Software for the Electrical Machines Laboratory

DL 8330SW

This software covers all the study subjects and the experiment activities that are performer in a computer controller electrical machines laboratory.
It works with the following types of machines:

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

It is divided in 2 sections hereunder described:

- ***Educational section:***

In this section we illustrate, through WEB pages, the test to be performed by providing all the information relevant

- General diagram of the test
- Insertion of the instruments
- Operation modes
- Quantities to be acquired by the instruments and quantities to be calculated
- Characteristic graphs for the test

- ***Operation section:***

In this section we illustrate how the instruments must be connected and how to start the program for controlling the execution of the test.

The above program provides:

- a Control Window, that allows to insert the name of the student and the characteristic data of the machine; moreover it contains the controls to operate during the automatic and semi—automatic tests;
- a Window with the diagram of the measurement sys- tem, that contains the block diagram of the measurement system, with the indications of the quantities coming from the instruments, updated in real time;
- a Spreadsheet Window that contains an electronic sheet where the values of the measurements taken during the execution of the tests are collected.
- once the test is completed, it is possible to open several Graph Windows, where it is possible to visualize in graphical form the data that have been gathered.

During the AUTOMATIC execution of the test the user controls the start of the test and the program automatically varies the conditions of the system and acquired the interesting quantities. In this case it is necessary to use an interface module (DL 1893) and motor driven modules that are controlled through computer; it is also necessary, of course, to have digital measurement modules for the experiment data acquisition and transfer.
During the SEMI-AUTOMATIC execution of the ten the user manually sets up the value of the quantities of the system (through non motor driven power supplies variac etc.) and controls the acquisition of the interesting variables through the program.

The software allows a complete graphic processing of the results that have been obtained. It is possible to open at the same time several different graphs.
These graphs ho be of two types: time graphs (showing the behaviour with time of the interesting quantities) or XX type graphs where it is possible to select the quantities to show in the X and Y axes.
Moreover the software allows to print all the data of the test for what concerns: data of the student and of the machine under test, data from the electronic spreadsheet, graphs.

DATA ACQUISITION / CONTROL UNIT

DL 1893

• Power supply from USB, < 100mA
• 2 relay outputs
• 2 analogue outputs, serial 8 bit D/A converter
Output: -10/+10 V
• 8 analogue inputs, 12 bit A/D converter
Input: -10/+10 V
Max speed of conversion: 10 kHz

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
- Calculation of the conventional efficiency

DIRECT CURRENT MACHINES

- Measurement of the internal resistance
- Calculation of the conventional efficiency of a dc generator
- 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 dynamometer

SYNCHRONOUS MACHINES

- Short-circuit characteristics
- Magnetization characteristics
- Measurement of the winding resistance
- External characteristics
- Regulation characteristics
- No-load test of a synchronous machine as a motor
- Parallel of a synchronous machine with the mains
- Diagram of the “V” curve of a synchronous motor

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 or 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 dynamometer

Required PC configuration:

- Operating system: Windows
- USB Port for the connection to the Interface Unit DL 1893
- CD-ROM driver

Software for the Electrical Machines Virtual Laboratory DL EMV

This e-Training 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 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 virtually 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.

DL 1028 SPLIT-PHASE MOTOR

Single-phase squirrel cage asynchronous motor; possible operation with either permanent or only for starting external capacitor.

Technical features:
- Power: 1.1 kW (0.64 kW)
- Voltage: 220 V
- Current: 7.7 A (7.7A)
- Speed: 2820 rpm, 50 Hz.

Accessories:

DL 1028AC	STARTING CAPACITOR UNIT
DL 1028AR	STARTING RESISTOR UNIT
DL 1028AL	STARTING INDUCTOR UNIT

DL 1028C CAPACITOR MOTOR

Single-phase squirrel cage asynchronous motor with splitted phases and running capacitor.

