OGURA
INDUSTRIAL CORP.

"What you need in a clutch"™

General Purpose Clutches

Introduction

General Purpose Clutches

The Ogura Clutch Company was founded in 1938. Since that time, it has grown to be the largest manufacturer of electromagnetic clutches in the world. Ogura has technical and manufacturing representation worldwide.

Ogura's numerous quality awards reflect a desire for continuous improvement which we apply not only to our products; but, also to our personnel. We believe the cornerstone of quality begins with people. This is why our personnel are continually trained on the latest manufacturing techniques and design principles. Our plants currently conform to ISO9001 and some to QS9000 guidelines.

We welcome the opportunity to put our manufacturing and engineering skills to work for you. If for some reason, your requirement does not fit within the product lines shown in this catalog, please contact us directly. We may have other products available to meet your requirements.

OGURA
INDUSTRIAL CORP.

Products In This Catalog

There are two basic models of clutches described in this catalog.

General Purpose Clutches:

These are typically bearing mounted clutches, which can be used in a variety of mobile, agricultural, marine or lawn and garden applications. They can be mounted on either the driving or driven shaft.

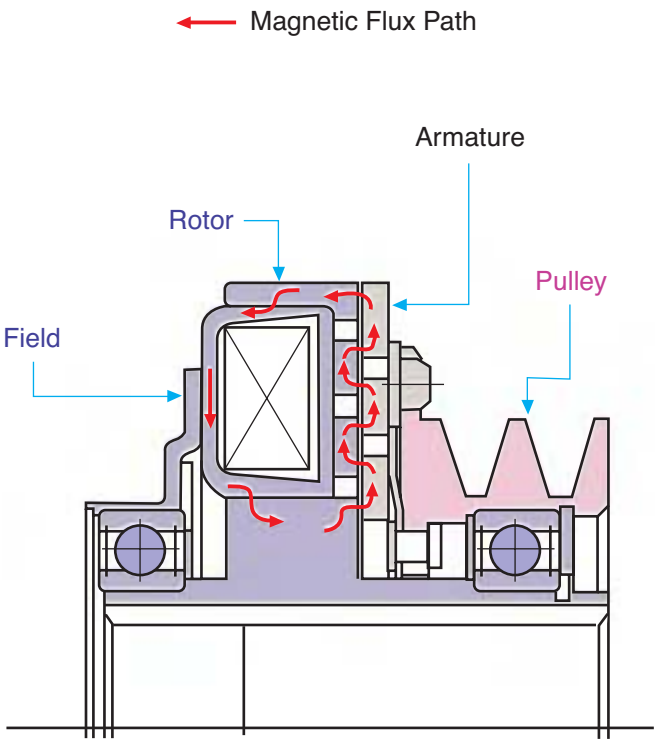
OGURA INDUSTRIAL CORP.

General Purpose Clutches Principle Of Operation

General purpose clutches are primarily made up of two major sub-assemblies. They are:

1. Field/rotor assembly: This is the coil and backing plate. The coil provides the magnetic flux that allows the clutch to pull in. The rotor provides the input rotation as it is normally connected to an input shaft.

2. Pulley/armature assembly: This includes the armature disk, springs, hub and pulley. This is normally the output of the clutch. In some instances, a mounting flange is used instead of a pulley.



In a general purpose clutch, either the pulley/hub or the bore (rotor) of the clutch can be the input. In most cases, the bore (rotor) is the input. This input is normally mounted directly on an engine shaft.

All general purpose clutches are bearing mounted. This means that the field is supported by a bearing on the shaft and does not have to be mounted separately. Some mobile clutches are one piece designs and some are two piece (the field/rotor is one part and armature/pulley is the other).

Engagement of the armature to the rotor is caused by the magnetic attraction between the rotor and the armature. The magnetic flux is transferred from the field into the rotor and then into the armature. The slots in the rotor and the armature are called banana slots. These slots allow the flux to contact the rotor and the armature in more than just two places. (A normal magnet only has a north and a south point of attraction.) By making multiple points of flux connection, the torque can be increased in this type of clutch.

The picture shows a standard clutch. It has three flux paths. This is called a triple flux or a six-pole design.

To disengage the clutch, the voltage going to the coil is simply turned off. Once the voltage is released, the springs between the armature and the hub pull the armature away from the rotor, creating an air gap so no contact is made when the clutch is turned off.

Reasons For Using An Electromechanical Clutch For Agricultural, Construction, Mobile And General Applications

1. Remote actuation:

The clutch can be engaged or disengaged from a remote location such as the cab in a truck or a control panel.

2. Safety:

In cases where the clutch is driving applications such as a stump grinder or a trencher, many times these can be fitted with an operator presence control so if the operator lets go of the handle, the clutch automatically disengages. Since electric clutches are not speed dependent, they can be engaged and disengaged at any point in their speed range.

