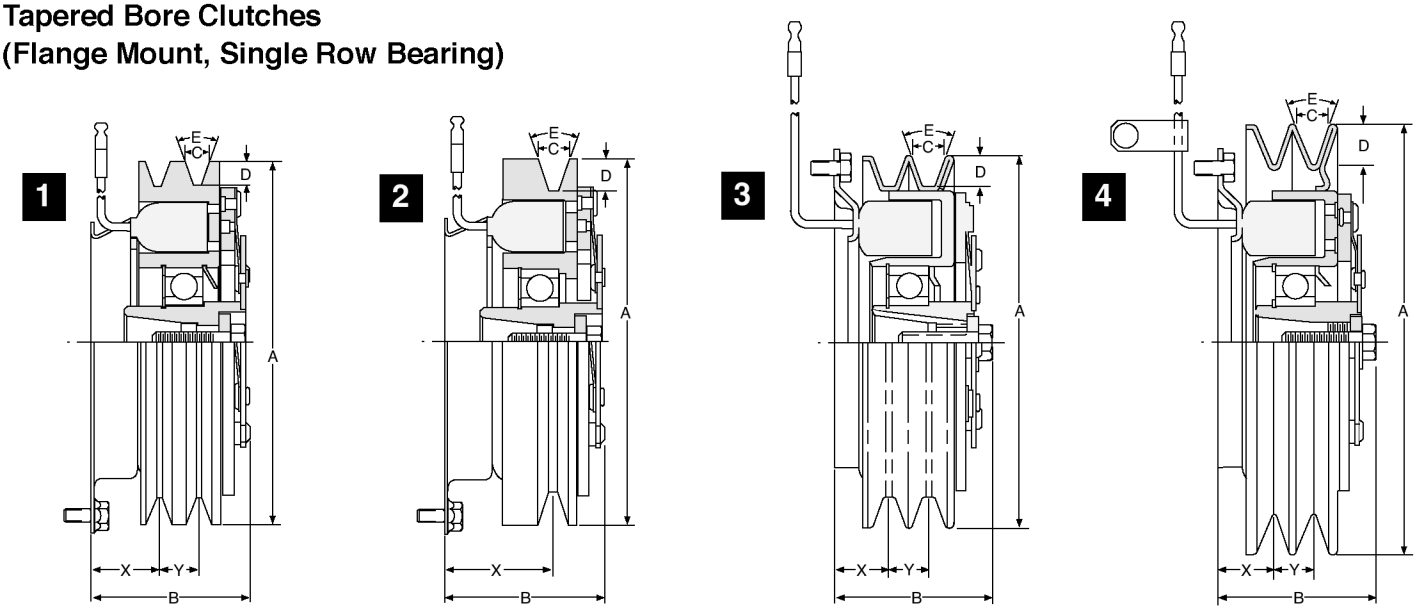
Clutch Rotation

Direction of drive can be a significant design consideration in applications with a peak load during clutch engagement. Warner Electric clutches incorporate leaf springs in the armature to transmit the load. When peak loads at start-up are possible, springs should be oriented so that they are placed in tension (stretch).

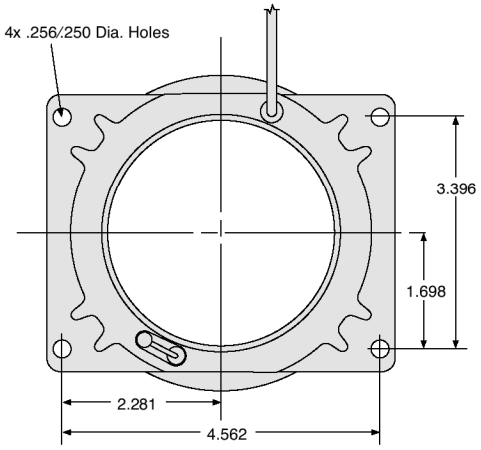
Clutch rotation can be determined by observing the leaf spring direction on the armature.

Engine, Pump and Compressor Clutches—Dimensions

Tapered Bore Clutches
(Flange Mount, Single Row Bearing)



Field
(Common)



Notes:

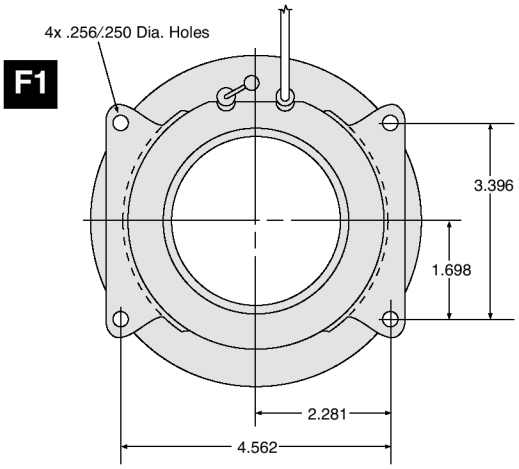
All dimensions are inches.
All units 12V unless otherwise indicated

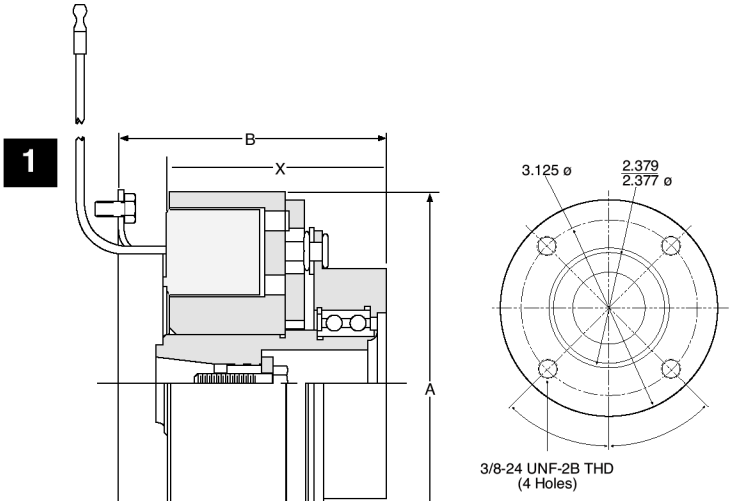
A	Clutch Type	B	X	Y	Groove Size C	Groove Size D	Groove Size E	Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
5.75	1	2.66	1.10	.59	.38	.36	36°	.841	4.55	2.64	75	CW	1436-97
5.90	1	2.66	1.17	.64	.38	.36	36°	.841	4.55	2.64	75	CW	1436-18
6.00	2	2.29	1.50	—	.50	.55	36°	.841	4.55	2.64	75	CW	1436-78
6.00	2	2.66	1.81	—	.50	.55	36°	.841	4.55	2.64	75	CW	1436-90
6.00	3	2.44	.89	.62	.50	.42	36°	.841	4.651	2.58	75	CW	1411-18
6.00	3	2.44	.89	.62	.50	.42	36°	.841	2.59	9.28	75	CW	1411-35[2]
6.25	2	2.66	2.13	—	.50	.50	36°	.841	4.55	2.64	75	CW	1406-70
6.70	2	2.82	2.38	—	.50	.50	36°	.841	4.55	2.64	75	CW	1436-19
7.00	4	2.50	.89	.62	.50	.55	36°	.841	4.651	2.58	75	CW	1411-72

[1]Cold current draw [2]24V

Tapered Bore Clutches (Flange or Yoke Direct Drive, Double Row Bearing)

Fields





Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

Drive shaft alignment must be within 3° maximum.
(Clutch centerline must be within 3° of power source centerline).

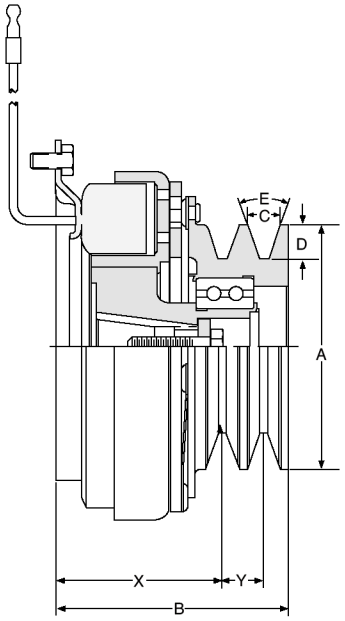
A	Clutch Type	Field Type	B	X	Y	Groove Size C	Groove Size D	Groove Size E	Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
6.14	1	F1	4.42	3.72	—	—	—	—	.841	4.58	2.62	200	CCW	1415-1

[1]Cold current draw

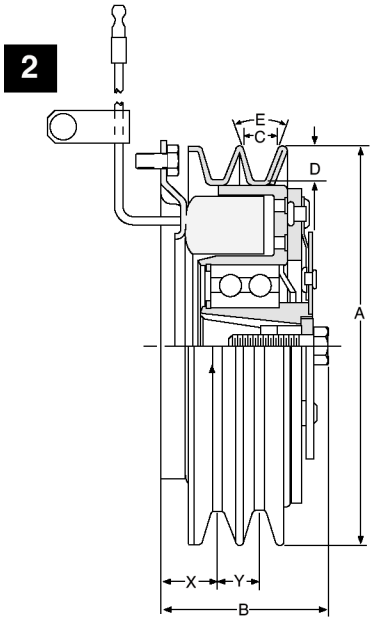
Engine, Pump and Compressor Clutches—Dimensions

Tapered Bore Clutches
(Flange Mount, Double Row Bearing)

