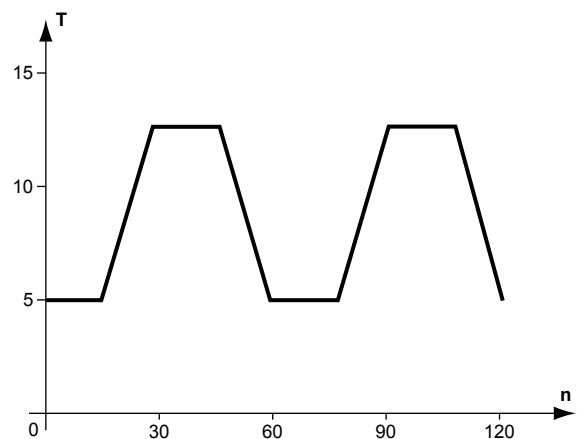


*This manual is to be given
to the end user*



ACTIVE LOAD

Rotating machine test bench

Instruction manual

ACTIVE LOAD

Rotating machine test bench

PREFACE

CE DECLARATION OF CONFORMITY

in accordance with the "Machinery" Directive: directive 89/392 EEC, amended 91/368/EEC, applicable at 1/01/95 and in accordance with the "Low Voltage" Directive: directive 73/23/EEC, amended 93/68/EEC, applicable at 1/01/97.

NOTE

LEROY-SOMER reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.

WARNING

PRECAUTIONS BEFORE USE

- If using a frame on castors, lock the brakes of the castors concerned.
- Check that all the test bench machines are correctly aligned and all the machine couplings are correctly installed.
- Check that the machine fixing screws are correctly tightened.
- Check that all the protective housings are correctly done up.
- Because of their purpose, the instructional test units are modular with fast connections, and therefore particular care must be given to earth connections.

All sub-assemblies must be connected, by the user, to the rail earth terminal by independent links, and the user must then connect the earth terminal to the installation earth.

PRECAUTIONS FOR USE

- **Electrical power supplies for the electrical machines must be provided with a 30 mA residual current device and have an easily accessible emergency stop close to the test bench.**
- Cables and fuse-based protective devices must match the power and current stated on each machine.
- **It is necessary to place thermal protective devices (generally PTO type for instructional series machines) in the power supply safety chain in order to switch off the supplies to the test bench in the event of a fault.**
- When a series or separately excited DC motor is installed on the test bench, it is essential to have overspeed protection that causes overall disconnection of the power supply circuit from the machine in order to avoid any risk of racing.
- **Level of noise from the test bench less than 70 dB.**

INSTALLATION PRECAUTIONS

- The test bench must be placed in a well-lit location as stipulated by the labour regulations.
- The test bench must be visible to the person operating the controls of the various power supplies concerned.
- He must have within reach a device for disconnecting the power supplies.
- Before the test bench is moved at all, it must be checked that all items are fixed using the original screws and that these are correctly tightened. While being moved, the slide rails must remain horizontal.
- If it is necessary to lift the bench, separate the items in order not to move any load greater than 50 kg. For machines weighing more than 50 kg, slings should be used on the 2 shaft ends.
- The bench must be placed on a flat, even floor.
- **After any modification of the items forming the bench, for example replacement of one test machine by another, it is necessary to repeat the aligning of the line shafting.**

PRECAUTIONS DURING USE

- Make sure there is an emergency stop device close by.
- **Before carrying out any work, make absolutely sure that all power supplies are disconnected and the line shafting has completely stopped rotating.**
- **The braking resistor must be placed in a dry and well-ventilated location. It must never be covered with an object. It must be kept well away from the user.**
- **It must not be handled during use, owing to the presence of high voltage and temperature, which may cause physical injury.**
- **During nominal operation, it can reach 100°C.**
- **During full-load operation, it can reach 145°C.**

SERVICING THE TEST BENCH

- Annually, check the tightness of the various items, the alignment of the machines and the condition of the couplings.
- Periodically check the brushes of the DC machines.

LEROY-SOMER declines all responsibility in the event of the above recommendations not being observed.

ACTIVE LOAD

Rotating machine test bench

CONTENTS

1 - Introduction	4
2 - Composition of the active load	4
3 - Characteristics and performance	4
4 - Environmental characteristics	5
5 - Weight and dimensions	5
6 - Connection diagram and examples	6
7 - Using the test bench without the software	11
8 - Using the test bench with the "ApILE" software	16
8.1 - Installing the "ApILE" software	16
8.2 - Procedure for using the "ApILE" software	17

ACTIVE LOAD

Rotating machine test bench

1 - Introduction

The **active load** uses one of the machines of the test bench to apply a torque to the shaft of the machine under test. For each of the 2 power ranges (0.3 kW and 1.5 kW), the active load system develops sufficient torque to bring the machine under test to stalling in order to read the torque/speed characteristics.

The choice of a servo-controlled synchronous motor as the **load** provides a great many advantages if it is compared to the traditional principle of test benches that use a powder brake:

- The **load** will apply a resistive torque or a driving torque with the same ease.
- By construction, its induction flux is fixed and known, and therefore the torque on the shaft is known perfectly by measuring the stator supply current.
- This constant flux eliminates periodic calibration of the measurement chain between the torquemeter and the mechanical measurement module.
- Its **control unit** always knows the position and speed of the rotor. It will therefore communicate it when data is acquired at the same time as the value of the torque on the shaft. The **control unit** will be responsible for calculating the product of the torque and the speed in order to ascertain and transmit the output power.
- Set-up is reduced to connecting 2 cables between the **control unit** and the **load**, the braking resistor and a communication cable between the drive and the PC.
- The energy produced during on-load tests is dissipated in a resistor which eliminates ventilation problems.
- The **control unit** contains the electrical measurement module, whose measurements are transmitted to the PC by the same communication as the mechanical parameters coming directly from this drive.
- The software includes the main functions necessary for acquiring the electrical and mechanical characteristics of each of the machines making up the test bench. It also provides other levels that give the user a choice of industrial applications using the various electrical machines in an application-dependent context.

3 - Characteristics and performance

Load machine characteristics	300 W range	1500 W range
Continuous stall torque (N.m)	4.3	12.4
Peak torque (N.m)	12.9	37.2
Inertia (kgcm ²)	2.9	11.4
Winding thermal time constant (S)	168	217
Max. cogging (N.m)	0.06	0.18
Kt (N.m/A)	2.4	2.4
Ke (V/km-1)	147	147
Rated torque (N.m)	4	10.8
Stall current (A)	1.8	5.2
Rated power (kW)	0.84	2.26
R (ph-ph) (Ohms)	17	2.96
L (ph-ph) (mH)	54.5	18.6

2 - Composition of the active load

The **active load** consists of 4 main items:

a) An instructional control unit comprising:

- A "UNIDRIVE SP" *universal drive* for an induction or self-starting synchronous motor, with a specific configuration (not modifiable).

Un = 400 V 3-phase

- An "SM-Application" *card* containing the main program (not modifiable).

- An *electronic card* for acquiring electrical measurements from the motor under test. This card is used to convert these electrical characteristics into numerical values, to the Unidrive SP.

b) A load mounted on a support and equipped with a coupling:

- *300 W range*: "UNIMOTOR - 095U2B200BACDA100190" self-starting synchronous motor.

Un = 480 V; Pn = 0.84 kW; I = 1.8 A; T = 4.3 N.m; n = 2000 rpm; 1096-line encoder.

- *1500 W range*: "UNIMOTOR - 115U2D200BACDA115240" self-starting synchronous motor.

Un = 480 V; Pn = 2.26 kW; I = 5.2 A; T = 12.4 N.m; n = 2000 rpm; 1096-line encoder.

c) An **instructional braking resistor** for recovering energy. This 2000 W - 75 Ω resistor is mounted under an IP20 metal cover.

d) "**ApILE**" software, for acquiring and using mechanical and electrical data from the machine under test.

The cables for connecting between the load and the control unit are supplied (see opposite).

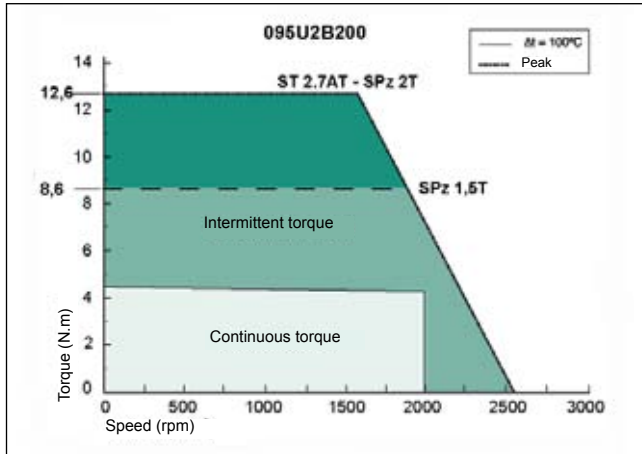
The cable for connecting between the PC and the control unit is also supplied (see opposite).

ACTIVE LOAD

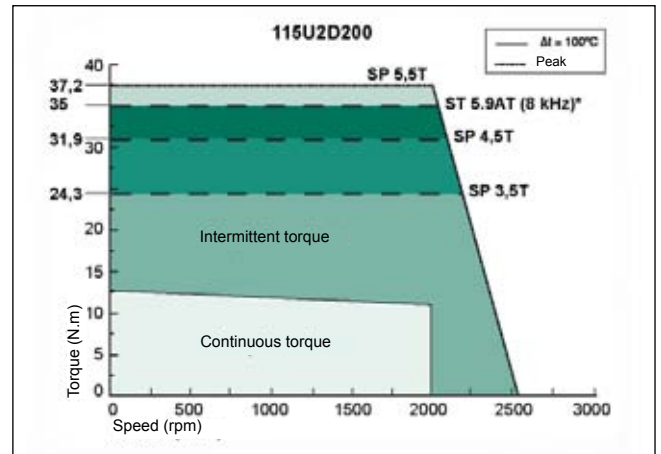
Rotating machine test bench

Performance of assemblies	300 W range	1500 W range
Minimum continuous speed (rpm)	0	0
Maximum continuous speed (rpm)	+/- 2000	+/- 2000
Rated continuous torque (N.m)	+/- 4	+/- 10.8
Maximum transient torque (N.m)	+/- 12.6	+/- 37.2

300 W Active Load



1500 W Active Load



4 - Environmental characteristics

Characteristics	
Protection	IP 20
Temperature: - storage - operating - transport	<ul style="list-style-type: none"> • -20°C to +50°C • 0°C to +40°C • -20°C to +50°C
Altitude	Less than 1000 m Derate the current by 0.5% per additional 100 m
Non-condensing humidity	Conforms to IEC 68-2-3 and IEC 68-2-30
Vibrations	Conforms to IEC 68-2-61
Electromagnetic compatibility	Conforms to IEC 1000-4-2, IEC 1000-4-4 and IEC 947-2 part 4

5 - Weight and dimensions

300 W or 1500 W active load

Powered by 400 V - 50 Hz 3-phase mains supply



Load control unit

L: 430 mm
D: 250 mm
H: 320 mm
Weight: 11.1 kg



Load

L: 410 mm
D: 220 mm
H: 320 mm
Weight: 15 kg



Braking resistor

L: 465 mm
D: 185 mm
H: 170 mm
Weight: 4.8 kg



Cables

length and weight

- PC: 2 m
- Load: 4 m (weight 1.5 kg)
- Encoder: 4 m (weight 1 kg)

