



Educational Technology For Technical High Schools

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Abstract

In Romania upper secondary education, technical route, aims at preparing of students complex in order, acquiring key skills, (knowledge and social skills) and specific technical and professional skills for qualification level III .

Key skills are formed through curricular general culture and enable graduates continue their studies . The technical and vocational for qualification level III is formed by curricular area "Technologies".

The school technological route has a twofold purpose, namely access to obtain educational baccalaureate

diploma, and also enables the technician level qualification.

In the COR (Classification of Occupations in Romania) are nominated for electric profile following qualifications "repairs and maintenance

electrician, maintenance electrician in the construction, electrical and power equipment electrician, construction electrician, electro-mechanical and electro-mechanical machinery and electrical equipment" For all these professions, graduates of technical schools should be able to have practical skills to achieve panels for the electric motor actuating in the field of their activity.

In order to acquire skills necessary for successful adaptation to labor market requirements the practical lessons of electric drives must be designed rigorously for future graduates.

To improve students understanding I introduced the concept of " technological scheme"

This scheme allows the learner to accomplish sizing motherboard that will mount appliances and also choosing the length of the connection wires in economic conditions.

Also I used computer programs to motivate students to understand how to work.

The results show how students were motivated by the realization mode devices panels and how they have acquired the skills needed for

their chosen profession, the final assessment being performed by qualification certificate obtained through a final exam.

The electric drive lessons, which are meant for "electrical technicians" demand on the labour market whose bid relates to either small and medium enterprises which produce panels for electrical drives and devices or to firms which provide services of installation, use, maintenance and repair of such electrical panels, should ensure the acquisition of:

I)KNOWLEDGE COMPETENCES

The graduate should be able to:

1.know, identify and describe the wiring diagram for different types of electric drives (starting and reversing the rotation of a low power DC electrical motor, starting and reversing the rotation of a low power AC electrical motor, the star triangle starting of a three phase high power AC electrical motor, controlling the speed of various types of electrical motors, etc.)

2. identify and correctly name different types of devices according to the symbols represented in the operating wiring diagram

3. clarify the role of each device and each contact in these schemes

4. understand and be able to explain the operating principle of the scheme for the electrical drive type that he has to execute

5. be able to design the manufacturing technology of the control panel which refers to:

a. the placement of devices on the support so that the connections would be as short and as easy as possible to perform

b. the realization of as orderly connections as possible in order to remedy any defect that may occur during his work



II) COMPETENCY BASED ON PRACTICAL SKILLS AND ABILITIES

The graduate will acquire skills and abilities to:

1. read wiring diagrams
2. install correctly the apparatus on a support
3. achieve the best economical and aesthetic conditions for any electrical panel (without waste of 10 conductor)
4. draw the appropriate technological scheme of connections for the appliances on the control panel support
5. identify and repair the existent defects in the electrical control panel of an electrical drive

In order to ensure that students acquire the mentioned competences, in my lessons

a. I introduced the concept of "technological scheme", a scheme that allows

- designing the way the appliances to be mounted on the support device are located on this
- an economical length sizing of the connection conductors
- a practical achievement the panel of devices in optimal conditions
- an easy detection of any defects

b. I used the computer to motivate the students to be actively involved in the learning process and to provide their comfort in this process

As for the EDUCATIONAL MEANS for the practical work that concerns a control circuit for the two-way operation of a low power DC or AC electrical motor, I used:

A) a support that consists of an horizontal plate and a vertical plate made of insulating material, on which the student can install in the following devices:

- 1) a terminal lugs (input-output)

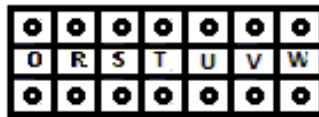


Fig. 1

- 2) two fuses

a) top view of the terminals that connect the circuit	b) symbol in the wiring diagram

Fig. 2

- 3) three control buttons (a "stop button", two two "Start" buttons)

a) top view of the terminals that connect the circuit	b) symbol in the wiring diagram

Fig. 3

- 4) two contactors

a) top view of the terminals that connect the circuit	b) symbol in the wiring diagram
	<p>Contactor coil - terminals marked A1, A2</p>



		Normally open contacts marked 13ND-14 ND 43ND-44 ND
		Normally closed contacts marked 21NC-22NC 31NC-32NC

Fig. 5

5) a bimetal overload thermal relay

a) top view of the terminals that connect the circuit	b) symbol in the wiring diagram	

Fig. 4

B) a PC that can be used to draw and project onto a screen:

a) the wiring diagram of the drive connections numbered in the logical sequence of the devices to be monitored in order to make the control panel

b) a top view of the device support on which the apparatus are to be mounted

c) a technological scheme of connections with the connection wires numbered according to the the wiring circuit

C) a video projector

D) a screen

I used animation effects in Power Point:

1) to establish the correlation between each unit placed on the supporting device and the corresponding symbol in the wiring diagram

2) to allow the entire group of students to achieve the correct connections between the devices, at the same time