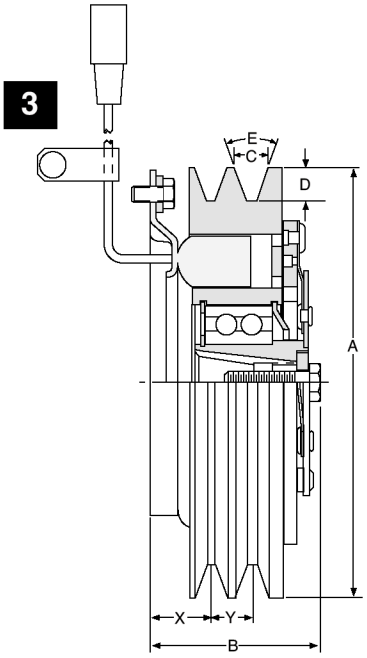
1



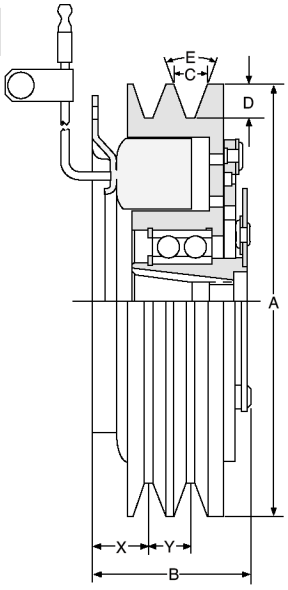
2



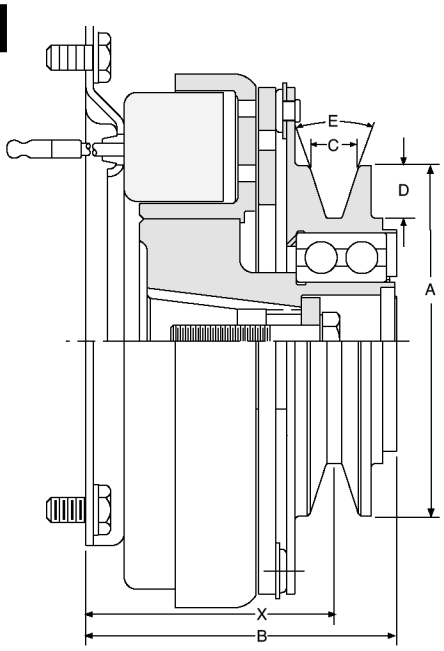
3



4

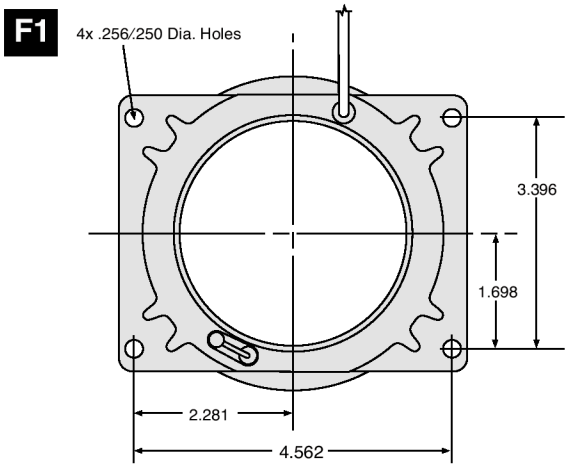


7



Tapered Bore Clutches
(Flange Mount, Double Row Bearing)

Fields



Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

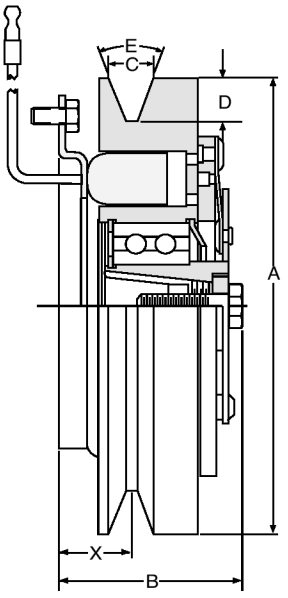
A	Clutch Type	Field Type	B	X	Y	Groove Size C	Groove Size D	Groove Size E	Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
3.52	7	F1	3.122	2.5	—	—	.52	38°	.841	4.99	2.41	75	CW	1411-96
3.75	1	F1	3.62	2.55	.62	.50	.53	36°	.841	4.99	2.406	75	CW	1411-69
6.00	2	F1	2.50	.91	.62	.50	.42	36°	.841	4.651	2.58	75	CW	1411-39
6.00	2	F1	2.50	.91	.62	.50	.42	36°	.841	2.59	9.28	75	CW	1411-50[2]
6.00	2	F1	2.51	.91	.62	.50	.42	36°	.841	4.36	2.752	90	CW	1411-67
6.00	2	F1	2.51	.91	.62	.50	.42	36°	.841	4.36	2.752	90	CW	1411-55[3]
6.00	2	F1	2.46	.91	.62	.50	.42	36°	.841	4.651	2.58	75	CW	1411-68[3]
6.00	2	F1	2.54	.91	.62	.50	.42	36°	.841	4.651	2.58	75	CW	1411-54[3]
6.00	3	F1	2.66	1.32	.62	.50	.55	36°	.841	4.55	2.64	75	CW	1466-21
6.70	4	F1	2.57	.88	.62	.50	.55	36°	.841	4.952	2.423	120	CW	1466-53
7.00	2	F1	2.50	.91	.62	.50	.56	36°	.841	4.651	2.58	75	CW	1411-41
7.00	2	F1	2.50	.91	.62	.50	.56	36°	.841	4.36	2.752	90	CW	1411-42
7.00	2	F1	2.51	.91	.62	.50	.55	36°	.841	4.36	2.752	90	CW	1411-56[3]
7.00	2	F1	2.50	.91	.62	.50	.56	36°	.841	2.59	9.28	75	CW	1411-86[2]

[1]Cold current draw [2]24V [3]Special terminal

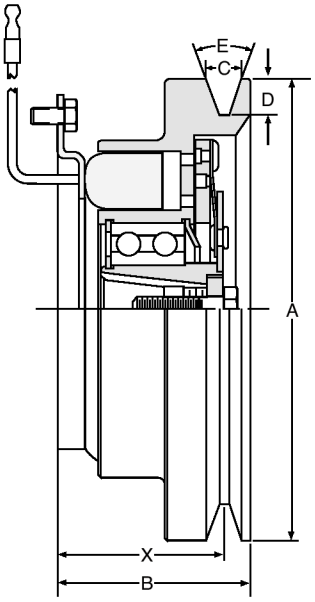
Engine, Pump and Compressor Clutches—Dimensions

Tapered Bore Clutches
(Flange Mount, Double Row Bearing)

2



4



Same Field as page 11

Notes:

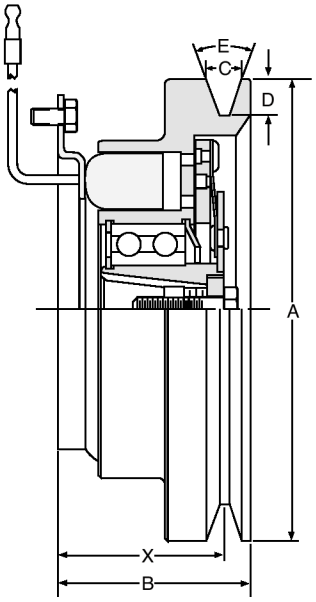
All dimensions are inches.
All units 12V unless otherwise indicated

A	Clutch Type	B	X	Y	Groove Size C	Groove Size D	Groove Size E	Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
6.00	2	2.48	.93	—	.60	.52	38°	.841	4.55	2.64	75	CW	1466-69
6.00	2	2.48	1.50	—	.60	.52	38°	.841	4.55	2.64	75	CW	1466-70
6.00	2	2.66	1.41	—	.50	.55	36°	.841	4.55	2.64	75	CW	1466-20
6.00	2	2.66	1.24	—	.66	.59	38°	.841	4.55	2.64	75	CW	1466-26
6.10	2	2.78	1.35	—	.66	.55	38°	.841	2.54	9.43	75	CW	1466-64[2]
6.70	4	2.79	2.38	—	.50	.50	36°	.841	4.55	2.64	75	CW	1406-19
6.70	4	2.79	2.38	—	.50	.50	36°	.841	2.545	9.43	75	CW	1436-41[2]
6.70	4	2.79	2.05	—	.50	.50	36°	.841	2.545	9.43	75	CW	1436-48[2]
6.70	4	2.79	2.05	—	.60	.56	38°	.841	4.55	2.64	75	CW	1406-43

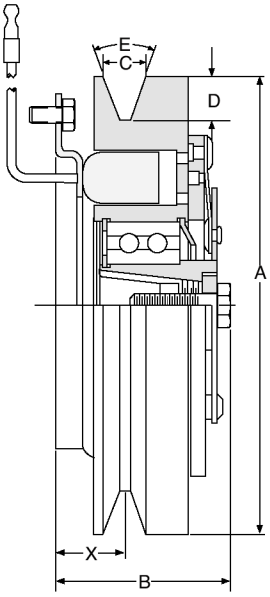
[1]Cold current draw [2]24V

Tapered Bore Clutches
(Flange Mount, Double Row Bearing)

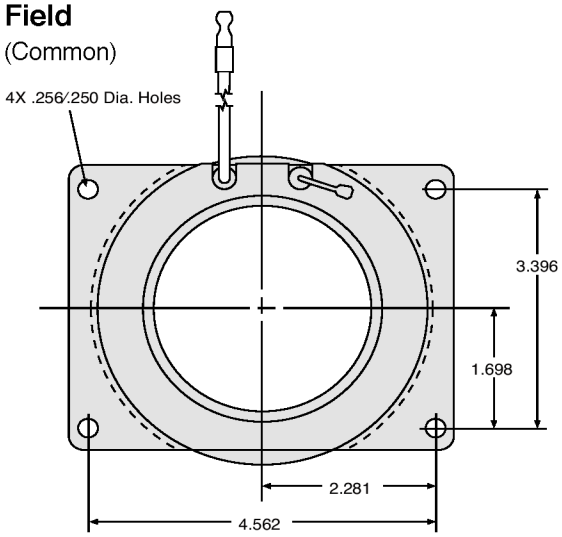
1



2



Field
(Common)



Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

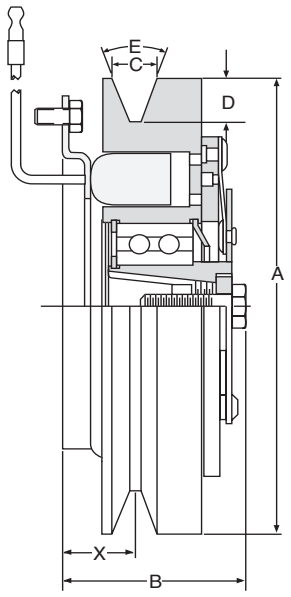
A	Clutch Type	B	X	Y	Groove Size C	Groove Size D	Groove Size E	Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
6.70	1	2.84	2.38	—	.60	.56	38°	.841	4.55	2.64	75	CW	1406-44
6.70	1	2.53	1.95	—	.60	.56	38°	.841	4.55	2.64	75	CW	1406-49
6.70	1	2.53	1.95	—	.60	.56	38°	.841	2.545	9.43	75	CW	1436-55[2]
6.70	1	2.84	2.37	—	.66	.56	38°	.841	4.55	2.64	75	CW	1406-47
6.70	2	2.48	1.02	—	.60	.56	38°	.841	4.55	2.64	75	CW	1406-34
6.70	2	2.48	1.02	—	.60	.56	38°	.841	2.545	9.43	75	CW	1436-49[2]
6.70	2	2.48	1.18	—	.60	.56	38°	.841	4.55	2.64	75	CW	1406-42
6.70	2	2.48	1.18	—	.60	.56	38°	.841	2.545	9.43	75	CW	1436-51[2]

