didalab
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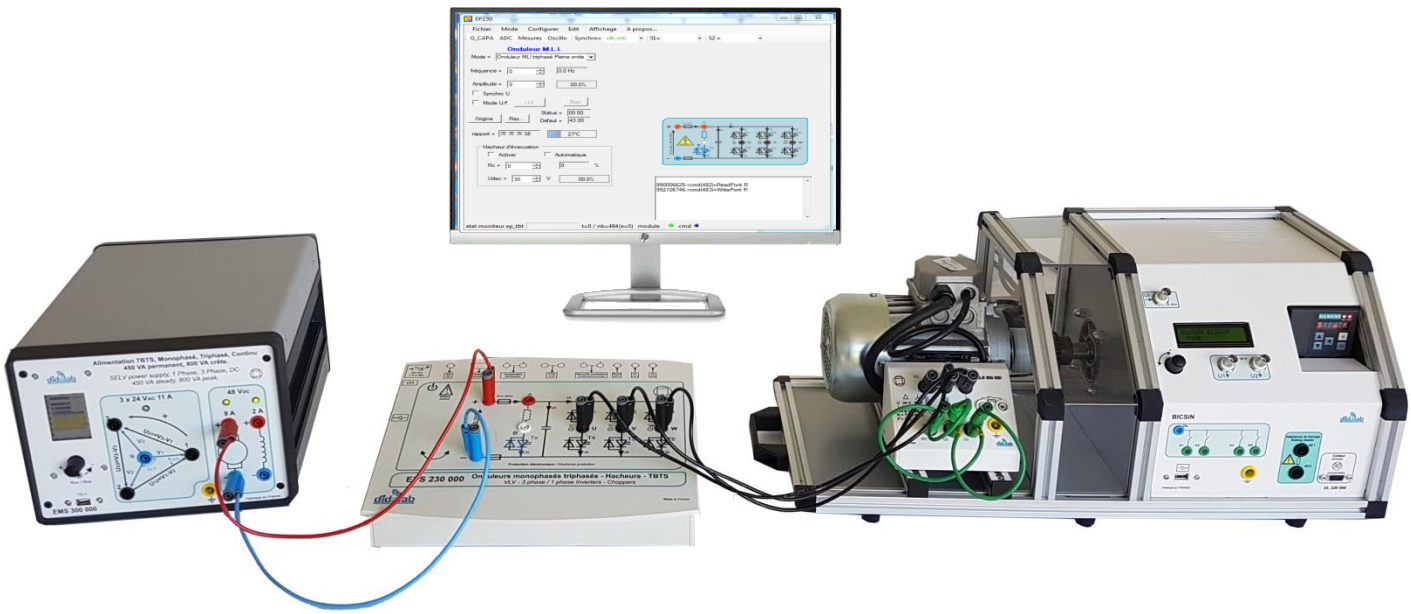
Electrical Engineering
Power electronics
300 W - LV



Our pedagogical Solutions

POWER SUPPLY | POWER BRIDGES | MOTOR BENCHES | ENVIRONMENT

LV : Low voltage

This range of power already presents electro-technical phenomena (characteristics of motors) .
However, by having a relatively low(weak) power the cost of equipment remains moderate.

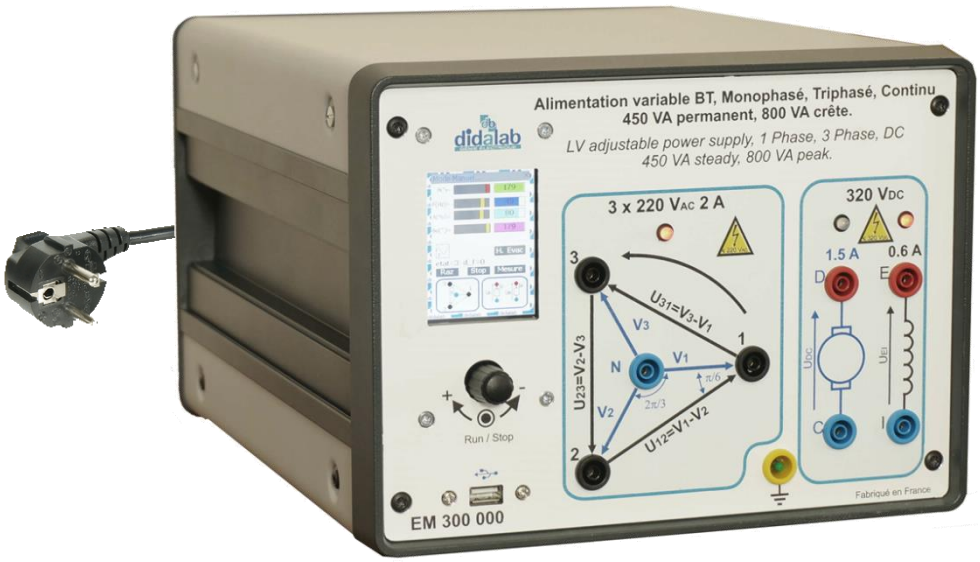
This range addresses mainly:
All the trainings which propose practical class of electronics of power and the electro-technics.
Furthermore, thanks to our revolutionary supply, it allows to work with "standard" tables (with 1-ph 230 V / 16 A plugs).

