

DE LORENZO

UNIPLAN

Always leading the pack



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Uniplan Laboratory

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DL 2080 THREE-PHASE TRANSFORMER

Core-type transformer with splitted windings.

It can be also used with single-phase supply.

Rated power: 2.8 kVA

Primary voltages: 2 x 190 V (phase)

Secondary voltages: 2 x 70 V (phase)

Frequency: 50/60 Hz



DL 2093 SINGLE-PHASE TRANSFORMER

Shell-type transformer with splitted windings.

Transformer

Rated power: 2 kVA

Primary voltage: 220 V

Secondary voltages: 2 x 26 V

Frequency: 50/60 Hz

The static machines are sized for a standard power with low operating voltage, while the windings are splitted in more sections to allow the maximum number of possible combinations.

For special requirements, the transformers can be also realized with different sizing powers and operating voltages.

An educational terminal board, to which the inside windings are connected, shows a clear synoptical diagram with industrial conventional indications.

Educational objectives

Among the main practical tests that can be performed, we remind:

- ohmic resistance of windings
- transformation ratio
- polarity and connection group
- no-load test
- short-circuit test
- external characteristics
- conventional efficiency

Accessories

Used to perform the practical tests described in the manual:

- Power supply DL 1059
- Basic bench DL 1001-1
- Connecting leads DL 1155A
- Electric measurements DL 1031
- Computer interfacing:
see pages 10/11

**DL 2050
SQUIRREL CAGE THREE-PHASE
ASYNCHRONOUS MOTOR**



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

Power: 3.5 kW
Voltage: 220/380 V
Current 14/18 A
Speed: 1450 rpm, 50 Hz

**DL 2035
STAR/DELTA
STARTER**

Starter for three-phase squirrel-cage induction motor DL 2050.

DL 2054 SCHRAGE MOTOR



Variable speed three-phase motor, rotor supply, shunt excitation and movable brushes.

Power: 0,4 ÷ 2,2 kW
Voltage: 380 V
Current: 6.2 A
Speed: 400 ÷ 2200 rpm, 50 Hz

**DL 2051
THREE-PHASE SQUIRREL CAGE
2-SPEED ASYNCHRONOUS MOTOR**



Induction motor with Dahlander type three-phase stator winding to realize either 2 or 4 poles and squirrel cage rotor.

Power: 1.8/3 kW
Voltage: 220 V
Current: 9/11 A
Speed: 720/1450 rpm, 50 Hz

**DL 2036
POLE SWITCHING UNIT**

Device suitable to change the number of poles in Dahlander motor DL 2051.

**DL 2053A
SLIP RING THREE-PHASE
ASYNCHRONOUS MOTOR**



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

Power: 3 kW
Voltage: 220/380 V
Speed: 1500 rpm, 50 Hz
It can operate also as a synchronous machine.

**DL 2053RHD3 STARTING AND
SYNCHRONIZATION MODULE**

Starting rheostat for DL 2053A and synchronization device with mains frequency.

Possibility to use the motor as synchronous generator if driven by a motor.

DL 2037 STARTING RHEOSTAT

Starting rheostat for three-phase slip-ring induction motor.

Educational objectives

Among the main practical test that can be performed, we remind:

- measurement of the ohmic resistance of the windings
- measurement of the transformation ratio with slip-ring motor
- no-load test
- short-circuit test with locked rotor
- construction of Heyland circular diagram
- conventional efficiency
- real efficiency and electromechanical characteristics through direct tests with either electromagnetic brake or braking dc generator
- slip measurement

Accessories

Used to perform the practical tests described in the manual:

- Power supply DL 1059
- Universal base DL 1158
- Basic bench DL 1001-1
- Connecting leads DL 1155A
- Electric measurements 1031
- Mechanical measurements
- Braking device: see page 5
- Speed measurement:
DL 2052D with DL 2031, alternatively DL 2026 or DL 2026R
- Direct torque measurement:
DL 2006C with DL 2006F
- Direct speed, torque and mechanical power measurement: DL 10055 with DL 2006F
- Computer interfacing:
see pages 10/11

**DL 2057
DIRECT CURRENT MOTOR
COMPOUND EXCITATION**



Power: 3 kW
Voltage: 220 V
Speed: 1500 rpm
Excitation: 140 V/0.7 A
It can also operate as generator.
DL 2040 STARTING RHEOSTAT
DL 2041 EXCITATION RHEOSTAT