Technical features:
- Power: 1.1 kW
- Voltage: 220 V
- Current: 7.7 A
- Speed: 2820 rpm, 50 Hz
- Capacitor: 100 µF

DL 1029 UNIVERSAL MOTOR

Single-phase collector motor with inductor winding in series to the winding of the rotor; able to operate either with ac or dc power supply.

Technical features:
- Power: 0.3 kW ac /0.55 k W dc
- Voltage: 170 V ac/ 190 Vdc
- Current: 6 A ac/ 4.5 A dc
- Speed: 3300 rpm, 50 Hz

DL 1029R REPULSION MOTOR

Single-phase collector motor with short-circuited rotor.

Technical features:
- Power: 0.23 kW
- Voltage: 220 V
- Current: 3.4 A
- Speed: 2900 rpm, 50 Hz

Educational objectives:
Measurement through direct methods of the following characteristics:
- Mechanical characteristic (torque as a function of the speed)
- Electromechanical characteristic (torque, speed, input current, efficiency and power Factor as a function of the output power)

THREE-PHASE ASYNCHRONOUS MOTORS

Unilab

DL 1021 SQUIRREL CAGE THREE-PHASE ASYNCHRONOUS MOTOR

Induction motor with three-phase stator winding and squirrel cage buried in the rotor.

Technical features:

- Power: 1.1 kW
- Voltage: 220/380 V Δ/Y
- Current: 4.7/2.7 A Δ/Y
- Speed: 2800 rpm, 50 Hz

Accessories:

DL 2035	STAR/DELTA STARTER

DL 1022 SLIP RING THREE-PHASE ASYNCHRONOUS MOTOR

Induction motor with both stator and rotor three-phase windings.

Technical features:

- Power: 1.1 kW
- Voltage: 220/380 V Δ/Y
- Current: 4.3/2.5 A Δ/Y
- Speed: 2830 rpm, 50 Hz

Accessories:

DL 1017RHD3	STARTING UNIT
DL 1022RHD3	STARTING AND SYNCHRONIZATION UNIT

DL 1027 THREE-PHASE 2-SPEED SQUIRREL CAGE ASYNCHRONOUS MOTOR

2 or 4 pole induction motor with Dahlander-type three-phase stator winding and squirrel cage rotor.

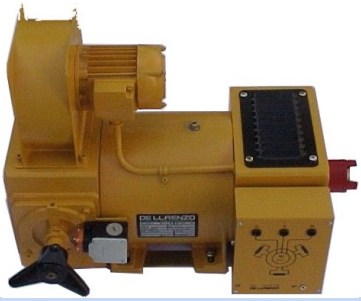
Technical features:

- Power: 0.9/1.1 kW
- Voltage: 380 V
- Current: 2.5/3.3 A
- Speed: 1420/2830 rpm, 50 Hz

Accessories:

DL 2036	POLE SWITCHING UNIT

DL 1027S SCHRAGE MOTOR



Variable speed three-phase motor, rotor feeding, shunt excitation and adjustable brushes.

Technical features:

- Power: 0.25 - 1.85 kW
- Voltage: 380 V
- Current: 3.1 - 4.6 A
- Speed: 500 - 2350 rpm, 50 Hz

Educational objectives:

- Measurement of the ohmic resistance of the windings
- Measurement of transformation ratio with slip-ring motor
- No-load test
- Short-circuit test with locked rotor
- Drawing of the Heyland circular diagram
- Conventional efficiency
- Real efficiency and electromechanical characteristics through direct tests with the electromagnetic brake, the powder brake or the dynamometer
- Slip measurement
- Variable frequency speed control

DL 1023 DIRECT CURRENT MOTOR COMPOUND EXCITATION

It can be also used as a generator.

Technical features:

- Power: 1.1 kW
- Voltage: 220 V
- Speed: 3000 rpm
- Excitation: 160 V / 0.25 A

Accessories:

DL 1017RHD	STARTING RHEOSTAT
DL 1017RHE	EXCITATION RHEOSTAT

DL 1023S DIRECT CURRENT MOTOR SERIES EXCITATION

It can be also used as a generator.

