

Background Information

Basic Definitions

Accel/Decel – Control soft start/stop feature where voltage is increased over a period of time, adjustable from 0 to 3 seconds.

Acceleration Time – Time required to accelerate a load to speed also called time to speed. (unit of measure = seconds)

Anti-backlash Armature Assembly – Armature plate and hub attached to each other by a flat spring. The result is zero backlash between the armature plate and hub; also called Spring Drive. Available on models 303 and 304.

Anti-Overlap – Control feature that prevents both the clutch and brake being applied at the same time.

Ajusto-gap® – Self adjusting spring mechanism that separates the armature plate from the friction face. Available on Spline and Pin Drive.

Bearing Mount – Unit that is supported on the customer's shaft by an internal bearing.

Build Up Time – Coil turn-on time to build the flux field.

Burnishing – The wear in process between the armature plate and friction face surface to obtain rated torque.

Coil Time Constants – Time to either build up or decay flux fields.

Customer Switches – Any type of customer logic that determines whether the clutch or brake is activated.

Decay Time – Coil turn-off time to decay the flux field.

Deceleration Time – Time required to decelerate a load to a stop also called time to zero speed. (unit of measure = seconds)

Emergency Stop – Control feature that prevents the clutch from activating.

Field – Metal housing that contains the coil, used in a clutch.

Flange Mount – Field or magnet that is bolted to the customer's machine by a mounting plate. This plate can be inside or outside mounting style.

Friction Material – NON-ASBESTOS lining material between the magnetic poles used to reduce wear and stabilize torque transmission. Other friction materials are available.

Lining Co-efficient's are:

Standard = .45, High (HK) = .68, Low (LK) = .18;

Consult factory for availability of HK and LK linings.

Flux Field – Magnetic lines of force that clamp the armature plate and friction surface together to transmit torque. The strength of the flux field is proportional to the units torque.

Gap – Distance between the armature plate and friction face.

Inertia or WK² – Measure of an objects resistance to change of motion. Bodies at rest tend to stay at rest and bodies in motion tend to stay in motion. (unit of measure = Lb-In²)

Inside Mount – Flange mount plate where the mounting bolt circle is inside the diameter of the field or magnet.

Magnet – Metal housing that contains the coil and friction material, used in a brake.

Outside Mount – Flange mount plate where the mounting bolt circle is outside the diameter of the field or magnet.

Over-Excite – Control feature that applies a spike of high voltage to the field magnet for rapid engagement

Overlap – When both the clutch and brake are applied at the same time.

Pin Drive – Drive type where pins are used to transmit torque. These pins allow the armature plate to slide on them for engagement with the friction surface.

Rotating Field – Magnet that spins with the shaft it is attached to. A slip ring and fixed carbon brush box are used to transfer the electrical current to the rotating magnet.

Rotor – Rotating friction face that is attached to the customers shaft.

Rotor and Field Assembly – Field that does not spin and contains a rotor that is bearing mounted inside it. This is a stationary field type.

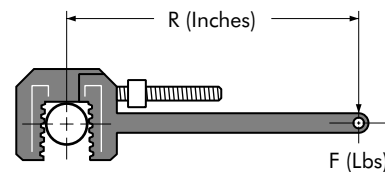
Short Protection – Control feature where the incoming line fuses blow when any type of electrical over load is encountered protecting the control from damage.

Spline Drive – Drive type where a spline is used to transmit torque. The spline allows the armature plate to move on it for engagement with the friction surface.

Spring Set Brake – Holding type of brake that is activated by springs and requires power for release. This type of brake requires periodic adjustment and is not suited for cycling applications.

Stationary Field – Field that does not rotate it is either flange or bearing mounted.

Torque – The action of a force producing or tending to produce rotation. Torque consists of a force (lbs) acting upon a length (ln) of a lever arm. (unit of measure = in-lbs)



Torque = Force "F" (lbs) x Lever Arm "R" (inches)

Static Torque – Torque at zero speed (holding).

Dynamic Torque – Torque at running speed

Torque Adjustment – Control feature where the field or magnet voltage is variable. Lowering the voltage lowers the torque capability of the unit. Previously this feature was used for soft start/stop; if this is required use a control with accel/decel.