Thus you can make your electro-technical and power electronics practical works in a "electronic" environment (a non-specialized laboratory)

However, the power bridges and motor test benches can be also used in classical electro-engineering environment with 3-ph measuring workbenches (3-phase alternative current (fixed and adjustable), adjustable continuous current …)

Power supply

EM 300: Electrical engineering power supply



Input voltage
1-phase AC power supply on **mains sockets, 240 VAC 16 A,**

Output voltages
3-phase alternative current + neutral 3x220 VAC 2 A
or **direct current** 320 VDC 1.5A,
Direct current (for excitation) 320 VDC 0.6 A

Steady power: 450 VA, Peak power: 800 VA

Integrated measurements:
voltages, currents, active power, reactive power, phase shift...

MAIN CHARACTERISTICS:

EM 300 000 power supply is specially designed to carry out practical works in Power electronics and Electrotechnics in the DIDALAB 300-W range. Its main assets are:

- Output voltage comply with SELV standard s (avoiding expensive measuring and/or protection systems).
- **Pluggable directly to the mains: single-phase socket 240 V_{AC} 16A (available in any given classroom).**
- A LCD HMI associated to a digital potentiometer enables to select the values to display (DC/AC voltage, direct current, effective single or tri, phase difference, cosine φ, etc.

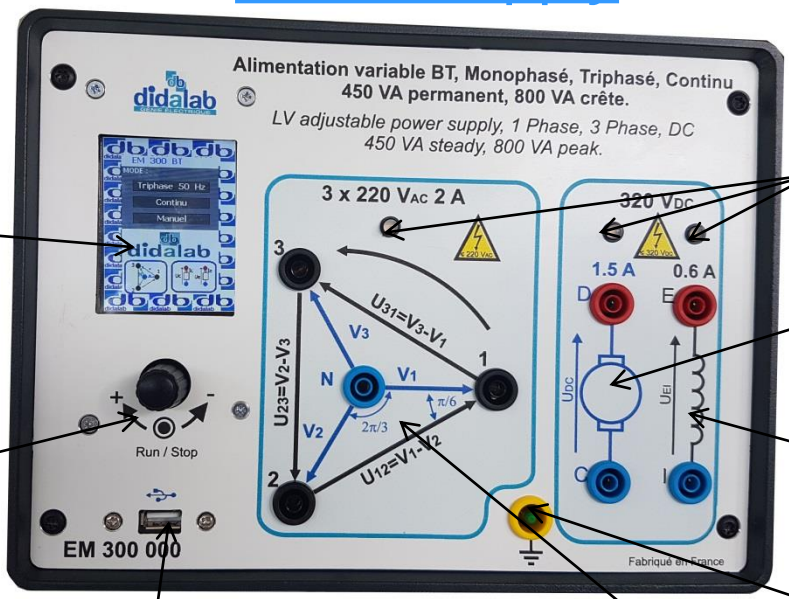
- *Optional: a software under Windows enables to retrieve the information of electrical power to carry out rotating machines yield studies (mechanical energy acquisition on the load module).*

Back

Supply socket for mains 220 Vac/50 Hz

Ø 4-mm security sockets to connect a resistance for energy discharge.

Power supply



HMI

Digital Potentiometer

Prise USB pour récupération des données sur Pc
(Tension, courant, puissance, cos phy, …)

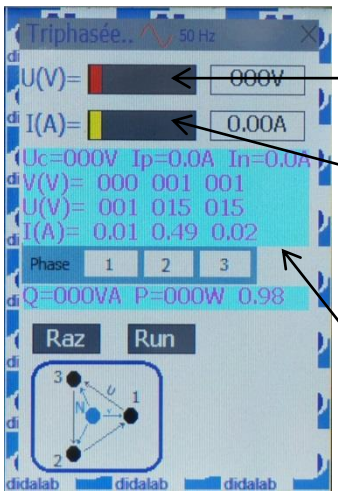
Display leds
State of the power supply

DC power supply
340Vdc 1.5A

DC power supply
340Vdc 0.6A

Earth socket

AC power supply
1-phase, 3-phase
220 Vac 2A

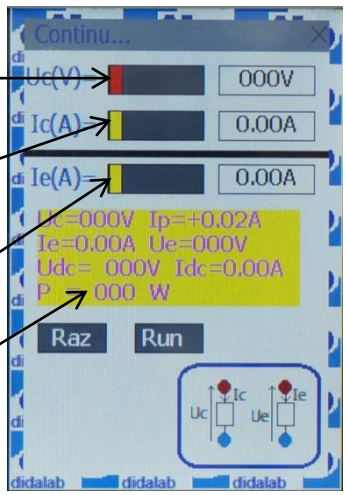


Control slider for voltage

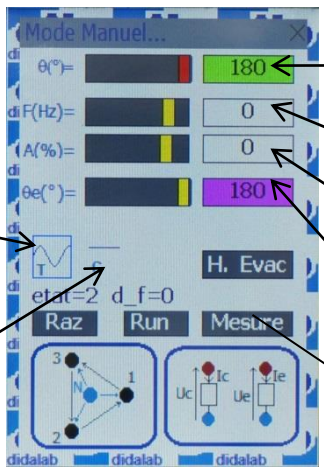
Control slider for current

Control slider for excitation current

Measures



Manual mode



Delay angle
(0 to180°)