Technical features:

- Power: 1.1 kW
- Voltage: 220 V
- Speed: 2730 rpm

Accessories:

DL 1017RHD	STARTING RHEOSTAT
DL 1017RHES	EXCITATION RHEOSTAT

DL 1023P DIRECT CURRENT MOTOR SHUNT EXCITATION

It can be also used as a generator.

Technical features:

- Power: 1.1 kW
- Voltage: 220 V
- Speed: 3000 rpm
- Excitation: 160 V / 0.25 A

Accessories:

DL 1017RHD	STARTING RHEOSTAT
DL 1017RHE	EXCITATION RHEOSTAT

DL 1024 DIRECT CURRENT GENERATOR COMPOUND EXCITATION

It can be also used as a motor.

Technical features:

- Power: 0.75 kW
- Voltage: 220 V
- Current: 3.4 A
- Speed: 2800 rpm
- Excitation: 190 V / 0.25 A

Accessories:

DL 1017RHE	EXCITATION RHEOSTAT

DL 1024S DIRECT CURRENT GENERATOR SERIES EXCITATION

It can be also used as a motor.

Technical features:

- Power: 0.75 kW
- Voltage: 220 V
- Current: 3.4 A
- Speed: 2800 rpm

Accessories:

DL 1017RHES	EXCITATION RHEOSTAT

DL 1024P DIRECT CURRENT GENERATOR SHUNT EXCITATION

It can be also used as a motor.

Technical features:

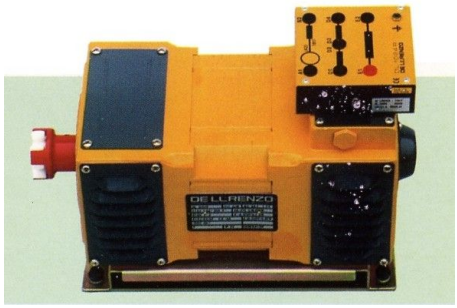
- Power: 0.75 kW
- Voltage: 220 V
- Current: 3.4 A
- Speed: 2800 rpm
- Excitation: 190 V / 0.25 A

Accessories:

DL 1017RHE	EXCITATION RHEOSTAT

DL 1024R DIRECT CURRENT POLIEXCITATION MACHINE

Suitable for series, shunt or compound excitation motor or generator.



Accessories:

DL 1017RHD	STARTING RHEOSTAT
DL 1017RHE	STARTING RHEOSTAT FOR THE SHUNT OR COMPOUND CONFIGURATION
DL 1017RHES	STARTING RHEOSTAT FOR THE SERIES CONFIGURATION

Educational objectives:

- Winding resistance
- Mechanical and iron losses
- Conventional efficiency
- Magnetization, external and regulation characteristics of the generators
- Electromechanical characteristics of the motors through the direct method
- Electronic control of the speed of the motors

DL 1026A THREE-PHASE SYNCHRONOUS MACHINE

Machine with smooth inductor and three-phase stator armature winding for operation either as an alternator or as a synchronous motor.

Technical features:
Alternator:
- Power: 1.1 kVA

Motor:
- Power: 1 kW

- Voltage: 220/380 V D/Y
- Current: 2.9/1.7 A D/Y
- Speed: 3000 rpm
- Excitation: 175 V / 0.4 A

Accessories:

DL 1026RHD3	STARTING AND SYNCHRONIZATION RHEOSTAT
DL 1030	PARALLEL BOARD

DL 1026R RELUCTANCE MOTOR

Three-phase synchronous motor with squirrel cage rotor without dc excitation.