**DL 2059
DIRECT CURRENT GENERATOR
COMPOUND EXCITATION**

Power: 2.4 kW
Voltage: 220 V
Current: 11 A
Speed: 1420 rpm
Excitation: 200 V/1.2 A
It can also operate as motor.
DL 2043 EXCITATION RHEOSTAT

**DL 2064
POLYEXCITATION DIRECT
CURRENT MACHINE**

	Generator	Motor
Power:	2,4 kW	3 kW
Voltage:	190 V	220 V
Current:	13 A	15 A
Speed:	1500 rpm	1700 rpm

Suitable for operating as motor or as generator with compound, series or shunt excitation.

DL 2040 STARTING RHEOSTAT
DL 2041 EXCITATION RHEOSTAT
DL 2044 EXCITATION RHEOSTAT

**DL 2058
DIRECT CURRENT MOTOR
SERIES EXCITATION**

Power: 1.2 kW
Voltage: 220 V
Speed: 1000 rpm
It can also operate as generator.
DL 2042 STARTING RHEOSTAT
DL 2044 EXCITATION RHEOSTAT

**DL 2061
DIRECT CURRENT GENERATOR
SERIES EXCITATION**

Power: 2.4 kW
Voltage: 220 V
Current: 11 A
Speed: 1420 rpm
It can also operate as motor.
DL 2044 EXCITATION RHEOSTAT

**DL 2055
DIRECT CURRENT MOTOR
SHUNT EXCITATION**



Power: 3 kW
Voltage: 220 V
Speed: 1500 rpm
Excitation: 200 V/1.4 A
It can also operate as generator.
DL 2040 STARTING RHEOSTAT
DL 2041 EXCITATION RHEOSTAT

**DL 2060
DIRECT CURRENT GENERATOR
SHUNT EXCITATION**



Power: 2.4 kW
Voltage: 220 V
Current: 11 A
Speed: 1420 rpm
Excitation: 200 V/1.4 A
It can also operate as motor.
DL 2043 EXCITATION RHEOSTAT

Educational objectives

Among the main practical test that can be performed, we remind:

- resistance of windings
- mechanical and iron losses
- conventional efficiency
- magnetization, external and regulation characteristics of the generators
- electromechanical characteristics of the motors through direct method
- electronic speed control of motors

Accessories

Used to perform the practical tests described in the manual:

- Power supply DL 1059
- Universal base DL 1158
- Basic bench DL 1001-1
- Connecting leads DL 1155A
- Load DL 2090 and driving motor DL 2055 (only for the generators)
- Electric measurements DL 1031
- Mechanical measurements See Three-phase synchronous machines



DL 2066 RHE EXCITATION RHEOSTAT

Cursor linear rheostat suitable for the excitation of the synchronous machine.

DL 1030 PARALLEL BOARD

Rotating light synchronoscope provided with the accessories required to perform the parallel connection between generators or between the alternator and the mains

Educational objectives

Among the main practical test that can be performed, we remind:

- measurement of the ohmic resistance of windings
- magnetization characteristic
- no-load losses through the auxiliary motor method
- short-circuit characteristic
- conventional efficiency
- external and regulation characteristics of the alternator through direct and indirect methods in accordance with Behn-Eschemburg or Potier

DL 2066A THREE-PHASE SYNCHRONOUS MACHINE

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

Alternator: 2.4 kVA
Motor: 2 kW
Voltage: 220/380 V Δ/Y
Current: 6.3/3.6 A
Speed: 1500 rpm, 50 Hz
Excitation: 190 V/0.6 A

- mains parallel and regulation of the active and reactive power exchange
- Mordey "V" curve of synchronous motor
- electromechanical characteristics of the synchronous motor through direct method

Accessories

Used to perform the practical tests described in the manual:

- Power supply DL 1059
- Universal base DL 1158
- Basic bench DL 1001-1
- Connecting leads DL 1155A
- Driving motor
Motor DL 2053A with DL 2053RHD3, or motor DL 2055
- Load DL 2090
- Electric measurements DL 1031
- Mechanical measurements
Braking device: see page 5
Speed measurement:
DL 2025D with DL 2031, alternatively DL 2026 or DL 2026R
Direct torque measurement:
DL 2006C with DL 2006F
Direct speed, torque and mechanical power measurement: DL 10055 with DL 2006F
- Computer interfacing:
see pages 10/11

