

Another method of reducing brush noise is by connecting a capacitor across the input terminals *as close to the brush ring as possible*. The value of this capacitor should not exceed

$$C = \frac{500L_M}{R_M^2}$$

where L_M is in millihenries, R_M is in ohms, and C is in microfarads.

opposite the brush ring assembly. The structures designed to support the field assembly must be sufficiently strong to avoid any distortion of the field assembly when it is bolted in place. The field assemblies of Alnico magnet motors must be mounted in non-magnetic structures in order to preserve the specified performance characteristics. Satisfactory materials are aluminum, brass and non-magnetic stainless steel. The minimum thickness of non-magnetic

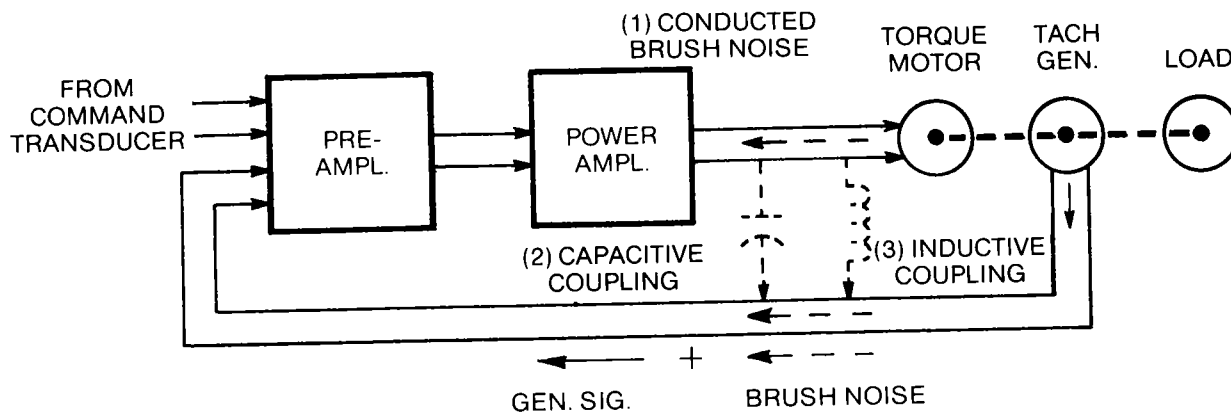


Figure 1-9

Methods by which electromechanical interference is transmitted to control circuitry.

HOUSING DESIGN for FRAMELESS MOTORS

The frameless motors in this catalog fall into three basic configuration categories: frameless, frameless with armature adapter machined to existing mounting dimensions (See Figure 1-11) and units with a partial housing and mounting flange or tabs (See Figure 1-12).

For the purely frameless units and units with armature adapters, a housing for the field structure must be incorporated into the system design. In general, the field structure is piloted on the outer diameter and is mated on the face

material required to separate the field structure from magnetic material is 1/4 inch. Samarium Cobalt motors may be mounted in magnetic or non-magnetic housings.

Units with a partial housing do not require a special field housing. They can be bolted onto a flat plate, and thus are ideal for mounting on the exposed end of a shaft. Mounting features for this arrangement include round or square flanges or tabs.

To maintain the integrity of the mechanical and magnetic structure of the motor, the armature should be mounted on a shaft in such a way as to minimize eccentricity around any point in