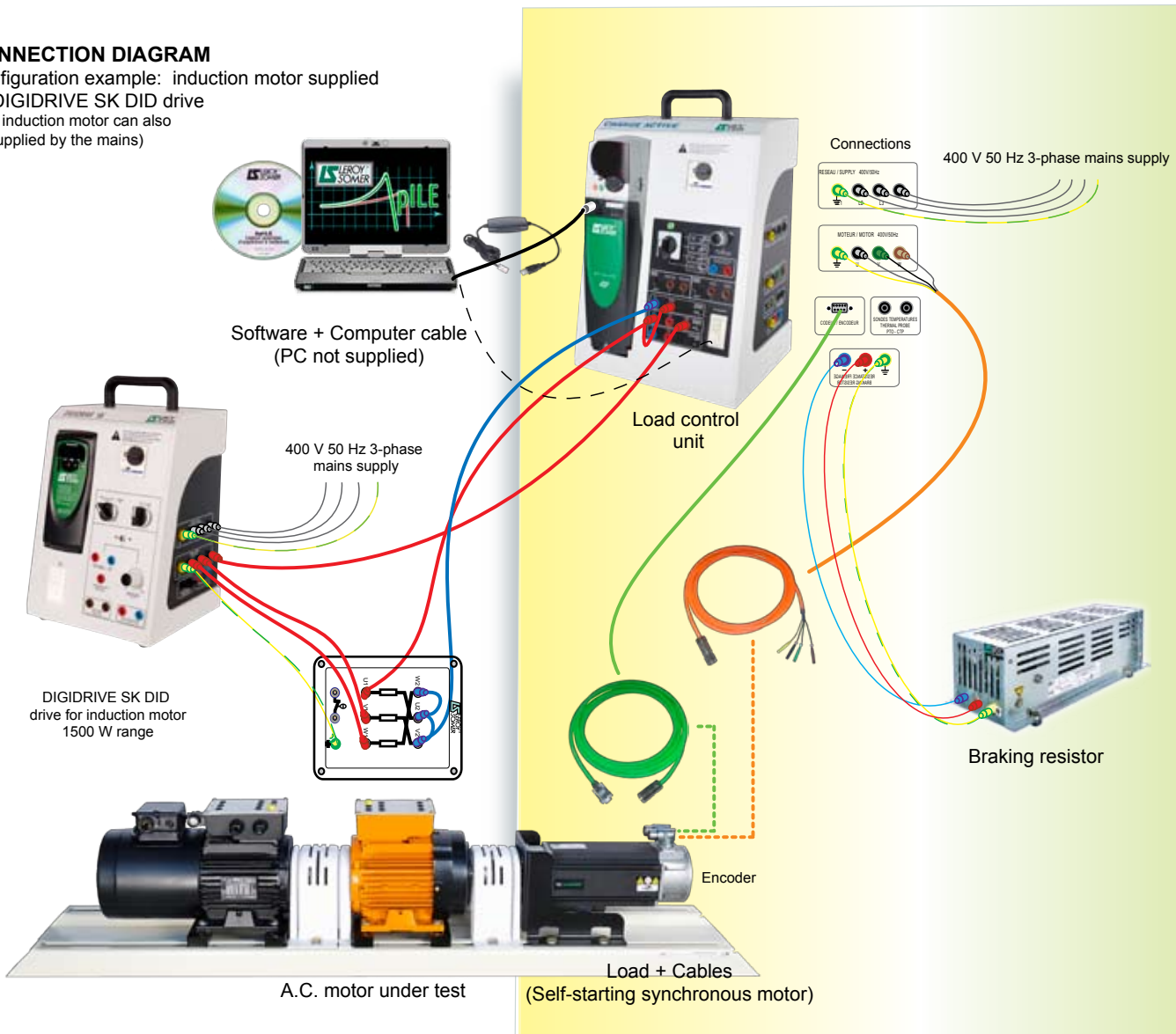
ACTIVE LOAD

Rotating machine test bench

6 - Connection diagram and examples

CONNECTION DIAGRAM

Configuration example: induction motor supplied by DIGIDRIVE SK DID drive
(The induction motor can also be supplied by the mains)



ACTIVE LOAD

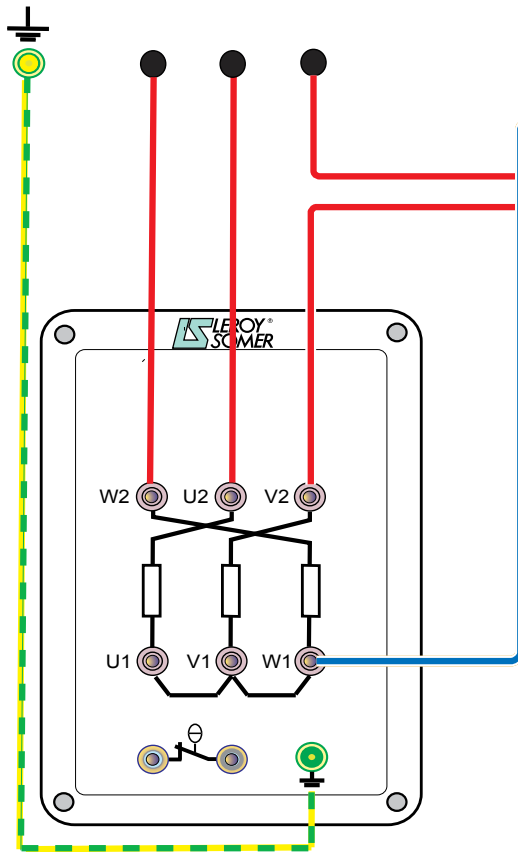
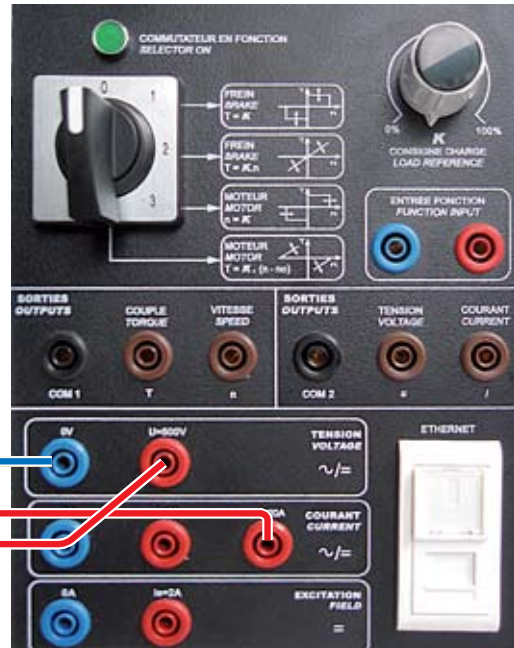
Rotating machine test bench



Connection of a 230 V/400 V 3-phase squirrel cage induction motor

Possible power supplies:

- 400 V 3-phase
- 0 to 440 V 3-phase
- Frequency inverter output



ACTIVE LOAD

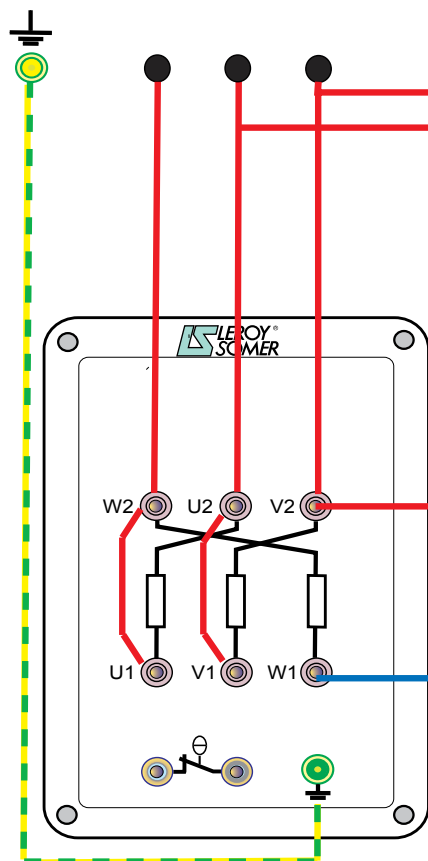
Rotating machine test bench



Connection of a 400 V delta 3-phase squirrel cage induction motor

Possible power supplies:

- 400 V 3-phase
- 0 to 440 V 3-phase
- Frequency inverter output



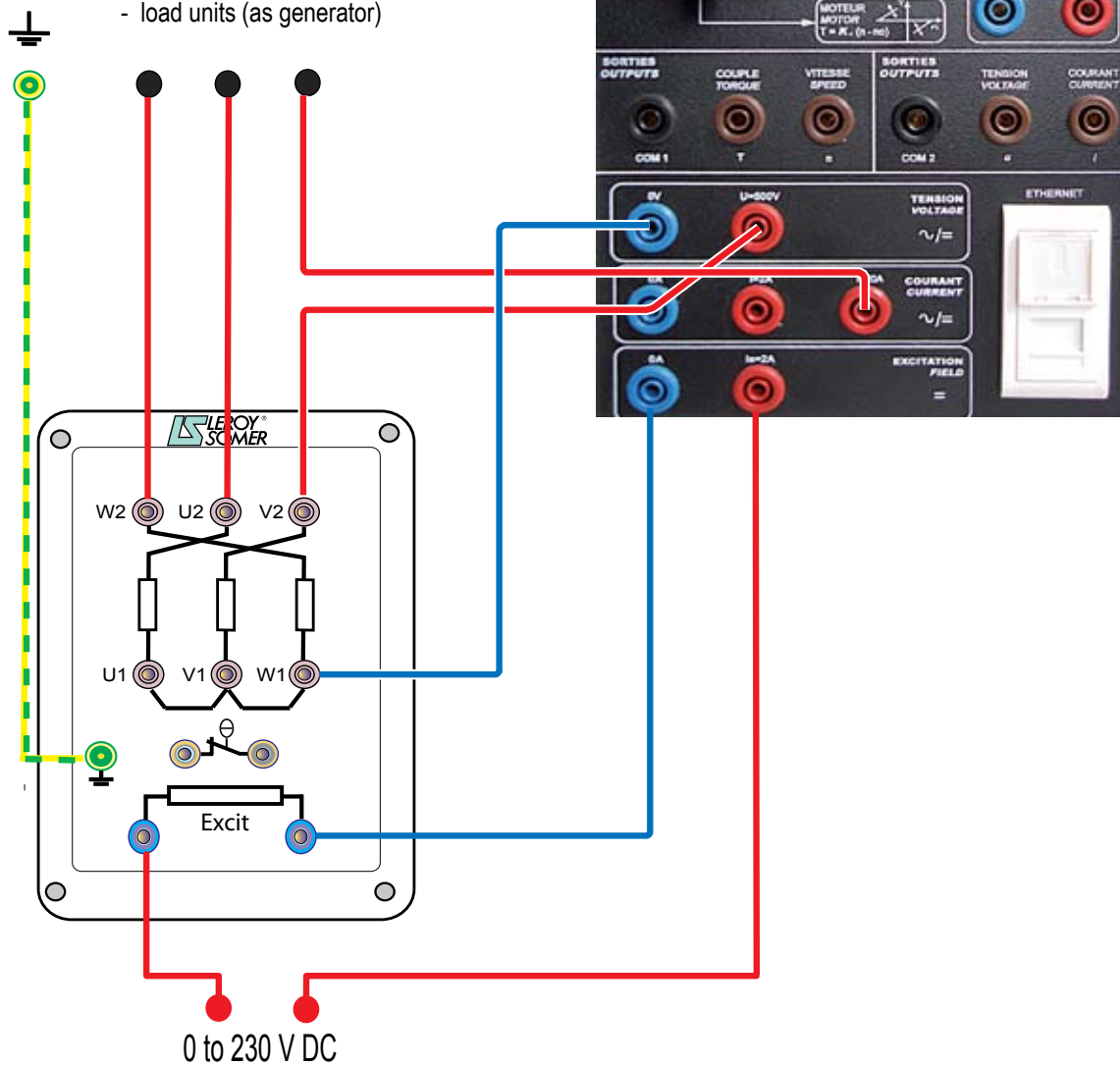
ACTIVE LOAD

Rotating machine test bench



Connection of a 3-phase synchronous machine

- Possible connections:
- 400 V 3-phase (as motor)
 - load units (as generator)