Technical features:
- Power: 0.5 kW
- Voltage: 220/380 V D/Y
- Current: 3.6/2.1 A D/Y
- Speed: 1500 rpm, 50 Hz

Educational objectives:
- Measurement of the ohmic resistance of the windings
- Magnetization characteristic
- No-load losses through the method of the auxiliary motor
- Short-circuit characteristic
- Conventional efficiency
- External and regulation characteristics of the alternator through direct and indirect methods in accordance with Behn-Eschemburg or Potier
- Mains parallel and regulation of the active and reactive power exchange
- Mordey "V" curve of synchronous motor
- Electromechanical characteristics of the synchronous motor through the direct method
- Alternator voltage stabilization

DL 1093 SINGLE-PHASE TRANSFORMER

Core-type transformer with splitted windings.
It can also be used as an auto-transformer.

Technical features:

As a transformer
- Rated power: 500 VA
- Primary voltages: 220/380 V
- Secondary voltages: 2 x 110 V

As an auto-transformer
- Rated power: 200 VA
- Voltage: 220/380 V
- Frequency: 50/60 Hz

DL 1080 THREE-PHASE TRANSFORMER

Column-type transformer with splitted windings.
It can also be used with a single-phase supply.

Technical features:
- Rated power: 1kVA
- Primary voltage: 2 x 190V (phase)
- Secondary voltage: 2 x 70V (phase)
- Frequency: 50/60 Hz

Educational objectives:
- Ohmic resistance of the windings
- Transformation ratio
- Polarity and connection group
- No- load test
- Short-circuit test
- External characteristics
- Conventional efficiency

DL 1019M EDDY-CURRENT BRAKE

Smooth roll rotor and salient pole stator.
Provided with water level, arms, weight and balance weight for measuring the output torque of the motor.
Possibility of assembling a load cell.

Technical features:

- Maximum supply voltage: 250 Vdc
- Maximum speed: 4000 rpm
- Maximum power in S3: 1.4 kW

DL 1019P POWDER BRAKE

Electromagnetic brake.
Provided with water level, arms, weight and balance weight for measuring the output torque of the motor.
Possibility of assembling a load cell.
The brake includes an axial cooling fan that is supplied by the mains voltage.

Technical features:

- Maximum supply voltage: 20 Vdc
- Maximum speed: 4000 rpm
- Maximum torque: 20 Nm

DL 1025 DC DYNAMOMETER

Direct current generator in which the frame is free to swing around its axis.
Provided with water level, arms, weight and balance weight for measuring the output torque of the motor.
Possibility of assembling a load cell.

Technical features:

- Maximum power: 1.1 kW
- Electric power: 0.75 kW
- Voltage: 220 Vdc
- Current: 3.4 A
- Maximum speed: 3000 rpm

Accessories:
DL 1017R RESISTIVE LOAD

Suitable for supplying fixed and variable alternating current and fixed and variable rectified direct current, in order to easily carry out all the tests on electrical machines of the UNILAB laboratory and in general in an electric measurement laboratory.
Provided with start push-button with remote control switch, stop push-button, key-unlocked emergency mushroom head pushbutton and differential magneto-thermal protection on the main sockets.
Connector for the overspeed protection of the motors.
The control devices and the safety connecting terminals, according to the IEC standards, are arranged on the front.

Technical features:

	DL 1013M1	DL 1013M2	DL 1013M3
Output voltages:			
Variable ac	3x0-480 V, 5 A (progr.) 3x0-240 V, 10 A (progr.)	3x0-430 V, 5 A 3x0-240 V, 8 A	3x0-440 V, 4.5 A 3x0-240 V, 8 A
Fixed ac	3x380 V + N, 16 A	3x380 V + N, 16 A 3x220 V, 8 A	3x380 V, 4.5 A 3x220 V + N, 16 A
Standard fixed ac	220 V, 10 A	220 V, 10 A	127 or 220 V, 10 A
Variable dc	0-290 V, 12 A (progr.) 0-225 V, 1 A	0-240 V, 10 A 0-225 V, 1 A	0-240 V, 10 A 0-225 V, 1 A
Fixed dc	220 V, 10 A	220 V, 10 A	220 V, 10 A
Power supply	3x380 V + N,50/60 Hz	3x380 V + N,50/60 Hz	3x220 V + N,50/60 Hz

OTHER POWER SUPPLIES

DL 1067S MOTOR-DRIVEN POWER SUPPLY UNIT WITH AUTOMATIC REGULATION

Suitable for power supplying with variable voltage the braking systems and the excitation of the machines through manual or automatic operation.