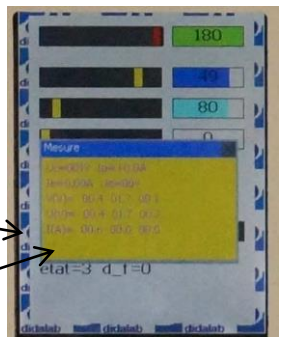
Inverter frequency
(Hz)

Inverter amplitude

DC excitation power supply

Activation of the AC operating mode

Activation of the DC operating mode



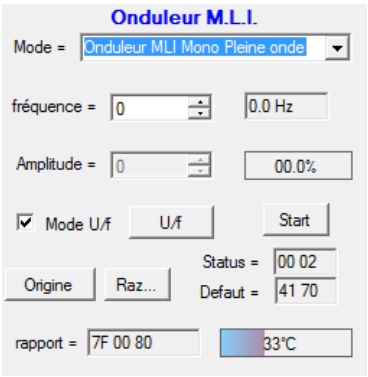
The measures depend on the operating mode :
- In 3-ph AC mode: RMS voltage (V and U (phase voltage and compound voltage) in each phase ; RMS current in each phase
- In DC mode: average voltage and average current.

Power bridges

EP MONITOR : Program for setting the parameters and for acquisition

This programs operates with Windows environment and is used to control all the power bridges (rectifier, chopper, inverter, AC controller) via USB.
When you connect the bridge to the PC and launch the program, the program automatically recognizes the bridges it is connected to.

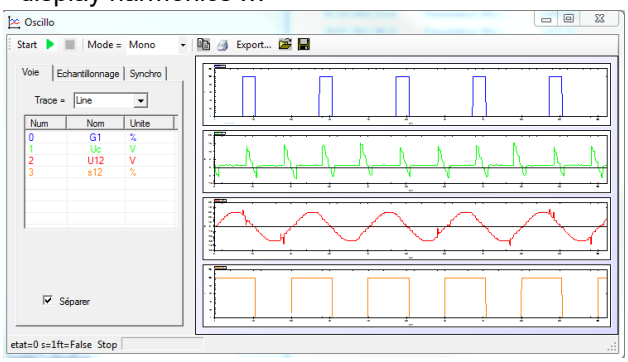
➢ The student chooses the bridge structure



Example with the EPS230 inverter

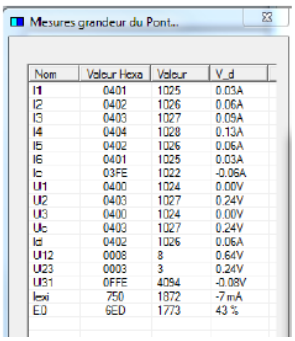
➢ He sets the operating parameters

➢He chooses the values he wants to display on the internal oscilloscope,
➢Due to calculation function in the internal oscilloscope, he can display harmonics …



Example with the EPS130 rectifier

➢The student can display the measures in all the arms of the power converter (Voltage, control current for the or the IGBT, in the load, …)

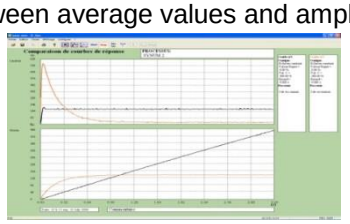


Optional extra: D_CCA, Program for speed and position servo-control

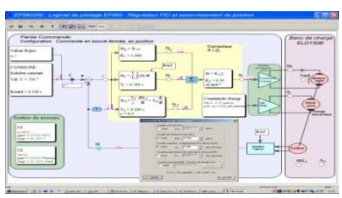
In a Windows environment, this program allows the control of the power converters via a USB port. Its graphic interface is very friendly and allows:

- Selection of the system structure: open loop, closed loop for speed,…
- Selection of the set value: constant value, ramp, sine, trapezoid, its characteristics
- Selection of the corrector and the adjustment of its parameters (P, PI, PID, digital Z corrector, fuzzy logic, tachometer feedback)
- The recording of the current test, comparison with previous tests.
- The measure of the characteristic value in servo-control (time constant, 5% response time, overflow amplitude, harmonics : ratio between average values and amplitudes, phase shift etc…).