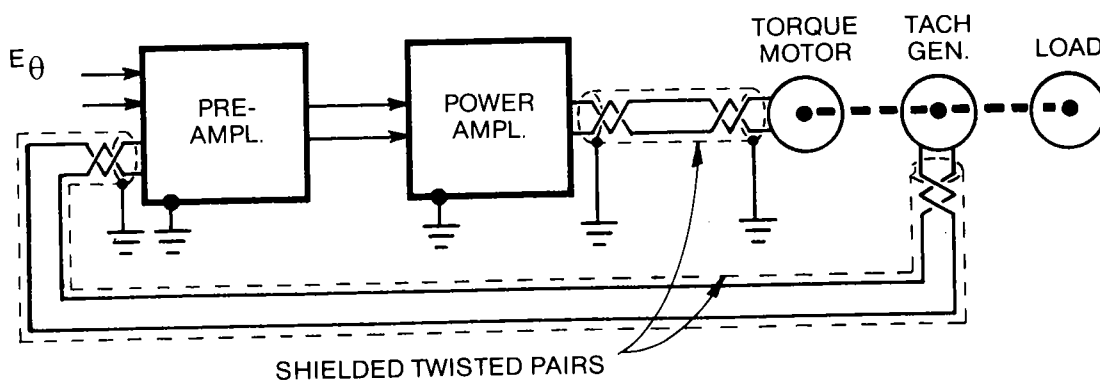


FIGURE 1-10

Recommended methods of protection against EMI.

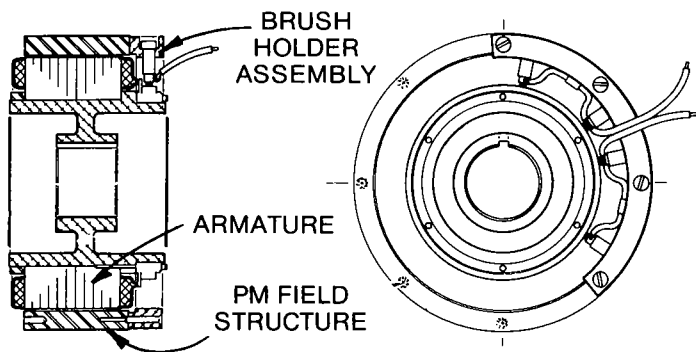


Figure 1-11

Frameless torque motor with armature adapter machined to existing mounting dimensions.

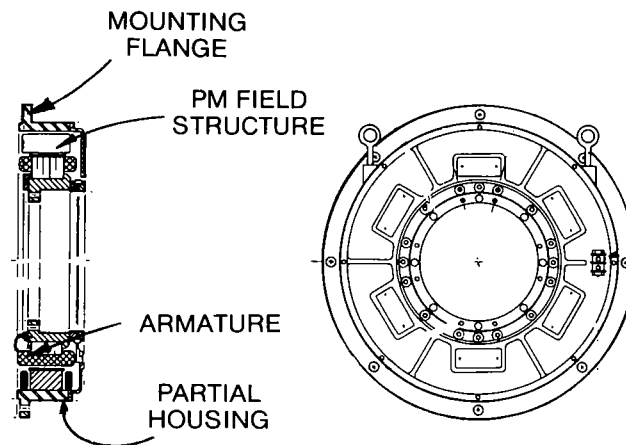


Figure 1-12

Frameless unit with partial housing.

the armature plane. Each individual data page specifies a required concentricity between the stator and rotor. This mounting requirement stems from a maximum run-out of one-third of the air gap dimension.

The rotor bore, as indicated on the individual data pages, may be used as a pilot for shaft mounting. Standard rotor-to-shaft mounting methods include shrink fits, interference fits, adhesives (such as Loctite®)* and axial clamping of both sides of the laminations. Units can be supplied with keyways or with adapter hubs suitable for mounting directly onto the customer's shaft.

*Trademark of Loctite Corp., Newington, CT

MOTOR HANDLING and STORAGE

Frameless Motors

Because frameless DC motors are designed to be an integral part of system equipment, they require some special handling procedures. Improper handling in shipping or installation can substantially degrade motor performance.

When received, a frameless motor should be unpacked carefully to avoid damaging the brush ring assembly or the commutator surface. Precautions must be taken to avoid bending any of the brush springs or scoring the mounting diameters. The commutator surface must remain free of scratches, fingerprints and oils. For Alnico magnet motors, **DO NOT LOOSEN OR REMOVE THE FLUX KEEPERS** until

installation (See page xvii for details). If motors must be transported, they should be packed in the original shipping packages for protection against shock and vibration. Electrical performance tests and mechanical inspection of parts for critical dimensions are performed at the factory before shipment. If performance tests are required by the customer at receiving inspection, they should be limited to those tests described on the Inland test data form which accompanies each unit.

