



EP 660 pack

- Three-Phase Inverter,
- Serial Chopper,
- 1, 2, 4 Quadrants
- Reversible Chopper,**
- Single-Phase Inverter,

ONE/THREE PHASE INVERTER & CHOPPER 1,5/3 kW

MAIN FEATURES

The **EP 660 Unit**, from the **Electrical Engineering** range, includes the EP 660 000 rack & the technical manual. It enables the study of bridges :

Choppers :

- **Serial,**
- **Voltage reversible,**
- **Current reversible,**
- **Four quadrants,**
- **Overfitted double serial,**

Single phase inverter :

- **Fixed frequency, shift control full wave,**
- **Variable frequency, shift control full wave,**
- **PWM +/-E, +E/0/-E,**

Three-phase inverter :

- **constant U/F ratio,**
- **PWM +/-E, +E/0/-E,**

Control :

- **Speed control,**
- **Position control,**
- **Vector control.**

TECHNICAL CHARACTERISTICS

Rated characteristics

- ◆ Maximum power voltage: 300V DC.
- ◆ Maximum peak voltage into each static switch : 10 Amp.
- ◆ Acceleration ramp from 0 to 100%, from 1 to 200 seconds.
- ◆ Control:
 - Mouse & display screen,

SAFETY DEVICES :

- ◆ Protection against short-circuits,
- ◆ Constant supervision of Power Supply : mini. 12 V; maxi. 300V.
- ◆ Load current control of the filter capacity at the switching on.
- ◆ Emergency stop when the reversibility capacitor voltage is over 350V.
- ◆ Supervision of the reversibility capacitor voltage.
- ◆ Supervision of the heat dispersion devices temperature,
- ◆ Supervision of the motor temperature (PTO).

ENVIRONMENT

Equipment to be used together with the EP 660 Unit:

- Electrotechnical bench with variable DC voltage, Power: 1.5 kW & auxiliary Power Supply (excitation),
- Resistance load bench: 1.5 kW,
- Single & three-phase self-inductance load bench: 2/4 kvar,
- Asynchronous motor bench with load generator: 1.5 kW,
- Dual beam 60 MHz Oscilloscope with voltage differential probe & current clamp.
- 600 V/20 Amp. Multimeter, Ø 4 mm leads, double plugs.

Technical manual

the **EP 660 Unit** is provided with one installation & maintenance handbook giving all informations concerning the installation & use conditions .

Packing :