Comparison in open loop of the response in voltage control, then in current control, without frictional disturbance



Screen for settings
Example of a speed control with a 1 loop PID corrector

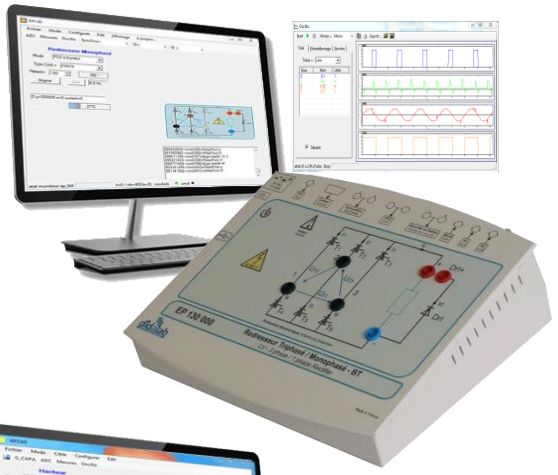


Optional extra: Prototyping and new correctors

In order to accentuate the pedagogical qualities, or even make research with our converters, a software module is proposed..
It can synthesize any type of command (Open loop, Closed loop, PI, PID, state return...) under Scilab® environment, then generate the executable code which will be downloaded in the converter thus allowing its control in real time.
This graphical tool has all the power of Scilab® / Xcos simulation software; the comparison between simulation and reality is then possible during practical works (speed control of a DC motor ..)

Power bridges

EP 130: 1-phase, 3-phase rectifier, 300W, LV



For the study of:

- 1-phase rectifier

All diodes, all thyristors, mixed symmetrical, mixed asymmetrical

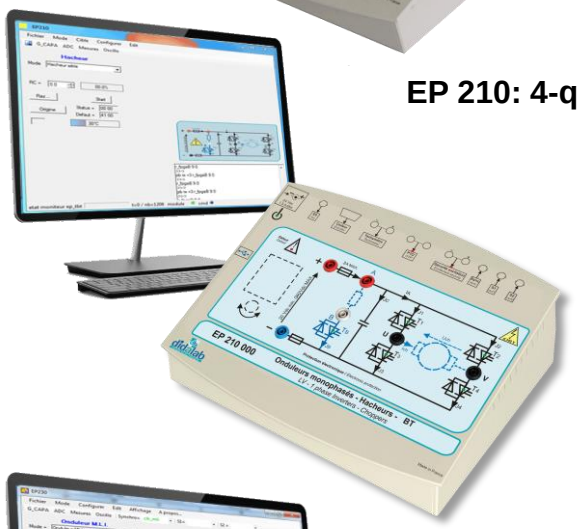
- 3-phase rectifier

All diodes, all thyristors, mixed

- Assisted inverter

-Optional extra: speed servo control, prototyping

EP 210: 4-quadrants chopper/ 1-phase inverter, 300W , LV



For the study of:

- Chopper

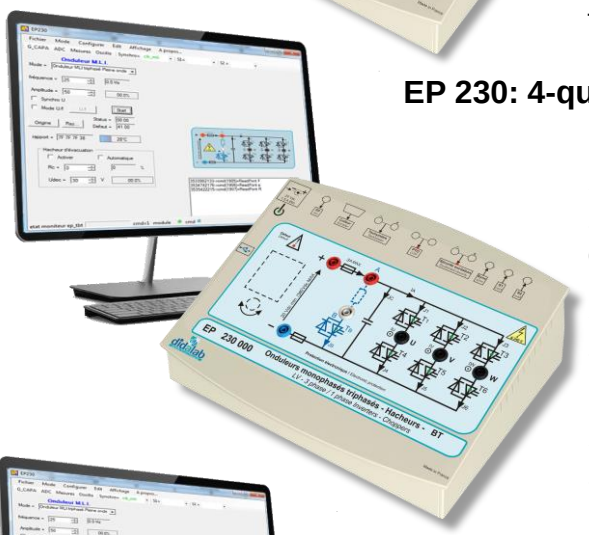
Serial, voltage reversible, current reversible, four quadrants, over-fitted double serial

- 1-phase inverter

Shift control full wave with fixed frequency, with adjustable frequency, PWM +E/-E, PWM +E/0/-E, constant U/f

-Optional extra: speed and position servo control, prototyping

EP 230: 4-quadrants chopper/ 1-phase, 3-phase inverter, 300W , LV



For the study of:

- Chopper

Serial, voltage reversible, current reversible, four quadrants, over-fitted double serial

- 1-phase inverter

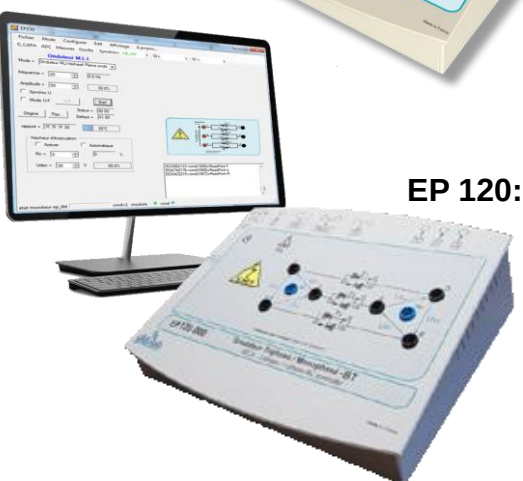
Shift control full wave with fixed frequency, with adjustable frequency, PWM +E/-E, PWM +E/0/-E, constant U/f

- 3-phase inverter

Shift control full wave with fixed frequency, with adjustable frequency, PWM +E/-E, PWM +E/0/-E, constant U/f

- Optional extra: speed and position servo control, prototyping

EP 120: 1-phase, 3-phase AC controller, 300 W, LV



For the study of:

- Up-line 1-phase AC controller

Phase angle controller, burst firing controller

- Up-line 3-phase AC controller

Phase angle controller with neutral, phase angle controller without neutral

Motors

The bench can accept various motors to test, we suggest the following motors but you can ask us for other ones.

