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كلية الهندسة
قسم الهندسة الكهربائية

الكراس التعريفي
لتجارب مختبر المكائن الكهربائية
المرحلة الثانية

DC GENERATORS

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Contents

Experiment NO. 1:1

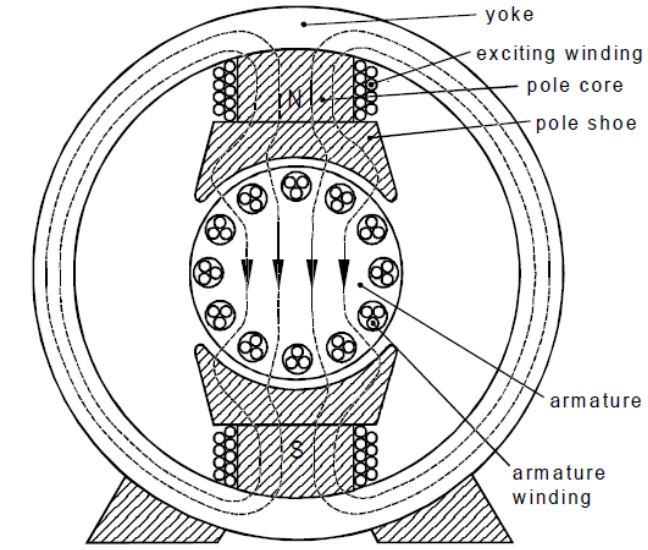
THE CONSTRUCTION OF DC MACHINES

OBJECTS:

The object of this experiment is to study some of the design detailed a D.C. machine in general.

THEORY:

A D.C. Machine has a stationary member called 'stator' and a rotating member called' rotor'.

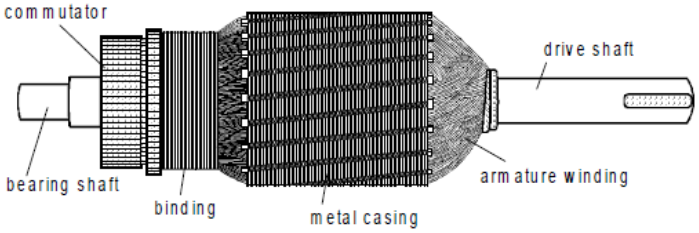


The Stator Consist of:

1.A yoke or cylindrical frame.
2.The field windings.
3.The field Poles.
4.The Interpol and its winding.
5.Brushes.

The Rotor Consist of:

1.Armature shaft.
2.Armature core.
3.The armature winding.
4.The commutator which converts the alternating voltage in the individual armature conductors to a D.C. voltage across the brushes.



PROCEDURES:

Inspect the disassembled machine carefully and record all necessary information listed below;