Technical features:
- DC output: 0 to 210 V, 2 A
- Automatic regulation of excitation to keep a constant voltage
- Power supply: 220 V, 50/60 Hz

DL 1054 STABILIZED POWER SUPPLY UNIT

Suitable for power supplying with variable voltage the braking systems and the excitation of the machines.

Technical features:
- Output: 0÷120V, 2 A or 0÷220V, 1 A.
- Power supply: single-phase from mains

DL 10305 POWER SUPPLY FOR THE POWDER BRAKE

Suitable for power supplying with variable voltage the powder brake.

Technical features:
- Output: 0÷10V, 2 A or 0÷20V, 2 A
- Power supply: single-phase from mains

Electrical measurement

DL 10065N ELECTRICAL POWER DIGITAL MEASURING UNIT

Measurement in direct current of: voltage, current, power and energy.

Measurement in alternate current of: voltage, current, power, active energy, reactive energy, apparent energy, cosphi and frequency.

Main technical features:

- DC voltage: 300 Vdc
- DC current: 20 Adc
- AC voltage: 450 Vac
- AC current: 20 Aac
- Power: 9000 W

Power supply: single-phase, 90-260 V, 50/60 Hz
Communication: RS485 with MODBUS RTU protocol

Mechanical measurement

DL 2006CN TORQUE MEASURING UNIT

Suitable to measure the motor output torque through a load cell arranged on the braking system.

Technical features:

- Power supply: single-phase from mains
- Digital readout and analogue output proportional to the measured value.

DL 10055 MECHANICAL POWER DIGITAL MEASURING UNIT

For direct measurement of motor output torque through load cell and of rotating speed through optical transducer, with mechanical power display; provided with direct current variable power supply for the excitation of the brakes or of the dynamometer.
Digital readout of the measured quantities and their conditioning to voltage levels that are directly compatible with a plotter or that can be interfaced for data acquisition and automatic plotting of the electromechanical characteristics of the machines.
Connector for overspeed protection of the motors through the connection to the power supply module.

Technical features:

- Torque: 9.99 - 50.0 Nm (10 mV/dgt)
- Speed: 6000 rpm (1 mV/rpm)
- Power: 9990 W (1 mV/W)
- Dc output: 0-220 V, 2 A
- Power supply: single-phase from mains

DL 2006E LOAD CELL

Resistance electronic strain-gauge with 150 N range, to be mounted on the braking system to measure the mechanical torque.

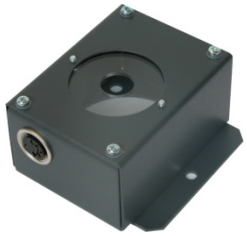
Speed measurement

DL 2025DN ELECTRONIC TACHOMETER

Suitable to measure the revolving speed through tachometric or optical transducer mounted on the machine.
Digital readout and analogue output proportional to the measured value.
Complete with built-in connector for overspeed protection to be connected to the power supply unit.

Power supply: single-phase from mains

DL 2031M OPTICAL TRANSDUCER



Suitable to measure the revolving speed through a slotted optical switch with encoder disc, that can be also used for stroboscopic measurements.
Connector for the transfer of the signal to the electronic tachometer DL 2025D.
Prearranged for its assembling on the machines of the laboratory.