EL 3x1: DC motor with separate excitation, 300W LV

MOTOR CHARACTERISTICS	Value	Units
Power supply	170	Vdc
Nominal current	2	A
Excitation voltage	190	Vdc
Excitation current	0.52	A
Speed (for nominal current)	2 000	Tr/min
Mechanical power	300	W

EL 3x2: DC motor with permanent excitation, 300W LV

MOTOR CHARACTERISTICS	Value	Units
Power supply	170	Vdc
Nominal current	2	A
Speed (for nominal current)	2 000	Tr/min
Mechanical power	300	W/S2*

EL 3x3: 3-phase AC squirrel motor, 300W LV

MOTOR CHARACTERISTICS	Value	Units
Nominal voltage	240 / 400	Vac
Nominal current	2 A / 1,2	A
Cosine φ	0,74	
Opertating power	370	W
Speed (synchronism)	1 360	tr/min

EL 3x6: Brushless motor, 300W LV

MOTOR CHARACTERISTICS	Value	Units
Sine voltage power supply	230	Vac
DC voltage power supply (trapezoïd)	310	Vdc
Speed (for nominal current)	2000	Tr/min
Mechanical power	300	W
Connection for Hall effect probe via DB15	3	DB15

EL 3x7: 1-ph/3-ph AC motor, 300W LV

MOTOR CHARACTERISTICS	Value	Units
Nominal voltage	240 / 400	Vac
Nominal current	2 A / 1,2	A
Cosine φ	0,74	
Opertating power	370	W
Capacitor	30	µF
Speed (synchronism)	1 360	tr/min

EL 3x5: 3-ph synchronous motor /generator, 300W LV

MOTOR CHARACTERISTICS	Value	Units
Sine voltage power supply	230	Vac
Nominal current	0.9	A
Speed (for nominal current)	1500	Tr/min
Mechanical power	300	W

Load benches

EL31x : BICMAC Instrumented load bench for AC and DC motors

300-W motor bench:

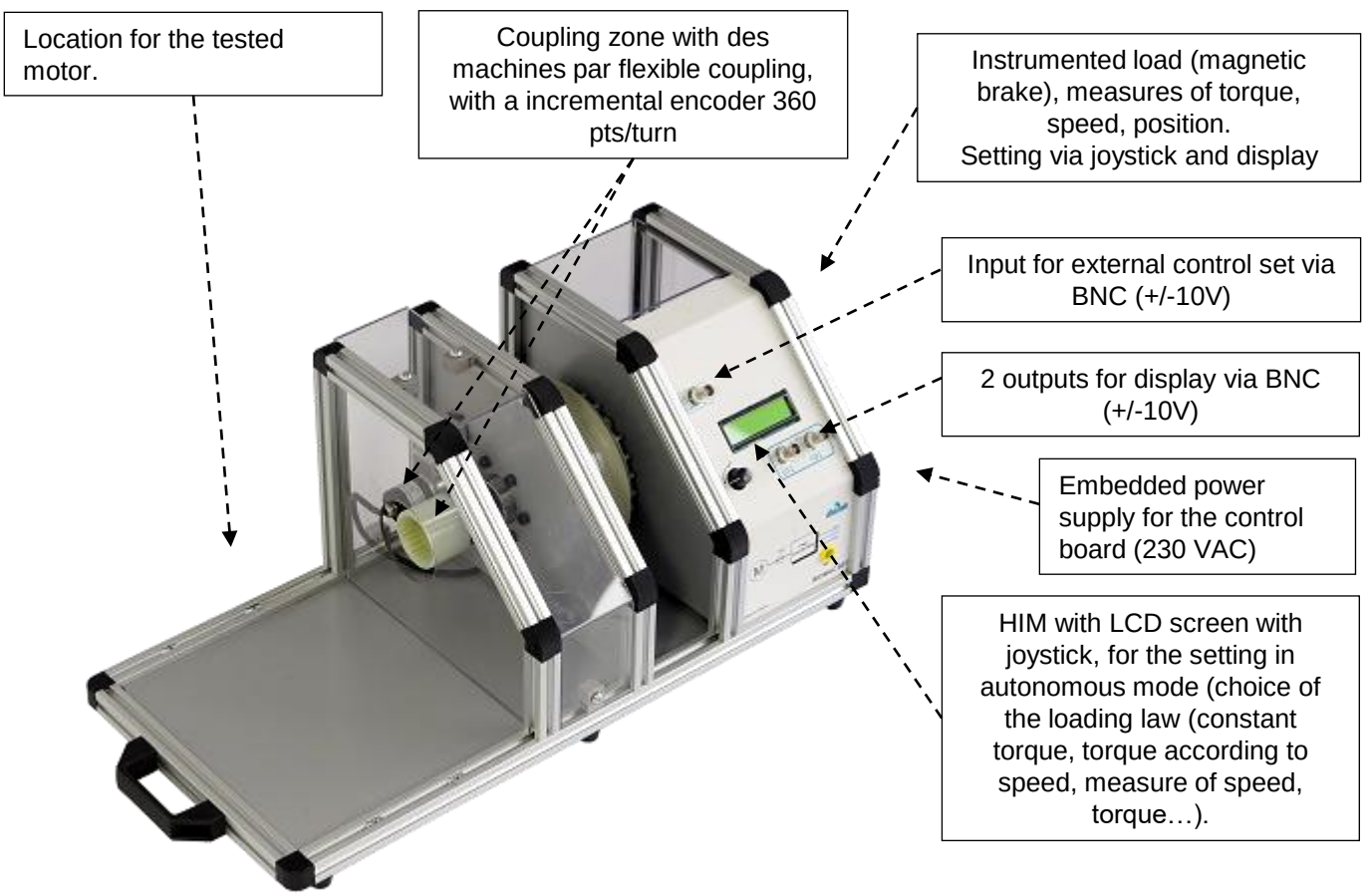
- The load is a magnetic brake
- A control board and its power supply carries out the load generation and the acquisition of results (constant load, load according to speed, to square speed …)
- Various testing settings are available (with 3-phase asynchronous motor, DC motor, Brushless motor…),