[1]Cold current draw [2]24V

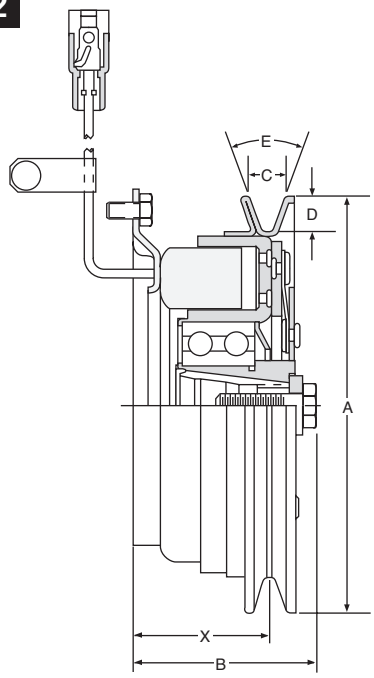
Engine, Pump and Compressor Clutches—Dimensions

Tapered Bore Clutches
(Flange Mount, Double Row Bearing)

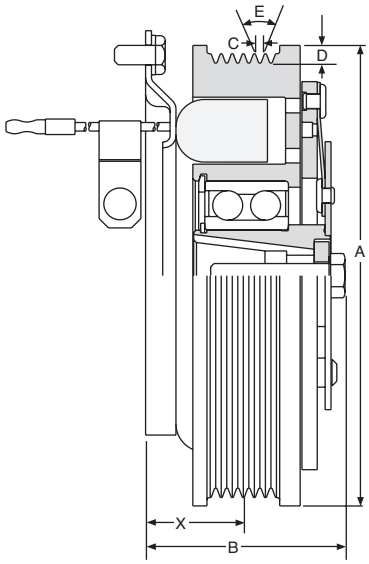
1



2



4



Same Field as page 11

Notes:

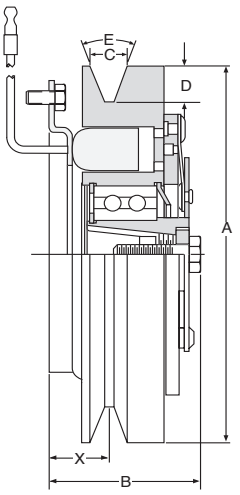
All dimensions are inches.
All units 12V unless otherwise indicated

A	Clutch Type	B	Number of Grooves	Groove Size X	Y	C	D	E	Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
5.79	4	2.53	6	1.24	.14	.14	.14	40°	.841	2.5	9.61	75	CW	1466-105[2]
6.70	1	2.48	1	1.02	—	.50	.50	36˚	.841	4.55	2.64	75	CW	1406-39
6.70	1	2.48	1	1.02	—	.50	.50	36˚	.841	2.50	9.61	75	CW	1466-68[2,3]
6.70	1	2.48	1	.87	—	.50	.50	36˚	.841	2.545	9.43	75	CW	1466-84[2]
6.70	2	2.97	1	2.29	—	.78	.68	38˚	.841	4.651	2.58	75	CW	1411-49
6.70	2	2.73	1	2.05	—	.79	.69	38˚	.841	4.651	2.58	75	CW	1411-61
6.70	2	2.52	1	1.95	—	.50	.50	36˚	.841	4.651	2.58	75	CW	1411-70

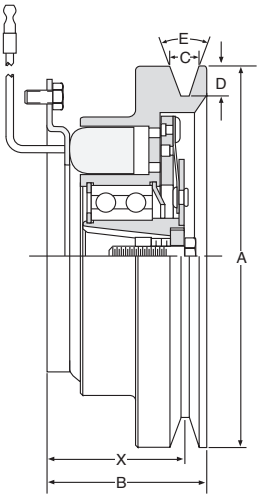
[1]Cold current draw [2]24V [3]Special terminal

Tapered Bore Clutches
(Flange Mount, Double Row Bearing)

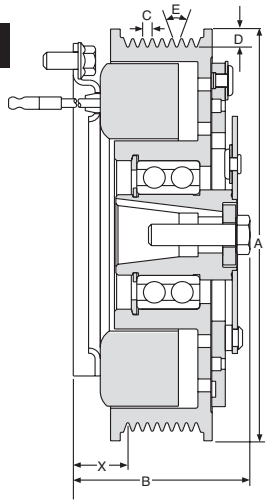
1



2

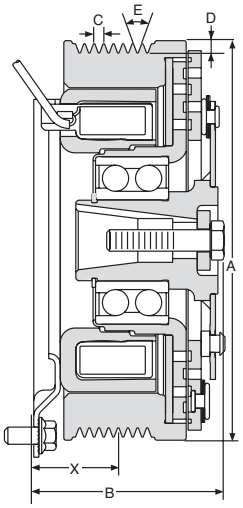


3

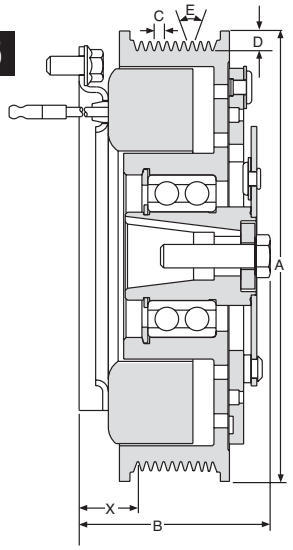


Same Field as page 11

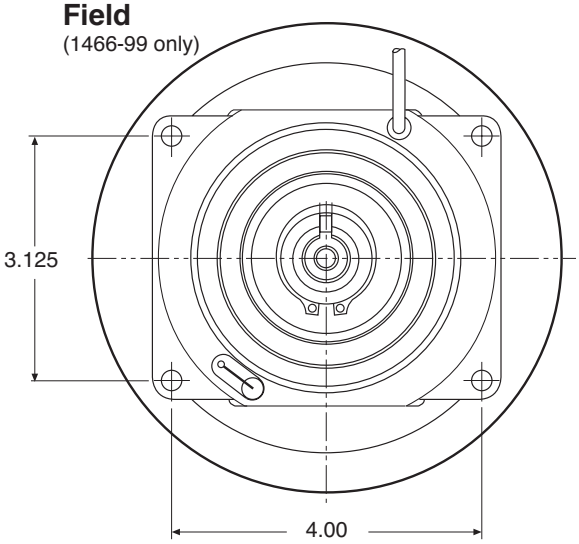
4



5



Field
(1466-99 only)



Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

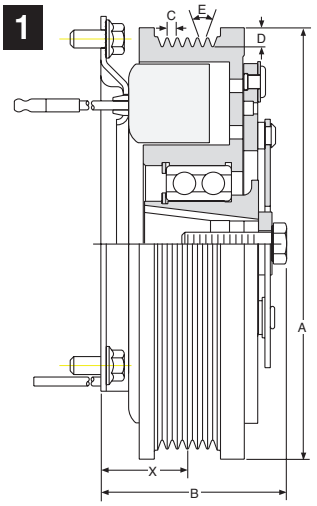
A	Clutch Type	B	Number of Grooves	Groove Size X	Y	C	D	E	Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
5.82	4	2.76	8	1.16	.14	.14	.14	40°	.841	4.89	2.45	180	CW	1417-44
6.00	3	2.71	8	.89	.14	.14	.14	40°	.841	4.35	2.42	100	CW	1417-42
6.00	3	2.71	8	.89	.14	.14	.13	40°	.841	2.47	9.73	100	CW	1466-99[2]
6.00	3	2.71	8	.89	.14	.14	.13	40°	.841	4.35	2.42	100	CW	1473-69
6.00	5	2.71	10	.85	.14	.14	.14	40°	.841	4.35	2.42	100	CW	1417-49
6.92	1	2.48	1	1.02	—	.80	.69	38°	.841	4.55	2.64	75	CW	1406-41
7.00	1	2.48	1	1.19	—	.79	.69	38°	.841	4.55	2.64	75	CW	1406-97
7.25	2	2.82	1	2.29	—	.79	.88	38°	.841	4.55	2.64	75	CW	1466-92[4]

[1]Cold current draw [2]24V [4]A/B groove

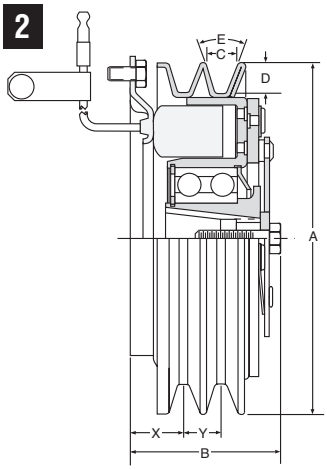
Engine, Pump and Compressor Clutches—Dimensions

Tapered Bore Clutches
(Special Construction, Flange Mount, Double Row Bearing)

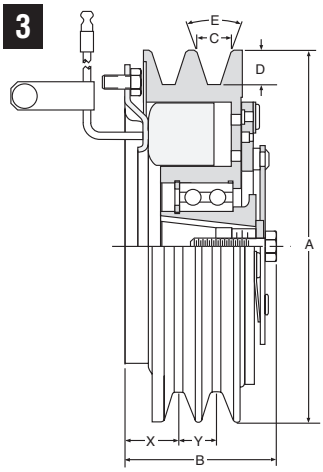
1



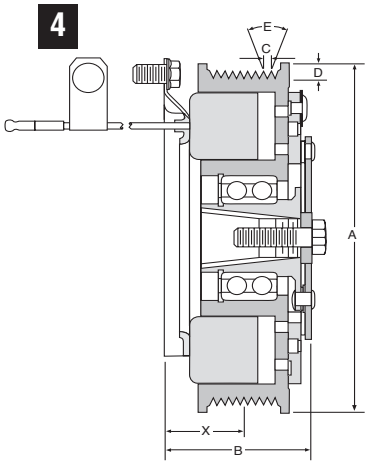
2



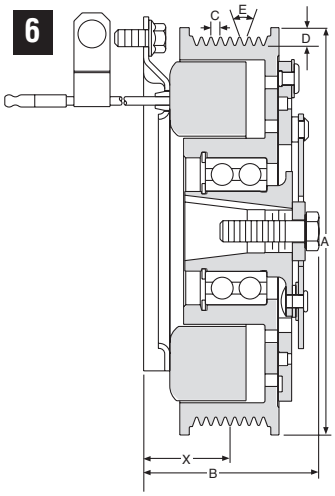
3



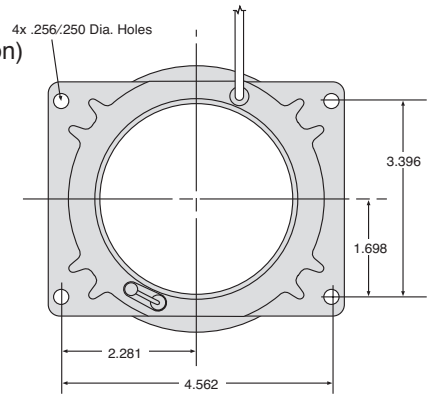
4



6



Field
(Common)



Notes:

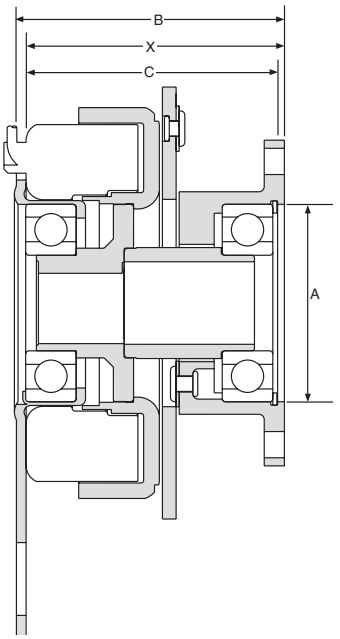
Clutches on this page are specially constructed to withstand more severe operating environments. All dimensions are inches. All units 12V unless otherwise indi-

A	Clutch Type	B	Number of Grooves	Groove Size X	Y	C	D	E	Gage Line	Current[1] Draw Amps	Resistance Ohms[1]	Static Torque lb ft	Rotation	Model No.
5.75	1	2.57	6	1.20	—	.14	.14	40°	.841	4.952	2.423	120	CW	1417-11
5.80	6	2.61	6	1.20	.14	.14	.14	40°	.841	2.47	9.73	100	CW	1417-41[4]
6.00	2	2.52	2	.91	.62	.50	.42	36°	.75	4.36	2.752	90	CW	1417-2[2]
6.00	2	2.57	2	.91	.62	.50	.42	36°	.841	4.36	2.752	90	CW	1417-8
6.00	4	2.60	7	.85	.14	.14	.14	40°	.84	4.95	2.42	120	CW	1417-18
6.22	3	2.46	2	.85	.73	.61	.64	34°	.841	4.36	2.752	90	CW	1417-9
6.70	3	2.57	2	.88	.62	.50	.55	36°	.841	4.952	2.423	120	CW	1417-4
6.89	3	2.57	2	.78	.75	.61	.63	34°	.841	4.952	2.423	120	CW	1417-12[3]
7.00	2	2.52	2	.91	.62	.50	.55	36°	.75	4.36	2.752	90	CW	1417-1[2]
7.00	2	2.57	2	.91	.62	.50	.56	36°	.841	4.36	2.752	90	CW	1417-7

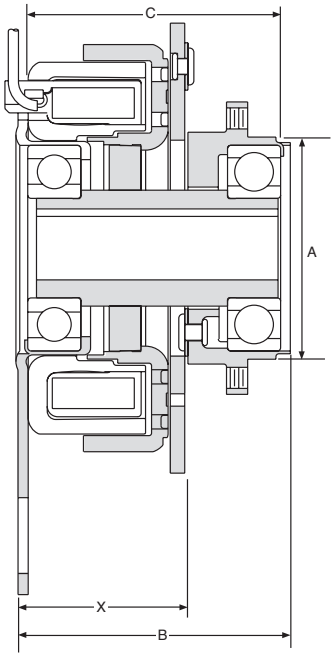
[1]Cold current draw [2]8:1 Taper [3]A/B grooves [4]24V

Straight Bore Clutches (Bearing Mount)

1

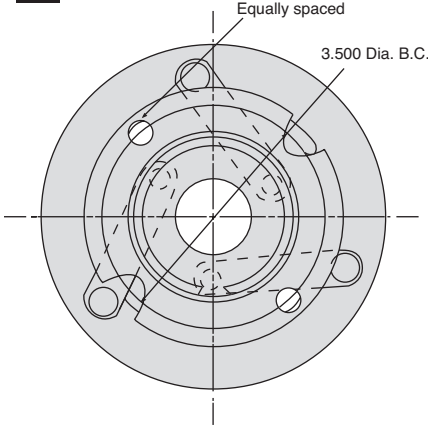


2

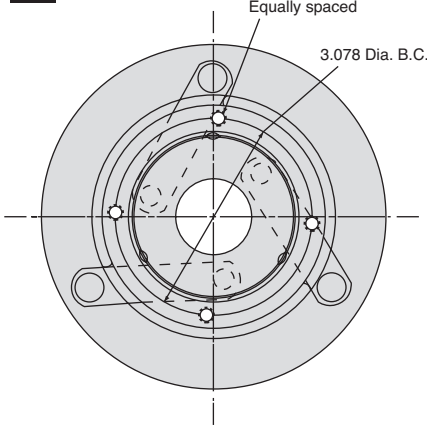


Armatures

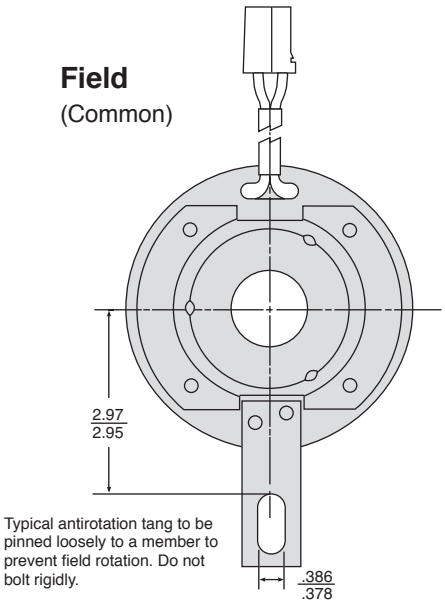
A1



A2



Field
(Common)



Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

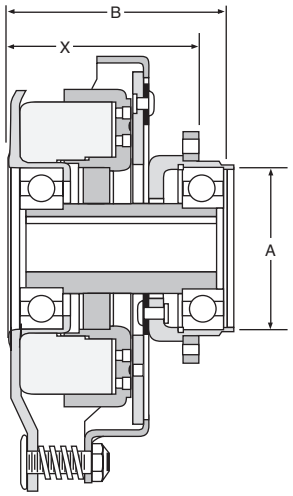
Bore Size	Clutch Type	Armature Type	A	B	X	C	Static Torque lb ft	Current[1] Draw Amps	Resistance Ohms[1]	Rotation	Keyway	Model No.
3/4"	2	A2	2.64	3.31	2.60	2.635	80	.56	161	CCW	.189	5215-105[2]
1"	1	A1	2.44	3.375	3.21	3.045	70	4.89	2.45	CCW	.25	5215-60

[1]Cold current draw [2]90 Volts

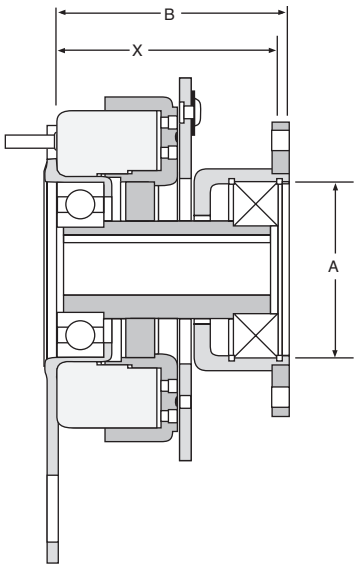
Engine, Pump and Compressor Clutches—Dimensions

Straight Bore Clutches (Bearing Mount)