ACTIVE LOAD

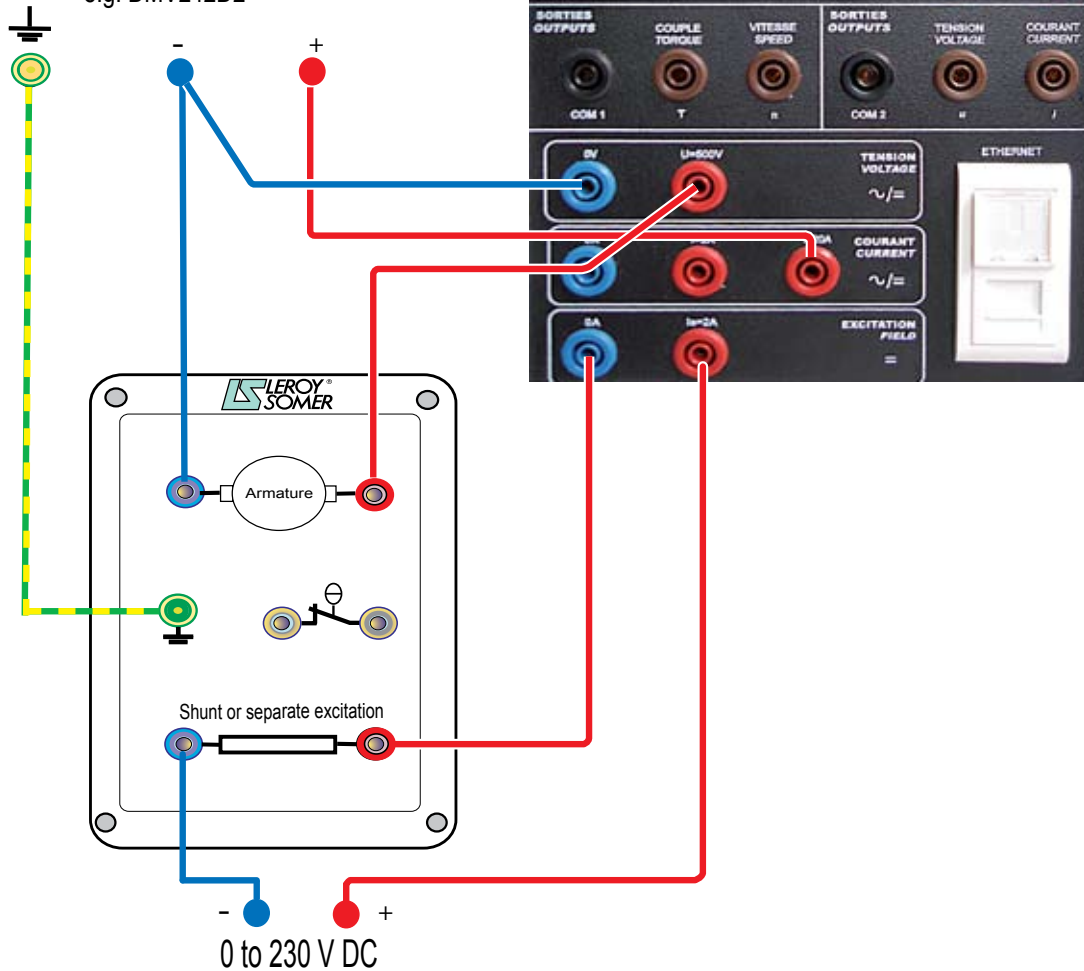
Rotating machine test bench



Connection of a D.C. machine

Possible power supplies:

- 0 to 270 V DC
- D.C. variable-voltage regulator e.g. DMV242D2



ACTIVE LOAD

Rotating machine test bench

7 - Using the test bench without the software

Manual operation allows the characteristics of different industrial electrical machines to be studied.

Under certain power supply conditions, for example with a variable speed drive, limiting of the input current will clamp the supplied torque and it will be possible to display only the characteristics of the motor-drive assembly.

It is therefore strongly recommended to power machines directly from an AC or DC mains supply simply protected against long overloads, but with no current regulation.

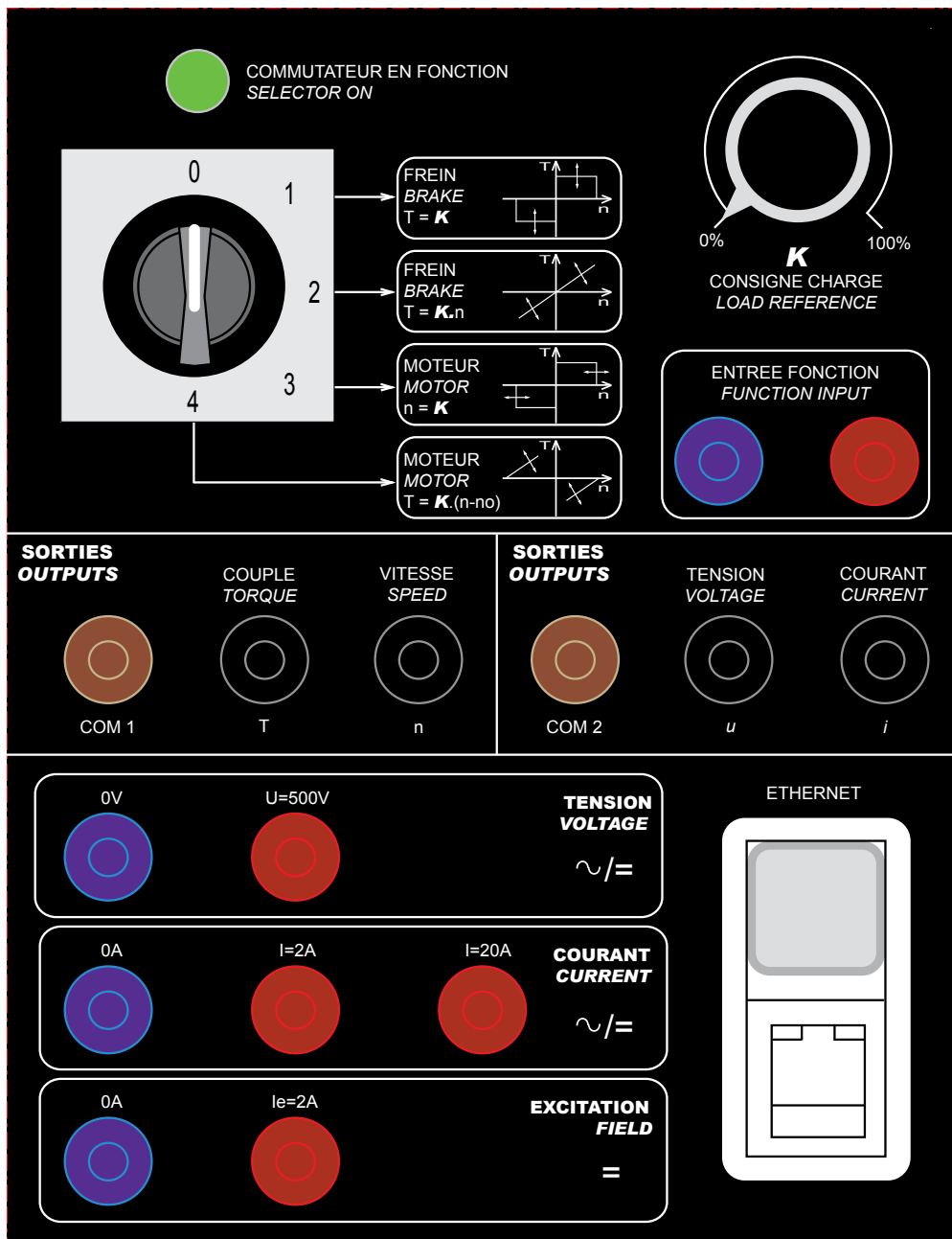
The manual Load mode selector enables 4 different torque/speed laws.

This selector switch works only if there is no communication established with a computer.

The potentiometer will act on the torque or the speed depending on the position of the selector switch.

The LED indicates the system status:

- On: manual operation from the selector switch and the potentiometer
- Off: operation via PC; the position of the selector switch and potentiometer has no effect on this mode.



ACTIVE LOAD

Rotating machine test bench

With the **active load** system, the main selector switch on the drive's front panel provides 4 positions that enable the following functions under certain conditions that govern the safety of the assembly.

- Selector switch at 0: "Stop"

- Selector switch at 1: "Brake $T = K$ "

Starting conditions: Machine tested rotating and potentiometer K at 0

The **active load** sets a zero speed, with no torque when $K = 0$. The torque will increase proportionally, with the rotation of the potentiometer K , until locking of the shaft when the resistive torque becomes greater than the motor torque.

On the asynchronous machine, this function can be used to read a maximum number of points between "no load" and "maximum torque" of the machine.

- Selector switch at 2: "Brake $T = K.n$ "

Note: During operation, do not change the direction of rotation of the machine under test. Any change in the direction of rotation must be accompanied by the selector switch being set to 0.

Starting conditions: Machine tested rotating and potentiometer K at 0

The **active load** stores the current speed of the machine under test and its direction of rotation. The speed is set at 0. The speed will reduce proportionally with the rotation of the potentiometer K until stalling occurs.

This operation should be reserved for asynchronous machines, for reading the points on the curve of torque as a function of speed over the entire range from rated n to $n = 0$

- Selector switch at 3: "Motor $n = K$ "

Starting conditions: Machine tested stopped and potentiometer K at 0

Only one direction of rotation is possible (clockwise).

The **active load** behaves as a motor, and will drive the machine under test over a speed range of 0 to 2000 rpm.

This position can be used to read the EMF of many machines, both AC and DC.

- Selector switch at 4: "Motor $T = K(n-n_0)$ "

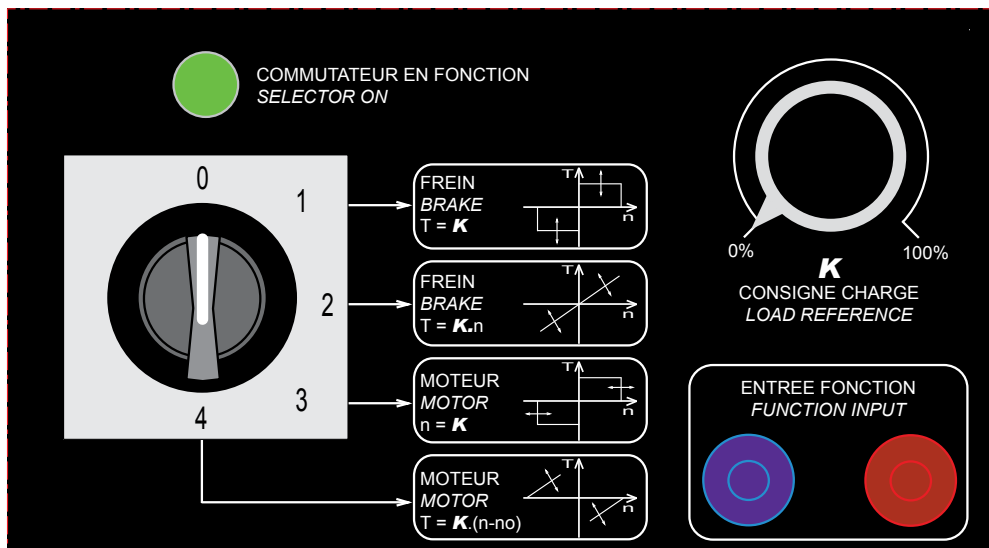
Note: During operation, do not change the direction of rotation of the machine under test. Any change in the direction of rotation must be accompanied by the selector switch being set to 0.

Starting conditions: Machine tested rotating and potentiometer K at 0

The **active load** stores the current direction of rotation and sets its speed reference at 2000 rpm in this direction of rotation but with no torque with $K = 0$.

The torque will increase proportionally, with the rotation of the potentiometer K . The machine under test accelerates, and goes into a generator quadrant.

This position enables reading of the operating points of a generator, both AC and DC.

