LAYCO ELECTRIC INNOVATIONS

Your Premium Provider for Supply and Service of Electric Motors, Industrial Controls, and Power Distribution Solutions

Information Sheet # 03

Your Reliable Guide for Power Solutions

SERVO REPAIR & MAINTENANCE
Brush and Brushless Servos

1.0 Introduction:

One of the many areas of LEI expertise is the supply and maintenance of servomotors. Servomotors both AC and DC, brushed and brushless are integral components within a multitude of applications requiring precise control of pieces of equipment/machinery.

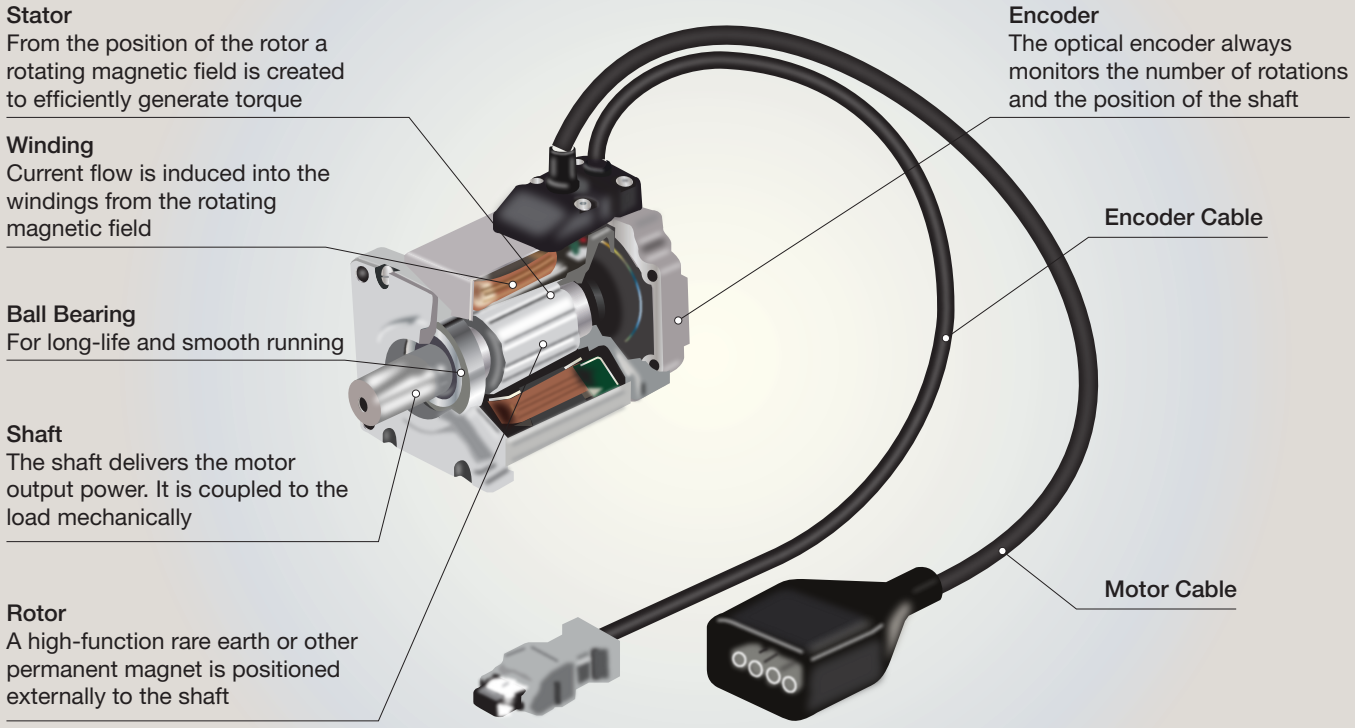
This information sheet introduces servomotors, the components within them, the importance of working with a supplier that is experienced in their operation, maintenance, and the experience to deliver a fully operational servomotor having gone through a rigid inspection, overhaul, and test procedure.

2.0 What is a Servomotor:

Servomotors are used in a multitude of industrial and commercial applications including robots, CNC machinery and many automated manufacturing processes. A servomotor is a rotary or linear actuary coupled to a piece of machinery for precisely controlling an angular or linear position, velocity, and acceleration. A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position within the machinery it is controlling.

Figure 1

Typical Components Within a Servomotor



To fulfill our commitment to be the leading supplier, the Layco Electric Innovations team ensures they are always up-to-date with the current industry standards as well as industry trends. As a service, our **Information Sheets** are circulated on a regular basis to existing and potential power customers to maintain their awareness of changes and developments in standards, codes and technology within the power and motor control industry.

3.0 Operation of a Servomotor:

Operating in a closed-loop servomechanism the servomotor uses a position feedback to control its motion and final position. To determine feedback the motor is fitted with an encoder, see *figure 1.* The measured position of the output is compared to the command position, the external input to the controller.

4.0 Brushless Versus Brushes:

The sample depicted in *figure 1* is a brushless variant. The main advantage of brushed servomotors is their reduced cost. However, where electrical noise (brushes arcing on the commutator) feedback into the electronic controls is an issue, the brushless type is preferred.

Brushless motors also eliminate the need to replace brushes during maintenance cycles. The principal disadvantage of brushless is a higher initial cost, but by reducing electrical noise and repair cycles, it is just as common to see brushless servomotors.

5.0 What Goes Wrong with a Servomotor:

Like any piece of machinery a servomotor is subject to mechanical wear and deterioration of electrical components. Manufacturers recommend inspection at given intervals of bearings, shaft wear, alignment, breakdown of winding insulation, faulty connections, and replacement of brushes is a brushed machine.

6.0 LEI Servomotor Repair Process:

LEI has a set process for the repair and overhaul of servomotors. This process starts from an initial inspection to evaluate if the servomotor is repairable through the following steps to have a fully refurbished unit:

6.1 Mechanical Component Initial Evaluation:

A visual evaluation of parts subject to wear and damage. This includes checking the shaft, keyway, endbells, terminals, and connections. The general state of the casing is also examined as are any fixing points.

6.2 Evaluating Stator and Insulation:

- A surge evaluation or short test is undertaken to determine is the stator has to be rewound. After this evaluation the insulation resistance of each of the phases is undertaken by a megger test.
- The next step is the phase balance test. A RMS meter is used to ensure the windings are balanced between the phases. (If the servomotor is fitted with a brake this will also be checked at this stage).
- The conditions of the magnets in the servomotor are then checked using a KE test.
- The final stage of evaluation is to test if the feedback device on the servomotor is working as intended.

6.3 Taking Apart the Servomotor:

Careful disassembly includes -

- Removing the backplate and then the encoder and its housing. Care is taken in disconnecting the wiring.
- Next the end bells are removed and the rotor is pulled from the stator. At this stage a visual examination of the rotor and shaft is made.
- The final stage of disassembly is to remove the bearings, bearing housing, and any brake.

6.4 Cleaning:

After disassembly all the servo parts are thoroughly cleaned with an alkaline washer.

6.5 Stator Rewind:

The stator will be stripped of all its copper, cleaned and sprayed with insulating paint. Phase paper is cut and installed to line the stator iron and provide protection against ground faults.

The stator is rewound with the appropriate wire size and number of wires to ensure the correct magnetism is attained when the windings are under load.

6.6 Servomotor Test:

When reassembly is complete a series of tests is conducted, including, a resistance check, surge test, hi-pot, and evaluate of the poles. When fully reassembled the Back EMF (Electromotive Force) can be obtained. Back EMF is a voltage that is generated by servomotors at certain speeds and must meet factory specification in order for motors to operate at expected torque.

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