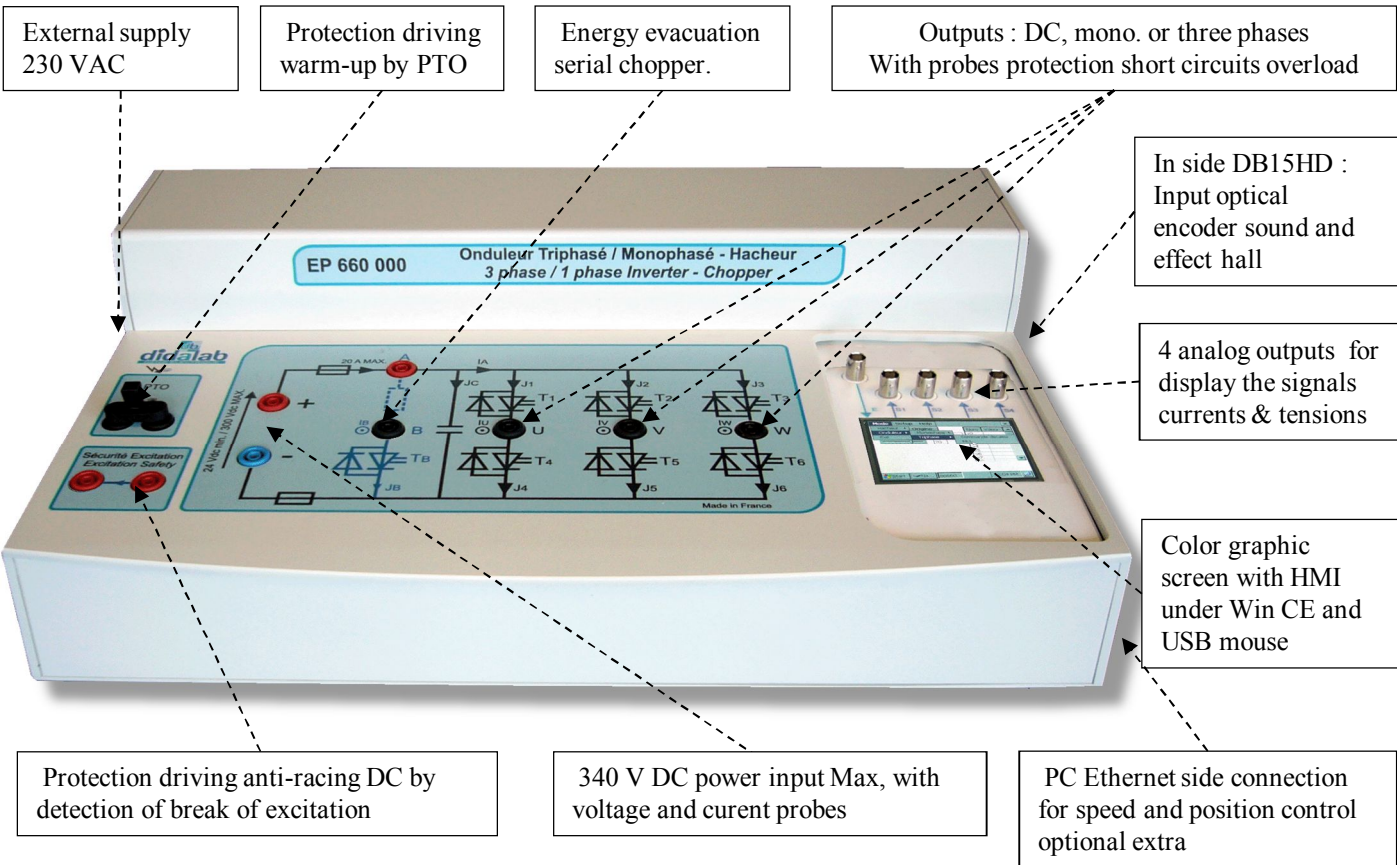
Net weight : 16 Kg
Gross weight : 20 Kg
Dimensions net : 40 x 60 x 25 cm
(L x W x H) gross : 50 x 80 x 35 cm

EP 660 000 - Safe power structure with 6+1 IGBT for 1,5 kW motors :

The EP660000 module is based on a PVC structure to be put on table. The power supply is external (60/340 VDC max, 15A).

The console of command integrated into module is totally digital and of very high power level (ARM9 32 bits, 200 Mips associated with a FPGA of 400 000 doors), it insures the management of the system of the safety load, recuperative power, short circuit, overtaking of tension.

The EP660000 is designed to be used from a continuous variable supply with PD3, in compliance with the current safety standards.



Control system

Analog input (+/-10 V)

4 outputs of display on oscilloscope (images of voltage, speed, position, current...)

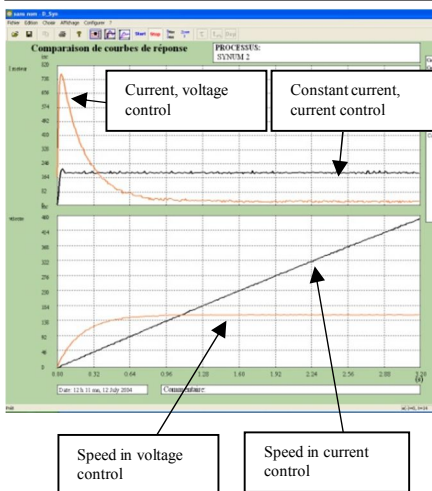
Color display 320 x 240 pixels RVB 24 bits, under Windows CE and HMI for configuration



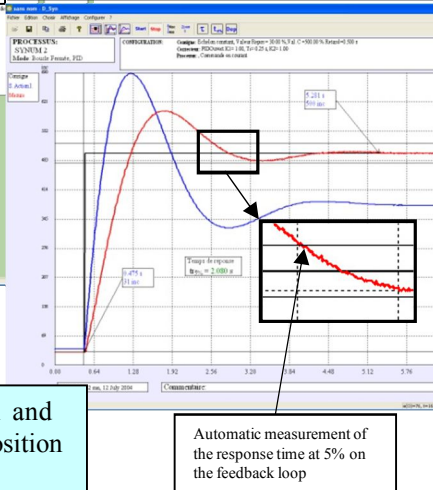
EP660200 : SERVO CONTROLE SOFTWARE « D_CCA » (optional)