DL 2026 CONTACT TACHOMETER

Suitable for measuring the revolving speed with digital readout.
Measuring range: 0 to 19,999 rpm.
Power supply: 4 x 1.5 V batteries (UM 3), included.

DL 2026R OPTICAL TACHOMETER

Suitable to angular speed measure with a digital indicator.
Measure range: 50 to 19,999 RPM
Power supply: 4 1.5 V batteries (UM3), included
Completed with 5 reflector sensors.

DL 2309A1 SPEED CONTROL OF AC MOTORS

The objective of this unit is to demonstrate the PWM technique for piloting a three-phase inverter used for the variable frequency control of the speed in a three-phase asynchronous motor.
Digital control inverter programmable from keyboard with on screen guide.
The speed control can be realized through manual control of a potentiometer or through closed loop tachometric control.
The acceleration and deceleration ramps can be separately regulated from 5 to 15 seconds approx.
Inversion of the sense of rotation. Instrument for the rotation speed.

Technical features:

- Power : 1.5 kW
- Maximum output voltage: 3 x 220 V adjustable
- Rated current : 7A
- Output frequency: 0 to 240 Hz
- V/F ratio: constant up to the basic frequency.
- Constant voltage operation for higher frequencies.
- Direct current braking.
- Protections against minimum/maximum supply voltage, thermal protection and limitation of the output current.
- Power supply: single-phase from mains

Accessories:

DL 1021	SQUIRREL CAGE THREE-PHASE ASYNCHRONOUS MOTOR
DL 1019M	EDDY-CURRENT BRAKE
DL 2031M	OPTICAL TRANSDUCER
DL 1013A	BASE

DL 2308A SPEED CONTROL OF DC MOTORS

Single-phase fully controlled thyristor bridge for the open and closed-loop speed regulation of a separate excitation motor (1 kW).
Three control loops: speed, current and armature voltage.
Potentiometers for speed setting, current limitation and armature voltage drop compensation.
Potentiometers for gain setting of speed and current regulators, with time constant set in 3 steps.
Provided with acceleration and deceleration ramps.
Analogue meters for speed, voltage and current indication.
Manual or automatic control through microcomputer provided with A/D and D/A converters with 0 to 10 V input-output.

Technical features:

- Power: 1 kW
- Rotor current: 10 A max
- Tachometer input: 9 V at 3000 rpm
- Fixed excitation voltage: 220 Vdc, 1 A
- Variable excitation voltage: 0-220 Vdc, 0.8 A
- Power supply: single-phase from mains, galvanically insulated.

Accessories:

DL 2307/8M	MOTOR/GENERATOR GROUP OF MACHINES
Alternative:	
DL 1023	DIRECT CURRENT MOTOR COMPOUND EXCITATION

DL 1024P	DIRECT CURRENT GENERATOR SHUNT EXCITATION
DL 2031M	OPTICAL TRANSDUCER
DL 1013A	BASE

MOTOR CONTROLLERS

Unilab

DL 2315 SPEED CONTROL OF DC MOTORS

Semi-controlled single phase bridge. Suitable for the control of the speed of independently excited dc motors. The control is performed by regulating the conduction period of a single-phase semi-controlled thyristor bridge both in open and closed loop. The controller consists of three control loops: speed, current and armature voltage.

Technical features:

- Power of the motor: 1.1 kW max.
- Power of the converter: 1.8 kW
- Armature voltage: 0 ÷ 180 V
- Armature current: 10 A max.
- Fixed excitation voltage: 220 Vdc, 1 A
- Excitation voltage: 200 V, 1 A

Accessories:

DL 1023 DC	SHUNT EXCITATION MOTOR
DL 1017R	RESISTIVE LOAD
DL 1019M	EDDY CURRENT BRAKE
DL 1013A	UNIVERSAL BASE

Recommended:

DL 2315T	ISOLATION TRANSFORMER

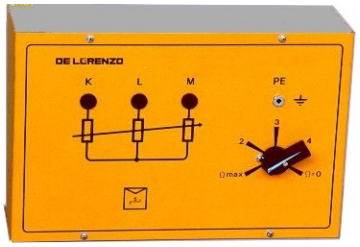
DE LORENZO

DL 1017RHD STARTING RHEOSTAT

Step-variable rheostat for the half torque starting of the dc motors of the laboratory.