Inland motor parts are tested, assigned serial numbers and guaranteed only as matched sets. Tested performance is not valid if parts are interchanged between motors.

In storage, containers and racks should be of non-magnetic materials. Field assemblies should be spaced a minimum of ½ inch apart. Motor parts should be protected against exposure to, or contact with, small magnetic particles such as iron filings, chips or dust. If such particles are attracted to the magnetic areas of the motor, they are very difficult to remove. In addition, should any material lodge in or across the motor airgap, performance may be seriously degraded.

Storing motor parts in normal factory ambient temperatures is acceptable. For extended storage, corrosion should be guarded against by storing the parts in a sealed plastic bag together with a desiccant suitable for protecting the motor against excessive humidity. The original packaging by the factory is adequate if it is kept intact.

Housed Motors

Inland housed motors require handling similar to that of conventional frame-type motors. Care should be taken to protect the unit against exposure to small magnetic particles such as iron filings, chips or dust.

As with frameless units, storage at factory ambient temperatures is acceptable. For extended storage, motors should be packaged with a desiccant to protect against excessive humidity. The original packaging by the factory is adequate if it is kept intact.

INSTALLATION

The exact manner in which frameless torque motors are installed varies with the motor. However, there are five basic methods, each of which depends upon the particular motor configuration: rare earth frameless, Alnico frameless and partially housed frameless with shipping clamp plate, clamp bolt or pole piece clamp.

The procedure to be followed when installing frameless rare earth magnet motors is as follows:

- 1) Insert the permanent magnet field assembly into the housing cavity allocated for it. If the housing material is magnetic, exert care to avoid sudden impact of stator against the housing.
- 2) Secure the field assembly to the housing with mounting screws. The screw size is specified on the motor drawing, but the screws are not provided.
- 3) Guide the rotor into its final position within the field assembly, being careful to avoid scratching the commutator surface or chipping the magnets. If possible, it is recommended that the rotor be wrapped with a piece of polyester film (such as Mylar®)* thinner than the air gap before it is inserted. Once the rotor is in place the polyester film should be removed.
- 4) Install the brush ring. Take care in slipping the brushes over the commutator. Avoid bending the brush springs or scratching the commutator surface. For proper position, line up the numbers marked on the stator and brush ring assembly. Then secure the brush ring assembly in place with the mounting screws provided.

Frameless Alnico units should be installed as follows:

- 1) Insert the permanent magnet field assembly into the housing cavity allocated for it. **DO NOT LOOSEN OR REMOVE THE KEEPER.**
- 2) Guide the rotor into its final position within the field assembly, being careful to avoid damage to the commutator surface.
- 3) Remove the keeper ring using the jack screw as shown in Figure 1-13.

4) Secure the field assembly to the housing with mounting screws. The screw size is specified on the motor drawing, but the screws are not provided.

5) Install the brush ring. Take care in slipping the brushes over the commutator. Avoid bending the brush springs or scratching the commutator surface. For proper position, line up the numbers marked on the stator and brush ring assembly. Then secure the brush ring assembly in place with the mounting screws provided.

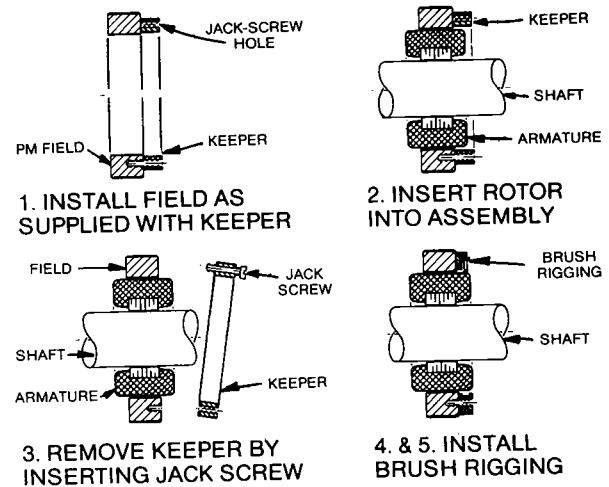


Figure 1-13
Keeper removal.