- Can be operated under Windows (Professional editions), it enables the control of the servosystem via RJ45 Link.
- It enables the User the configuration of the system, via an ergonomic graphic interface:
 - Selection of the system structure: speed or position open/close loop.
 - Selection of the control type and characteristic values: constant step, limited ramp, sine, speed trapezoid signals
 - Selection of the corrector and its adjustments (P, PI, PID, Cascade, "Z" corrector, Corrector programmed in «C»...)
 - Selection of the power interface type (current or voltage)
 - Selection of the acquisition and recording parameters (Choice of sampling periods)
 - Selection of the measurements units (mm or digital increments for the position and mm/s or digital increments for the speed)
- It also enables the structured running of the experimental work:
 - Time response display of one (or several) characteristics parameters: position, speed, acceleration, motor current, motor voltage, control signal, overflow, corrector output etc...
 - modification of the time diagram scales (zoom in X, or Y)
 - Determination of the automatic control characteristic values:
 - constant step : time constant, 5% response time, absolute overlap, relative overlap,
 - sine excitation : average value, amplitude, frequency, period
 - response in a harmonic system : ratio of medium values, ratio of the amplitudes, phase shift
 - saving the configuration of the current test with the response curves of various recordable sizes
 - comparing the result of the on-going trial with results previously recorded
 - export curves to be used by other processing such as Excel and SCILAB
 - allow modelling in the linear range thanks to a compensation of dry friction

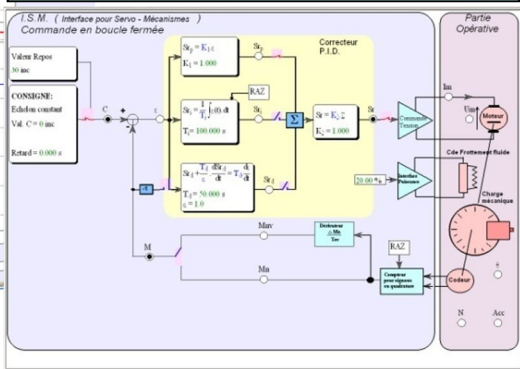
Comparison screen between open loop responses in voltage control mode, and current mode, without friction disturbances.



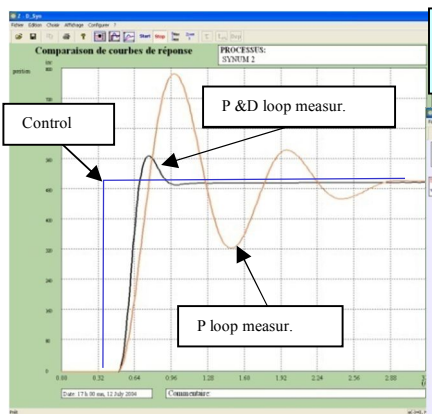
Response in closed loop speed control, with automatic calculation of the reaching time in the 5% zone.



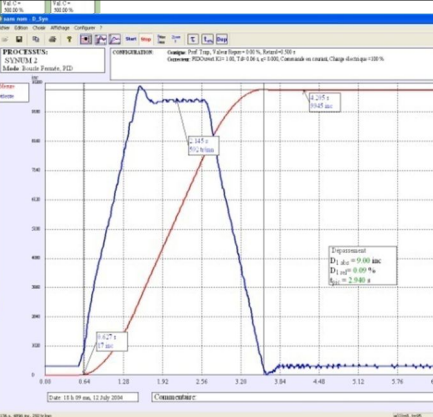
Parameter screen
Exemple of speed control by PID single loop corrector



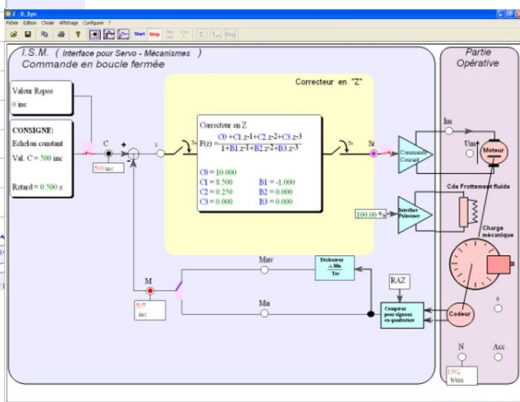
Comparison of curves : Proportionnal and Proportionnal Derivate closed loop position control.