Product Definitions

Custom Design – Group of individual components assembled by the customer. Custom Design products are: Clutch-Couplings, Custom Clutches, Flange Mounted Brakes, Clutch-Brake-Couplings and Custom Clutch-Brakes.

Packaged Products – Complete unit or sub-assemblies that are factory assembled and tested. Packaged Products are: C-Face Packages, Foot Mounted Packages, Sheave Clutches, Shaft Mounted Brakes and Spring Set Holding Brakes.

Brake – Power applied motion stopping device. (Packaged or Custom design)

Clutch – Motion starting device between parallel shafts. (Packaged or Custom design)

Clutch-Coupling – Motion starting device between in line shafts. (Custom design)

Clutch-Brake – Motion start-stop device between parallel shafts. (Packaged or Custom design)

Clutch-Brake-Coupling – Motion start-stop device between in line shafts. (Custom design)

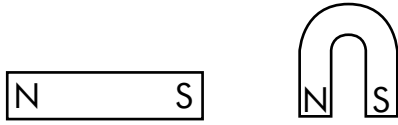
Spring Set Holding Brake – Power released holding device.

These brakes require periodic adjustment and are not suited for cycling applications. Spring Set Holding Brakes are considered a Packaged Product; The body is assembled and tested at the factory, the hub portion is mounted to the machine as a separate item by the customer.

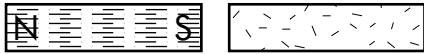
Background Information

Introduction to Electromagnetism

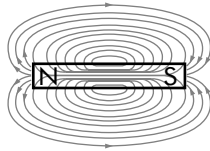
Every magnet has two poles regardless of its size or shape. These poles are referred to as North (N) and South (S).



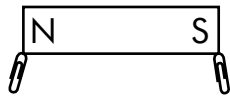
Molecules line up with the poles in a magnet.



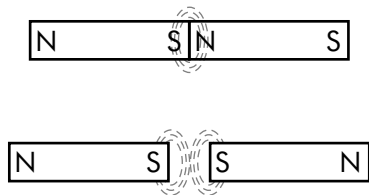
Invisible magnetic lines of force known as a magnetic flux travel in a path through and around the magnet from pole to pole.



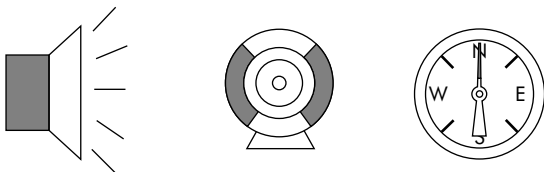
This magnetic flux or field can attract ferrous objects such as iron and steel to either pole.



Unlike magnetic poles attract each other while like poles repel each other.

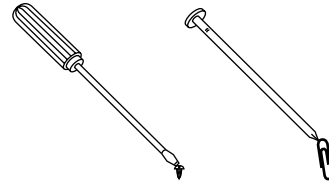


There are basically two types of magnets. These are permanent and temporary. Both types are used extensively. Permanent magnets can be found in speakers, permanent magnet D.C. motors, door latches, compasses, generators, and hundreds of other items we see and use daily.

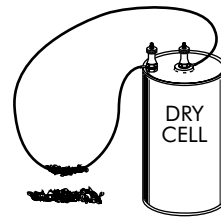


Permanent magnets are hardened by the addition of other metals such as nickel and cobalt that alter their molecular structure and will retain their magnetism indefinitely. Temporary magnets lose their magnetism rather quickly.

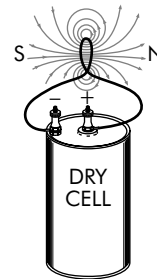
Any ferrous object that has been subjected to a magnetic field can be temporarily magnetized. However, this residual magnetism will eventually be lost.



Another form of temporary magnet is the electromagnet. As direct current flows through a wire, a magnetic field forms around this wire.

