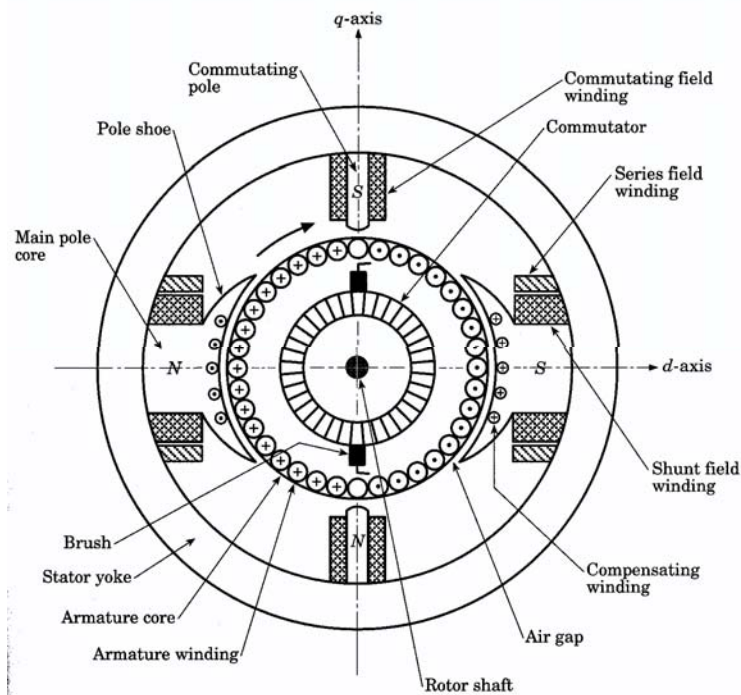


Technical Information

Neutral zone

In case of brush problems on a DC motor we can distinguish between electrical, mechanical and environmental problems. Mechanical problems are e.g. vibrations, out-of-roundness, high bar etc. Environmental problems are humidity, ambient influence, environment etc. As electrical problems we regard low load or “commutation problems”. Then a routine answer is, that the neutral zone isn't set correctly. What does that mean ?

The following sketch is an illustration of a simple, two pole DC motor:



In a DC motor, commutation is the process of periodically reversing the current flowing in individual armature coils in order to maintain unidirectional torque as the armature coils move under alternate field poles. The commutator must reverse current through armature coils which left the influence of one field pole and are approaching the influence of an alternate field pole. The motor brush then contacts

more than one commutator segment and an armature loop is momentarily shorted. If the short has a difference of potential across its ends, severe sparking can occur between the brush and the commutator. The commutator then can burn and pit and brush life is reduced. It is thus necessary to insure that voltage is not induced in the commutator loop at the time of the momentary short. If the short occurs when the active conductors in the armature loop are moving in parallel to the field, mag-

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netic lines of force will not be cut and voltage will not be induced in the armature loop. This vertical axis occupied by the shorted armature loop is the geometric **neutral axis**. In theory, this is where black commutation takes place. But life is not that simple! Due to the self induced e.m.f. and changes in load, the situation is somewhat more involved and beyond the scope of this article. In the end however,

electrical neutral must be properly set to assure good commutation and good brush life. There are various methods to determine the neutral line of a machine.

Simplified method

The following modifications render a result a little less accurate but much quicker:

- Machine at rest, armature disconnected and locked.
- The poles are fed with low voltage alternating current rendering unnecessary the switching required when using D.C.
- The brushes are left in place on the commutator.
- The millivoltmeter is connected to the terminals of the armature. Rotate the brush holder ring until the millivoltmeter set to its most sensitive scale shows a minimum reading in mV

In each instance it is advisable to repeat the operation for two or three different positions of the armature.

It is useful in practice to mark the yoke indicating the best brush rocker position for each measurement. This will result in a series of marks surrounding the true neutral position or they may coincide. Repeating the process by moving the rocker in the opposite direction will produce a point coincident with the first series. This will be the neutral.

On LOAD

Method using the SEM 2000 Spark Detector

Accurate setting of the no load neutral setting (by the previous method) implies that the commutator poles are accurately positioned and that these operate in a linear manner as a function of the load. In practice this is not often so on account of armature reaction and that commutation is not always acceptable at full load despite accurate positioning of the neutral.

The SEM detector is a unit which quantitatively measures the commutation by a summation of corrected

average values of frequencies greater than 35 KHz normally associated with commutation.

This instrument is simply connected with the brush holders via a hand probe and can be used on all machines whose DC supply voltage does not exceed 1450V.

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The optimum setting of the brush holder ring, for a given load, is obtained by shifting this about the theoretical point and to correspond quite simply to the minimum of indicator deviation. When seeking this minimum it is advisable to begin with, to operate at reduced load and to proceed with a small shift of the brush rocker, back for a motor (forward for a generator), in relation to the theoretical point and to the direction of rotation of the machine in order to carefully appraise the result of this modification. By repeating this operation at increased loads the best setting for the most severe operating conditions can easily be found.