3. Reduced power consumption from the engine:

Since the clutch is only engaged when it is required to run, engine horsepower can be utilized for other functions when the clutch is not driving. This is particularly important if horsepower is required to perform an independent driving function or in applications such as fans or blowers that consume a lot of horsepower and do not need to run all the time the engine is running.

4. Simple installation:

Since the clutch runs directly off the battery, all that is required is a basic switch to engage and disengage the clutch.

5. Operator convenience:

Rather than a mechanical linkage which can cause an additional force required by an operator to engage a clutch, an electric clutch is engaged by a simple flip of a switch. Because the clutch is engaged electrically, this switch can be incorporated into a control panel so the operator does not have to be in the same location as the clutch when it engages.

6. Cold weather starting:

By using a clutch, the load is not engaged at start up. This allows the engine to come up to full efficiency before engaging the clutch. This helps to prevent engine stalling.

Ogura
General Purpose Clutch Design Advantages

1. Solid forged rotor:

A one piece solid forged rotor means no chance of internal parts separation. Our rotors also have an even wall thickness around the coil which gives optimum flux distribution, maximizing torque.

2. Different coil voltages available:

Although 12 volt is the most common, 24 volts can also be made available. Depending upon the quantity, other specialty voltages can be made.

3. High temperature, longer life grease:

All models include our special long life grease which has shown a significant improvement in life over other standard high temp greases.

4. E-coating:

Where possible, all parts in the clutch are e-coated to give maximum corrosion protection.

5. High temperature epoxy coil:

To help prevent failure from both vibration and outside contaminants, all coils are sealed in the coil shell with a high temperature epoxy coating.

6. Forged machined pulley:

All models in this section use a heavy duty machined pulley or flange. A stronger pulley resists damage due to abusive environments.

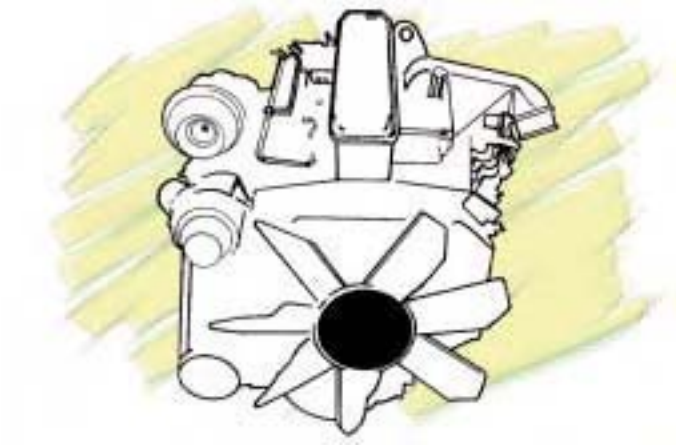
7. Reduced burnishing time:

Ogura is using a coating on the clutch faces that significantly reduces burnishing time. This is standard on all units.

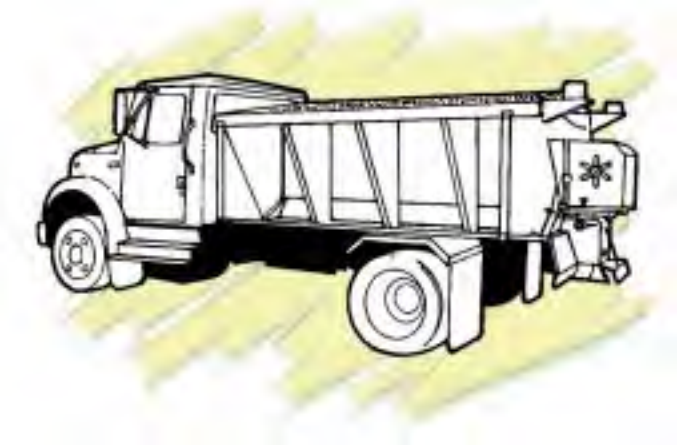
Typical Applications For General Purpose Clutches

General purpose clutches are used to remotely engage a number of different types of applications. The simple design function and installation of these clutches help to enhance machine value to the end user because of the added safety and convenience they add over other styles of clutching.