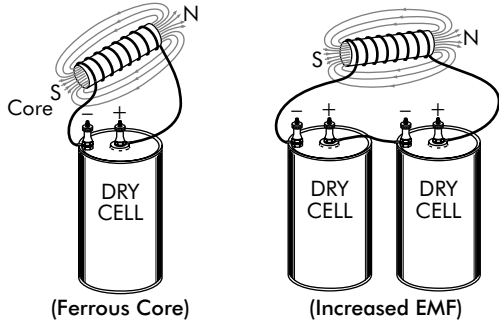
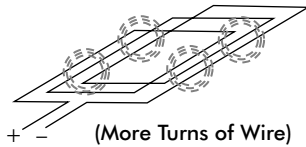


A magnetic field forms in a circular pattern around the wire when current is applied. The field collapses when current is removed.

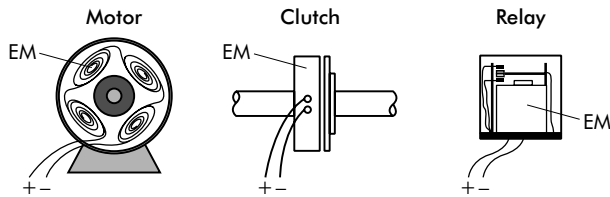


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The intensity or strength of an electromagnet can be increased by adding turns of wire, increasing voltage (EMF), and/or by adding a ferrous core material to serve as a path for the flux. The electromagnet can be controlled in design and application by these same factors.

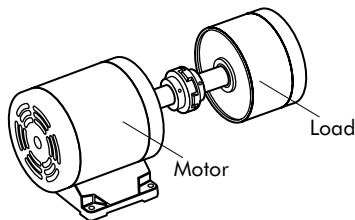


Electromagnets (EM) are used in motors, relays, clutches, and brakes, and hundreds of other items we see and use daily.



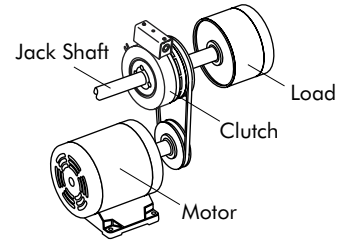
How Dynacorp® Friction Clutches and Brakes Operate

There are many applications where a load or machine is directly coupled to a driving motor.



However, in many instances, this is not feasible nor practical on a continual basis. This is especially true when cycling speed up and down, rapidly cycling the load, rapidly reversing, jogging, soft starting, slipping, indexing, positioning, or braking.

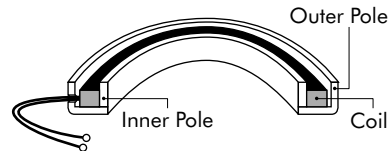
A clutch is a device which will allow the coupling and decoupling of the motor and the associated load when required.



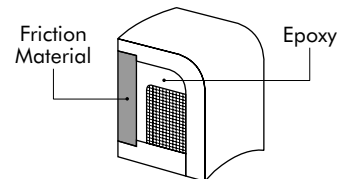
When the clutch is engaged, the motor and load can be solidly connected together for full torque transmission or can be allowed to slip at a pre-determined rate to transmit various torques at various speeds while accelerating to drive speed. When the clutch is disengaged, the motor and load are disconnected and no torque is transmitted.

Dynacorp® clutches are electromagnetic single disc friction clutches consisting of input and output members which engage and disengage electromagnetically. When de-energized, the input member rotates freely with the motor. The output coasts to a stop/rest. When energized, both members rotate. A friction material is used to help transmit torque from the input member to the output member.

Dynacorp® products do not use permanent magnets. They use temporary electromagnets commonly known as field magnets. These field magnets consist of a coil, an inner pole, and an outer pole.



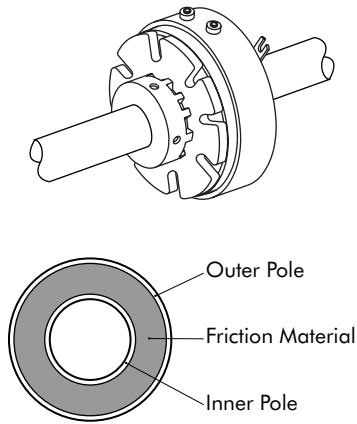
Most field magnet coils are epoxy bonded with the friction material into the field magnet housing.