Settings of the load:

The load is set via potentiometer and display,
In our case (magnetic brake), it is a **braking** load,
Choice between: constant torque (-sign(N).C), proportional to the speed (a.N), proportional to the square speed ($b.n^2$), external

Measures:

The measures displayed are:
Measured values: torque C_m (N.m), rotation speed N (en tr/min),
Calculated measures: mechanical power P (W), with $P_m=C_m.\omega$



Load benches

EL32x : BICSIN Instrumented load bench with active load and simulation of Digital Industrial Systems

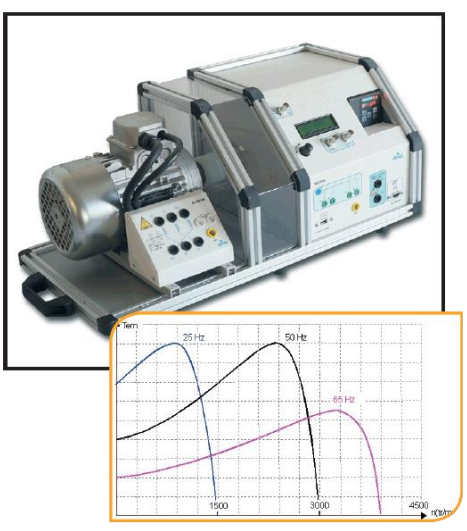
Instrumented load generator, based on:
- Brushless 750W SIMOTICS® S-1FL6,
- Variator SINAMICS ® V90,
- PC-board Interface,
- Display/ digital potentiometer for setting parameters
- Control software with PC via USB (EL320100, basic version).

SIMOTICS S-1FL6

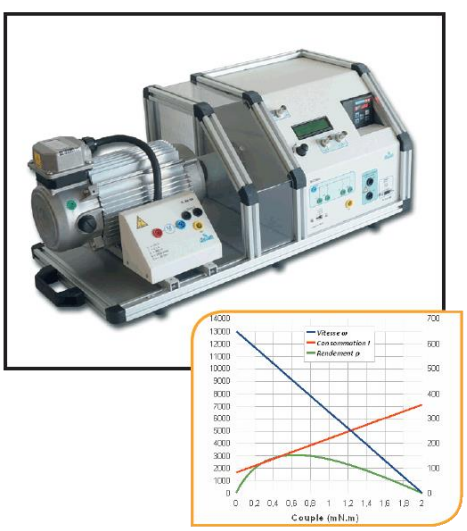
SINAMICS V90

Motor characteristics plotting

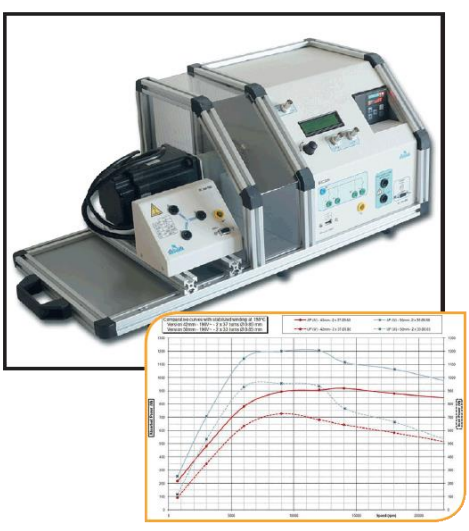
Torque speed relation
3-ph AC motor (EL 323 000)



Torque speed relation
DC motor (EL 322 000)



Torque speed relation
Brushless motor (EL 326 000)



Load benches

EL32x : BICSIN Instrumented load bench with active load and simulation of Digital Industrial Systems