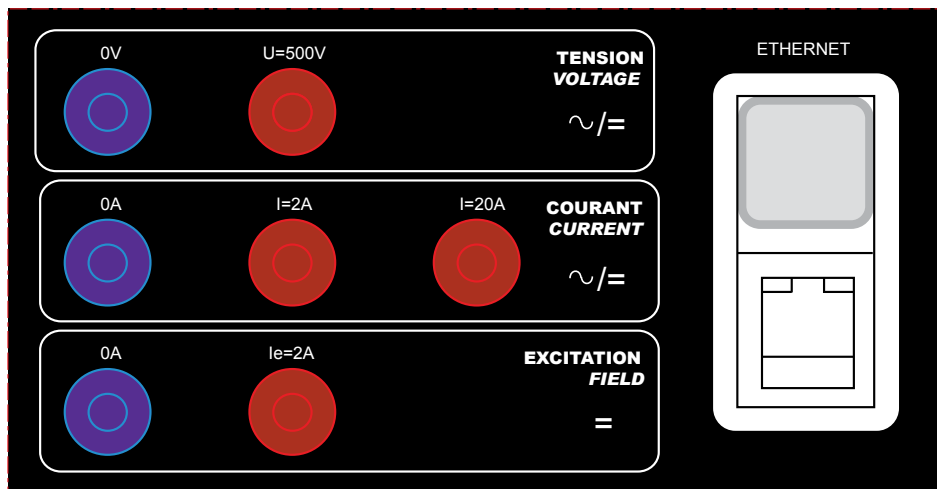


ACTIVE LOAD

Rotating machine test bench

Electrical measurement connections:

The various inputs accept AC or DC values.



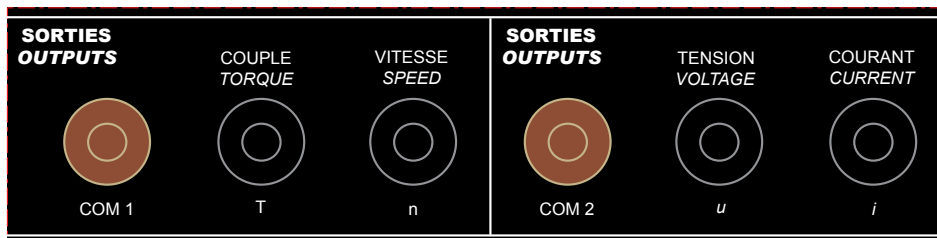
Active load - manual mode

Selector switch	Squirrel cage or slip ring induction motors	Synchronous machines	DC machines
0	No load delivered	No load delivered	No load delivered
1 Brake T = K	Torque/speed measurements up to maximum torque of the induction motor	Measurements of torque/speed as a synchronous motor	Measurements of torque/speed as a motor
2 Brake T = Kn	Torque/speed measurements over the entire speed range of the motor		
3 Motor n = k	No-load driving of the induction motor	No-load measurements of the alternator	No-load measurements of the DC machine
4 Motor T = K (n-No)	Torque/speed measurements above the synchronous speed	Measurements of torque/speed as an alternator	Measurements of torque/speed as a generator if power supply so permits

"In manual mode, one or more multimeters must be used on the 4 analogue outputs on the front panel of the control unit".

Analogue outputs:

The analogue outputs return the images of the main characteristics (torque, speed, voltage, current). These are expressed as 0-10 V signals.



Mechanical measurements:

Image of the torque in +/- 10 V:

- 300 W range = 1 V/Nm
- 1500 W range = 0.3 V/Nm

Image of the speed in +/- 10 V:

All ranges: 10 V = 2000 rpm

Electrical measurements:

The 2 terminals, U and I, return:

- a DC image, if the mains power supply of the machine under test is DC
- an AC image, if the mains power supply is AC

Image of the voltage in 0 to 10 V ~/=

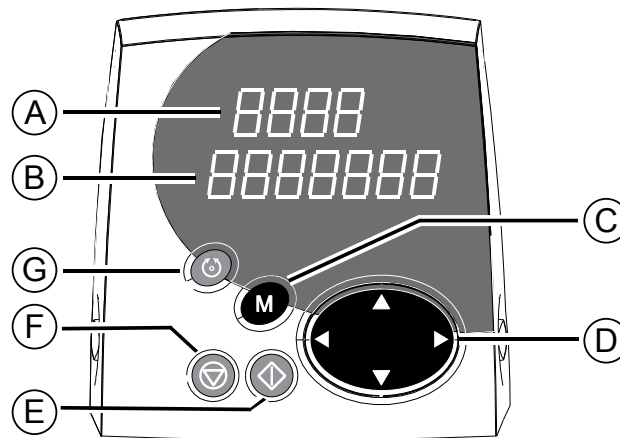
All ranges: 10 V = 1000 V

Image of the current in 0 to 10 V ~/=

All ranges: 10 V = 2 or 20 A (depending on use)

ACTIVE LOAD


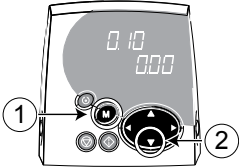


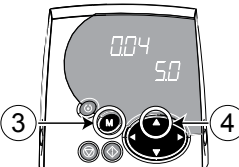


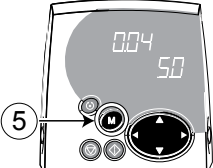


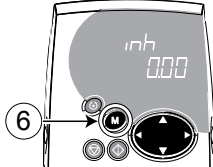
Rotating machine test bench



Command	Label	Function
	(A)	Upper display comprising 4 x 7-segment displays for indicating: <ul style="list-style-type: none"> - the drive operating status - the adjustment parameters, comprising the menu and the parameter
	(B)	Lower display comprising 7 x 7-segment displays for indicating: <ul style="list-style-type: none"> - the operating mode - the content of parameters - the fault code
	(C)	Mode button which can be used to switch from normal mode to parameter-setting mode.
	(D)	The 2 arrows can be used to move within the 7-segment displays of the lower display to modify its value or switch from one menu to another. The 2 arrows can be used to scroll up and down through the parameters or their value.
	(E) (F) (G)	In keypad mode, these buttons are used for the following commands: <ul style="list-style-type: none"> - run - stop, clear fault - reverse direction of rotation

ACTIVE LOAD

Rotating machine test bench

Action	Function
	Power-up. Drive disabled (terminal 31 open) (initial state)
	① : Access to parameter-setting mode. Parameter 0.10 is displayed flashing. ② : The  and  keys are used to access the parameter to be modified. For example, select parameter 0.04 .
	③ : Access to parameter modification. The parameter number is no longer flashing. Its value is indicated in the lower display (the lowest order digit flashes). ④ : Press and hold down the key, to make the parameter value scroll quickly. The final adjustment is made by short presses on the same key. For more speed,  or  can be used to move to modify the other digits.
	⑤ : The new value of 0.04 is stored. Press  or  to select a new parameter to be modified.
	⑥ : Return to the initial state of the drive.

Adjustment of level 2:

List of display parameters

Parameter	Description	Unit
#0.13 / #20.03	Motor speed	rpm
#0.14 / #20.04	Motor torque	1/100 Nm
#0.15 / #20.05	Average excitation current	1/1000 A
#0.16 / #20.06	Average supply current	1/1000 A
#0.17 / #20.07	rms supply current	1/1000 A
#0.18 / #20.08	Average supply voltage	1/10 V
#0.19 / #20.09	rms supply voltage	1/10 V
#0.20 / #20.10	rms supply current or voltage filtered at 500 Hz	V or A
#0.21 / #20.11	Average power	kW
#0.22 / #20.12	Instantaneous power	kW

ACTIVE LOAD

Rotating machine test bench

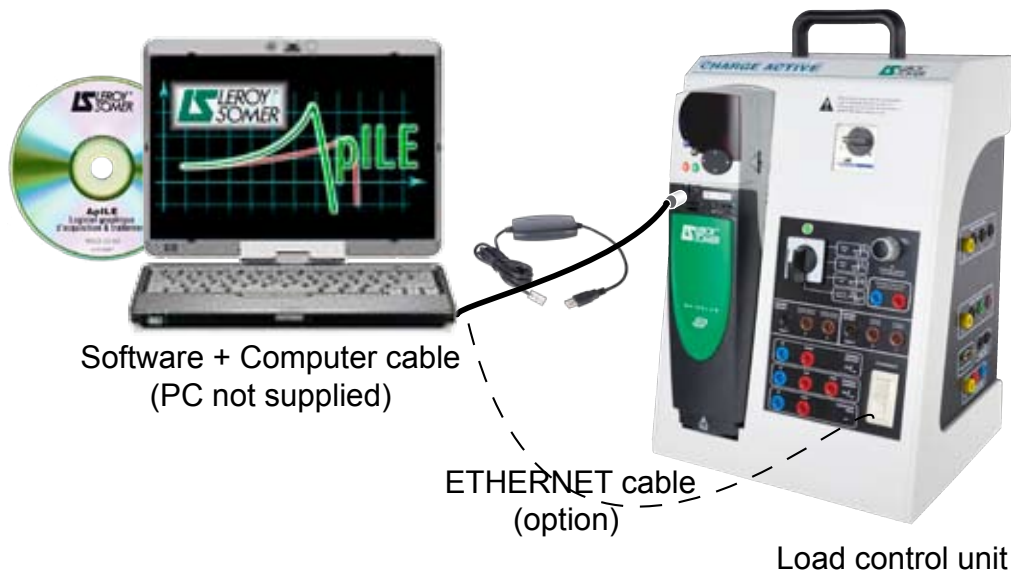
8 - Using the test bench with the "ApILE" software

The control unit must be connected to the PC with 3 types of connection means:

- 1 USB/RJ45 cable supplied as standard connected to the UNIDRIVE SP drive.
- 1 RS232 cable if the PC is compatible connected to the UNIDRIVE SP drive.

- 1 Ethernet cable connected to the RJ45 on the front panel of the control unit. This last solution can be used only if the control unit includes the SM ETHERNET card option.

When the Ethernet option is present in the drive, it overrides the other communication modes, and makes the drive's RJ45 input unavailable.



8.1 - Installing the "ApILE" software

Create a new folder on the PC that will be connected to the Active Load control unit.

Rename this folder "Leroy-Somer" or "Active Load".

Open the CD entitled "1500 W Active Load" or "300 W Active Load".

Open the "Technical documents" folder.

Open the APILE software folder.

Select all the items (Ctrl A).

Copy the selection into the folder created on the PC.

Connect the communication cable supplied with the Active Load between the PC and the RJ45 located on the control unit drive underneath and to the left of the display.

Start APILE by clicking on the APILE.exe icon.

In the window that has just opened, click on "Hardware configuration" and select the communication port you are using.

Exit APILE and restart it; the green LED on the control unit should go out. This means that communication between the PC and the Active Load is established.

From this moment, and as long as the communication remains valid, it is no longer possible to use the manual function switch or the front panel of the control unit.

Other software:

There are two other tools in the LS Software folder: Winflash.exe is used to load the control unit drive with future enhancements made available to you by LS.

CTScope Fr.ZIP provides two options:

- CTScope must be installed on the PC since it includes a file necessary for running Winflash.
- Ctscope is a digital oscilloscope that works with the internal data of the control unit's Unidrive SP. It can plot 4 curves simultaneously.



The management of communication priorities by the PC, using the RS232 or USB comms cables, does not allow CTScope to be used at the same time as APILE.

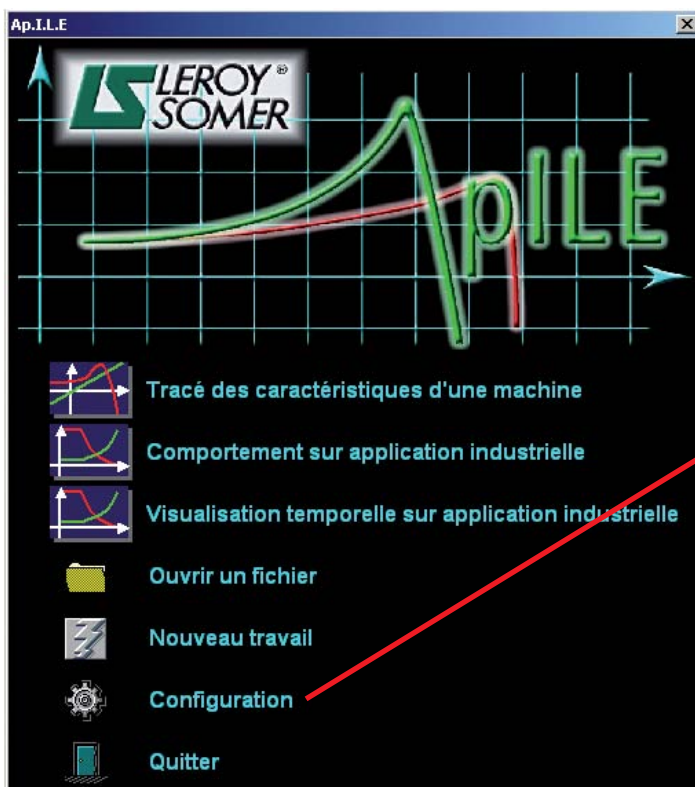
APILE and CTScope can run simultaneously with the Ethernet TCP/IP option.