DL 1017RHD3 STARTING RHEOSTAT

Step-variable three-phase rheostat for the half torque starting of the slip ring motors of the laboratory.



DL 1017RHE EXCITATION RHEOSTAT

Suitable for the shunt excitation of the dc machines and of the synchronous machines of the laboratory.

DL 1017RHES EXCITATION RHEOSTAT

Suitable for the series excitation of the dc machines of the laboratory.

DL 1022RHD3 STARTING AND SYNCHRONIZATION UNIT

Starting rheostat for the three-phase slip ring induction motors and excitation device for the synchronization of the motor with the mains.

DL 1026RHD3 STARTING AND SYNCHRONIZATION UNIT

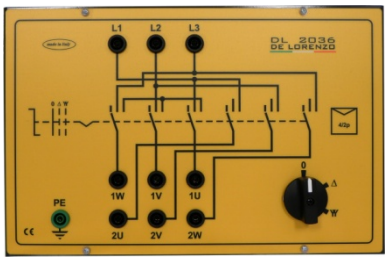
Starting rheostat for the three-phase synchronous machines and excitation device for the synchronization with the mains.

DL 2035 STAR/DELTA STARTER

Star/delta starter for the three-phase squirrel-cage induction motors.

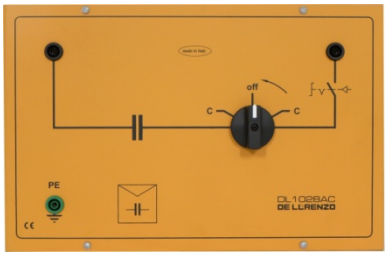
DL 2036 POLE CHANGING UNIT

Switch to change the number of poles in Dahlander type motors.



DL 1028AC CAPACITOR UNIT

Set of capacitors for either starting or steady-state running of the split-phase motor.



DL 1028AR RESISTOR UNIT

Auxiliary resistor for the starting of the split-phase motor.

DL 1028AL INDUCTOR UNIT

Auxiliary inductor for the starting of the split-phase motor.

DL 1030 PARALLEL BOARD

Rotating light synchronoscope, complete with the accessories that are required to perform the parallel connection between synchronous generators or between the alternator and the mains.

DL 1041 FLYWHEEL

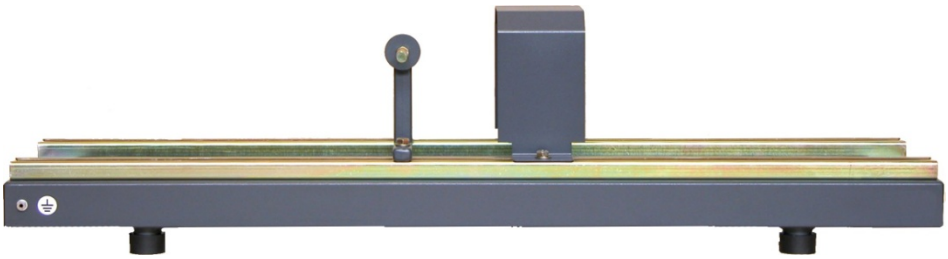
Used in the deceleration tests on rotating machines for the calculation of the mechanical iron and copper losses at different excitations.

DL 1020 THREE-PHASE TRANSFORMER

Used for the fine regulation of the voltage in the short circuit test of an induction motor.

DL 1013A UNIVERSAL BASE

Duralumin alloy varnished structure mounted on anti-vibration rubber feet, provided with slide guides for the fixing of one or two machines and with a coupling guard.
Complete with a device for the locking of the rotor of the slip ring asynchronous machines in the short circuit test.