300-W motor bench:

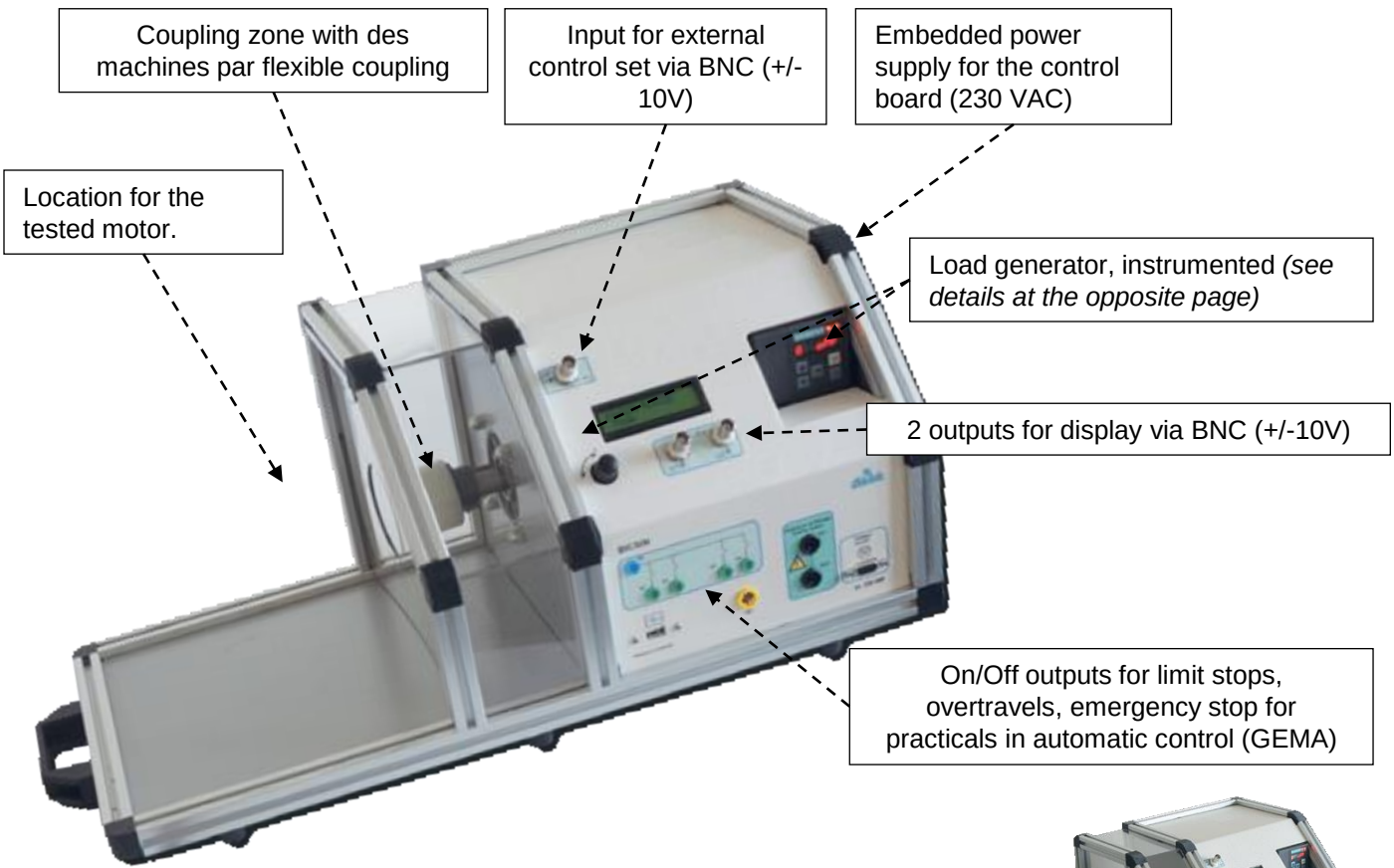
- The load is a brushless motor, controlled by an industrial variator
- A control board and its power supply carries out the load generation and the acquisition of results (constant load, load according to speed, to square speed …)
- Various testing settings are available (with 3-phase asynchronous motor, DC motor, Brushless motor…),

Settings of the load:

The load is set via potentiometer and display,
In our case (controlled brushless motor), it is a **braking or driving** load**,**
Choice between: constant torque (-sign(N).C), proportional to the speed (a.N), proportional to the square speed ($b.n^2$), inertial (J.A), external
If C>0 : BicSIN carries out a braking torque
If C<0 : le BicSIN carries out a driving torque

Measures:

The measures displayed are:
Measured values: torque C_m (N.m), rotation speed N (en tr/min),
Calculated measures: mechanical power P (W), with $P_m=C_m.\omega$



Example of setting : EL322 : *300 W, LV, DC motor, coupled with an active load with acquisition of mechanical values*

R and L loads

ELD 050 000 Load rheostat
210 Ohms 320 VA avec fusible de protection
For a 3-phase load; put a set of 3 rheostats