For partially housed Alnico units with shipping clamp-plates, typified by type T-10036 (See Figure 1-14) the rotor must not be removed from the stator or partial demagnetization and change of motor torque characteristics will occur. The field and armature assemblies are installed into the shaft and the field support as a single unit. The clamp plate is then removed to permit rotation of the armature. After removing the clamp plate, be sure to tighten the mounting bolts.

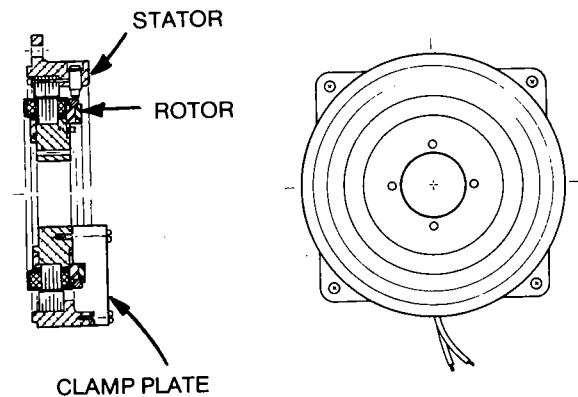


Figure 1-14
Clamp-plate motor, type T-10036.

*Trademark of DuPont, Wilmington, DE.

Partially housed Alnico units with clamp-bolt or pole-piece clamp are similar to each other in that the accessory clamp elements are simple screws. In the case of the clamp-bolt types, which are typified by the T-10035 motor (See Figure 1-15), securing the clamping bolts moves the rotor axially a sufficient amount to lock the rotor and field together at an existing interface.

The pole-piece clamp type, typified by the

T-18002 motor (See Figure 1-16), locks the rotor to the field at the air gap by forcing a number of movable field pole-pieces radially inward until clamping action takes place. After installation of this type motor, the clamping set screws are loosened, and the main pole-piece stud nuts are retightened to secure the pole pieces in their proper position.

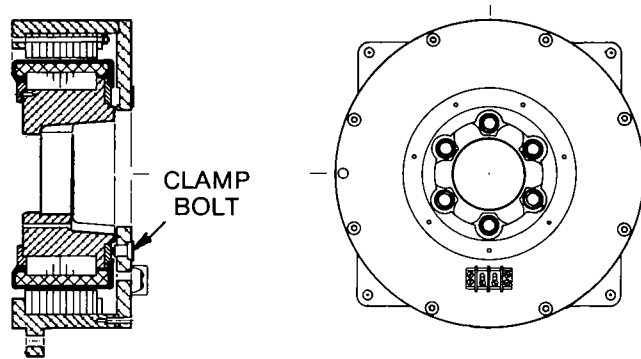


Figure 1-15
Clamp-bolt motor, type T-10035.

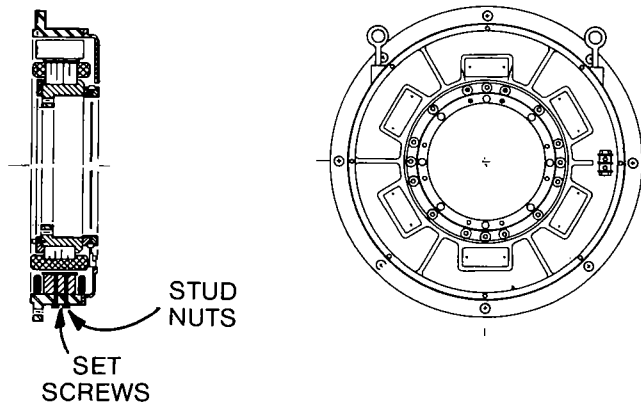


Figure 1-16
Pole-piece clamp motor, type T-18002.