AGRICULTURAL
(Used on blowers, augers and choppers)



FAN CLUTCH
(Automatically turns on or off fan when needed; this provides fuel and power savings)

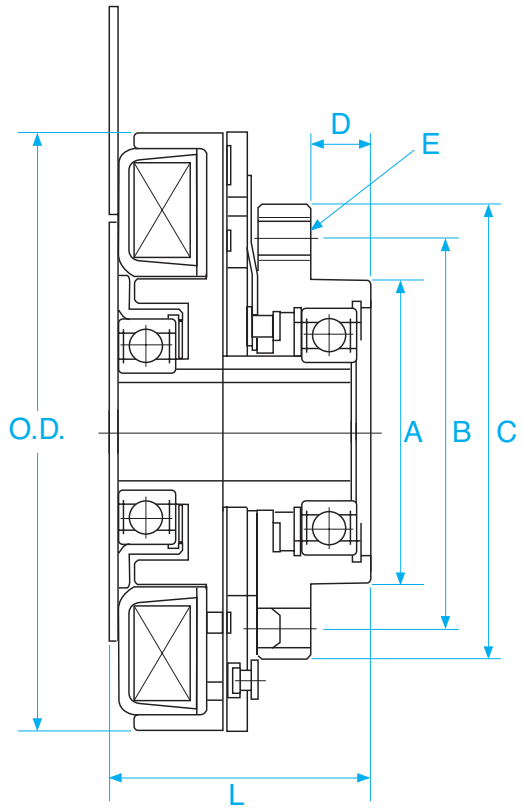


SALT AND SAND SPREADERS
(A simple flip of the switch engages spreader)

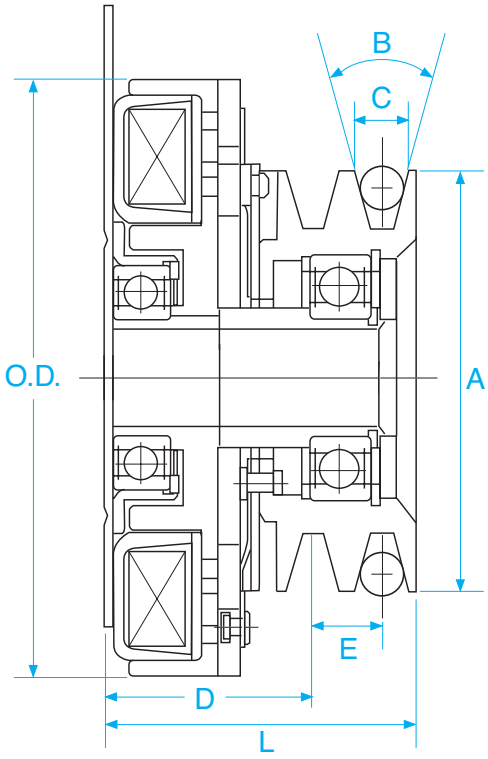
TRENCHERS AND STUMP GRINDERS
(Operator convenience and safety)