ELD 102 000 Self
35 mH 400V with protecting fuse

For a 3-phase load; put a set of 3 selfs

Environment

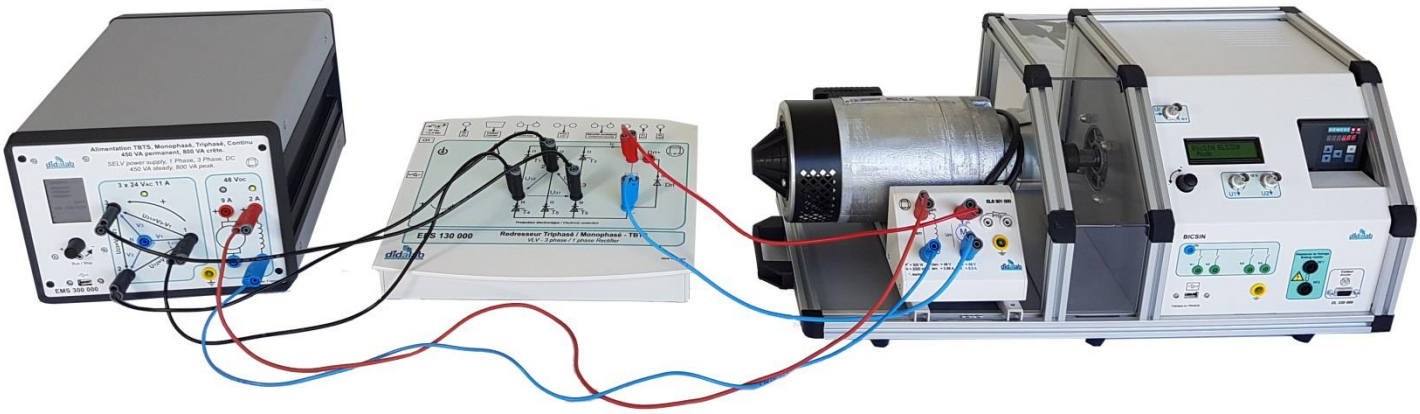
For each working station

- ✓ 1 electronic table (with 5 to 6 sockets, 220V-16A / 50 Hz)
- ✓ Set of 52 patching cords (25, 50, 100, 200 cm) insulated, 36A, stackable
- ✓ 1 PC with Windows
- ✓ 1 Oscilloscope with differential probes
- ✓ 1 ampermeter probe
- ✓ 1 TRMS multimeter

Note : The software supplied with the power bridges has an internal oscilloscope and thus allows to trace on your computer the various curves for voltage/current … However, he is always interesting for the students to make the "real" measures with more traditional measuring instruments

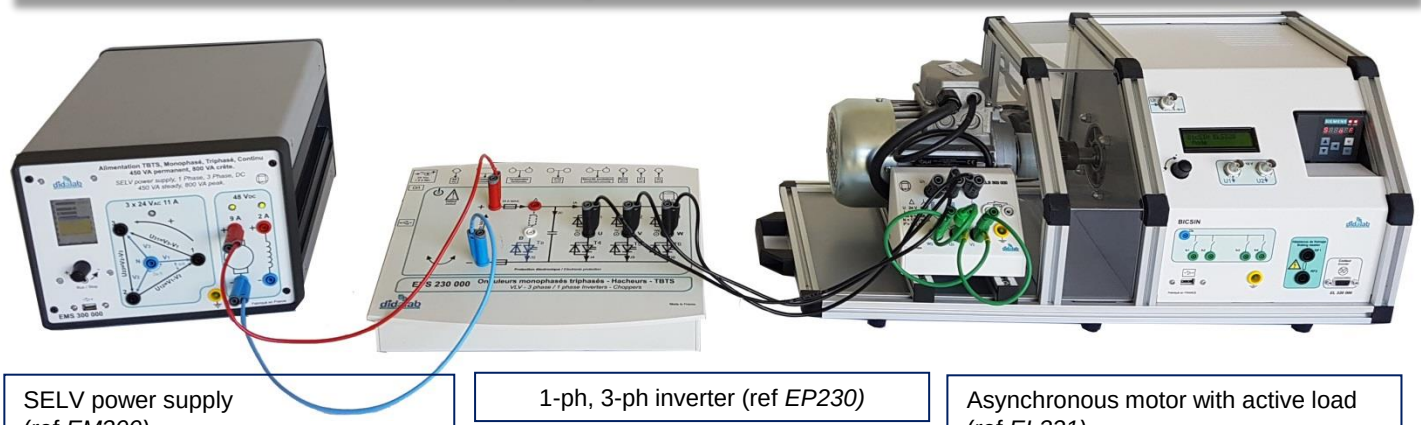
Examples of settings

Control of a DC motor with a rectifier



LV power supply (réf *EM300)*	1-ph, 3-ph rectifier (réf *EP130)*	DC motor with active load (ref *EL321)*

Control of a 3-ph asynchronous motor with a PWM inverter



SELV power supply (ref *EM300)*	1-ph, 3-ph inverter (ref *EP230)*	Asynchronous motor with active load (ref *EL321)*

Control of a 3-ph asynchronous motor with a industrial variator

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FABRICATION FRANÇAISE

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