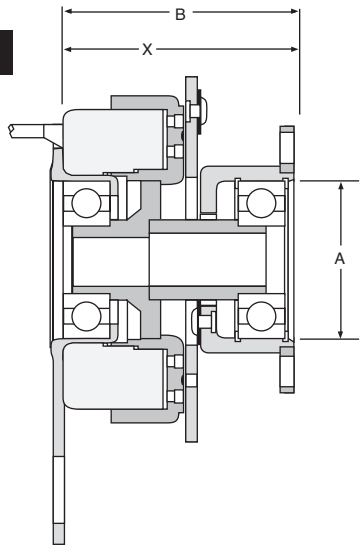
1



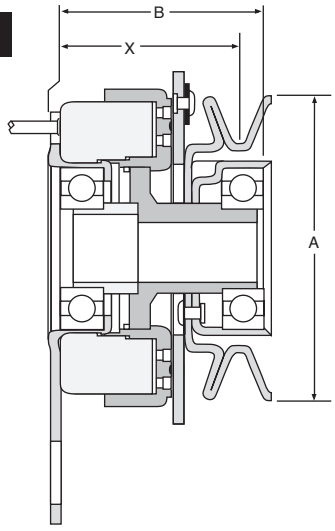
2



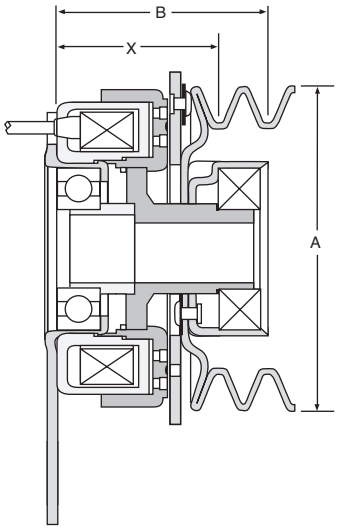
3



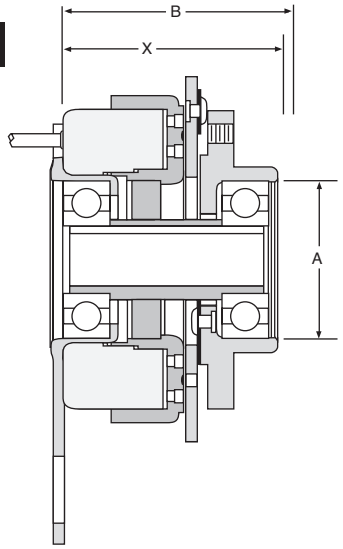
4



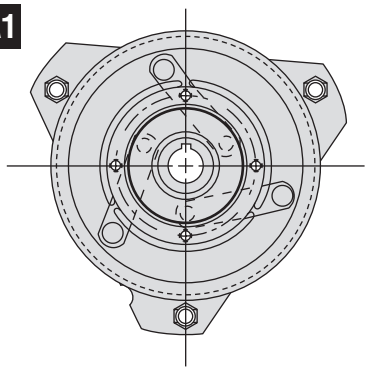
5



6

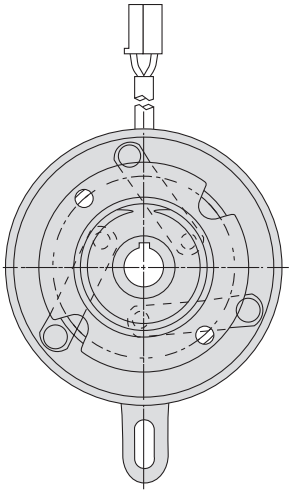


A1



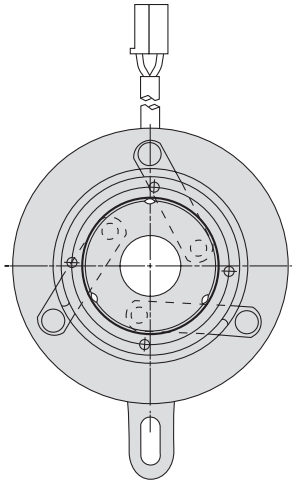
3.078 Dia. B.C.
4 x 1/4-20 UNC

A2



3.50 Dia. B.C.
2 x .324

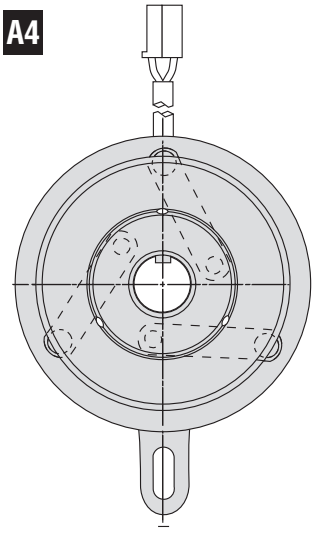
A3



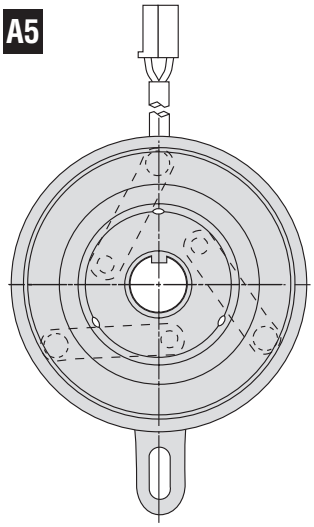
3.50 Dia. B.C.
4 x .284

Straight Bore Clutches (Bearing Mount)

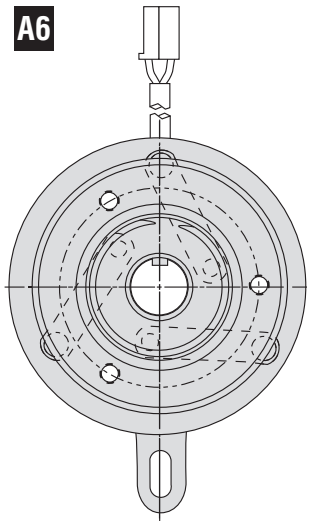
A4



A5

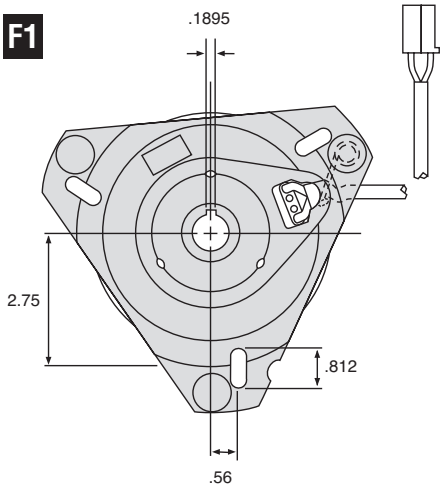


A6

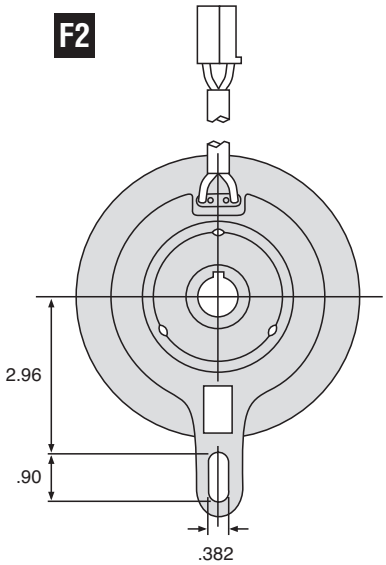


3.62 Dia. B.C.
3 x 5/16-18 UNC-2B

F1



F2



Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

Bore Size	Clutch Type	Armature Type	Field Type	Pitch diameter A	A Belt	B Belt	B	X	Y	C	D	E	Static Torque lb ft	Current[1] Draw Amps	Resistance Ohms[1]	Rotation	Keyway	Part No.
3/4"	1	A1	F1	2.64	—	—	3.41	2.95	—	—	—	—	105	4.51	2.66	CCW	.19	5215-66
3/4"	2	A2	F2	2.44	—	—	3.40	3.21	—	—	—	—	70	4.51	2.66	CCW	.19	5215-67
1"	3	A2	F2	2.44	—	—	3.21	3.21	—	—	—	—	105	4.84	2.48	CCW	.25	5215-60
1"	3	A3	F2	2.64	—	—	2.96	2.60	—	—	—	—	105	4.84	2.48	CCW	.25	5215-57
1"	4	A4	F2	4.6	—	4.62	3.52	2.77	—	.63	.55	36˚	70	4.51	2.66	CCW	.25	5215-63
1"	5	A5	F2	5.1	5.07	—	3.73	2.37	.67	.49	.48	34˚	70	4.51	2.66	CW	.25	5215-77
1"	6	A6	F2	3.00	—	—	3.08	2.30	—	—	—	—	105	4.84	2.48	CCW	.25	5215-82

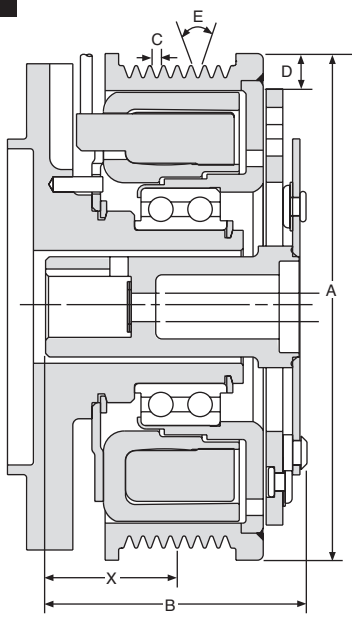
[1]Cold current draw

Engine, Pump and Compressor Clutches—Dimensions

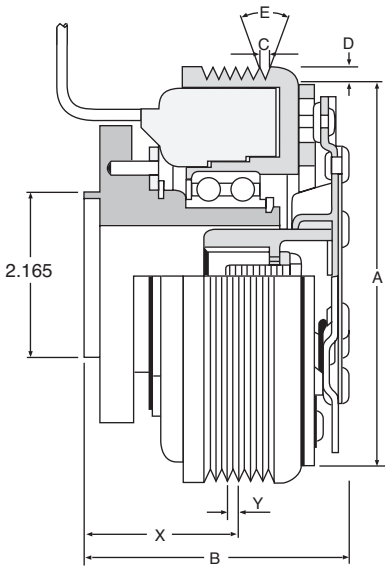
Straight Bore Clutches
(Special Construction, Flange Mount)

(The clutches on this page include mounting hub)

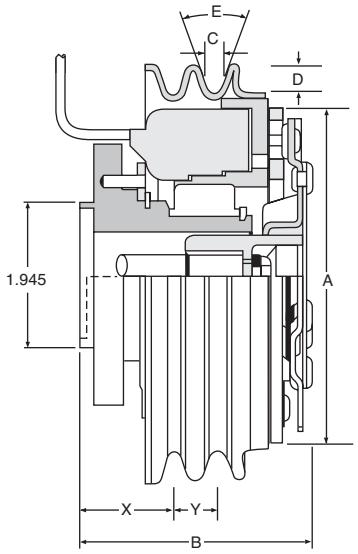
1



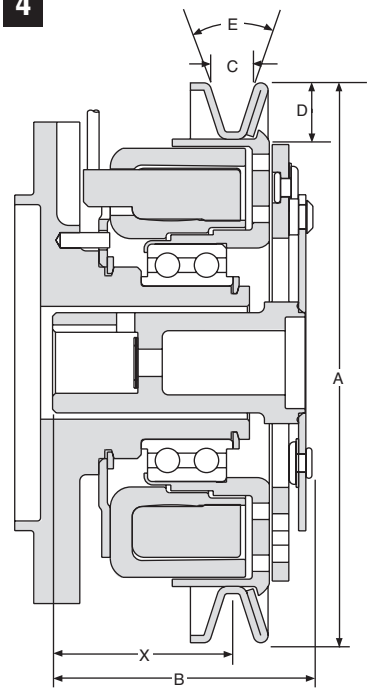
2



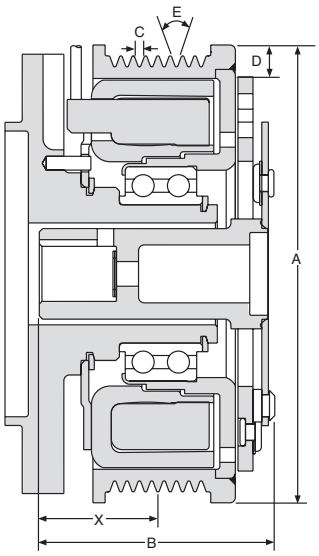
3



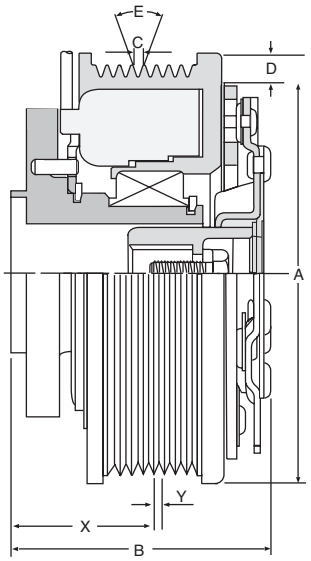
4



5

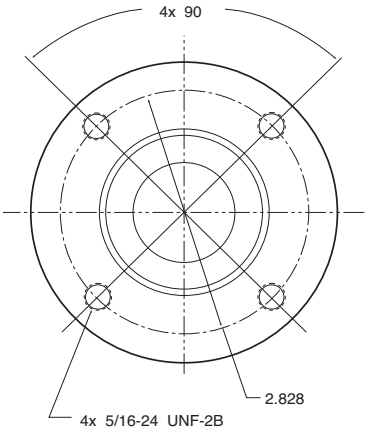


6

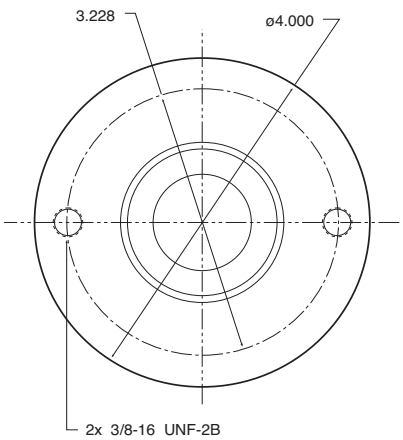


Mounting Hubs

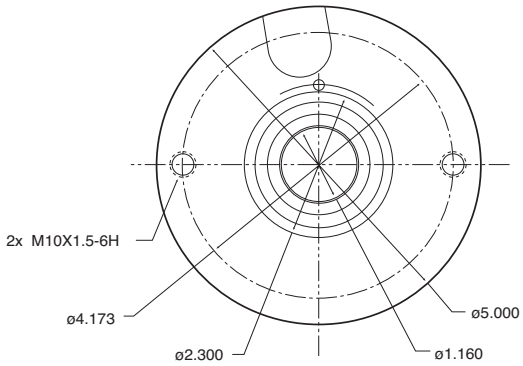
F1



F2



F3



F3 Mounting hub fits AA mount pumps

Notes:

