

الهندسة	الكلية
الكهرباء	القسم
DC Machines	المادة باللغة الانجليزية
مختبر المكائن الكهربائية	المادة باللغة العربية
الثاني	المرحلة الدراسية
سامح صباح حادث	اسم التدريسي
Connection & Rotation Direction Test Of DC-Shunt Machines Operating as Motor	عنوان المحاضرة باللغة الانجليزية
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اعداد:

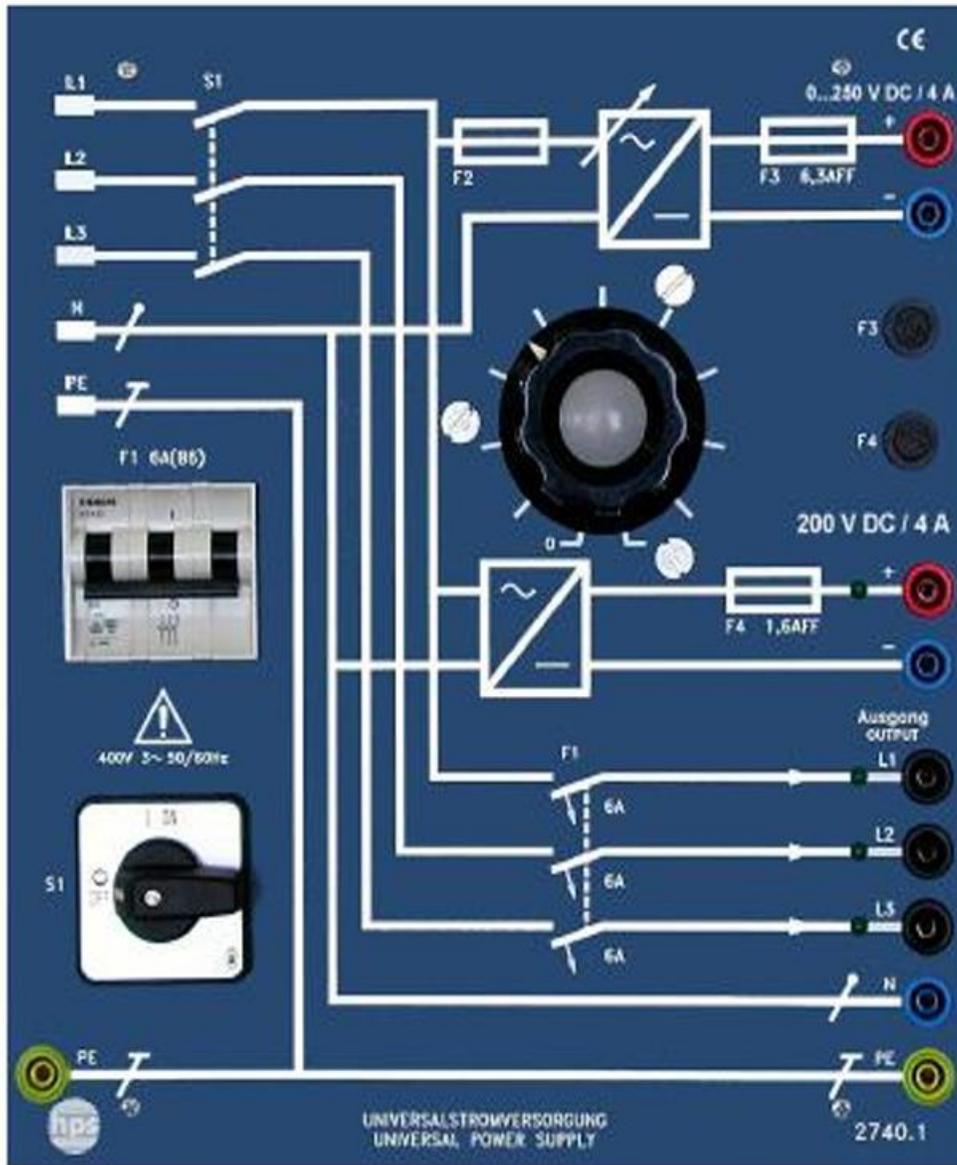
الدكتور ستار صبري كريم

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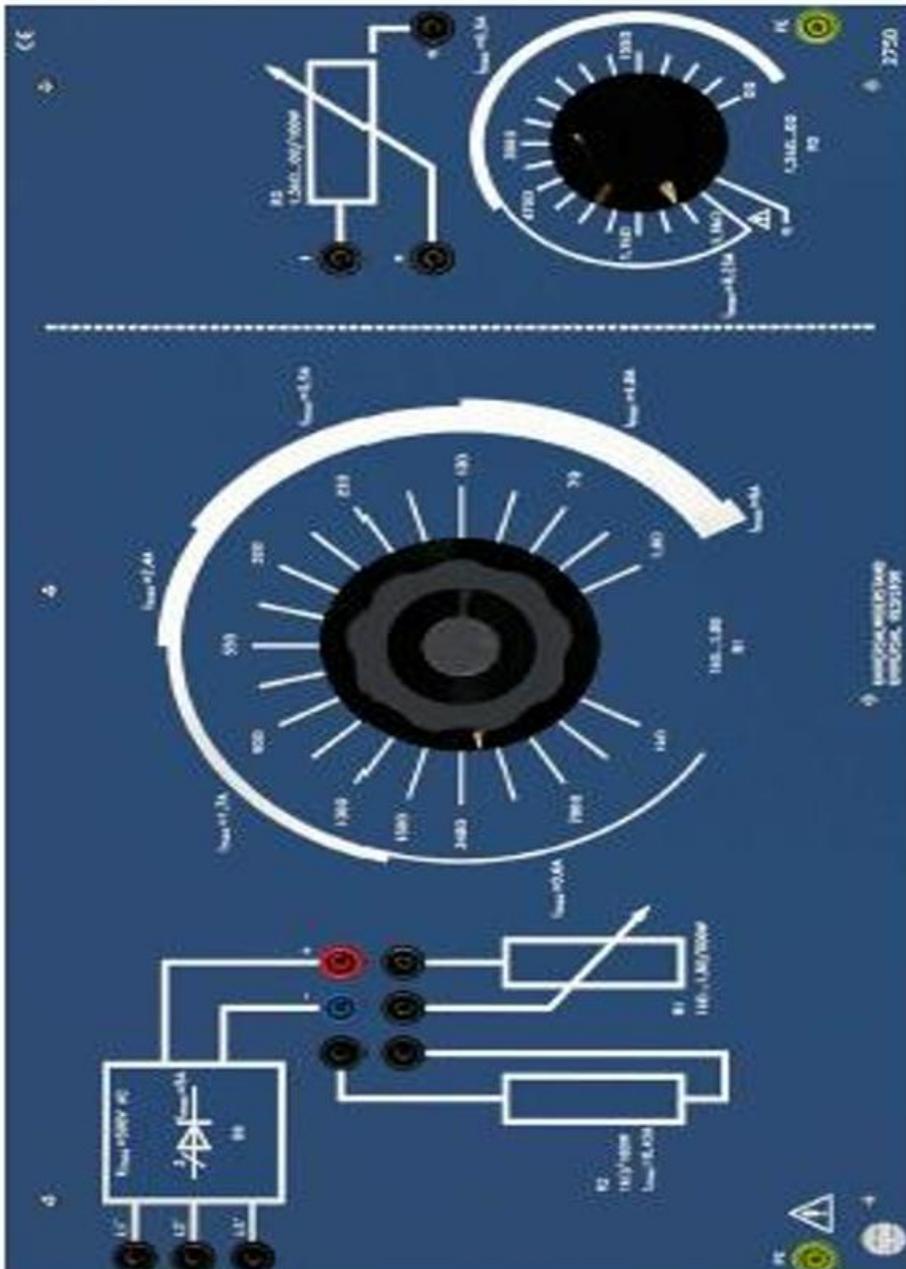
المهندس عبدالله فوزي شفيق

تدريس المادة: سامح صباح حادث

UNIVERSAL POWER SUPPLY (TYPE 2740)



UNIVERSAL RESISTOR (TYPE 2750)



Experiment NO. 2.1

Connection & Rotation Direction Test Of DC-Shunt Machines Operating as Motor

OBJECT:

The object of this experiment is to make the student be familiar with the assembly, connections, braking unit and direction of rotation of DC shunt machines.

THEORY:

Shunt-wound DC machines are used as generators and as motors. The shunt wound machine consists basically of the stator with the exciting winding, the rotor with the armature winding and the carbon brushes which supply the armature with current together with the commutator. The exciting winding and armature winding are connected in parallel and connected to the same voltage source (see Fig.17.

a). This type of connection is known as self – excited DC machines. The shunt wound machine can also be operated as a separately – excited machine. The exciting winding is then supplied by an own voltage source (see Fig.17. b).