DL 1059 MOBILE POWER SUPPLY



Fixed and variable outputs are obtained from one three-phase variator:

- D.C. fixed 220V, 4.5A
 - A.C. fixed 3 x 380V, 20A
 - D.C. variable 0-250V, 28A
 - A.C. variable 3 x 0-260V, 17A
- switchable with:
- D.C. fixed 220V, 28A
 - A.C. fixed 3 x 220V, 17A
 - D.C. variable 0-250V, 4.5A
 - A.C. variable 3 x 0-440V, 13A

D.C. outputs obtained by means of a double three-phase bridge with ripple 4.2% max. Magneto-thermic protection.

Provided with start push button with remote control switch, key-unlocked emergency pushbutton.

Input supply: 3-phase 380V + N + H





**DL 2006Um
EDDY CURRENT
BRAKE**

Smooth cylinder rotor and salient poles stator. Complete with water level, arms, weights and balance weights for measuring the output torque of the motor.

Possibility of mounting a load cell.
Power: 3 kW at 1500 rpm.
Maximum speed: 4000 rpm.

Complete with:
DL 2006AL POWER SUPPLY
Variable power supply for the brake DL 2006Um.
Supply: 220 V, 50 Hz.



**DL 2062
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.
Power: 2.4 kW
Voltage: 220 V
Current: 11 A
Speed: 1420 rpm
Excitation: 200 V / 1.4 A

**DL 2090 RESISTIVE
LOAD**

Suitable for realizing the electric load for the dynamometer DL 2062.

Accessories

Used to perform the braking tests:

- Power supply DL 1059
- Universal base DL 1158
- Connecting leads DL 1155A
- Mechanical measurements
 - Speed measurement: DL 2025D with DL 2031, alternatively DL 2026 or DL 2026R
 - Direct torque measurement: DL 2006C with DL 2006F
 - Direct speed, torque and mechanical power measurement: DL 10055 with DL 2006F
- Computer interfacing: see pages 10/11

The brakes are sized for a braking power greater than the overload power of all the electric motors of the laboratory.

An educational terminal board, to which the inside windings are connected, shows a clear synoptical diagram with industrial conventional indications.

**DL 2043 EXCITATION
RHEOSTAT**

Excitation rheostat for the dynamometer.



**DL 10055
MECHANICAL POWER DIGITAL
MEASURING UNIT**

Suitable 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 braking systems.

Digital readout of measured quantities and conditioning to voltage levels directly compatible with plotters. Interfaceable for data acquisition and automatic plotting of the electromechanical characteristics of the machines.

Connector for overspeed protection of motors for connection to power supply unit.

Technical features

- Torque: 9.99 - 50.0 Nm (1 mV/dgt)
- Speed: 6000 rpm (1 mV/rpm)
- Power: 9990 W (1 mV/W)
- DC output: 0-220 V, 2 A
- Power supply: 220 V, 50/60 Hz



**DL 10065
ELECTRIC POWER DIGITAL
MEASURING UNIT**

Suitable for electric power measurement both in direct and alternate current, single or three-phase, also with unbalanced loads.

Provided with: digital voltmeter and ammeter for dc measurements; digital voltmeter and ammeter switchable to the different phases and digital wattmeter single-three phase for ac measurements.

Analog outputs proportional to the measured quantities and directly compatible with plotters or interfaceable for automatic plotting of the characteristic curves of the machines.

Technical features

- DC/AC voltage: 500 V (10 mV/V)
- DC/AC current: 19.99 A (250 mV/A)
- AC power: 9990 W (1 mV/W)
- Power supply: 220 V, 50/60 Hz



**DL 1031 ELECTRIC POWER
DIGITAL MEASURING UNIT**

For dc voltage and current measurement consisting of a two-range voltmeter and an ammeter, both switchable on two lines

For ac voltage, current and power measurement in single or three-phase systems consisting of two-range voltmeter, switchable on different phases, an ammeter, switchable on phases without circuit break, and a two-wattmeter system (aron method) with reading inverter.