I prepared on the computer a set of slides containing:

a) the wiring diagram of the operation

b) the technological scheme of connection

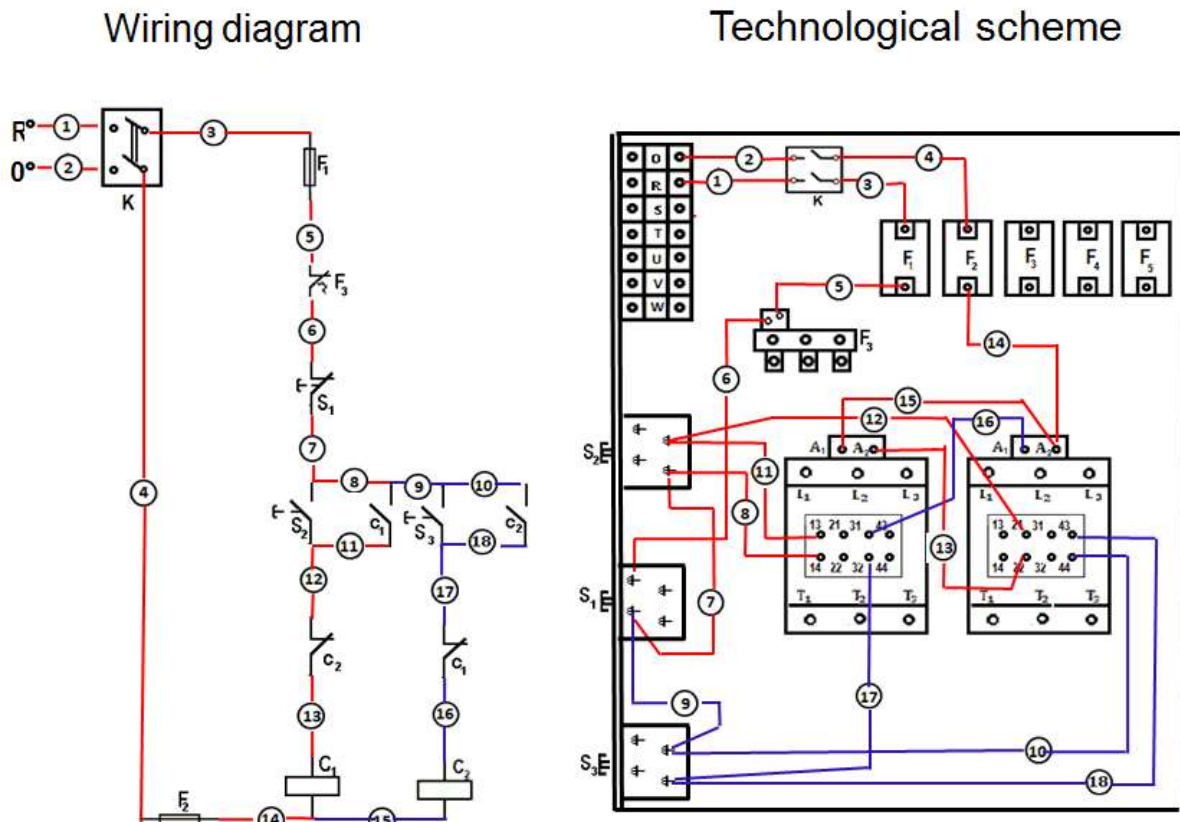


Fig.6

c) a slide in which at a time, on the same page, one can see both the symbols for the apparatus and the top view of the apparatus placed on the supporting device. The teacher who coordinates the practical work will use the mouse to command / show the symbols and the contacts. By watching this slide, the students will be able to install the appliances on the support and make the mental correlation between the symbol and different parts of the apparatus mounted on the support

d) a slide that shows

- 1) on its left side, a drawing of the location of the corresponding circuit diagram symbols
- 2) on its right side, a drawing of the location of the equipment on the support

On this computer animated Power Point slide, the students can see, at a time, the connections corresponding to the wiring scheme linked to the corresponding wiring scheme. Each conductor has the same number in both the wiring diagram and the technological scheme.

I used two different colours for the conductors:

- red for the circuit which controls the clockwise rotation of the electrical motor
- blue for the circuit which controls the counterclockwise rotation of the electrical motor

The student draws in sequence the conductors on the worksheet and then, immediately makes the links between the corresponding terminals of the device to which it relates, on the support

At the end of the work, with my assistance, each student

1. powers his circuit and, IF:

- a) by pressing the power button S2 he switches on the contactor C1
- b) by pressing the stop button S1 he triggers the contactor C1
- c) by pressing the power button S3 he switches on the contactor C2
- d) by pressing the stop button S1 he triggers the contactor C2
- e) by pressing both buttons S2 and S3 none of the pieces of apparatus is powered

that means he made the correct connections

2. the worksheet asks each student:

- a) to disconnect the circuit



b) to simulate one defect (stipulated in the worksheet) on the unpowered circuit
c) in turns, each student will power the malfunctioned circuit, and the whole group will observe the effect of the simulated defect and write his observations on the worksheet.

This didactic technology lesson places the student in the centre of the learning process and increases the learning efficiency. Students understand the learning process, are involved in solving the tasks and are successful.

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