Ogura General Purpose Clutch Types

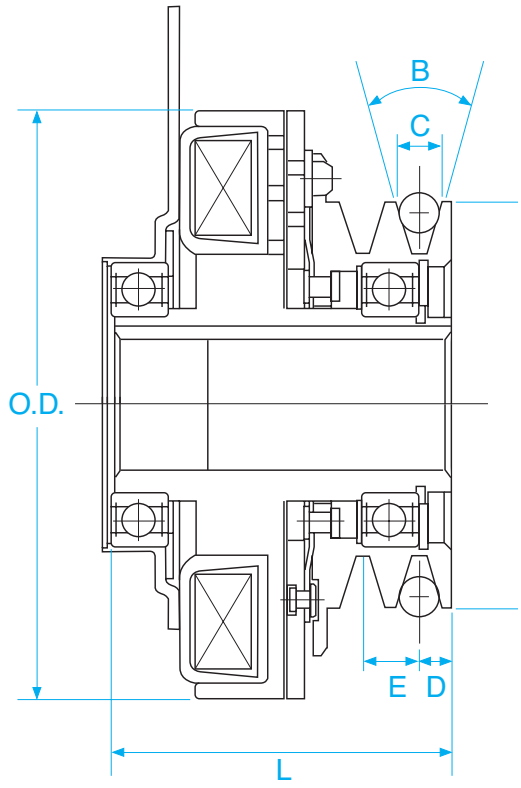
1



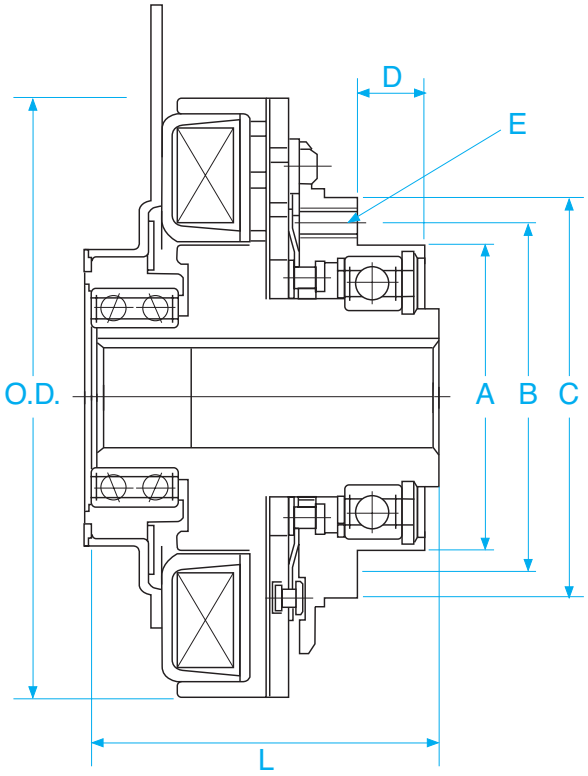
2



3

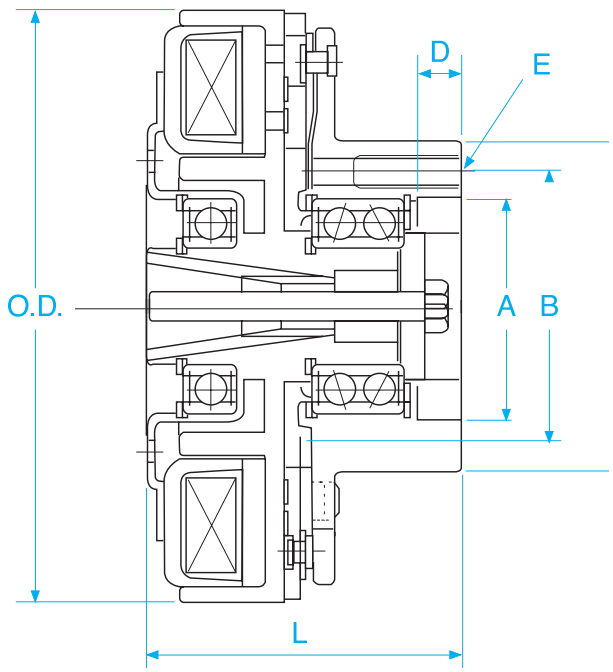


4

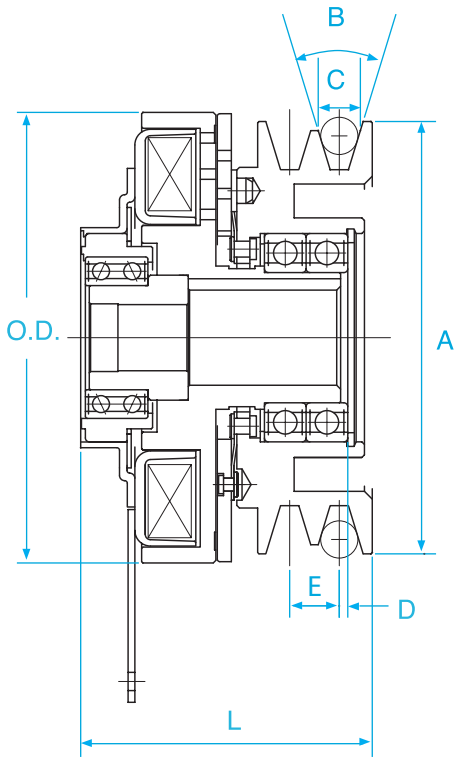


General Purpose Clutch Types

5



6



General Purpose Clutch Dimensions

OGURA PART NO.	STATIC TORQUE (lb. ft.)	CLUTCH TYPE	BORE SIZE	KEY WAY	VOLTAGE & WATT (V/W)	O.D. Body Diameter	L overall length	A pulley diameter	PITCH diamater nominal	OVER ball diamater	GAUGE ball diameter	B diameter or degree	C	D	E	WEIGHT (lbs)
505894	110	5	*Taper	.16x.11(w)	12/50	6.0	3.15	2.25	-	-	-	2.75	3.37	0.43	4-5/16	11
515294	110	2	25mm	1/4x1/8	12/47	5.9	2.62	4.07	4.07	4.41	0.3438	38	0.36	1.89	0.41	12
509812	110	2	1	1/4x1/8	12/50	5.9	3.29	4.13	4.13	4/30	0.4375	34	0.50	2.00	0.68	10
515609	110	1	1	1/4x1/8	12/47	5.9	2.59	3.0	-	-	-	3.625	4.49	0.59	3-5/16	10
516849	250	3	1	1/4x1/8	12/50	6.7	3.85	4.65	4.65	4.82	0.4375	34	0.54	0.35	0.64	16
521325	250	3	1.125	1/4x1/8	12/50	6.7	3.86	4.65	4.25	4.82	0.4375	34	0.54	0.35	0.64	16
522879	250	3	1.125	1/4x1/8	12/50	6.7	3.91	5.23	5	5.56	0.44	34	0.49	0.37	0.625	17
519225	250	4	1.125	1/4x1/8	12/50	6.7	3.85	3.40	-	-	-	3.89	4.45	0.78	6-M8	16
525569	250	4	1.25	1/4x1/8	12/50	6.7	3.86	3.41	-	-	-	3.90	4.45	0.78	6-M8	16
509044	250	3	1.4375	3/8x3/16	12/50	6.7	3.85	4.65	4.65	4.82	0.4375	34	0.54	0.35	0.64	16
527323	350	6	1.4375	3/8x3/16	12/68	6.8	4.53	6.54	6.29	6.66	0.5625	34	0.64	0.13	0.75	18

* Taper is standard automotive 1" : 4" ratio. Gauge line diameter is .841". Weight is approximate.
In non-taper bore clutches, square keys are used. Actual keyway height shown is less.
Ogura has many other modified standards available. Contact us if the above clutches do not meet your design requirements.