RUN (1): General Data

1. Complete name plate data.
2. Type of bearings,
3. Method of ventilation.

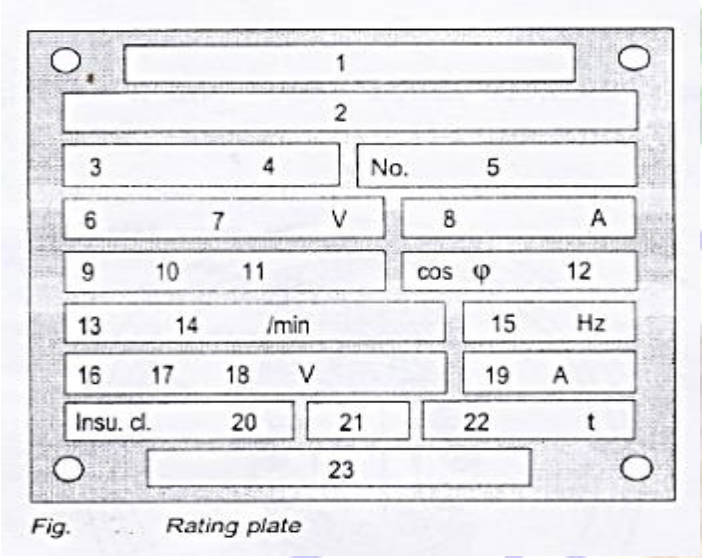


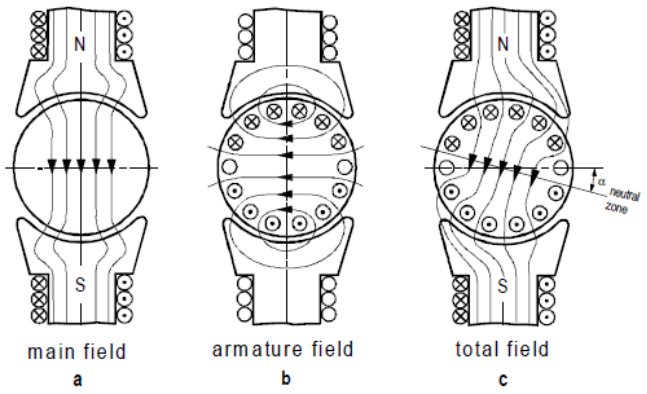
Fig. . . Rating plate

Box no.	Parameters
1	name of the manufacturer
2	type designation
3	type of current
4	function
5	manufacture number
6	switching type of the stator winding
7	rated voltage
8	rated current
9	rated power
10	unit Watt [W or kW]
11	operation mode
12	rated power factor
13	direction of rotation
14	rated speed
15	rated frequency
16	specification for excitation
17	switching type of the rotor winding
18	rated value for the exciting voltage
19	rated value for the exciting current
20	insulating material class
21	types of protection
22	weight in t (only for large machines)
23	additional notes

Table Possible specifications on the rating plate

RUN (2) Main Poles and Field Coils

1. Construction of field Yoke.
2. Attachment of poles to field yoke.
3. Construction of pole cores and shoes.
4. Number of poles.
5. Pole material.
6. Length of a pole along the armature.
7. Width of a pole around the



armature.

8. Area of poles around the armature.
9. Length of the air-gap under a pole tip and a pole center line.
10. Number of field coils on pole and their relative location with respect to field yoke.

RUN (3): Inter Poles:

1. construction
2. Number
3. Length of a pole along the armature
4. Width of a pole around the armature
5. Do the inter-poles have pole shoes?
6. Position of the inter-poles.
7. Number of field coils on the inter-pole shoes.

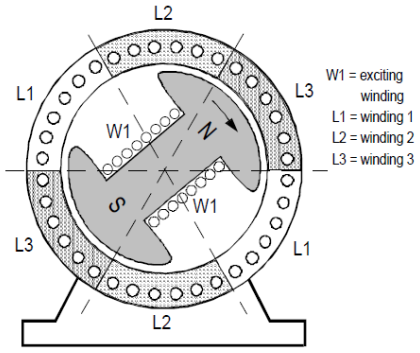


Fig. 8.1.2.1 Principle of the internal-pole machine with salient-pole rotor

RUN (4): Armature Core and Winding:

1. Length
2. Diameter
3. Material
4. Construction
5. If laminated, count the number of

Lamination per cm.

6. Number of slots
7. Width of a slot
8. Depth of a slot
9. Width of a tooth
10. Are the slots skewed?

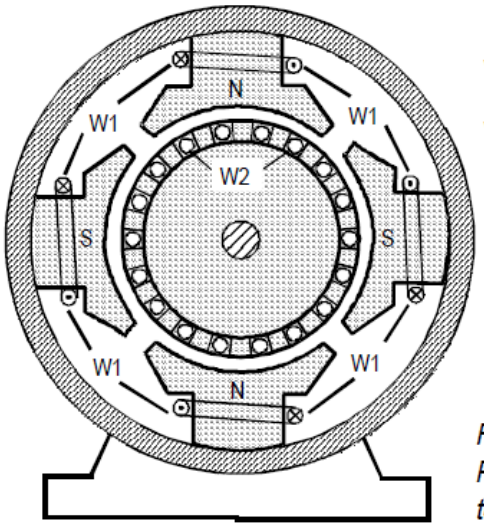


Fig. 8.1.1.1 Principle of the external-pole machine

11. Percent of armature surface covered by poles. (Using the area of poles around the armature in step 8. Run 2.
12. How many coils per slot there? (There are many coils as commutator bars).