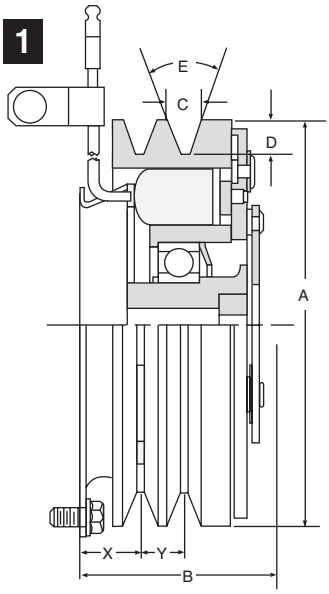
All dimensions are inches.
All units 12V unless otherwise indicated

Bore Size	Clutch Type	Mounting Hub Type	A	B	X	Y	C	D	E	Static Torque lb ft	Current[1] Draw Amps	Resistance Ohms[1]	Rotation	Keyway	Model No.
1/2"	2	F2	4.91	3.19	1.24	.14	.14	.13	40°	90	4.92	2.44	CW	.16	1417-24
1/2"	3	F1	5.59	3.19	1.60	.56	.38	.36	36°	90	4.92	2.44	CW	.16	1417-26
.532	6	F2	4.96	2.95	1.44	.14	.14	.14	40°	70	4.63	2.59	CW	.16	1417-31
.627	4	F3	5.76	2.83	2.23	—	0.437	0.42	36°	90	2.523	9.513	CCW	0.158	1417-34[2]
.627	4	F3	5.76	2.83	2.23	—	0.437	0.42	36°	90	2.523	9.513	CW	0.158	1417-35[2]
.627	5	F3	5.00	2.83	1.54	0.14	0.14	0.14	40°	90	2.523	9.513	CW	0.158	1417-45[2]
.627	1	F3	5.00	2.83	1.54	0.14	0.14	0.14	40°	90	2.52	9.51	CW	0.158	1417-48

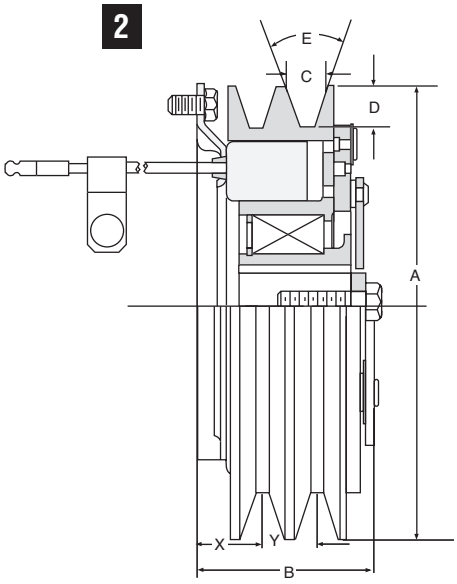
Engine, Pump and Compressor Clutches—Dimensions

Straight Bore Clutches (Special Construction)

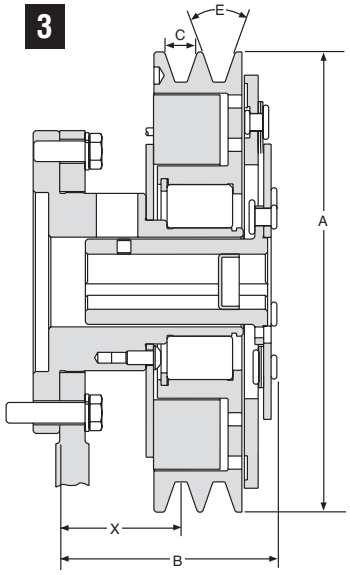
1



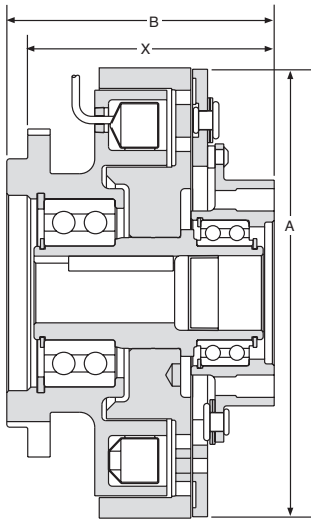
2



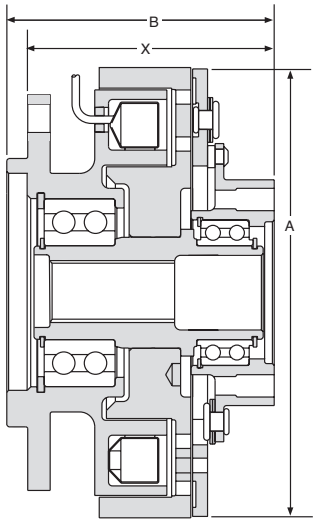
3



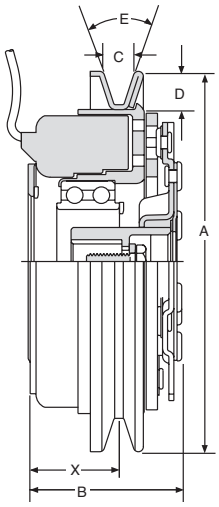
4



5

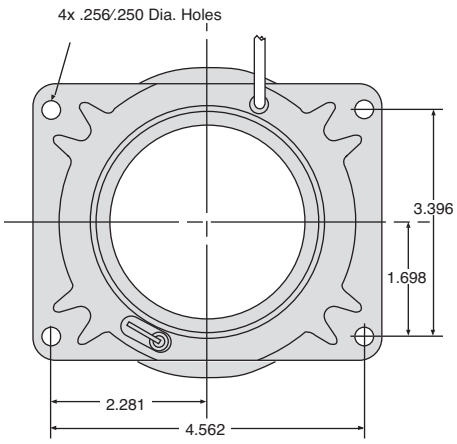


6

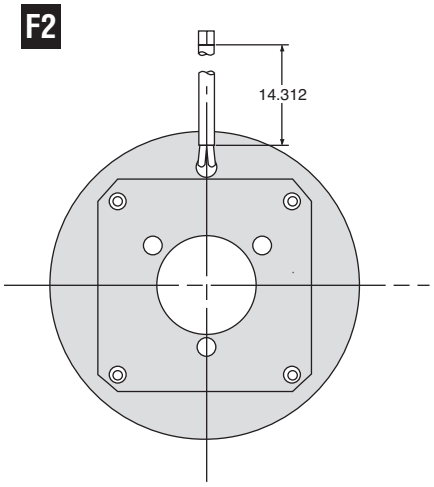


Fields

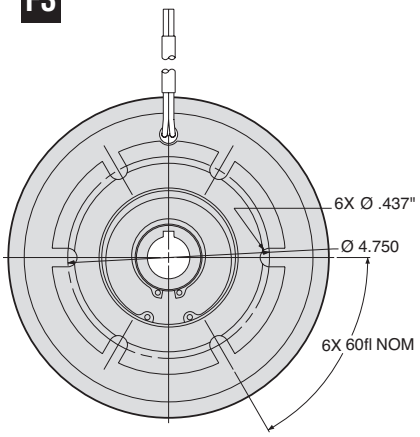
F1



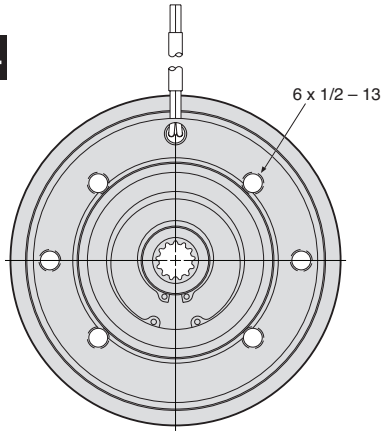
F2



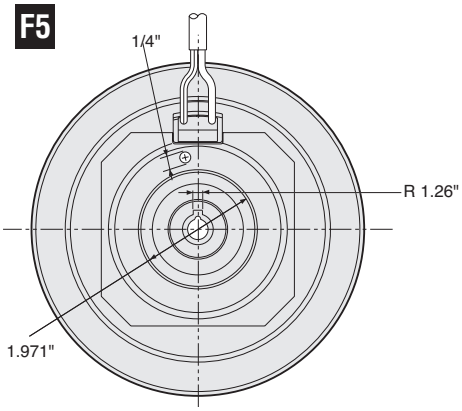
F3



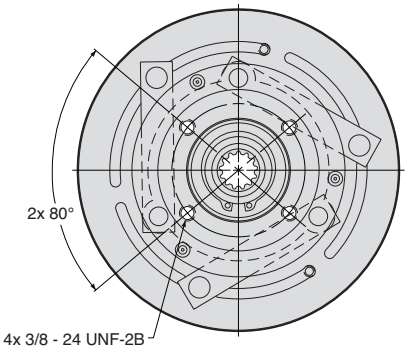
F4



F5



D1



Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

Bore Size	Clutch Type	Field Type	Drive Coupling	Pitch diameter A	A Belt	B Belt	B	X	Y	C	D	E	Static Torque lb ft	Current[1] Draw Amps	Resistance Ohms[1]	Rotation	Keyway	Model No.
9/16"	1	F1	—	5.98	5.73	—	2.63	.89	63	.51	.46	38°	75	4.55	2.65	CW	.127	1417-16
3/4"	2	F1	—	6.22	—	5.88	2.56	.85	.73	.61	.63	34°	90	4.36	2.752	CW	.189	1417-10
3/4"	2	F1	—	6.22	—	5.88	2.56	.85	.73	.61	.63	34°	90	2.59	9.28	CW	.189	1417-13[2]
1"	3	F2	—	8.36	—	8.00	3.98	2.19	.69	.60	.54	38°	200	5.538	2.167	CW	.252	1415-4[3]
1"	4	F3	D1	7.56	—	—	4.469	4.11	—	—	—	—	200	5.54	2.17	CCW	0.25	1415-5
Sp	5	F4	D1	7.56	—	—	4.469	4.11	—	—	—	—	200	5.54	2.17	CCW	—	1415-7[4]
1"	4	F3	D1	7.56	—	—	4.469	4.11	—	—	—	—	200	3.35	7.16	CCW	0.25	1415-8[2]
1"	3	F2	D1	8.36	—	8.00	3.98	2.19	.69	.60	.54	38°	200	3.35	7.16	CW	0.252	1415-10[2, 3]
.532"	6	F5	—	5.63	.44	—	2.43	1.37	—	.44	.42	36°	75	3.38	3.55	CW	0.16	1417-43

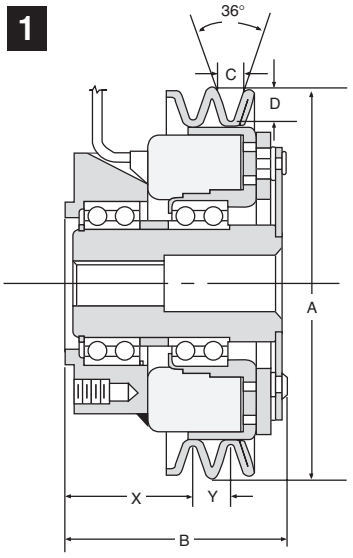
[1]Cold current draw [2]24V [3]For Gresen pump only

[4] 13 tooth spline hub clutches must be installed on pumps with internal involute flat root side fit splines per ANSI-892. Major diameter .901" max.