ACTIVE LOAD

Rotating machine test bench

8.2 - Procedure for using the "ApILE" software

- **The control unit** must be connected to the PC by one of the solutions given above.
 - Open ApILE:
 - This operation should cause the green LED located on the front panel of **the control unit** to go out.
- If the LED remains on, this indicates a communication problem between the PC and **the control unit**. In this case, you must click on the  **Configuration** button to choose the correct serial port and restart the program to obtain communication.
- When used for the first time, the communication between ApILE and the PC must be configured using the  **Configuration** button in order to adapt the communication parameters.



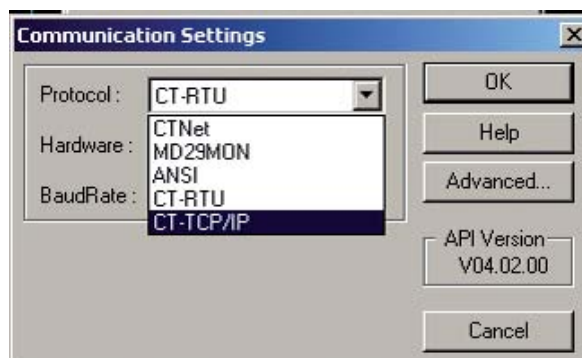
The window above opens and, depending on the type of serial link (excluding Ethernet), all that is needed is to select the correct communication port.

With the Ethernet TCP/IP option, you need to click on the button:



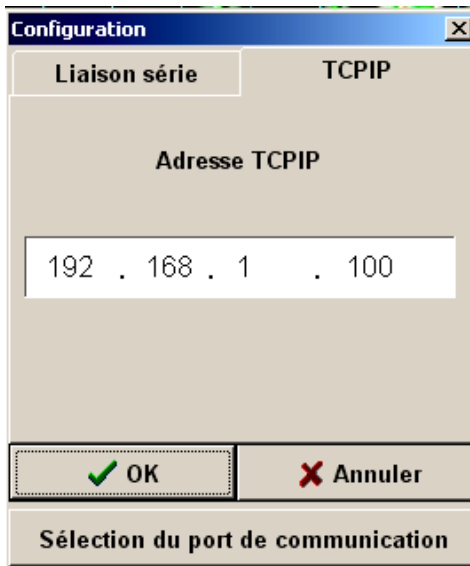
Which opens this new page

Select CT-TCP/IP, then OK



ACTIVE LOAD

Rotating machine test bench



It then becomes possible to modify the address of the drive which by default is always:

192 . 168 . 1 . 100

With the Ethernet TCP/IP option, it is also necessary to make sure that the PC connections are configured correctly to enable communication.

Reminder: The RJ45 plug coming from the PC via the RS232 socket or the USB socket is connected directly to the UNIDRIVE SP on the left under the display.

The RJ45 plug coming from the PC via the Ethernet output is connected to the front panel of the control unit on the socket marked Ethernet at the bottom right of the black front panel (if the Ethernet option is present).

Use of the Active Load with



Choosing the operating options:

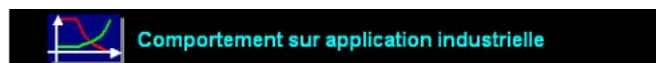
Characteristics plot:

This button opens a page for choosing the type of machine used and the type of law that will be applied to it.



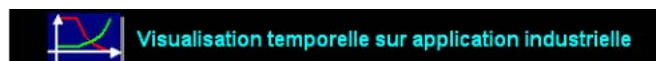
Performance on an industrial application:

This button calls up the page that lists the main applications encountered in the industrial field.



Time display on an industrial application:

This button generates an oscilloscope associated with the industrial applications seen on the previous page and adds new applications with a higher dynamic range in the movements.

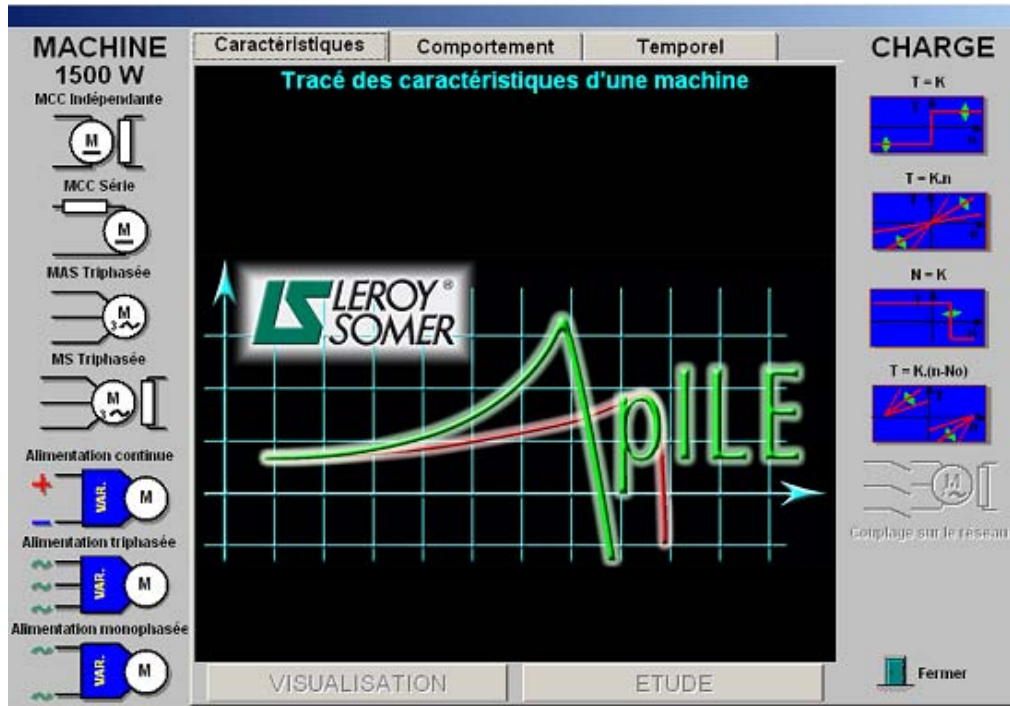


ACTIVE LOAD

Rotating machine test bench

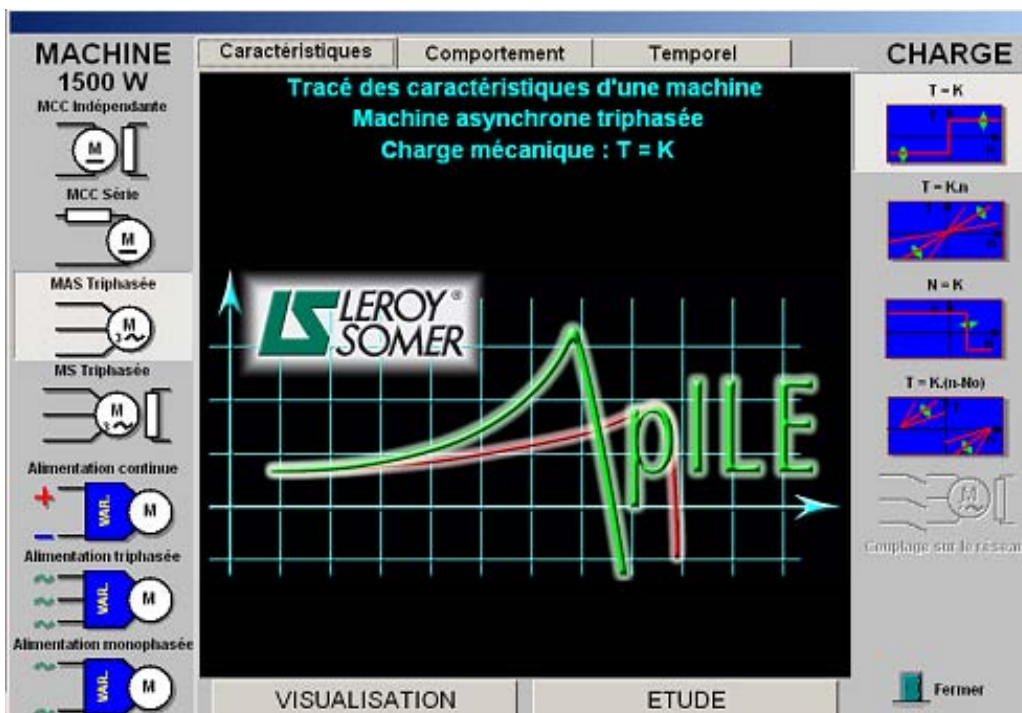


The left-hand column assists in selecting the machine or power supply that is going to be tested. The right-hand column contains the load types described previously in operation without a PC.



Choosing the test configuration:

One box in each column must be selected to make the 2 buttons, **DISPLAY** and/or **STUDY**, active. The generic title is repeated at the top of the display (Machine characteristics plot). The 2 lines underneath show the type of machine under test and the type of load that will be applied to it.

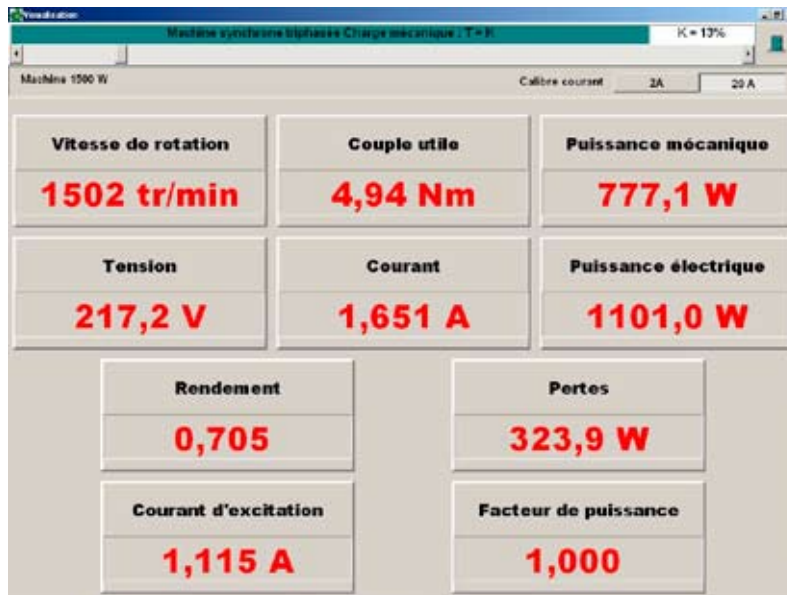


ACTIVE LOAD

Rotating machine test bench

DISPLAYING MEASUREMENTS

Pressing the **VISUALISATION** button opens the following window:



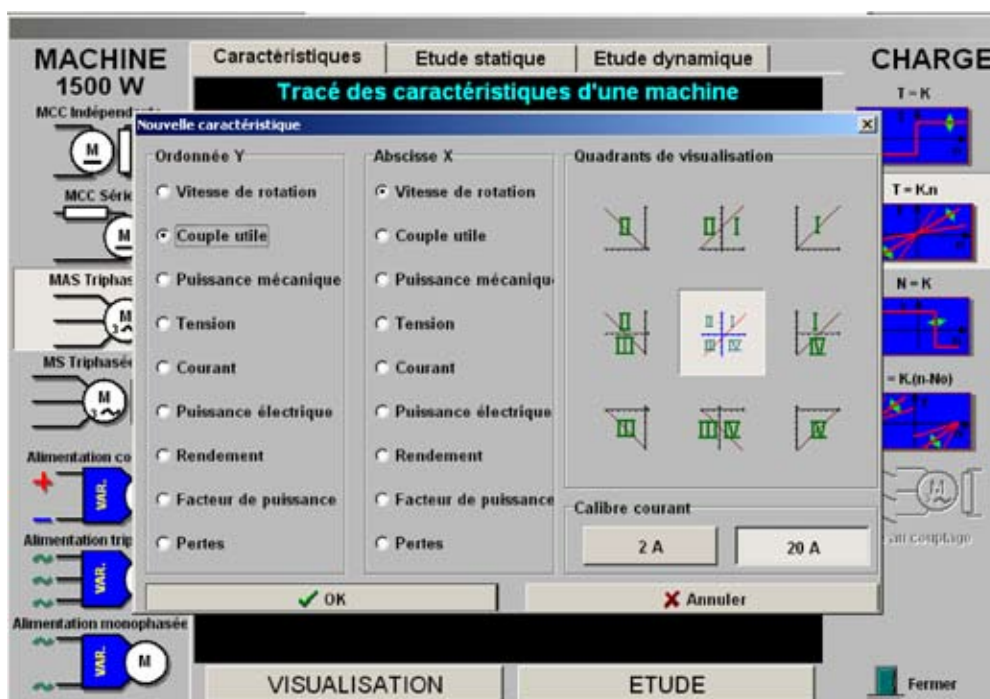
The information displayed in this window is not stored anywhere. It is only a display of the measured parameters. The slider at the top of the screen acts directly on the torque level of the load. It can be moved in 3 different ways:

- Directly with the mouse, moving it to the right or the left.
- Using the arrows at the two ends of the slider.
- Using the right and left arrows on the keypad.

Pressing the **ETUDE** button opens the following window:

The 2 left-hand columns are used to define the parameters that will be displayed on the X and Y axes. At this stage, it is only display on the screen. All the mechanical and electrical values are acquired if the connections have been carried out correctly. The right-hand part contains the operating quadrants available to the user.

By default, display of the curve of torque as a function of speed is offered, and display in all 4 quadrants. During working, it will always be possible to return to this screen by clicking on the "Characteristics" button in order to make other choices that will improve ease of use. The rating of the measurement of the current connected to the control unit must be confirmed on one of the buttons, 2 A or 20 A, in the box at the bottom right. The 20 A rating will be selected by default.



Pressing the STUDY button opens the window: "New characteristic".

ACTIVE LOAD

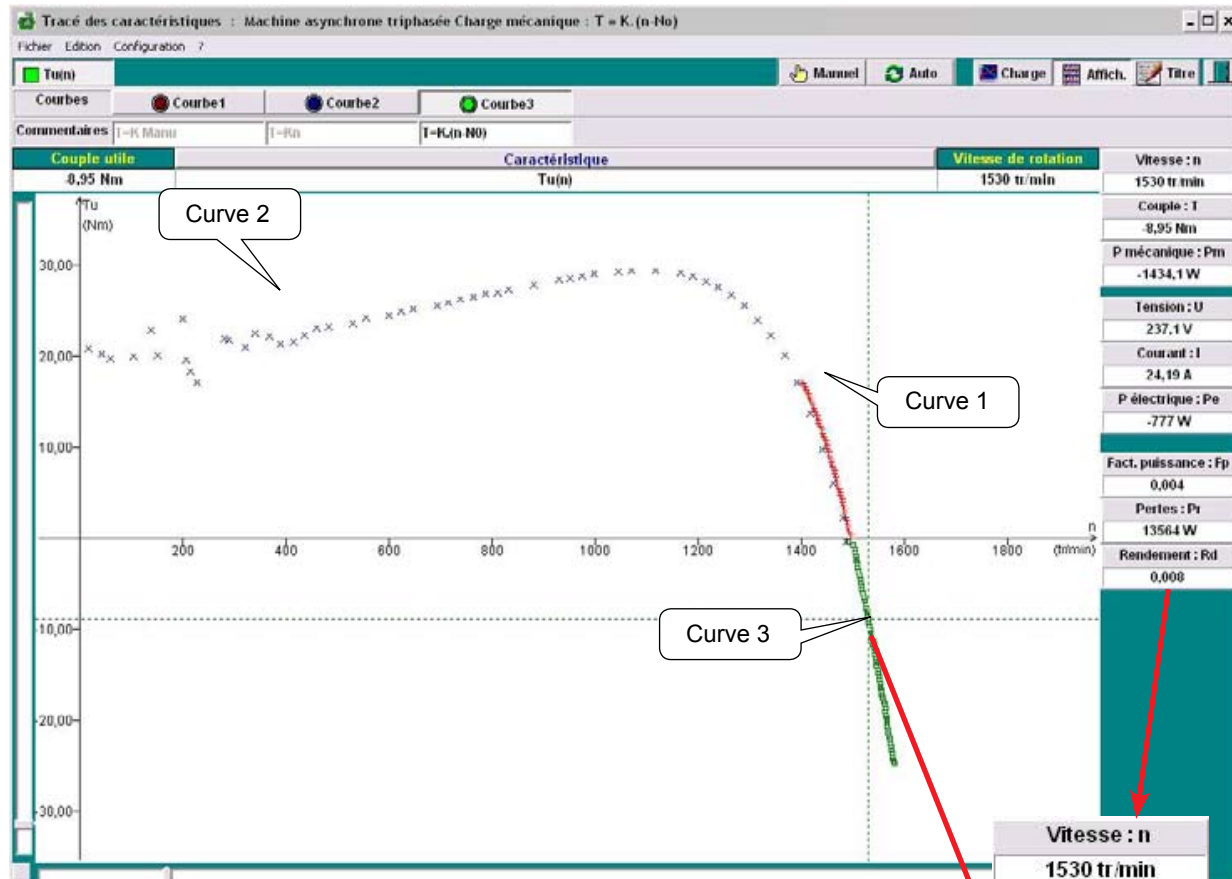
Rotating machine test bench

A double-click on the required quadrant opens the following window:

In this example, the user has carried out 3 tests grouped together into:

- Curve 1 in red T=K
- Curve 2 in blue T=K.n
- Curve 3 in green T=K.(n-N0)

In a generator quadrant (Q4), it is possible to plot up to 5 different curves on the same page.



The column at the right of the screen displays the values of all the parameters connected to the system.

After acquisition of a curve, if neither of the "Manual" or "Auto" buttons is activated, any of the points on the curve can be returned to. The values relating to this point will be displayed in the measurement column.

To display a point from one of the tests, the button of the corresponding test must be activated, and then the chosen point clicked on.

The upper part gives information on the mechanical values. The central part represents the Wattmeter of the installation. As all the machines under test are balanced, the single-phase method is used with a single voltage measurement; the software multiplies the measurement by 3 in order to display the correct electrical power. The lower part of this strip gives the result of internal calculations of: Power factor, Efficiency losses.

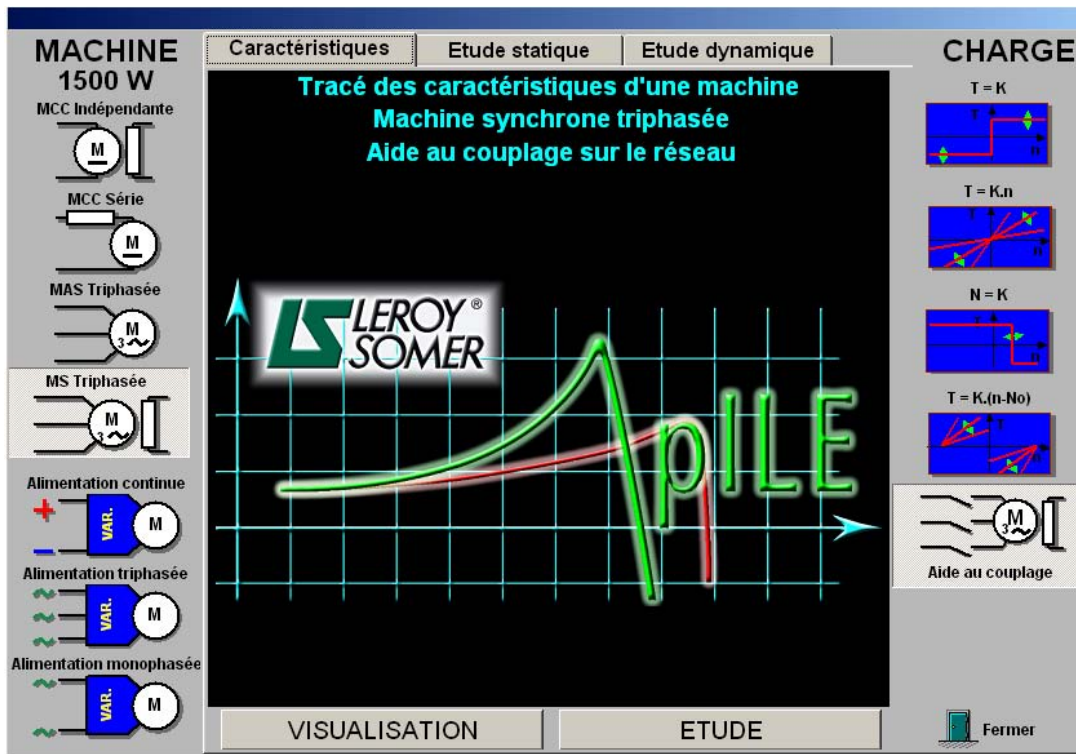
The "Disp." button is used to hide or display this measurement strip.

ACTIVE LOAD

Rotating machine test bench

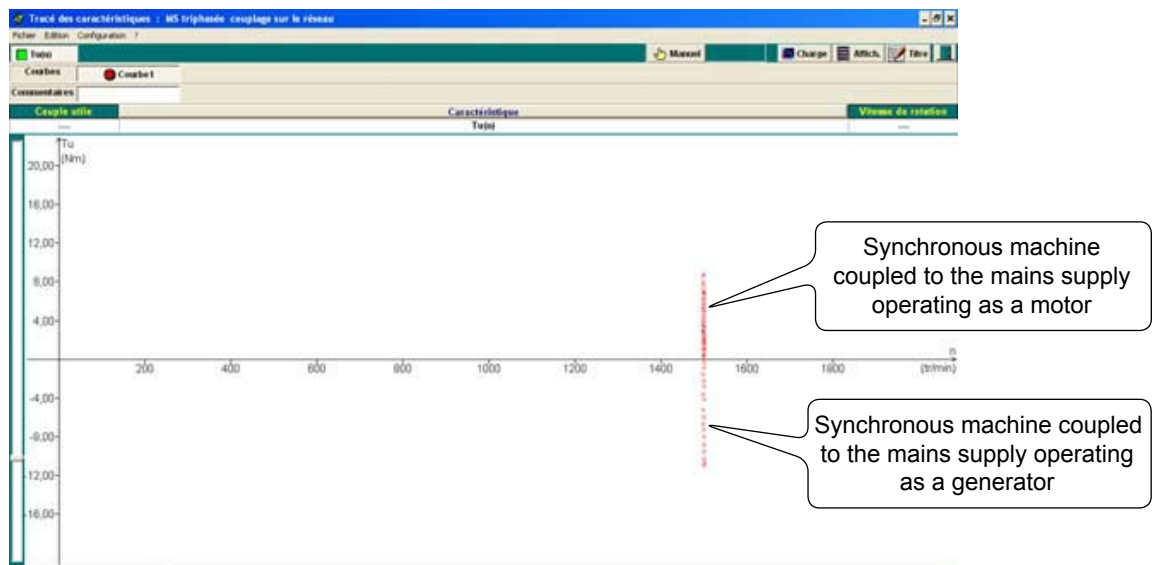
Help with alternator coupling to the mains supply:

When the machine selected in the left-hand column is a 3-phase synchronous machine, the right-hand column allows the "Help with coupling" function.