Closed loop position control response with trapezoid control, speed and position curves



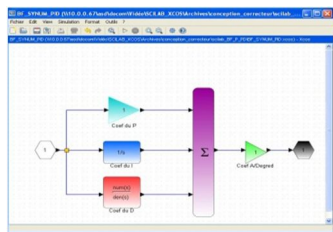
Parameter screen
Exemple of speed control by « Z » corrector



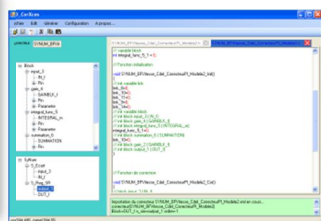
EP660800 – D_Scil, prototyping and code generator:

In order to accentuate the pedagogical and even research qualities of the EP660000 inverter module, a software module is proposed. It can synthesize any type of command (OL, CL, PI, PID, state feedback...) under Scilab® environment, then generate the executable code that will be downloaded in the inverter allowing its real-time control. This graphical tool has all the power of Scilab®/Xcos simulation software, so the simulation to real is accessible in public works, (speed control, position of a DC or AC three-phase motor at the best efficiency...).

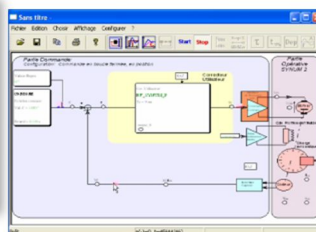
Example: From a simulation in OL then CL of the system under the Scilab/Xcos® open source software module, the D_Scil module automatically generates the code that will be transferred to the inverter chopper bridge and then tested under D_CCA in order to compare simulation results to experimentation results (cf: D_Scil documentation).



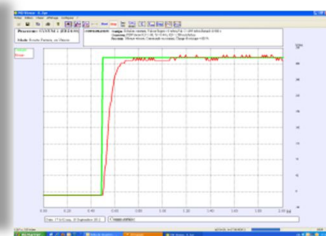
PID edited under Xcos



Software code generated under D_Scil



D_CCA implementation



Temporal result

Standard configurations:

EP 660 B : Basic pack «SAFE POWER STRUCTURE, WITH 6 IGBT COMPONENTS, FOR 1,5kW MOTORS» including :

References	Designations	Qties
EP660000	Safety power structure, with 6 IGBT components, for 1,5 kW motors Chopper 1,2, 4 quadrants, one three phase inverter, PWM Voltage and current probes integrated, HMI on TFT color screen & mouse. Resident software (under Win CE), USB Mouse.	1
EGD000008	Supply 12 Vdc, 4.2 A	1
EP660010	Technical guide	1

EP660C : Complete pack « STUDY OF CHOPPER AND INVERTER ONE THREE PHASE 1.5/3 KW, SPEED AND POSITION SERVOCONTROL ON DC MOTORS DC OU THREE PHASE AC MOTOR» including :

References	Désignations	Qties
EP660B	Basic pack «SAFE POWER STRUCTURE, WITH 6 IGBT COMPONENTS, FOR 1,5kW MOTORS	1
EGD000010	RJ45 lead	1
EP660200	Speed & position software servocontrol, Acquisition of the answer curves on PC (PC non included).	1

EP660S : Simulation pack « STUDY OF CHOPPER AND INVERTER ONE THREE PHASE 1.5/3 KW, SPEED AND POSITION SERVOCONTROL ON DC/AC MOTOR, D_SCIL NEW CORRECTOR GENERATOR» including :

References	Designations	Qties
EP660C	Complete pack «STUDY OF CHOPER, INVERTER, AND SRERVOCONTROL 1,5/3 kW»	1
EP660800	D_Scil Automatic code generator under SCILAB/XCOS Editor, real time code generator	1

Accessories :

ELD100500 : Resistor 33 Ohms, 960W, 5,4 A,

ELD100B : Electrotechnical work bench,

ELD150B : Active load 1,5kW with DC motor CC independant excitation, asynchronous three phase motor.

Accessoires : securized Leads 4 mm, mesuring devices, PC,