Installation Procedure For General Purpose Clutches

Things to check before installation begins:

Engine shaft size: Most of the time, general purpose clutches are mounted directly on the engine shaft. If the installation is not on an engine shaft, please make sure that the tolerances are close enough to provide a snug fit between the bore of our clutch and the shaft. (All engine manufacturers should produce shafts within the required tolerances.) Also, a standard rule of thumb is that the minimum diameter of the shaft for one piece designs is also the minimum amount of shaft engagement. (Two-piece designs would require shaft engagement in both pieces.) The engine shaft step radius needs to be smaller than the chamfer on the clutch or the clutch will not seat properly. If interference occurs, a spacer with a proper chamfer is required.

Direction of rotation: We manufacture our units to operate either clockwise or counter-clockwise. They can be mounted with the pulley toward the engine or they can be mounted with the pulley away from the engine. This mounting is critical because this determines which direction the leaf springs are orientated. If springs are not run in tension, they could suffer premature failure because they will be running in compression. If the torque required from the clutch is low enough, (less than 75%) and vibration and inertia are low, it is not as critical that the springs be mounted in the correct configuration.

Torque tab restraint: Prior to installation, it is critical to determine the torque tab placement. The function of the torque tab is to keep the lead wires from pulling out of the clutch due to the bearing drag. This torque tab should have a freedom of movement both axially and radially of about 1/16 of an inch. The simplest type of torque tab restraint is some type of "u" bracket that captures the torque tab, but does not grab it firmly. In heavy vibration applications, a larger surface area is required to prevent notching of the torque tab and the restraining pin or bracket.

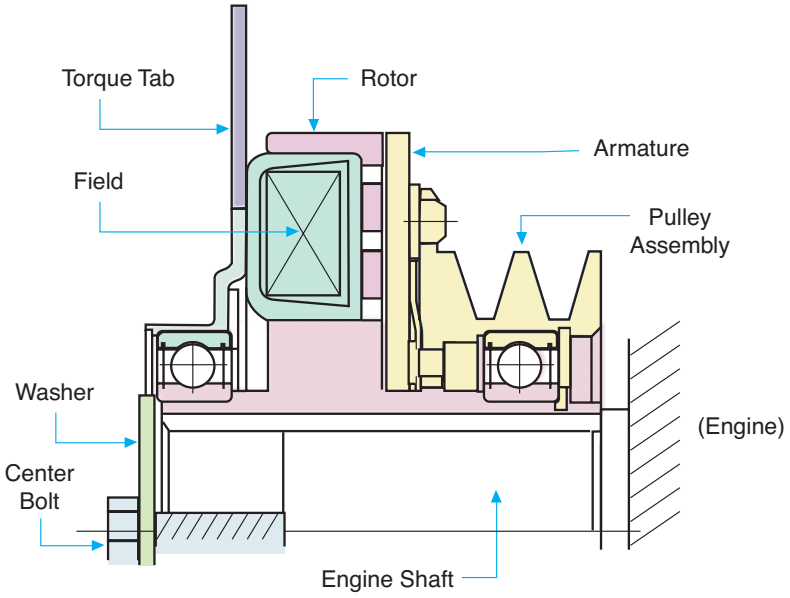
Key length and height: In many of the clutches, the key does not go all the way through the clutch. Therefore, the key length can only be as long as the keyway length within the rotor. Please check this before installation. In some clutches, the bearing inner race may be exposed on the top of the keyway. In this case, the key needs to be slightly undersized in this area so it does not force itself against the bearing inner race.

Installation Of General Purpose Clutches

Step 1: Slide the clutch onto the shaft, (for a two-piece clutch, slide both pieces on one at a time). Please make sure that the key is in the proper location. Do not force the clutch onto the shaft because, if the key is off slightly, damage could occur to the key or to the bore of the clutch. The shaft should extend into the clutch enough to support each component. A standard rule of thumb is the penetration should be at least equal to the diameter of the shaft. The clutch should be slid onto the shaft until the bearing inner race on the clutch contacts a step, washer or other drive pulley. In all cases, the mounting surfaces of these components need to be parallel to each other within .003". If these surfaces are not parallel, the clutch could become cocked on the shaft. (This would show up as a wobbling pulley.) The contact of these components, to the bearing inner race, can extend beyond the inner race because the seal is recessed. (If you are using a washer, make sure it is not cupped; otherwise, this cupping could dig into the bearing seal.) Please be sure to check the chamfer on the ground drive pulley, washer or clutch so they do not interfere with the radius on the step in the engine crankshaft. On some of our clutches, the bearing is kept on the inner sleeve via a snap ring, (pulley side). With this design, the rotor would then contact the appropriate step on the shaft. (See example below.)