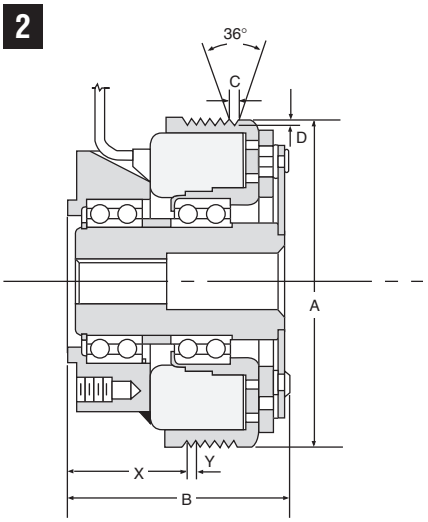
Engine, Pump and Compressor Clutches—Dimensions

Straight Bore Clutches (Shaft Mount)

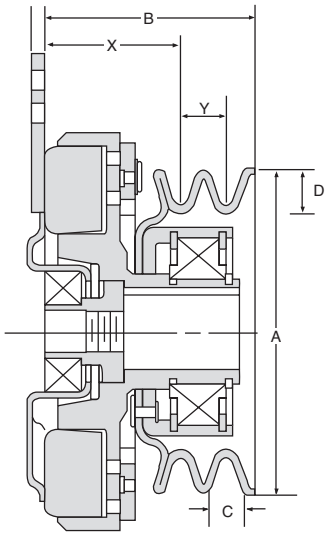
1



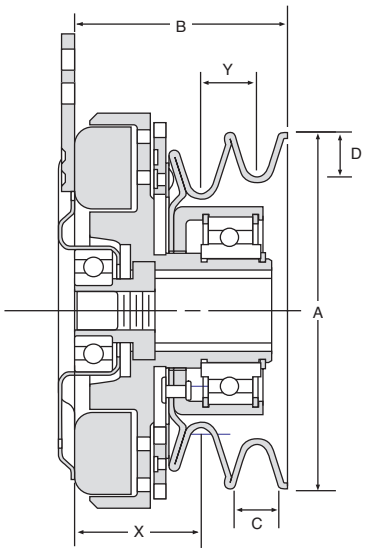
2



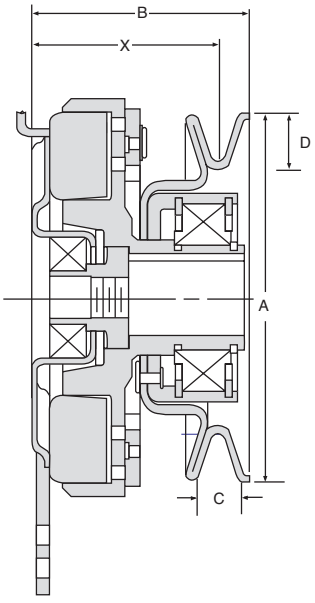
3



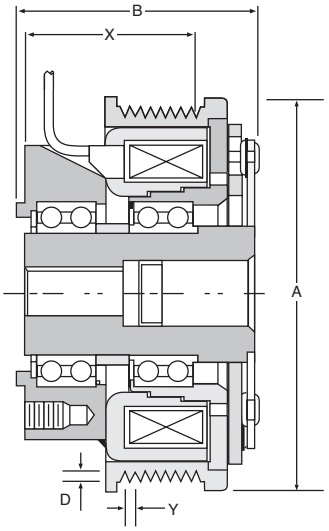
4



6



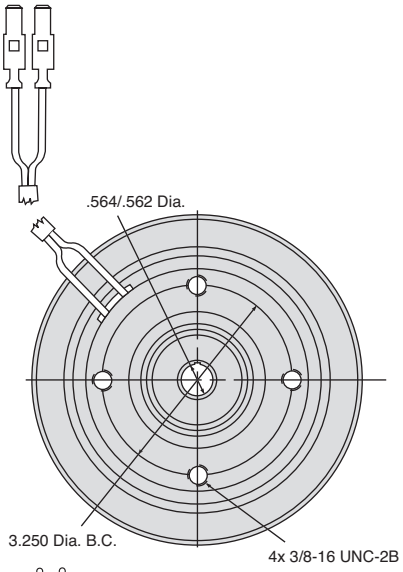
7



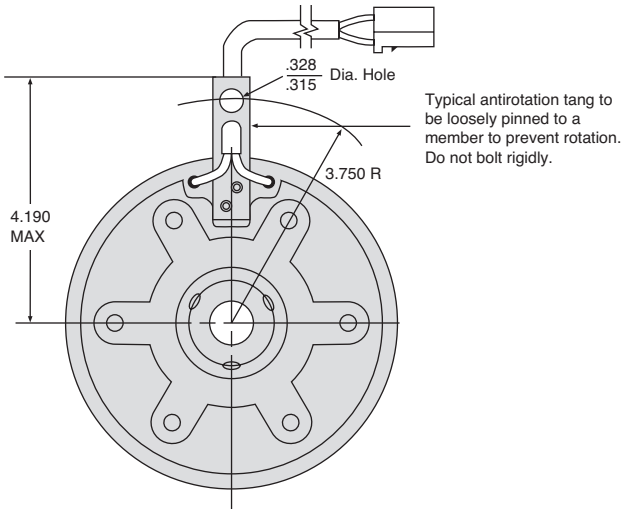
Straight Bore Clutches (Shaft Mount)

Fields

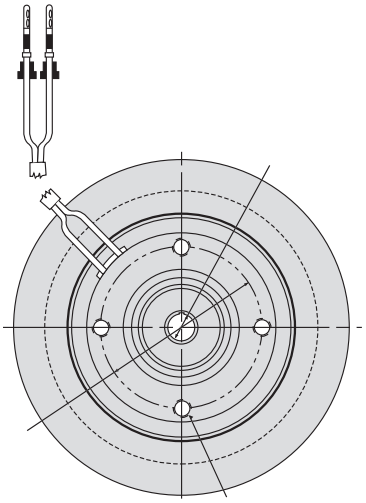
F1



F2

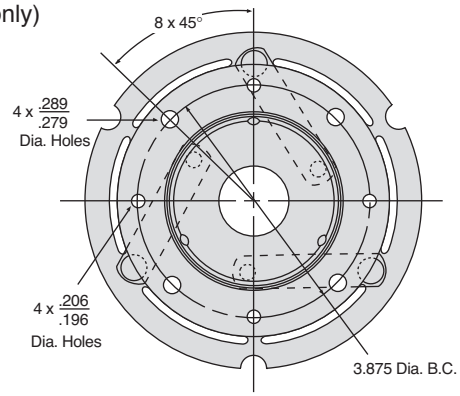


F3



Armature

(5208-62 only)



Notes:

All dimensions are inches.
All units 12V unless otherwise indicated

Bore Size	Clutch Type	Field Type	Pitch diameter A	A Belt	B Belt	B	X	Y	C	D	Static Torque lb ft	Current[1] Draw Amps	Resistance Ohms[1]	Rotation	Keyway	Model No.
9/16"	1	F1	5.65	—	—	3.30	1.88	.56	.380	.38	75	3.41	3.52	CW	.127	1417-14[2]
9/16"	2	F1	5.00	—	—	3.30	1.74	.14	.120	.126	75	3.41	3.52	CW	.127	1417-15[2]
9/16"	1	F1	6.05	—	—	3.30	1.752	.65	.44	.46	75	3.41	3.52	CW	.127	1417-17
9/16"	1	F1	6.05	—	—	3.30	1.752	.65	.44	.46	75	2.53	9.51	CW	.127	1417-38[3]
9/16"	7	F1	6.00	—	—	3.34	2.308	.14	.120	.13	75	3.38	3.52	CW	.13	1417-28
1"	3	F2	4.93	4.50	—	3.48	2.027	.67	.49	.48	70	4.17	2.88	CCW	.25	5208-55
1"	4	F2	5.22	—	3.98/4.51	3.53	1.859	.82	.637	.55	70	4.17	2.88	CCW	.25	5208-4
1 1/8"	3	F2	4.93	4.50	—	3.48	2.027	.67	.494	.48	70	4.17	2.88	CCW	.25	5208-29
1 1/8"	4	F2	5.22	—	3.98/4.51	3.53	1.859	.82	.637	.55	70	4.17	2.88	CCW	.25	5208-3
1 1/8"	6	F2	5.36	4.74	5.08	3.34	2.52	—	.612	.632	70	4.17	2.88	CCW	.25	5208-40

[1]Cold current draw [2]Bracket mounting [3]24 Volt

For all models shown: E Nom. 1.18, F Max. .170, G Max. 1.20, H Max. 1.47.

Glossary

Acceleration Time, Engagement Time

The time required to change the speed of a system from the moment the clutch receives the appropriate electrical signal until the clutch is fully engaged and the system is moving at its maximum speed.

Bearing Mount

A clutch which is preassembled into a complete operating unit and is mounted directly to the shaft.

Brushholder

A clutch component which carries electrical current from the lead wires to the rotating magnet.

Build Up Time

The time in seconds required to build up to 90% of rated flux which corresponds to 80% rated torque.

Burnishing

The process of cycling or “wearing in” of clutch or brake friction surfaces. This process ensures rated torque during initial cycles, and decreases the cycles required from installation to full rated torque output.

Decay Time

The time in seconds required to decay to 10% of rated flux which corresponds to 1% of rated torque on de-energization of the unit.

Deceleration Time, Engagement Time

The time required to stop a system from the moment the brake receives the appropriate electrical signal until the brake is statically engaged and the system is at rest.

Field

A component part of Warner Electric clutches consisting of a steel shell and a coil. Also referred to as a magnet.