The "Study" button opens the characteristics plotting window, enabling activation of the "Manual" button. The slider is automatically positioned at 50%, and the active load drives the synchronous machine at approximately 1500 rpm. The left and right arrows on the keypad can be used to adjust the speed precisely as close as possible to synchronism. Several methods for checking synchronism can be used in order to couple to the mains supply (synchroscope, 6-lamp method, etc.).

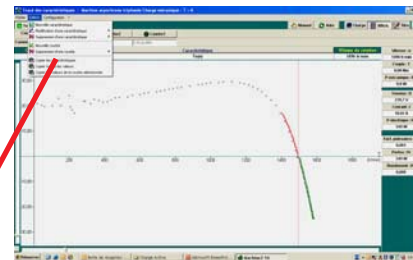
After connecting to the mains supply, the left and right arrows on the keypad can be used to load the machine + or - and to go to a motor quadrant or a generator quadrant.



ACTIVE LOAD

Rotating machine test bench

Other ways of using the measurements:
Using the Edit menu.



Adds a characteristic to the screen (4 maximum)

Calls up the characteristics window

Deletes one of the characteristics from the screen

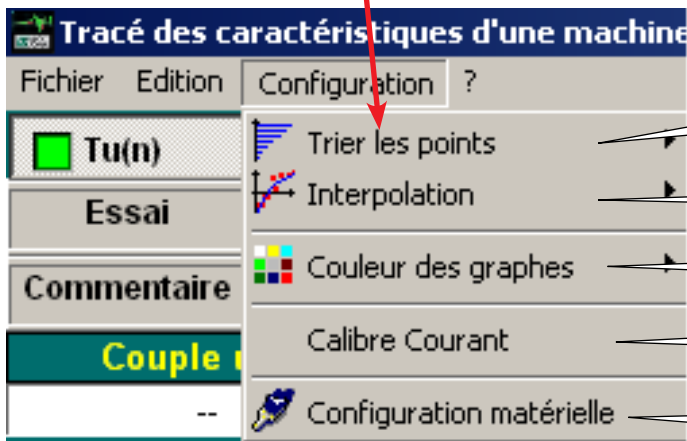
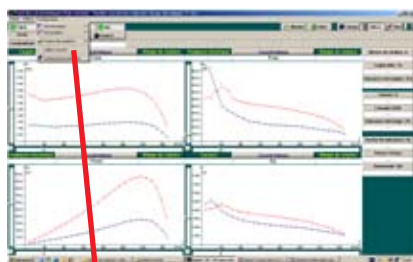
Adds a new test (5 maximum)

Deletes a test

The characteristics displayed on the screen (between 1 and 4) will be copied and can be pasted into a presentation document.

During acquisition, each point measured includes all the mechanical and electrical values connected on the front panel of the control unit. Copying all the values enables all the readings to be stored so that they can then be pasted into a spreadsheet.

The measurements from the selected test can be copied into a spreadsheet.



Opens a window for sorting the points according to a number of criteria

Used for interpolating the points of a test

Modifies the background colour of an acquisition page

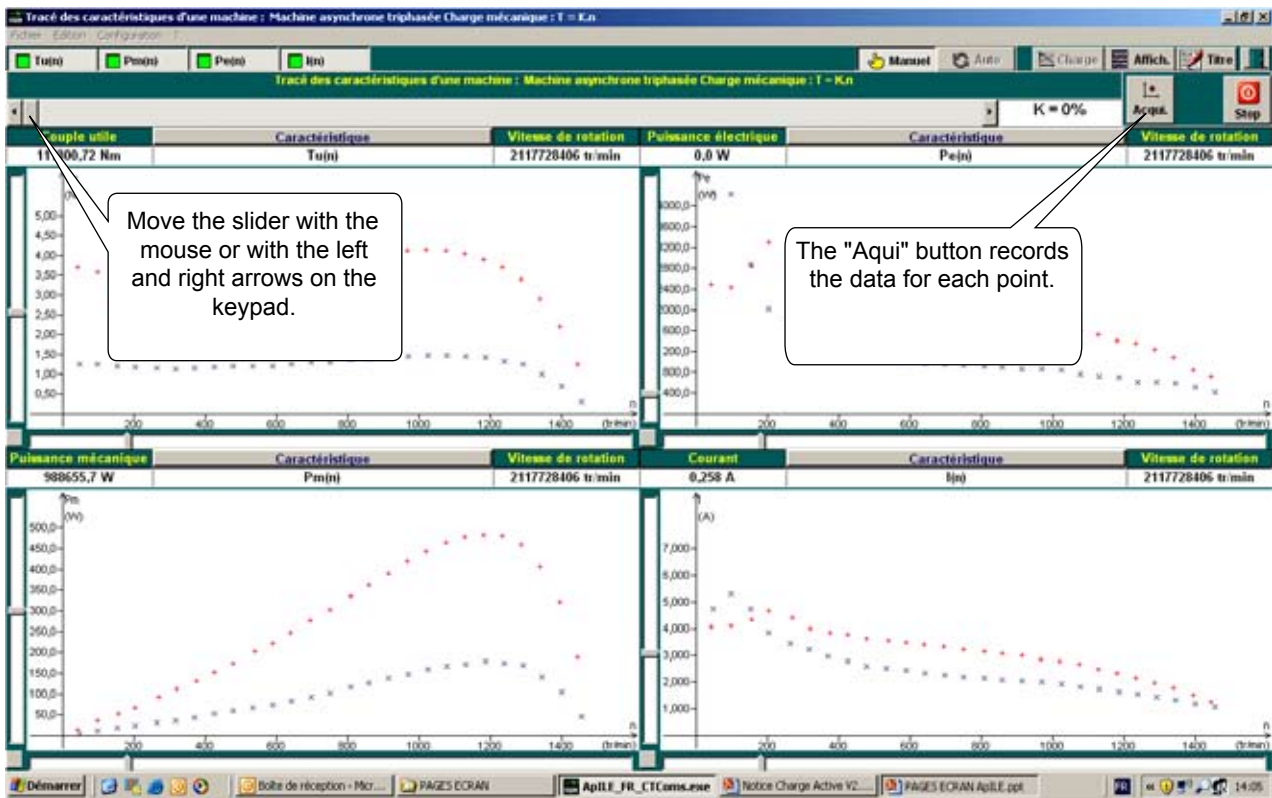
Calls up the window for selecting the 2 A or 20 A rating

Calls up the window for configuring the protocol for communicating with the PC

ACTIVE LOAD

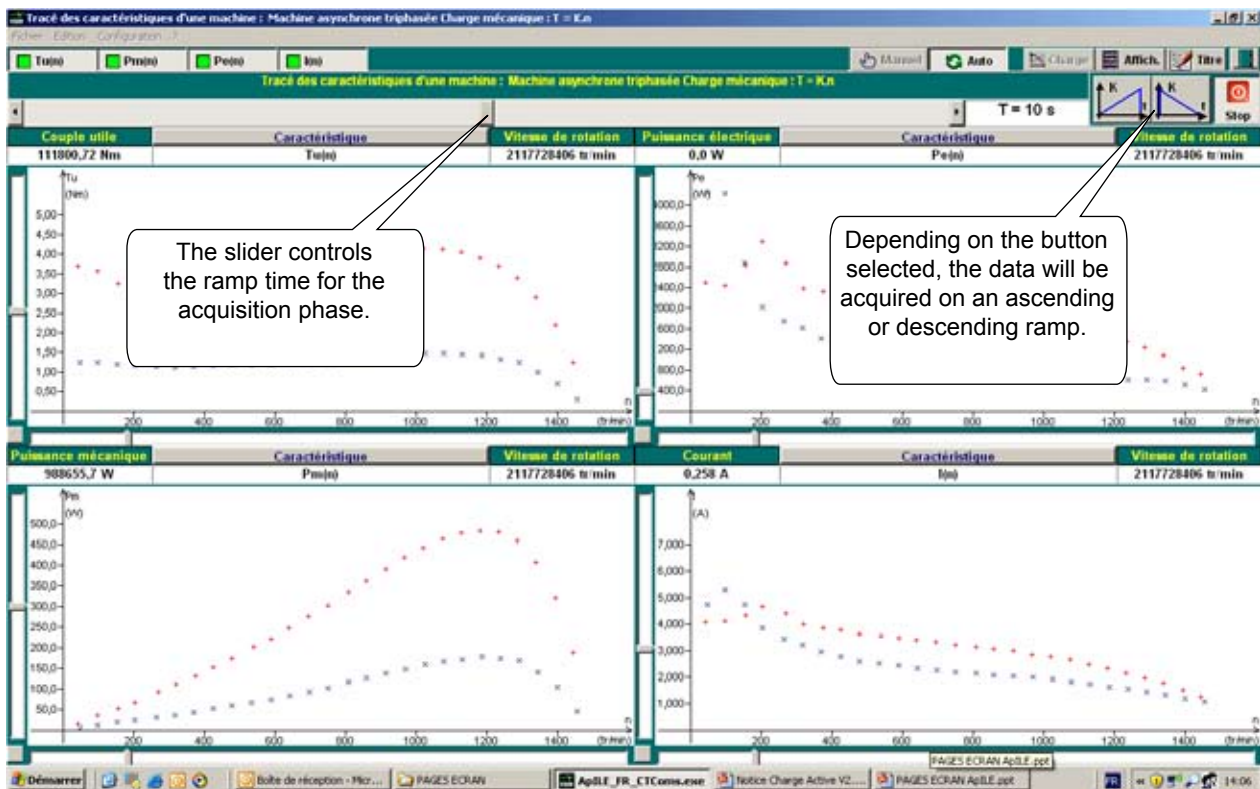
Rotating machine test bench

MANUAL ACQUISITION



* Caution, in manual mode, the percentage shown in the window to the right of the slider (K=xx%) represents the reference of the **active load**, and not of the machine under test. The **active load** at 100% reference develops a torque of at least 4 times the torque of the machine under test in order to be able to stall it or cause it to overspeed.