Step 2: A center bolt and washer, (customer supplied) is then placed into the end of the tapped shaft and then tightened down. The washer should be .250" in thickness. Bolt tightening torque will vary depending upon the bolt used in the application. This can be anywhere from 20 -50 ft. lbs. of tightening torque, depending upon the bolt. If vibration is heavy an adhesive may be required to prevent the bolt from becoming loose. The washer should contact the inner race of the bearing. It can extend beyond the inner race as long as it does not contact the outer race.

Step 3: At this point, the torque tab should be held in the appropriate position. Please make sure that there is freedom of movement both axially and radially of the torque tab of about 1/16". Double check the installation after it is tightened down, you should be able to push against the back of the field and move it slightly from side to side. Under no circumstances should the torque tab be tightened down firmly. This will cause failure of the field bearings.



Troubleshooting Guide

CLUTCH WILL NOT DISENGAGE

Potential Problem	Possible Reasons	Fix
Voltage not releasing.	Faulty switch.	Replace switch.
Rotor and armature locked together.	The clutch has been severely galled and has locked up. (Galling is the condition whereby a piece of metal is trapped between the armature and the rotor and melts due to high pressure and heat, spot welding the surfaces together.)	If rotor and armature connot be separated, replace the clutch. If they do separate, follow burnishing procedure.
Pulley bearing locked.	Bearing lost grease due to seal problem, temperature or water contamination.	Replace clutch.
▲ Brake plate clamped down too tightly.	If the brake nuts are screwed down too tight, the armature will be pressed against the rotor all the time. This should be evident by discoloration of the brake plate. If the unit ran long enough, the brake plate and the clutch would be destroyed.	Loosen brake nuts and reset air gap according to recommendations. If clutch is destroyed, replace clutch.

CLUTCH WILL NOT ENGAGE

Potential Problem	Possible Reasons	Fix
No voltage going to the clutch.	Wiring connector not seated properly.	Pull apart and re-seat connector.
	No voltage or low voltage coming from the battery.	Check with voltmeter, battery should be 8-16 volts. (Assuming 12 volt battery.)
	Defective charging system.	Fix charging system.
	Lead wire cut or broken internally.	Fix or replace lead wire. If destroyed, replace clutch.
	Fuse blown.	Replace fuse.
	Defective switch operating clutch.	Replace the switch.

▲ PTO Clutch/Brakes Only

Troubleshooting Guide

CLUTCH WILL NOT ENGAGE (continued)

Potential Problem	Possible Reasons	Fix
If voltage is going to the clutch, but the clutch will still not engage.	Coil open or shorted.	Check coil with ohmmeter. A range close to 3 to 4 ohms should be present at an ambient coil temperature of 70 F. Replace coil.
	Check coil voltage to make sure it is compatible with the voltage coming in. (If voltage is too high, this could cause the coil to burn out.)	Change battery or coil to meet your requirement.
	Burnt out coil caused by frictional contact (flange mounted clutches, rotor strike). If so, coil will be discolored, can be cracked, burnt or epoxy can be melted.	Replace coil.
	■ Rotor/armature air gap too large.	If straight bore, air gap can be readjusted. If unit has set screws, bottom out armature hub against field then back off to .1" and retighten set screws. If spacer on straight bore, reduce width of the spacer. If taper bore clutch, tap on armature cover to close gap.
	▲ Rotor/armature air gap too large.	Re-adjust according to air gap adjustment procedure.
Clutch engages, but load will not engage.	Rivets or springs broken.	Replace clutch.
	Key missing.	Put in key.
	Armature could be warped because of heat due to slippage. This means it will pull in, but will slip when a load is supplied. Clutch should show signs of heat.	Replace clutch and determine why it slipped.

▲ PTO Clutch/Brakes Only
■ Mobile Clutches Only

Troubleshooting Guide

CLUTCH SLIPS

Potential Problem	Possible Reasons	Fix
Low voltage going into the clutch.	Defective battery.	Replace battery
	Lead wire cut which could be intermittently grounding out the lead wire causing the clutch to turn on and off or not to give full voltage.	Fix or replace lead wire.
Erratic engagement.	If lead wire is kinked or pinched and the break is internal, the clutch operation may show up as being erratic engagement.	Fix or replace lead wire.
Clutch is contaminated.	Oil or other lubricant has been sprayed on the clutch surface. Sometimes this shows up after the clutch is disassembled. Physical evidence is either burnt oil or a greasy metallic surface showing oil still present.	Clean off surfaces with solvent and reburnish. Replace the clutch if damage is severe enough.
Clutch overloaded.	Output torque required is greater than what the clutch can handle. If input torque going into clutch is greater than the output torque required, the clutch will slip. If it slips too long, the clutch surfaces will be galled.	Size clutch correctly for the application. Replace clutch.
Output stalled.	If output is stalled, clutch could slip to the point where it will burn up and destroy either bearings or the field.	Replace clutch.
Clutch not burnished.	If full torque is required immediately and clutch is not burnished, it will slip and could become galled.	Try to reburnish clutch. If slipping is to severe, clutch will have to be replaced.