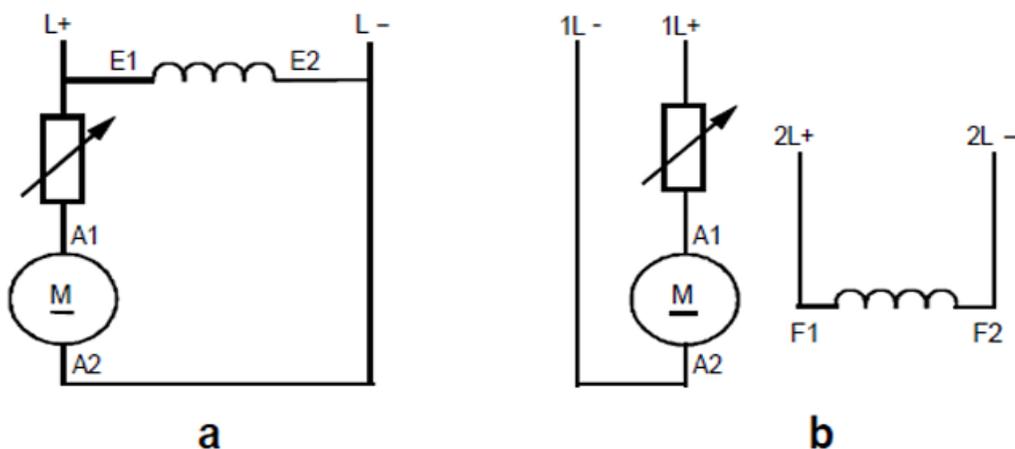


Fig.17. connection of shunt wound machine

The Torque Attenuator of control Unit: In control Unit (Type2730) an additional switch and a potentiometer are installed to reduce the brake machine torque .This is achieved by reducing the motor voltage of brake machine .This method is applied

in motors with a very stable torque - speed characteristics behavior such as in the shunt wound machine motor and synchronous motor .

If a brake unit (e.g. type 2719) is used together with the control unit as a load a controlled drive, a load can be switched on or off with this switch . the braking machine rotates in the opposite direction of rotation to that displayed on the control unit. To ensure that the experimental machine turns to the right direction, the braking machine must turn to opposite direction. The direction of rotation setting on the control Unit always refers to the experimental machine. The potentiometer is turned to the left, the torque can be reduced to zero value .

The Connection of the Machine : The armature winding (A1, A2) and the exciting winding (E1, E2) are connected directly to the terminal board of the shunt-wound machine. Fig. 10.5.1 shows the rating plate of the hps Shunt-wound DC Machine (Type 2701). As voltage specifications for the armature winding and the exciting winding, you see $U_A = 205 \text{ V}$ and $U_F = 205 \text{ V}$; this means that this machine can also be operated with separate excitation.

Attention! In shunt-wound machines and separately excited machines, you must make absolutely sure that the exciting voltage is not switched off during operation because these machines tend to „race“. Racing is the increase in speed far beyond the maximum permissible value which can lead to destruction of the machine!

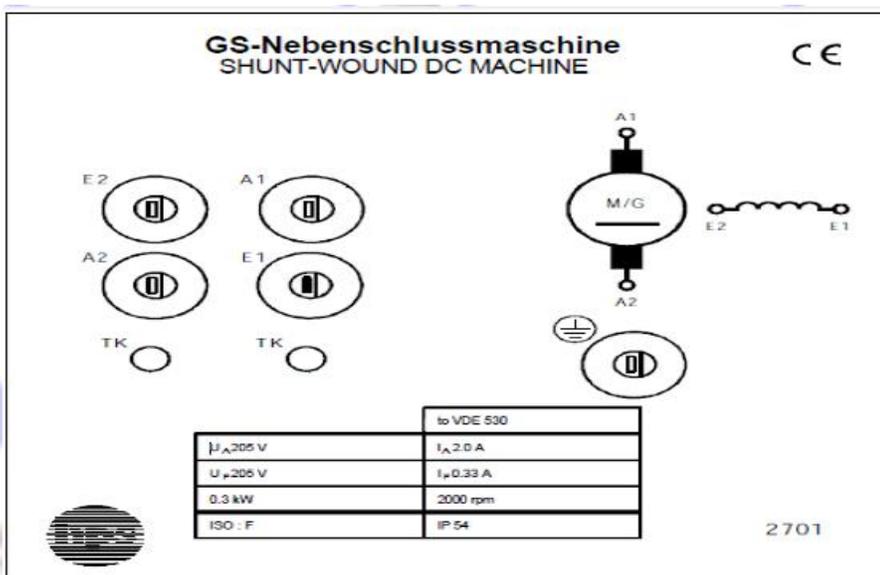


Fig. 18. Name plate data of DC shunt wound machine (Type2701)

NECESSARY EQUIPMENT:

- Shunt-wound DC Machine (Type 2701)
- Brake Unit (Type 2719)
- Control Unit (Type 2730)
- Universal Power Supply (Type 2740)
- 2 multimeter

PROCEDURE:

RUN 1:

1. Push the experimental machine onto the Brake Unit and couple it to the braking machine.(type2719).
2. Adjust the adapter feet so that the experimental machine and the braking machine are on one axis! Fix the experimental machine by pulling the clamping lever towards the braking machine.
3. Set up the experiment as shown in Fig.20 .
4. Set the operation mode MANUAL and „internal“ input on the Control Unit. Then Switch on the Control Unit.

