

## Software for the Electrical Machines Virtual Laboratory - DL EMV

This eTraining Package transforms the Computer to an Electrical Machines Laboratory, where it is possible to perform all the educational activities which are related to the study and the experiments on the machines, without the need to have any hardware: everything is virtually simulated by PC.

It covers the following types of machines:

- Single-phase and three-phase transformers
- Direct current machines
- Synchronous machines
- Asynchronous machines

It is divided in 3 sections as follows:

- **Study:**

In the section relevant to the study of the electrical machines the following subjects are illustrated by means of the Internet World Wide Web hypertextual technique:

- their operating principle
- their basic structure
- their characteristics

In this section multimedia tools (drawings, images, photos) and hypertextual techniques are widely used to illustrate the various components of the electrical machines and to provide, every time, the simplest path for the use of the information.

- **Design:**

In the section relevant to the design, we simulate, virtually by PC, the process of designing and manufacturing the electrical machine.

Once inserted the main design parameters (e.g., rated power, rated current, frequency, etc.), the computer proceeds step by step to dimensioning the machine. Drawings of the electrical and mechanical details and cross-sections of the inside complete this section to illustrate in detail the construction process.

All the data (set up parameters and calculated results) can be saved in a personal file that forms an electrical machines database.

The data can then be used for the practical realization of the machines.

For each machine it is necessary to input the design parameters while the manufacturing parameters are consequently calculated. All these parameters are used for the performance of the tests and for the actual realization of the electrical machine, if so required.

- **Operating tests:**

In the section relevant to the operating tests the program simulates, on the computer, the performance of the typical tests on the designed machine: no-load test, short-circuit test, load test, etc.

This allows an immediate check on the design targets of the machine, without actually constructing the machine.

In this phase the machine can be coupled to other machines in the database (for instance, for the load test).

Each test is complete with the relevant description that illustrates the purpose of the test and the relevant operating mode.

During the execution of the test it is possible to check on the monitor the values of the quantities which are acquired by means of virtual instrumentation and it is possible to draw the typical graphs, by selecting the interesting quantities.

On the static and rotating electrical machines it is possible to perform the following tests:

### TRANSFORMERS

- No-load test
- Short-circuit test
- Measurement of the winding resistance
- Measurement of the transformation ratio
- Direct test

### DIRECT CURRENT MACHINES

- Measurement of the internal resistance
- Magnetization characteristic of a dc generator
- External characteristic of a dc generator
- Regulation characteristic of a dc generator
- No-load test of a dc motor
- Direct test of a dc motor with an electromagnetic brake
- Direct test of a dc motor with a dc dynamometer

### SYNCHRONOUS MACHINES

- Magnetization characteristic
- Short-circuit characteristic
- Measurement of the winding resistance
- External characteristics
- Regulation characteristics

### ASYNCHRONOUS MACHINES

- No-load test of a three-phase asynchronous motor
- Short-circuit test of a three-phase asynchronous motor
- Measurement of the internal resistance of a three-phase asynchronous motor
- Measurement of the transformation ratio of a three phase asynchronous motor
- Direct test of a three-phase asynchronous motor with an electromagnetic brake
- Direct test of a three-phase asynchronous motor with a dc dynamometer

Required PC configuration:

Operating system: Windows 95/98/Me/NT-4/2000/XP

CD-ROM driver

USB port for the connection of the interface unit DL 1893