Technical features:

- DC voltage: 99.9 V - 500 V
- DC current: 19.99 A
- AC voltage: 99.9 V - 500 V
- AC current: 9.99 A
- Power: 6600 W
- Power supply: 220 V, 50/60 Hz

Speed measurement



DL 2025D ELECTRONIC TACHOMETER

Suitable for measuring the revolving speed through optical transducer DL 2031 fixed to the machine. Digital read out and analog output proportional to the measured value. Complete with connector for protection against overspeed to be connected to the power supply unit. Power supply: 220 V, 50 Hz.

DL 2031 OPTICAL TRANSDUCER

Suitable to point out the revolving speed through a slotted optical switch with encoder disc, used also for stroboscopic measurements. Complete with built-in signal transmission socket to DL 2025D.

DL MA3907 STROBOSCOPE

Flashing light source suitable for observing periodic motions. Flash frequency: 200 to 10,000 flash/min (3.3 to 166.6 Hz). Power supply 220 V, 50 Hz; 35 VA.

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 for measuring the revolving speed with digital readout. Measuring range: 50 to 19,999 rpm. Power supply: 4 x 1.5 V batteries (UM 3), included. Complete with 5 reflectors.



Torque measurement



DL 2006C TORQUE MEASURING UNIT

Suitable for measuring the motor output torque through load cell arranged on brake unit. Digital readout and analog output proportional to the measured value. Power supply: 220 V, 50/60 Hz.

DL 2006F LOAD CELL

Resistance electronic strain gauge with 500 N range, to be arranged on the brake unit to detect the mechanical torque.

DL 2091 INDUCTIVE LOAD

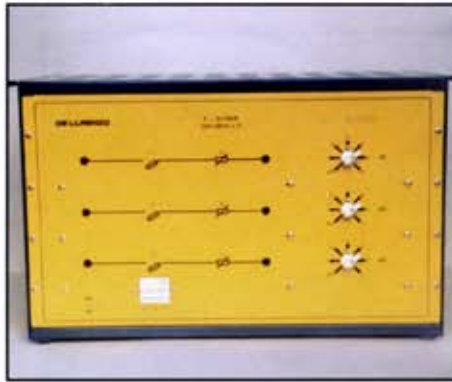


Inductive single-three phase load, step variable by means of three switches. In metallic case with synoptical diagram on the front panel. Suitable for series, parallel, star and delta connections.

Max. power: 3 x 900 VAR

Voltage: 220/380V Δ/Y

DL 2090 RESISTIVE LOAD



Resistive single-three phase load, step variable by means of three switches. In metallic case with synoptical diagram on the front panel. Suitable for series, parallel, star and delta connections.

Max power: 3 x 1.2 kW

Voltage: 220/380 V

DL 2021 CAPACITIVE LOAD



Capacitive single-three phase load, step variable by means of three switches. In metallic case with synoptical diagram on the front panel. Suitable for series, parallel, star and delta connections.

Max. power: 3 x 900 VAR

Voltage: 220/380 V Δ/Y

DL 2037 STARTING RHEOSTAT



Starting rheostat for three-phase slipping asynchronous motor DL 2052.

DL 2040 STARTING RHEOSTAT

Step-variable rheostat for 50% torque starting the 3 kW DC motors.

DL 2042 STARTING RHEOSTAT

Step-variable rheostat for 50% torque starting the 1.2 DC motors series excitation.

DL 2053RHD3 STARTING AND SYNCHRONIZATION MODULE

Starting rheostat for DL 2053A and synchronization device with mains frequency.

Possibility to use the motor as synchronous generator if driven by a motor.

DL 2041 EXCITATION RHEOSTAT



Suitable for the shunt excitation of direct current motors.

DL 2043 EXCITATION RHEOSTAT

Suitable for the shunt excitation of direct current generators.

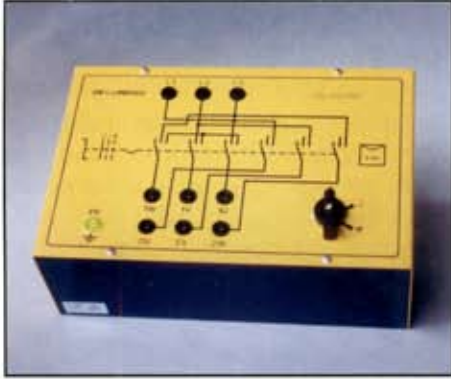
DL 2044 EXCITATION RHEOSTAT

Suitable for the series excitation of the direct current machines.