NOISY CLUTCH

Potential Problem	Possible Reasons	Fix
If clutch is able to move on the shaft:	Check center bolt and washer to make sure it is tight. If it is tight, make sure that the shaft is not too long. Clutch shaft should end before the end of the clutch to allow some deflection in the center bolt and washer to keep clutch on tightly.	Retighten center bolt or change spacer or shaft length

Troubleshooting Guide

NOISY CLUTCH (continued)

Potential Problem	Possible Reasons	Fix
Noise from pulley bearing.	Check if bearing feels rough. Check belt load to make sure pulley and bearings are not over loaded.	Reduce belt load.
	High temperature can be caused by either operating environment or due to slippage. If slippage, clutch should be discolored. Refer to slippage section for potential reasons.	Reduce the heat or eliminate slippage.
Pinging or scraping noise noticed when clutch is disengaged	Air gap too close.	Increase air gap.
	Surface is heavily galled.	Re-burnish the clutch.
■ Noise is evident when the clutch is first installed and rotated by hand.	Possible causes are bolts in field not tightened down properly.	Tighten bolts.
	Key in keyway not seated properly. This could cause it to cock to one side.	Remove rotor assembly and reseat keyway.
	Lead wire pinched between mounting face and field bracket cocking field assembly.	Loosen the bolts, remove wire and retighten field mounting bolts.
	If set screw version, this could be because of improper air gap between pulley/armature and field.	Loosen set screw, push together, then back off .1", and retighten setscrew.
	Mounting face not concentric with the shaft.	Re-machine mounting holes or switch mounting face (by switching you will be able to verify if mounting holes on the clutch are the problem or the mounting holes on the face are the problem.)
■ Mounting bracket has come loose from back of field assembly.	Check to see if projection welds are broken. If they are, check to see if rotor strike has occurred. Possible misalignment in combination of belt side load has broken projection welds.	Replace the clutch.

■ Mobile Clutches Only

Troubleshooting Guide

NOISY CLUTCH (continued)

Potential Problem	Possible Reasons	Fix
Noise from field bearing (Noisy field bearing has failed or is about to fail.) In general purpose and PTO brakes	Check to see if the clutch is discolored to see if it shows signs of slippage.	Refer to slippage section.
	Check for damage to both the outer race and inner race of the bearing. Make sure key is not too tight forcing pressure on the inner race. In the outer race area, check for marks or damage that could have caused the clearances to close up.	Replace clutch.
	Check temperature if shaft clutch is mounted on to make sure it is under 300 F.	Reduce reason for the high temperature overloading on the engine.
	Check torque tab or backing plate to make sure that there is freedom of movement of 1/16 of an inch axially and radially. Check to see if any marks are evident that would indicate axial forces applied.	Loosen torque tab to make sure it has freedom of movement both axially and radially.
▲ Pinging or scraping noise noticed when clutch is engaged.	Brake shroud and air gap set too close. This means that the armature is contacting the brake while the clutch is engaged.	Back off the air gap to the higher end of the air gap range.
▲ Brake plate rattles.	In a heavy vibration application, the pin holding the backing plate can become worn because of vibration opening up clearance. This can then generate noise because of the additional movement in the braking plate.	Change the method of securing the clutch to allow for a greater surface area of contact so force is more spread out and less wear takes place.

▲ PTO Clutch/Brakes Only

Formulas to Determine Selection

The following formulas will help you arrive at the required torque for your application. Most mobile clutches accelerate in .2 seconds. Please use this as the time required in section #3.

1) How to calculate torque when horsepower and speed are known

$$\text{torque ft lb} = \frac{5252 \times \text{horsepower} \times \text{service factor}}{\text{speed}} \qquad T = \frac{5252 \times hp \times k}{n}$$

2) Inertia - How to determine inertia when material and shape are known.

(Total system inertia is total inertia of all the components. If the components are not simple shafts or flanges, break down each of the components into its basic shape and calculate inertia of that individual component. When inertia is being calculated in relation to the clutch or brake, remember to adjust for reflected inertia amounts which may have a significant increase or decrease on the inertia that the clutch has to handle based upon a speed differential.