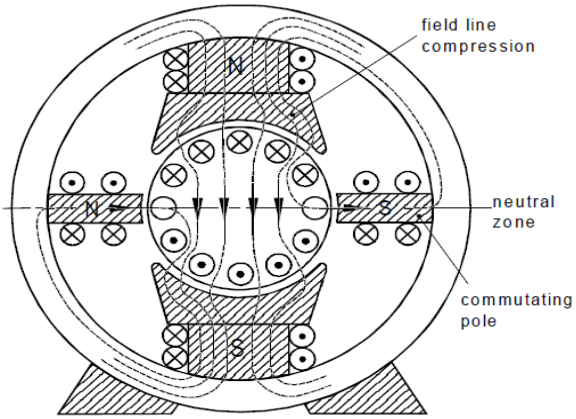


Fig. 9.4.2 DC machine with commutating poles

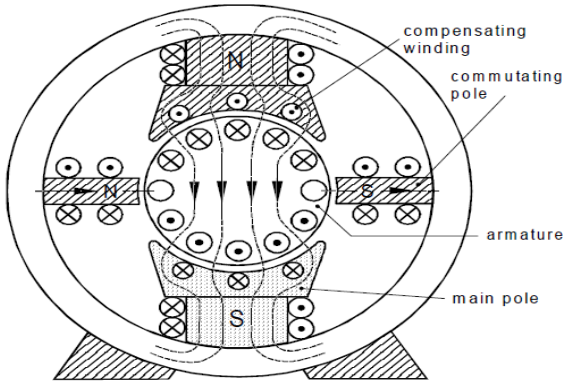
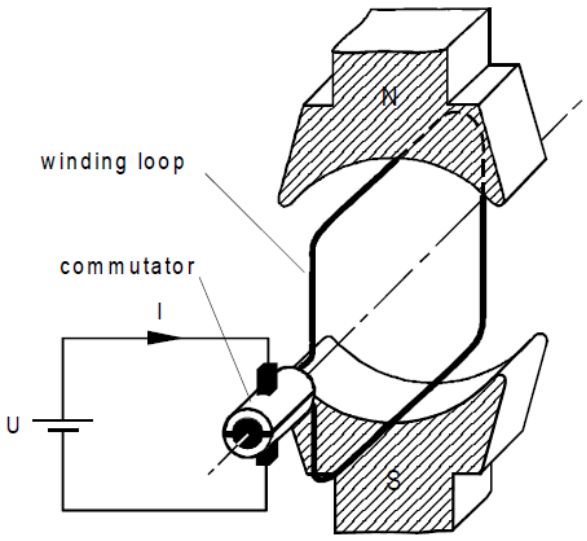
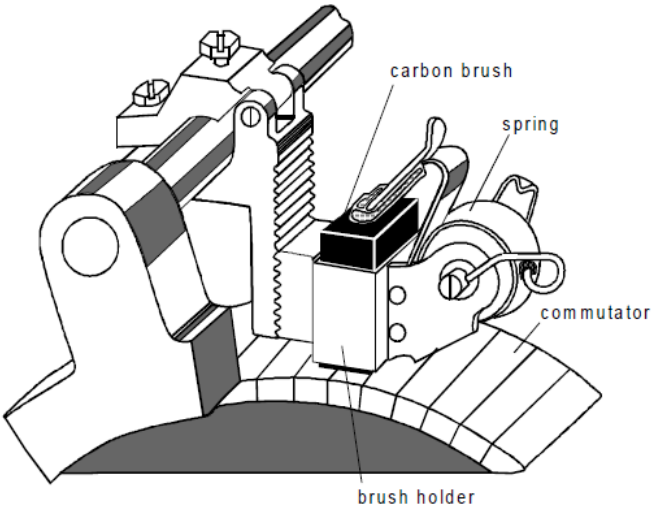


Fig. 9.4.3 DC machine with compensating winding and commutating poles

RUN (5): Commutator:

1. Material
2. Length
3. Diameter
4. Width of a segment
5. Thickness of mica insulation between segments.
6. Is the mica insulation high, flush, or undercut?
7. Number of segments.
8. Count the number of segments between the centers of adjacent positive and negative brushes.





RUN (6): Brushes:

1. Number of sets
2. Number of brushes per set
3. Material
4. Width of brush.
5. Thickness of a brush
6. How many commutator segments docs each brush cover?

DISCUSSION:

1. Draw a complete and detailed vertical cross - section of the machine Label all parts. Show the path of the flux ?
2. Draw longitudinal cross section of the commutator and label each part.
3. State the Method of connection of different field coils.
4. Calculates the current density in amperes per seq. Cm of brush surface at full load.
5. If the shunt field loss is 2 %of rated load, find the field resistance.
6. Calculate the thickness of armature core lamination, allowing 8% for insulation between Laminations.
7. Calculate the time during which the coil of an armature remains short-circuited by a brush at rated speed.
8. If armature copper loss is 6% of rated load, Find armature resistance for generator of step 5 above.