5. Check whether armature voltage, field voltage and protective- earth conductor (PE) of the Universal Power Supply are connected correctly to the experimental machine.
6. Turn the potentiometer for the armature voltage to the left stop (0 V).
7. Switch on the Universal Power Supply and check if the field voltage applies at the experimental machine (green LED lights).
8. Now increase the armature voltage until the rated speed of the machine (2000 rpm) is reached.
9. Note the direction of rotation of the experimental machine. direction of rotation:
10. Switch off the Universal Power Supply.

Speed (rpm)	Direction of rotation	CW(Clock Wise)	CCW(Counter Clock Wise)

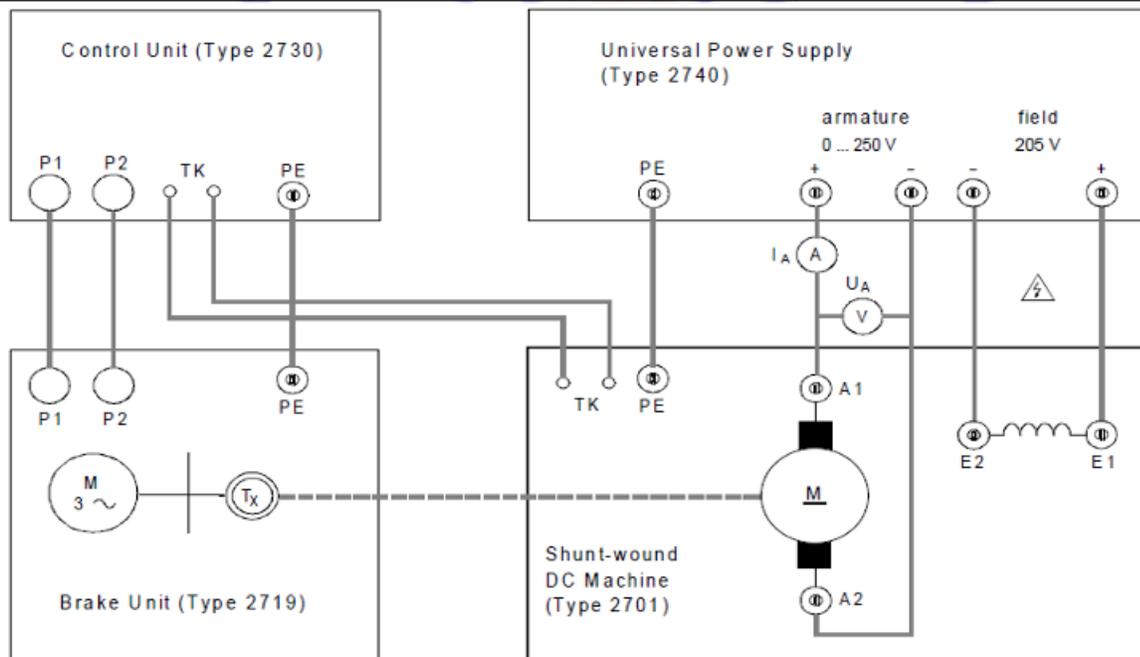


Fig.19. connection circuit diagram of DC Shunt wound machine

RUN 2:

Make the following settings on the Control Unit:

1. set speed-preselection switch to range of previously noted speed (3600 rpm)
2. set direction-of-rotation switch to direction of rotation noted before
3. Check the direction of rotation of the braking machine. R/L(CW/CCW) switch to R for right-hand rotation(CW) ; LED for right hand rotation must light.
4. Start the braking machine by briefly pressing the START/STOP key.
5. Compare the displayed speed with the previously noted one and adjust it if necessary with the set point potentiometer.
6. Stop the braking machine by briefly pressing the START/STOP key.

RUN 3:

1. Switch (on) the Universal Power Supply. Slowly increase in five steps the armature voltage till the speed has its rated value. Record in table the voltmeter readings and speed for each step for accurate setting for speed and torque..
2. To finish the experiment first switch off the Universal power supply and then the control unit .

DISCUSSION:

1. Explain the effect of increasing the armature voltage on the behavior of the shunt wound machine without the braking unit.
2. Explain the effect of increasing the armature voltage on the behavior of the shunt wound machine with the braking unit.
3. Draw the circuit diagram for the four machine types that can be obtained from the DC shunt wound machine. Name each type.