(Inertia constants lb. in.^{3})

(aluminum) = 0.924

(bronze) = 0.321

(cast iron) = 0.26

(steel) = 0.282

Values

wk^2 = lb. ft.^{2}

D, D_o, D_i, L = in.

Formula to determine inertia of a solid shaft

$wk^2 = .000681 \times p \times \text{Length} \times \text{Diameter}^4$

$wk^2 = .000681 \times p \times L \times D^4$

Formula to determine inertia of a hollow shaft

$wk^2 = .000681 \times p \times \text{length} \times (\text{outer diameter}^4 - \text{inner diameter}^4)$

$wk^2 = .000681 \times P \times L \times (D_o^4 - D_i^4)$

Reflected inertia via gears, chain or belt

reflected inertia = load inertia divided by the square of the speed ratio

$$wk^2_R = \frac{wk^2_L}{r^2}$$

3) How to calculate the amount of torque required to accelerate or decelerate a load when inertia value is known (t = time to speed or time to stop depending if you are using a clutch or a brake.)

$$\text{torque ft lb} = \frac{(\text{inertia} \times \text{the change in rpm})}{308 \times \text{the time required}} \qquad T = \frac{wk^2 \times rpm}{308t}$$

Garden Tractor Application Data Fax Sheet

Date: _____

TO:	**FROM:**
Ogura Industrial Corp. 100 Randolph Road P.O. Box 5790 Somerset, NJ 08875-5790 Phone: (732) 271-7361 Fax: (732) 271-7580 E-mail: info@ogura-clutch.com Web: http://ogura-clutch.com	_____ _____ _____ _____ _____ _____ _____

The answers to the following questions will help us suggest a clutch for your application using our standard products customized to fit your exact needs.

This application is for:
- ☐ Cost estimating only
- ☐ Current production requirement
- ☐ New product requirement

Application Type: ☐ Pump (hydraulic or water/vacuum) ☐ PTO clutch/brake for mower
☐ Other _____

Application Description: _____

Clutch Mounted On: ☐ Pump shaft ☐ Engine shaft ☐ Other

Torque required from clutch _____ Clutch to handle _____ horsepower

Shaft Diameter: ☐ Taper _____ ☐ Straight _____

Engagement speed of the clutch _____ **Running speed of the clutch** _____

Clutch pulley rotation (from the pulley side): ☐ Clockwise ☐ Counterclockwise

Inertia required for clutch to accelerate: _____
If you do not know iner tia, please refer to web site: http://ogura-clutch.com

Life: Target cycle life _____ Target hours of life _____

Pulley required: Number of grooves _____ , pitch diameter _____ belt type _____

What is the estimated annual quantity _____ , cost target _____ ?
(This is impor tant to determine if a "special" is possible based upon your quantity).

When do you require your first prototype _____ ? How many do you require _____ ?

When does production begin _____ ?

General Purpose Clutches

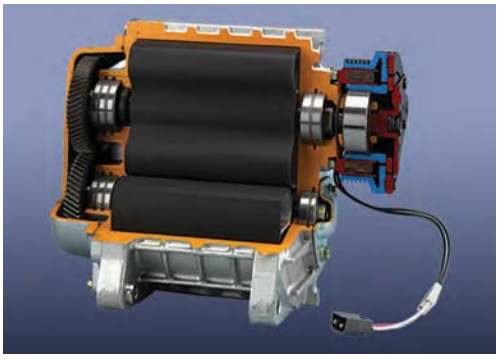
OGURA WARRANTY

Products are warranted against defects in material and workmanship for a period of 12 months from date of shipment, when applied in proper applications within specified ratings. This warranty covers repair or replacement, F.O.B. Somerset, New Jersey. There is no further warranty or implied representation as to any product. The company shall not be liable for any consequential damage caused by improper application or installation of its product.

OGURA
INDUSTRIAL CORP.

Other Products Available From Ogura

1 ▶



◀ 2

3 ▼

◀ 4

5 ▼

6 ▼

1 Ogura Supercharger: For increased gas and diesel horsepower and performance and decreased engine emissions.

2 Spring Applied Brakes: Used to stop or to hold an electric motor from rotating when there is no electrical power applied.

3 Tooth Clutches: Deliver high torque in a small diameter.

4 Multi Disk: Deliver a high torque in a small diameter and can engage and disengage while rotating (used in multispeed gearboxes).

5 Marine: Heavy duty, compact marine clutches require minimal space while providing high torque.

6 Industrial: Ogura manufactures a wide variety of friction, magnetic particle and hysteresis clutches for a variety of industrial and office automation applications.

OGURA INDUSTRIAL CORP.

Ogura Industrial Corp.
100 Randolph Road • Somerset, NJ 08873
tel: 732-271-7361 • fax: 732-271-7580
e-mail: info@ogura-clutch.com
web: http://www.ogura-clutch.com