DL 2066RHE EXCITATION RHEOSTAT

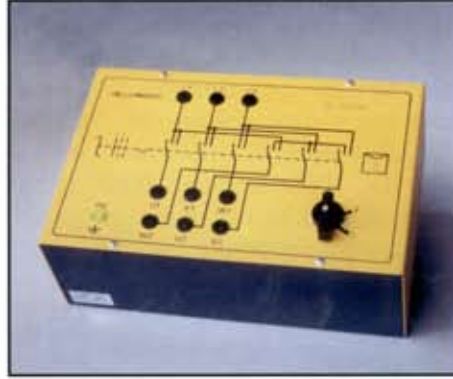
Cursor linear rheostat for the excitation of the synchronous machine.

**DL 2035
STAR/DELTA STARTER**



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

**DL 2036
POLE SWITCHING UNIT**



Device suitable to change the number of poles in Dahlander motor.

**DL 1030
PARALLEL BOARD**



Rotating light synchronoscope to perform the parallel connection between synchronous generators or between the alternator and mains.

**DL 2070
ELECTRO-MAGNETIC JOINT**



The joint, inserted between two machines, allows the coupling and the decoupling of two rotating machines.
Electric power at the electromagnet: 35 W
Max. speed : 3000 rpm
Nominal torque: 75 Nm
Supply voltage: 24 Vac

**DL 1158
UNIVERSAL BASE**



Realized with 20/10 steel tubular structure. It is provided with: self-orienting wheels with locking device, slides for easy coupling, locking system for locked rotor test and coupling accessories.

**DL 1158M UNIVERSAL BASE
FOR THREE MACHINES**

It allows the coupling and the decoupling of three electric machines.

DL 1015-2 TROLLEY

Tubular steel frame with two shelves and rubber castors.
Suitable for supporting and moving the machines.

DL 1016 CABINET

Fire varnished steel-plate, provided with key-locked doors.
It can be arranged under the DL 1001-1 basic bench.

DL 1155A CONNECTING LEADS

Set of 52 stackable leads in red and black colour for one measuring work group.
0.75 and 2.5 mm² in various lengths and with 4 mm plugs.

DL 1001-1 BASIC BENCH

Large sized bilaminated wooden board and square legs with compensation feet.
On request, drawers, book-shelf and sockets to improve its versatility.

DL 1150 STOOL

Turnable and vertically adjustable.
On request, back.

DL 1196 HOLDER FOR LEADS

Metallic frame for holding measuring leads.

The tests and measurements performed on both static and rotating electric machines can be organized to realize a personal computer based, IBM compatible, automatic acquisition and processing system, using the measurement and control units of the Uniplan laboratory already arranged for interfacing.

The flexibility of the system can be appreciated when considering its modularity and the possibility to realize different configurations.

For the practical set up of the automatic or semi-automatic systems a data acquisition unit (DL 1993) with multifunction board is required besides the motor-driven (DL 1059A, DL 2094 and DL 1067) and measuring (DL 10055 and DL 10065) units, programmed by the computer through a suitable software package.

**DL 9330SW3
SOFTWARE FOR AUTOMATIC
DATA ACQUISITION**

Software able to modify the parameter under control through motor driven devices and to record the test data through measuring units arranged for interfacing, with data post processing for graph or table display.

DL 1993 INTERFACE UNIT

Used to interconnect real world signals to a data acquisition system.

Input/output 2 mm terminals.

Technical features:

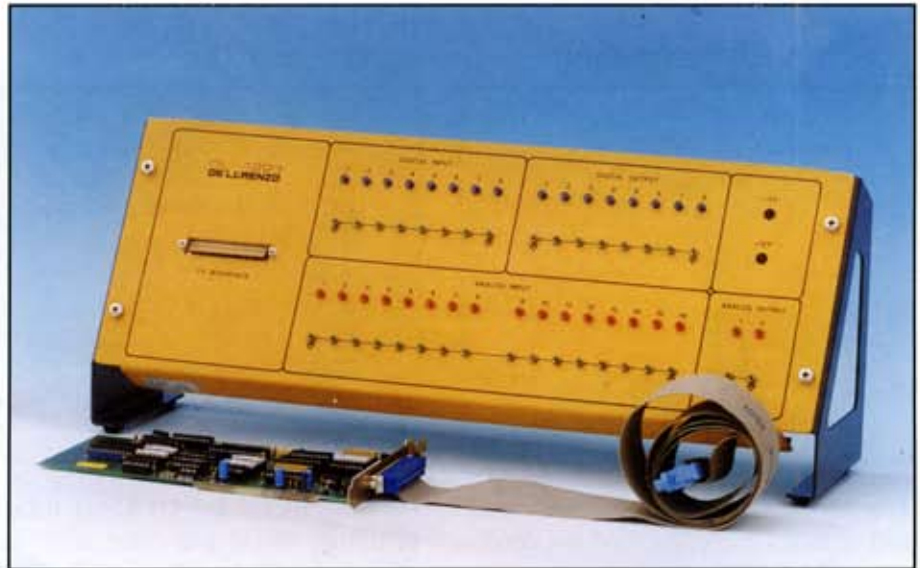
16 analog inputs: 0 - 10 Vdc

2 analog outputs: 0 - 10 Vdc

8 TTL inputs

8 relay outputs

Power supply: 220 V, 50/60 Hz

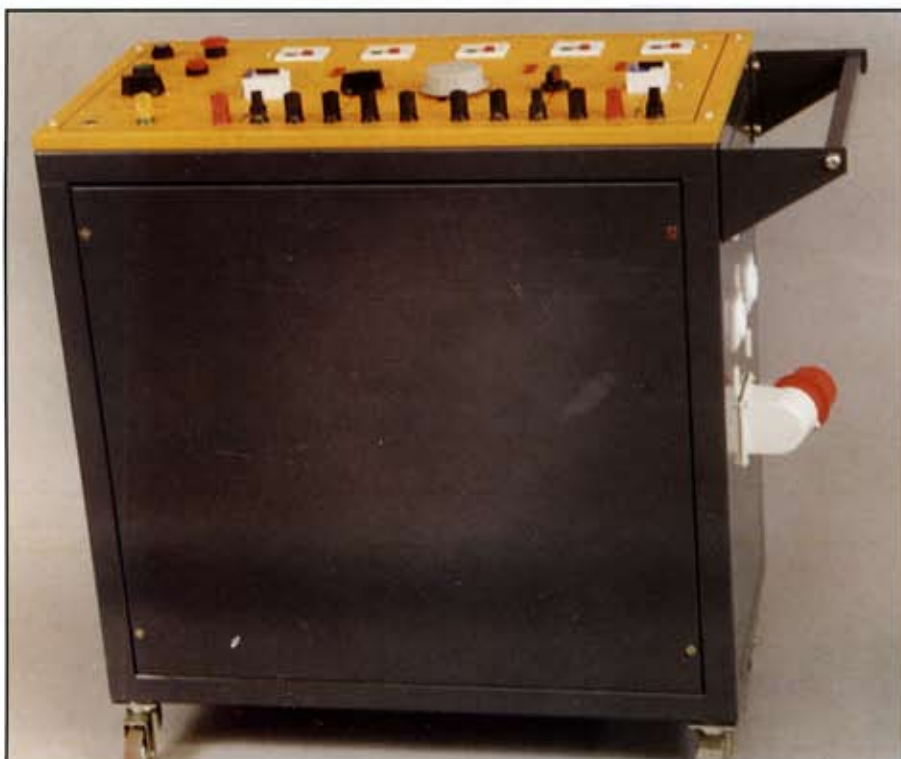


DL PC - PC IBM COMPATIBLE

DL PL8PA3 - PLOTTER
A3 paper format, 8 pens.

DL INFO122 - PRINTER
Serial dot matrix printer.

DL 1059A MOBILE AUTOMATIC POWER SUPPLY



Technical features

Mains outputs :

- single-phase 10/16A
- three -phase 16A

DC variable output : 0-250V, 2A

Possibility to be driven in manual or automatic mode through software.

Fixed and variable outputs are obtained from a three-phase variator:

- AC variable 0-240V, 22A

switchable in:

- AC variable 0-440V, 13A
- DC variable 0-300V, 30A

Max. ripple 4.2%

The outputs are provided with magneto-thermic protection and are of unloseable connecting terminals type.