Flange Mount

A clutch which has the field bolted directly to a fixed member on the machine.

Flux

Magnetic attraction caused by an electrical current.

Gap

The distance between armature and rotor faces in clutches when the unit is in an inactive state (i.e. disengaged).

Integral Key

A key shaped directly into the bore of a clutch. This is sometimes used in place of a standard keyway and key.

K Factor

See service factor.

Poles

1. Refers to magnet poles: North/South poles. 2. The edges of a Warner Electric magnet or field shell through which the magnetic flux flows.

Pulley

A sheave that turns or is turned by a belt so as to transmit torque, rotation.

Residual Magnetism

The condition in magnets where low level magnetism remains after the electric current is removed.

Rotor

The input member of a clutch/brake.

Service Factor

A figure by which torque is multiplied to ensure performance of the clutch under the worst case application conditions.

Tapered Bore (Shaft)

Many hydraulic pumps incorporate a taper on the output shaft, providing stronger clutch-to-shaft engagement than on straight shafts. Tapered shafts are most commonly in 4:1 and 8:1 taper ratios.

4:1 Taper: The shaft changes in diameter by one inch for each four inches of length.

8:1 Taper: The shaft changes in diameter by one inch for each eight inches of length.

Torque

Static: The torque which is developed when there is no relative motion or slippage between the mating friction surfaces. A clutch which is fully engaged and driving exhibits static torque. All standard units are rated on the basis of static torque after burnishing.

Dynamic: The torque developed when there is relative motion between the mating friction surface. The torque varies inversely with the amount of slip, so specific values must be taken from engineering data.

Clutch Location

Wherever possible, the clutch should be located on the higher speed shaft.

Clutch Rotation

Direction of drive can be a significant design consideration in applications with a peak load during clutch engagement. Warner Electric clutches incorporate leaf springs in the armature to transmit the load. Where peak loads at start-up are possible, springs should be oriented so that they are placed in tension (or stretch).

Spring rotation can be determined by observing the leaf spring direction on the armature.

Electrical Ratings

All current and resistance ratings are taken at ambient temperatures of 70ºF (20ºC).

Fluid Power Formulae

If you are sizing a clutch for a pump application, but do not know the HP required, the following formula will allow you to work back to the torque formulae.

If HP is unknown:

$$HP = \frac{GPM \times PSI \times .000583}{\text{Pump Efficiency}}$$

Where:

GPM = Fluid flow in gallons per minute

PSI = Pressure in pounds per square inch

Pump Efficiency = normally 85%

Rules of Thumb:

1 HP per gallon @ 1500 psi

.7 HP per gallon@ 1000 psi

If PSI is unknown:

1 cubic inch per revolution equals 16 lb.in. of torque per 100 psi.

1 gallon equals 231 cubic inches.

If GPM is unknown:

$$GPM = \frac{RPM \times DISP\ (IN^3)}{231}$$

Static Torque

The torque requirements for your particular application may be determined by using the following relationship:

$$T = \frac{5250 \times HP}{RPM}$$

$$T = \frac{CIR \times PSI}{75.4}$$

Voltage Requirements

Most clutches and clutch/brakes require 12 VDC to operate at their maximum torque rating. Less than 12 VDC may cause clutch slippage and premature failure.

Abbreviations:

T = Torque

HP = Horsepower

RPM = Speed of clutch (Revolutions per minute)

CIR = Cubic inch per revolution

PSI = Pounds per square inch

K = Service factor

Part Number Index

Warner	Page	Pitts	Ogura
1406-19	10	10595	502740
1406-34	11	10582	502731
1406-39	12	10581 12016	502730
1406-41	13	10583	502744
1406-42	11	10047 10584	502732
1406-43	10	10591	502736
1406-44	11	10596	502741
1406-47	11	10594 1274	502739
1406-49	11	10587 10990	502743
1406-70	6	7809	—
1406-97	13	10761	502400
1411-18	6	7531	332639 (MA-6A)
1411-35	6	10204	—
1411-39	9	10884	501939 (MAE-6AR)
1411-41	9	10089 10795 11153	502742
1411-42	9	—	—
1411-49	12	11947	508821
1411-50	9	11699	506121
1411-54	9	—	—
1411-55	9	—	—
1411-56	9	—	—
1411-61	12	10590	502745
1411-67	9	—	—
1411-68	9	—	—
1411-69	9	—	—
1411-70	12	10586	502393
1411-72	6	7534 12455	332334 (MA-7A)
1411-86	9	11212	506079
1411-96	9	—	—
1415-1	7	—	—
1415-4	21	13403	—
1415-5	21	—	—
1415-7	21	—	—
1415-8	21	—	—
1415-10	21	—	—
1417-1	14	—	—
1417-2	14	—	—
1417-4	14	13068	—
1417-7	14	—	—
1417-8	14	—	—
1417-9	14	—	—
1417-10	21	10259	—
1417-11	14	13785	—
1417-12	14	—	—
1417-13	21	—	—
1417-14	23	13279	—
1417-15	23	13829	—
1417-16	21	—	—
1417-17	23	—	—
1417-18	14	—	—
1417-24	19	—	—
1417-26	19	—	—
1417-28	23	—	—
1417-31	19	—	—
1417-34	19	—	—
1417-35	19	—	—
1417-38	23	—	—
1417-41	14	—	—
1417-42	13	—	—
1417-43	21	—	—
1417-44	13	—	—
1417-45	19	—	—
1417-48	19	—	—
1417-49	13	—	—
1436-18	6	7810 8167	502407
1436-19	6	7873	—
1436-41	10	12748	—
1436-48	10	12743	—
1436-49	11	10871	—
1436-51	11	12741	506075
1436-55	11	12350	—
1436-78	6	7859	—
1436-90	6	7572 7811	—
1436-97	6	8134	501316 (MA-57/8M)
1466-20	10	7927 12740	501589 505964
1466-21	9	7925	505966
1466-26	10	—	—
1466-53	9	13068	—
1466-64	10	—	—
1466-68	12	—	—
1466-69	10	11191	502722
1466-70	10	7928	502406
1466-84	12	11650	—
1466-92	13	—	—
1466-99	13	—	—
1466-105	12	—	—
1473-69	13	—	—
5208-3	23	—	—
5208-4	23	—	—
5208-29	23	—	—
5208-40	23	—	—
5208-55	23	—	—
5215-60	15	—	—
5215-57	17	—	—
5215-60	17	—	—
5215-63	17	—	—
5215-66	17	—	—
5215-67	17	—	—
5215-77	17	—	—
5215-82	17	—	—
5215-105	15	—	—

Notes

Mobile Power Application Data Form

For Application Assistance, Phone 815-389-6369 or Fax 815-389-7648

Date _____

Company Name _____

Address _____

City _____

Type of Application

_____

_____

_____

Shaft Diameter (give limits)

☐ Straight _____

☐ Taper _____

Maximum Torque at Clutch

☐ Lb. Ft.

☐ HP at RPM's _____ _____

☐ GPM at PSI _____ _____

Electrical System

☐ Regulated _____

☐ Unregulated _____

Clutch Duty Cycle

(Time On/Off)/Hr _____

Environment

Temp Range _____ °F

Location _____

Quantity

Annual _____

Power Source (give HP and Mfg)

☐ Gas _____

☐ Diesel _____

☐ Electric _____

☐ Other _____

Driven Load (give parameters)

☐ Air Compressor _____

☐ Pump _____

☐ Mower Deck _____

Note: Refer to the individual sections of this catalog for details.

Altra Industrial Motion

Warner Electric

Electromagnetic Clutches and Brakes - USA

South Beloit, IL
815-389-3771

For customer service:
1-800-825-6544
For application assistance:
1-800-825-9050

Electromagnetic Clutches and Brakes - Europe

St Barthelemy d'Anjou, France
+33 (0)2 41 21 24 24

For sales office:
+33 (0)2 41 21 24 76

Precision Electric Coils and Electromagnetic Clutches and Brakes - USA

Columbia City, IN
260-244-6183

Inertia Dynamics

Spring Set Brakes; Power On and Wrap Spring Clutch/Brakes

New Hartford, CT
860-482-4444

Matrix International

Electromagnetic Clutches and Brakes, Pressure Operated Clutches and Brakes

Brechin, Scotland
+44 (0) 1356 602000

South Beloit, IL
815-389-3771

Warner Linear

Linear Actuators and Guideways - USA

Belvidere, IL
815-547-1106

For application assistance:
1-800-825-9050

TB Wood's

Belted Drives and Flexible Couplings

Chambersburg, PA
717-264-7161

For assistance:
1-888-829-6637
Press #5 – Customer Service
Press #7 – Mechanical Applications

Wichita Clutch and Industrial Clutch

Pneumatic and Oil Immersed Clutches and Brakes - USA

Wichita Falls, TX
940-723-3400

Pneumatic Clutches and Brakes - Europe

Bedford, England
+44 (0)1234 350311

Twiflex Limited

Caliper Brakes and Thrusters

Twickenham, England
+44 (0) 20 8894 1161

Formsprag Clutch

Overrunning Clutches and Holdbacks

Warren, MI
586-758-5000

For application assistance:
1-800-927-3262

Marland Clutch

Roller Ramp and Sprag Type Overrunning Clutches and Backstops

Burr Ridge, IL
630-455-1752

Stieber Clutch

Overrunning Clutches and Holdbacks

Heidelberg, Germany
+49 (0)6221 30 47 0

Boston Gear

Enclosed and Open Gearing, Electrical and Mechanical P.T. Components

Charlotte, NC
704-688-7300

For customer service:
1-800-825-6544
For application assistance:
1-800-816-5608

Huco Dynatork

Precision Couplings and Air Motors

Hertford, England
+44 (0) 1992 501900

U.S.
800-825-6544

Ameridrives Couplings

Gear Couplings, Mill Spindles, Universal Joints

Erie, PA
814-480-5000

Universal Joints, Drive Shafts, Mill Gear Couplings

Green Bay, WI
920-593-2444

Bibby Transmissions

Disc, Gear, Grid Couplings, Overload Clutches

Dewsbury, England
+44 (0) 1924 460801

Nuttall Gear and Delroyd Worm Gear

Worm Gear and Helical Speed Reducers

Niagara Falls, NY
716-298-4100

Saftek Friction

Non-asbestos Brake and Clutch Materials

Telford, England
+44 (0) 1952 581122

Altra Industrial Motion - Asia Pacific and Africa

China	852 2615 9313
Taiwan	886 2 2577 8156
Singapore	65 6487 4464
Thailand	66 2 322 5527
Australia	612 9894 0133
S. Africa	27 11 918 4270

Warner Electric
449 Gardner Street • South Beloit, IL 61080
815-389-3771 • Fax: 815-389-2582
www.warnerelectric.com

P-1091-WE 5/08

Printed in USA