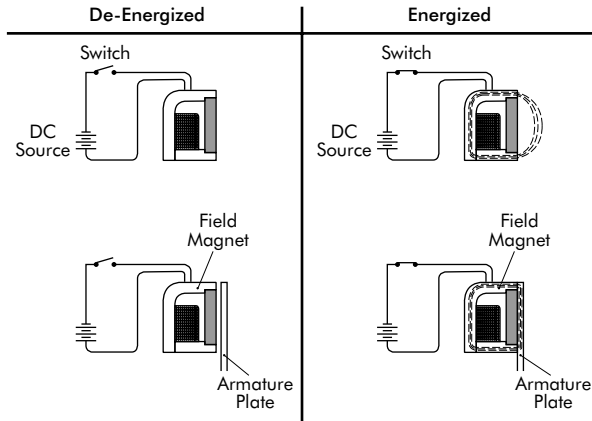
Typical coil voltages for both clutch and brake products are 6, 12, 24, and 90 VDC. 90V is most common in the U.S. 24V is typical in Europe.

Background Information

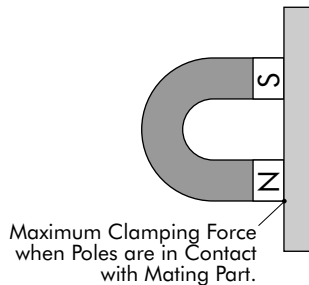
Since a field magnet typically rubs against another member, known as an armature plate, friction material is located between the poles to help transmit torque and reduce wear on both members.



When DC voltage is applied to a field magnet, magnetic lines of force (flux) attract the steel armature plate to the magnet and the clutch (or brake) engages.



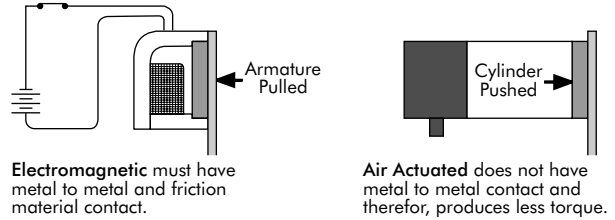
Dynacorp® friction products transmit torque by clamping two objects together electromagnetically. This clamping force requires a metal-to-metal contact between the magnetic poles and armature plate. Why? Think of a horseshoe permanent magnet and a bar of steel. The strongest clamping action occurs when they are in contact.



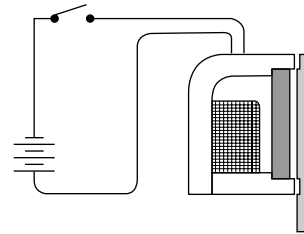
Also think of your home refrigerator and the magnets that hold up notes. Where is the strongest force? Friction material is added to reduce wear, provide torque stability, and help eliminate pole galling.

Burnishing

To obtain rated torque, it is necessary to establish intimate contact between the armature and mating magnetic poles. This is accomplished by either the normal wear-in process that will occur during operation in a machine or by pre-burnishing the friction surfaces.



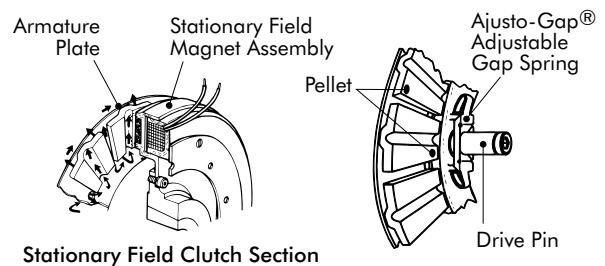
Dynacorp® clutches and brakes are shipped from the factory with the friction material slightly undercut below the magnetic poles. This is done to facilitate good initial armature to pole contact and allow for a rapid wear-in process.



Normal Wear Pattern
Grooving in the Armature Plate opposite of the Magnet or Rotor poles is normal.

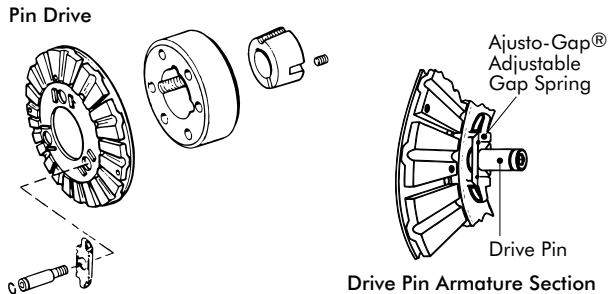
Wear-in time required is usually dependent upon speed, load, and duty cycle. If rated torque is required immediately, it is recommended the units be burnished at the installation. Burnishing can be accomplished by reducing the voltage to 30 or 40% of the rated voltage and cycling the units on and off in the application. At the reduced voltage, the units will slip under load and wear themselves in. The units should be cycled on and off at 2 second intervals to prevent the friction surfaces from overheating.