DL 1013B UNIVERSAL BASE

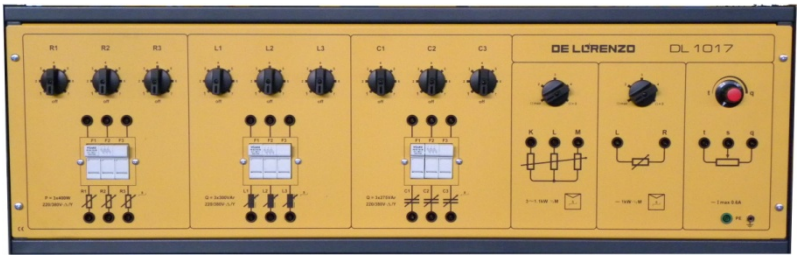
Duralumin alloy varnished structure mounted on anti-vibration rubber feet, provided with slide guides for the fixing of up to three machines, and in particular of the Schrage motor, and with a coupling guard.
Complete with a device for the locking of the rotor of the slip ring asynchronous machines in the short circuit test.

DL 1155A CONNECTING LEADS

5 red leads, diameter 4 mm., length 25 cm., section 0.75 mm2
5 black leads, diameter 4 mm., length 25 cm., section 0.75 mm2
5 red leads, diameter 4 mm., length 200 cm., section 0.75 mm2
5 black leads, diameter 4 mm., length 200 cm., section 0.75 mm2
5 red leads, diameter 4 mm., length 50 cm., section 1.5 mm2
5 black leads, diameter 4 mm., length 50 cm., section 1.5 mm2
4 red leads, diameter 4 mm., length 100 cm., section 1.5 mm2
4 black leads, diameter 4 mm., length 100 cm., section 1.5 mm2
4 red leads, diameter 4 mm., length 200 cm., section 1.5 mm2
4 black leads, diameter 4 mm., length 200 cm., section 1.5 mm2
2 yellow-green leads, diameter 4 mm., length 50 cm., section 1.5 mm2
2 yellow-green leads, diameter 4 mm., length 100 cm., section 1.5 mm2
2 yellow-green leads, diameter 4 mm., length 200 cm., section 1.5 mm2

The set of leads is also available with safety plugs and sections of 0.75 mm2 and 2.5 mm2 instead of 0.75 mm2 and 1.5 mm2 with the code DL 1155A-SC.

DL 1017 LOADS AND RHEOSTATS UNIT



Suitable for single- and three-phase capacitive, resistive and inductive step-variable loads.
Complete with half torque step variable starting rheostats for three-phase and direct current motors and with linear excitation rheostat.

- Maximum power: 3 x (275 VAR cap + 400 W +300 VAR ind)

DL 1017C CAPACITIVE LOAD

- Single or three-phase capacitive step-variable load
- Max. power: 3 x 275 VAR
- Max voltage: 220/380 V Δ/Y

DL 1017R RESISTIVE LOAD

- Single or three-phase resistive step-variable load.
- Max power: 3 x 400 W
- Max voltage: 220/380 V Δ/Y

DL 1017L INDUCTIVE LOAD

- Single or three-phase inductive step-variable load.
- Max. power: 3 x 300 VAR
- Max voltage: 220/380 V Δ/Y

DL 2096 MOTOR-DRIVEN RESISTIVE LOAD

Suitable for realizing resistive single or three-phase resistive loads through manual or automatic operation.

Technical features:
- Resistance: 3 x (1320 - 120) Ω
- Current: 3 x 1.8 A
- Power supply: single-phase from mains

CUT- AWAY MACHINES

De Lorenzo is able to provide the machines of the laboratory also in a cut-away version.
To order them, just add to the code of the machine the suffix SEZ (for example: if DL 1021 is the code of the machine, DL 1021SEZ is the code of the same machine in the cut-away version).