General protection with differential magnetothermic switch, key-unlocked emergency pushbutton.

Power : 380V + H + N



DL 2094 SINGLE THREE-PHASE MOTOR DRIVEN VARIABLE RESISTIVE LOAD

Within the automatic system it is used as a load for the dynamometer and the alternator. It is able to dissipate a maximum power of 3.3 kW, 220/380 V. It is possible to vary the resistance by means of a motor driven system that can be controlled either manually, through knobs placed on the front panel, or automatically, when interfaced to the DL 1993.

DL 10055 MECHANICAL POWER DIGITAL MEASURING UNIT

See page 6



DL 1067 POWER SUPPLY MOTOR-DRIVEN UNIT

Suitable for supplying with variable voltage the brake assemblies with manual operation or automatic operation through DL 1993 unit.

DC output: 0 to 210 V, 2 A.

Power supply: 220 V, 50/60 Hz.

DL 10065 ELECTRIC POWER DIGITAL MEASURING UNIT

See page 6

DL 2315B
SPEED CONTROL OF DC MOTORS

This unit is suitable for the speed control of the dc motors with independent excitation. The control is made by regulating the conduction period of a thyristor bridge of the semi-controlled single-phase type, both in open and in closed loop.

The control loops are three: speed, current and armature voltage.

Technical features:

- Power of the motor: 3 kW max.
- Power of the converter: 3.6 kW
- Armature voltage: 0 ÷ 180V
- Armature current: 20 A max.
- Excitation voltage: 200V - 2A



DL 2308B
SPEED CONTROL OF DC MOTORS

System for the speed control of DC motors with a separate excitation through a totally controlled thyristors bridge.

Max. power 3 kW.

Composed of:

- a totally controlled single-phase bridge, for the open and closed loop control
- three control loops (speed, current and armature voltage)
- analog meters of current, speed and voltage

Technical features:

- Power: 3 kW
- Fixed excitation voltage: 220V/1A
- Variable excitation voltage: 0 ÷ 220V/1.5A
- Armature current: 20 A max.
- Power supply: 220V, 50Hz

DL 2309
SPEED CONTROL OF AC MOTORS

Electronic frequency converter for the open and closed loop speed regulation of a three-phase induction motor.

Potentiometers for speed setting and acceleration and deceleration ramps.

Reversal in the direction of rotation.

Analog meters for frequency and speed.

Under and over supply voltage protection, temperature protection and output current limitation.

Technical features:

- Power: 4 kW
- Nominal current: 9 A
- Output frequency: 0 to 100 Hz
- Dynamic braking
- Complete with analog meters for frequency and rotating speed and with electronic protections against overvoltage, maximum current and overtemperature.





Established in 1947 in Milano, Ferrari Strumenti Elettrici can rightly boast a long tradition of quality and professional commitment in the manufacturing of electric measuring instruments.

The highly qualified production is articulated in the manufacturing of:

- Electromagnetic, electrodynamic and mobile coil voltmeters and ammeters.
- Electrodynamic wattmeters and phasemeters.
- Vibrating reed frequencymeters.
- Measurement laboratory equipment and accessories.

Accuracy classes: 0.2 - 0.5 - 1 - 2.5 as a function of models and ranges.

DL 1033ANA ANALOG METERS

Set of analog instruments suitable for Uniplan laboratory.

ML 12 - RCV5	Voltmeter cc/ca	3 - 15 - 30 - 150 - 450 V ±1% cc/±2,5% ca	5
ML 12 - RCA5	Amperemeter cc/ca	0,24 - 1,2 - 4 - 12 - 24A ±1% cc/±2,5% ca	4
WC 15-4	Single-phase Wattmeter	1 - 2 A/75 - 150 - 300 - 600 V ±0,5% cc/ca	2
COS 15-M	Single-phase Phasemeter	1 - 2 A/220 V 0,5 CAP - 1 - 0,5 IND	1
COS 15	Three-phase Phasemeter	1 - 2 A/380 V ±0,5% cc/ca	1
FC 15C	Frequencymeter	47 - 52,5 Hz/57 - 62,5 Hz 220 - 380 V	1
T AFL	Current transformer	5 - 10 - 20/1A	3

More detailed information can be obtained from the Ferrari Strumenti Elettrici brochure.

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