Armature plate assemblies for clutches and brakes are specially designed to dissipate heat. Uniquely shaped segments are welded to the armature plate. Air is able to flow under and around each segment. Graphite pellets are incorporated in segments on certain models to restrict galling of the pole surfaces and stabilize torque transmission.

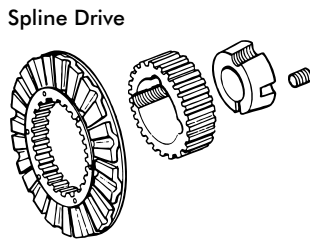


Background Information

Both brake and clutch products are available in pin (normal duty) and spline drive (heavy duty) models. In pin drive models, torque is transmitted on drive pins that extend through bronze bushings in the armature. Ajusto-gap® automatic wear adjustment is standard. Pin drive units tend to cost less and are quite acceptable for normal applications.

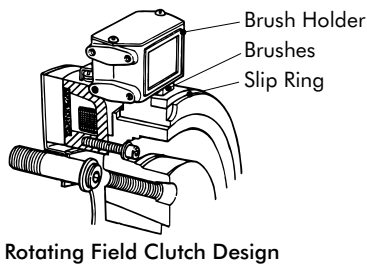


Spline drive units transmit torque via spline teeth. Splines may be made of stainless steel, steel, or nylon, depending on the model and size selected. Spline drives are ideally suited for heavy duty applications, especially where shock loading exists. Automatic wear adjustment is incorporated into the design of most of these units.

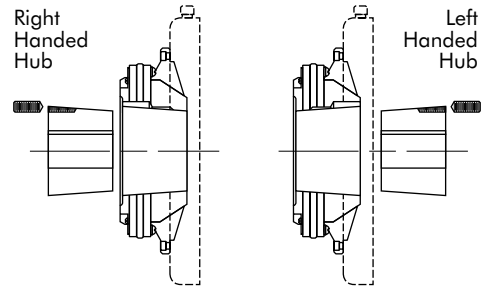


Clutches come in two styles... rotating (primary) or stationary field design.

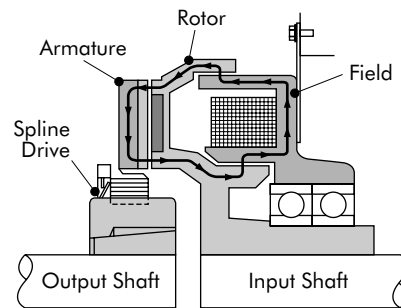
Rotating field clutches use a slip ring and hub assembly along with a brush holder and carbon brushes to provide power to the rotating field magnet.



Rotating field clutches are available with right or left handed style hubs for customer mounting convenience. The taper bushing enters from the back side of the assembly on the right hand style. On the left hand style assemblies, the taper bushing enters from the friction surface side.



Stationary field clutches keep the magnet coil stationary while rotating the associated poles and friction material (rotor assembly). When this clutch type is bearing mounted, the magnet coil rides on bearings in a stationary position as the rest of the assembly rotates.



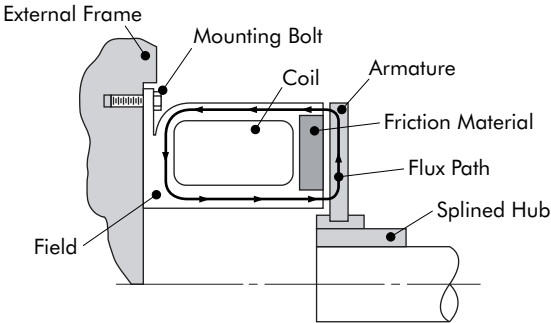
When energized, the lines of magnetic force or flux generated by the magnet coil traverse the air gap to the rotor (and poles) to attract the armature and transmit torque.

Background Information

Brakes

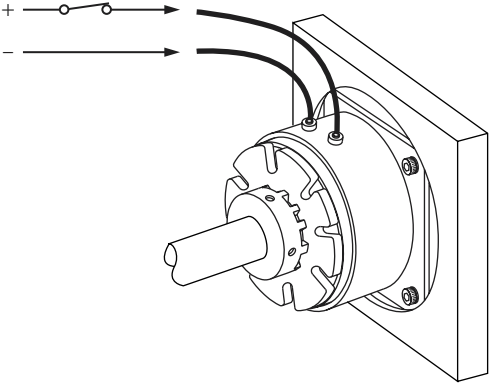
Unlike clutches, which are typically associated with starting, brakes are used for stopping.

With a Dynacorp® brake, the field magnet is mounted against or attached to a stationary surface. The field coil is either bolted down via a flange or held in place by an arm attached to a stationary surface.



The armature is attached to the load via a shaft.

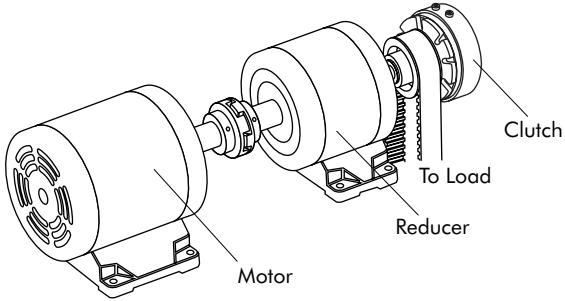
As the field magnet is energized, it attracts the armature and causes the load to stop.



Clutches and Brakes

Clutches

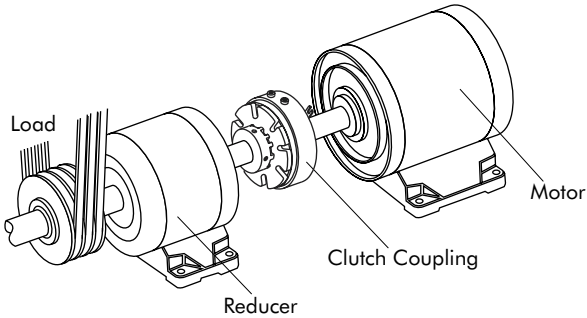
Clutch-couplings and clutches are terms often used interchangeably for they perform a similar function. Clutches are used to couple two parallel shafts via a sheave, belts, chain and sprocket, etc. The function is the same as a belt or chain drive, except the transmission of power is controlled by the clutch.



Note: Dynacorp® sheave clutches are available as factory assembled units.

Clutch-Couplings

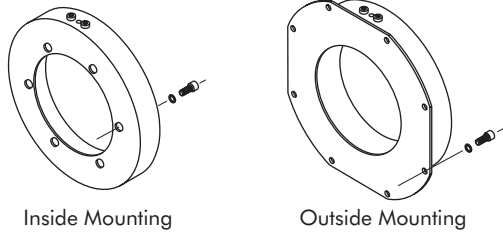
Clutch-couplings, on the other hand, are used to couple two in-line shafts. The function is the same as any type of shaft coupling, except the transmission of power is controlled by the clutch-coupling. Half of the clutch is assembled to one shaft. The remainder is on the other shaft.



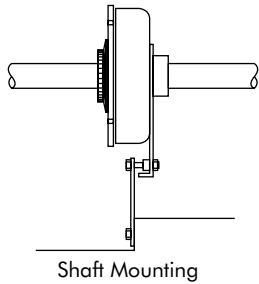
When specifying a unit, it is important to understand and distinguish these differences to avoid confusion..

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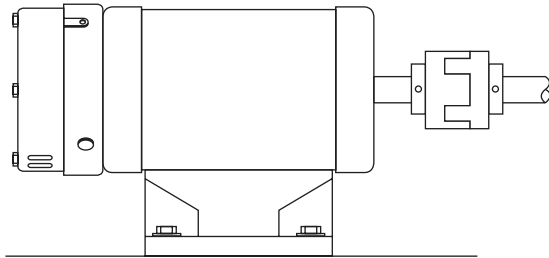
Brakes



Dynacorp® offers two different brake mounting configurations. The first is flange mounted. This configuration is offered with either inside or outside type backplates (IM or OM). The second is bearing or shaft mounted which uses an arm to hold the field magnet stationary.

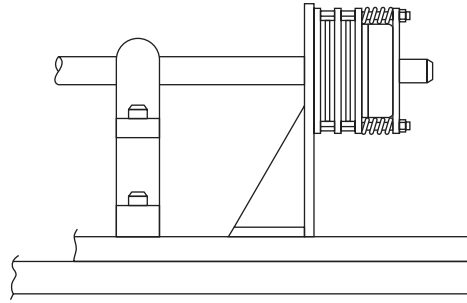


Shaft mounted brakes are available to those applications which require a brake to be mounted on a through shaft or shaft end. The body of the brake rides a bearing on the shaft and is held in place via a torque arm mounted to a stationary surface. The armature is fastened via a bushing to the shaft and rotates with it.



Motor mounted brakes mount directly to a rear C-face of a motor, thus providing a convenient means of stopping a motor and its associated load. Sizes are available to fit standard NEMA C-frame motors from 48YC to 326TC.

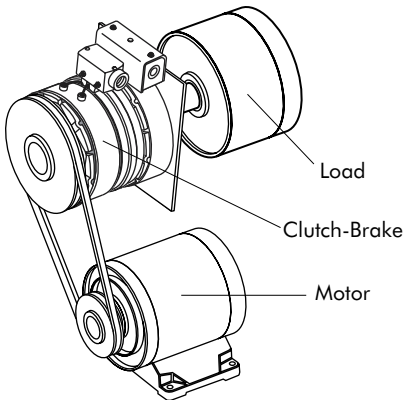
Spring Set Brakes



All brakes previously discussed have been power applied. Spring set brakes differ. Spring set brakes or electromagnetic release brakes, provide braking torque when in the de-energized state. As the brake is energized, the load is released and allowed to rotate. When de-energized, springs engage the brake. Spring set brakes are designed as flange mounted and "C" face mounted. Unlike power applied units, spring set brakes require periodic adjustment. Their primary application is a holding brake.

Background Information

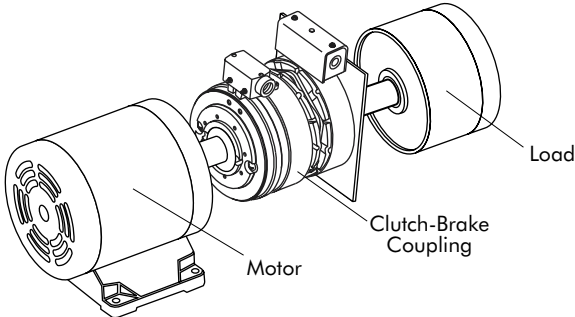
Clutch-Brakes



Clutches and brakes can be combined to provide both starting and stopping functions.

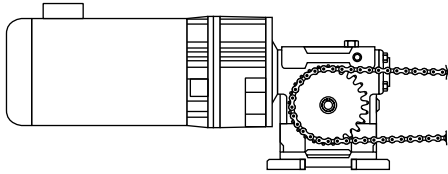
Clutch-Brake Couplings

Custom design clutches and brakes can come in the form of clutch-brake couplings. They are designed to couple in-line shafts as well as provide clutch and brake actions. A number of Dynacorp® clutch-brake couplings are available.

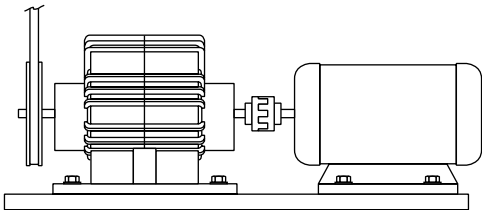


Custom design clutch and brake units or factory assembled clutch-brake packages can be utilized to provide these functions. NEMA C-Faceclutch-brake packages are available for all popular motor frame sizes. Foot mounted packages which couple the drive to the load are also available.

C-Faced Package



Foot Mounted Package



Clutches, brakes, clutch-brakes, and clutch-brake couplings provide starting and stopping accuracy. These devices permit rapid cycling of machinery while preventing motor burn-out. Accuracy and increased cycle rates result in greater production and throughput from associated machinery.