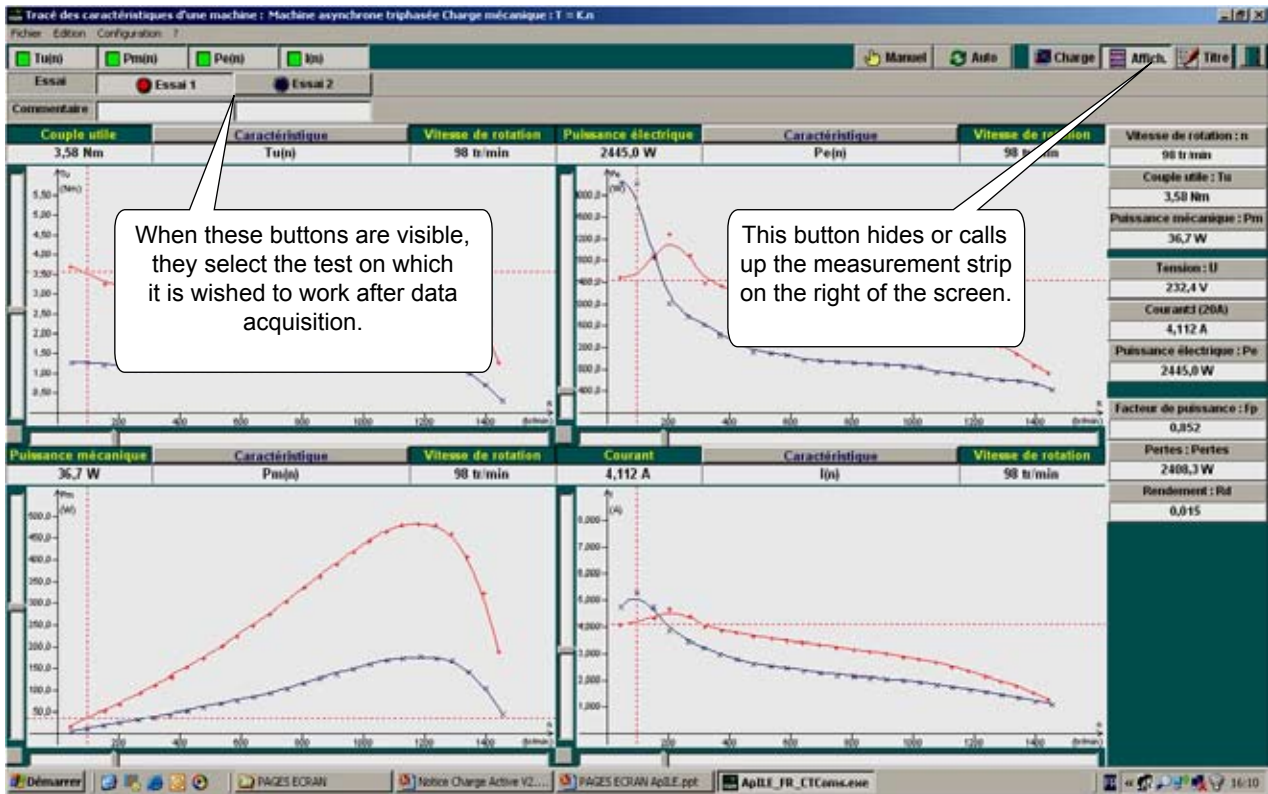
AUTOMATIC ACQUISITION



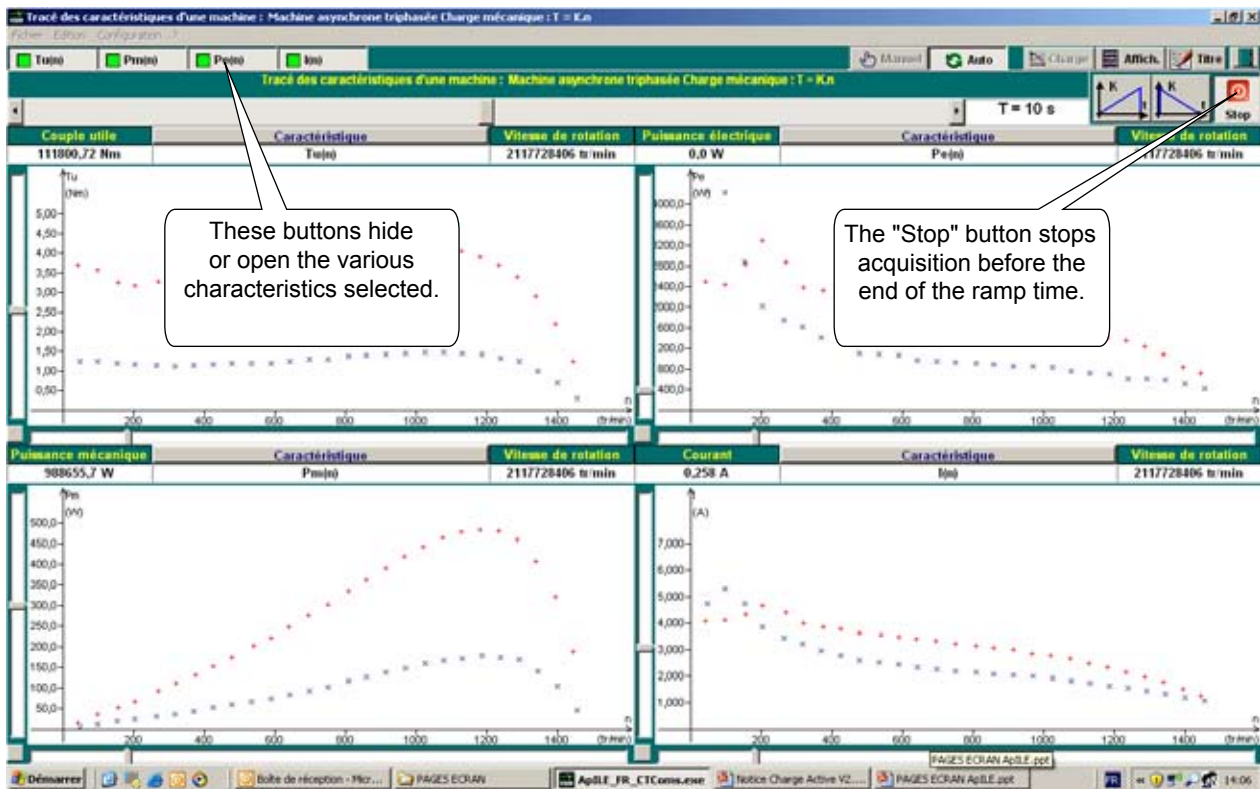
ACTIVE LOAD

Rotating machine test bench

Other functions:



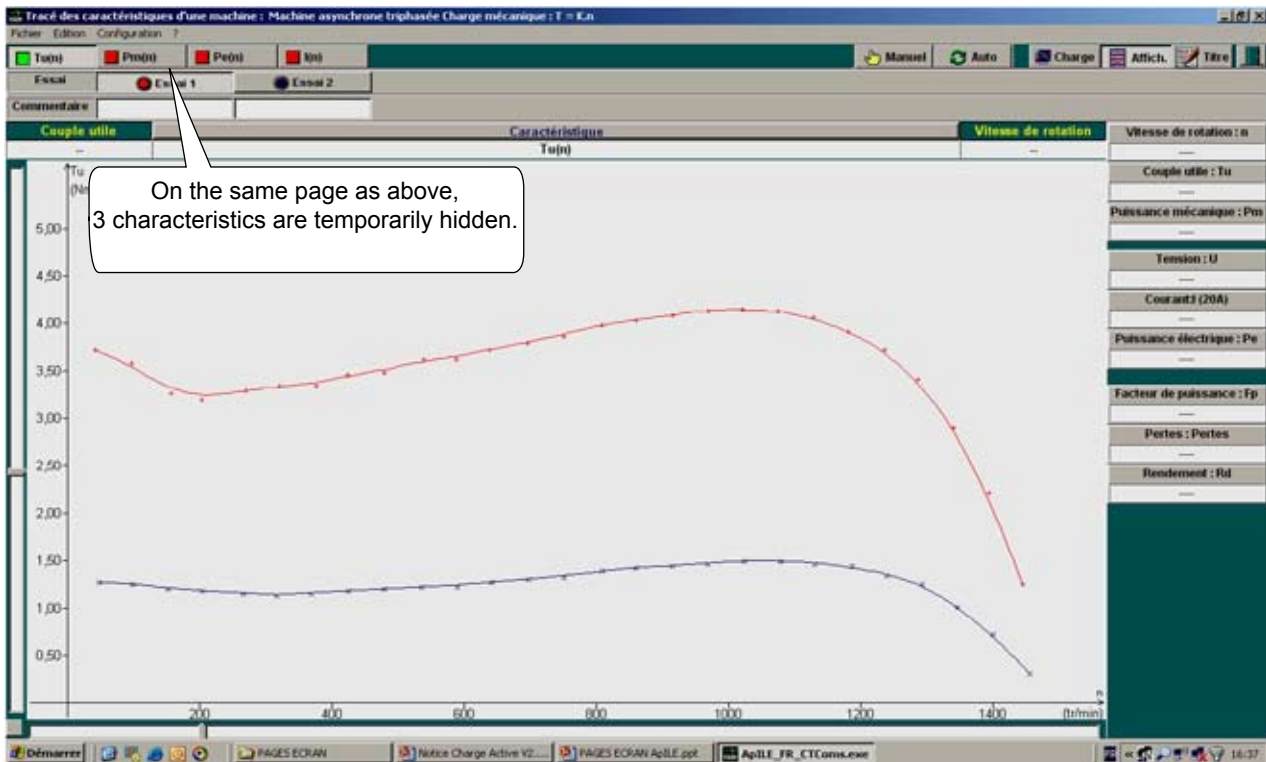
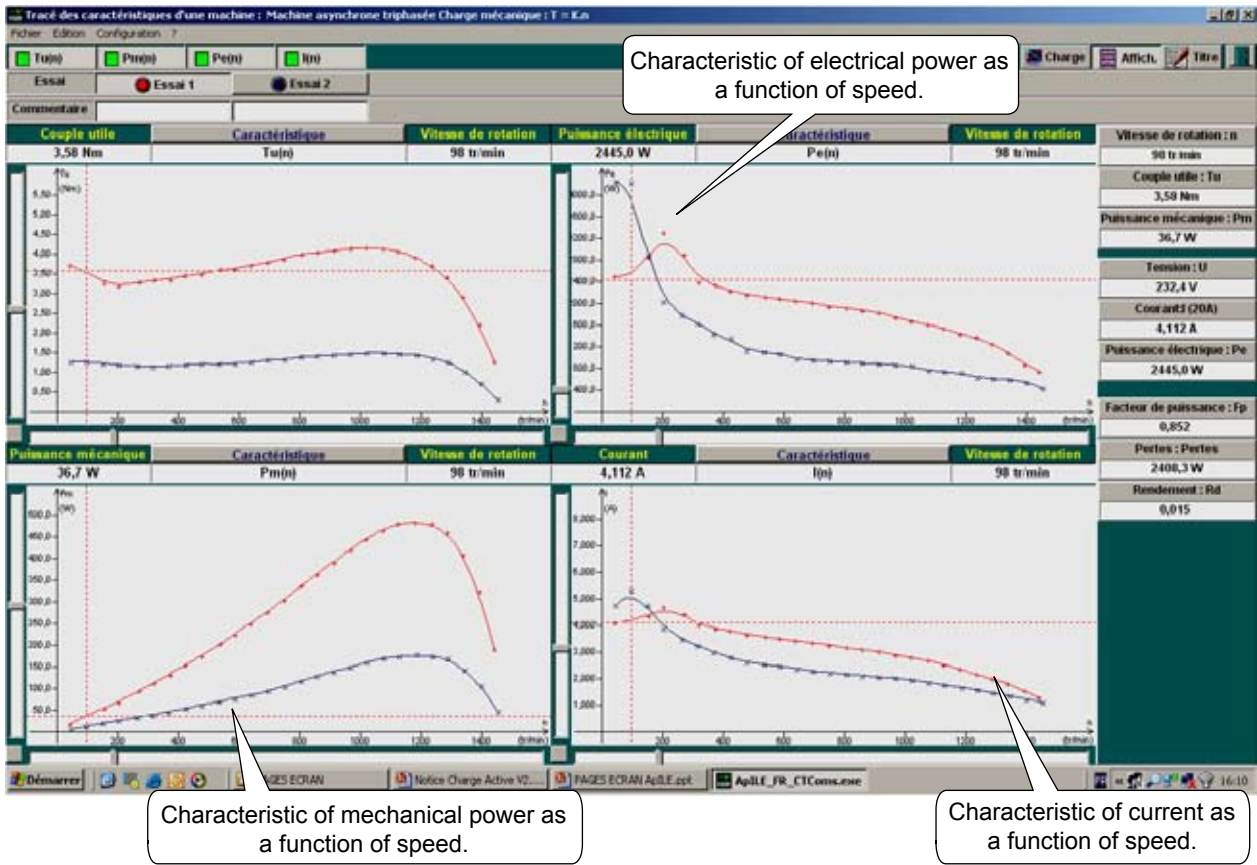
The example on these 2 pages shows that 4 characteristics can be displayed simultaneously.



ACTIVE LOAD

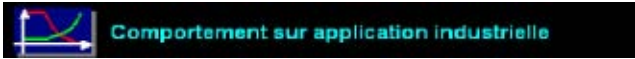
Rotating machine test bench

Example of running 2 tests with 4 different characteristics



ACTIVE LOAD

Rotating machine test bench



A large number of industrial applications work at variable speed. They are usually classified into 4 major Torque/Speed ratio families. The **active load** can be used to work on these industrial applications.

The button

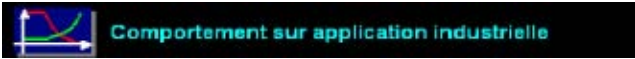


Opens animations of applications consistent with the type of load chosen:



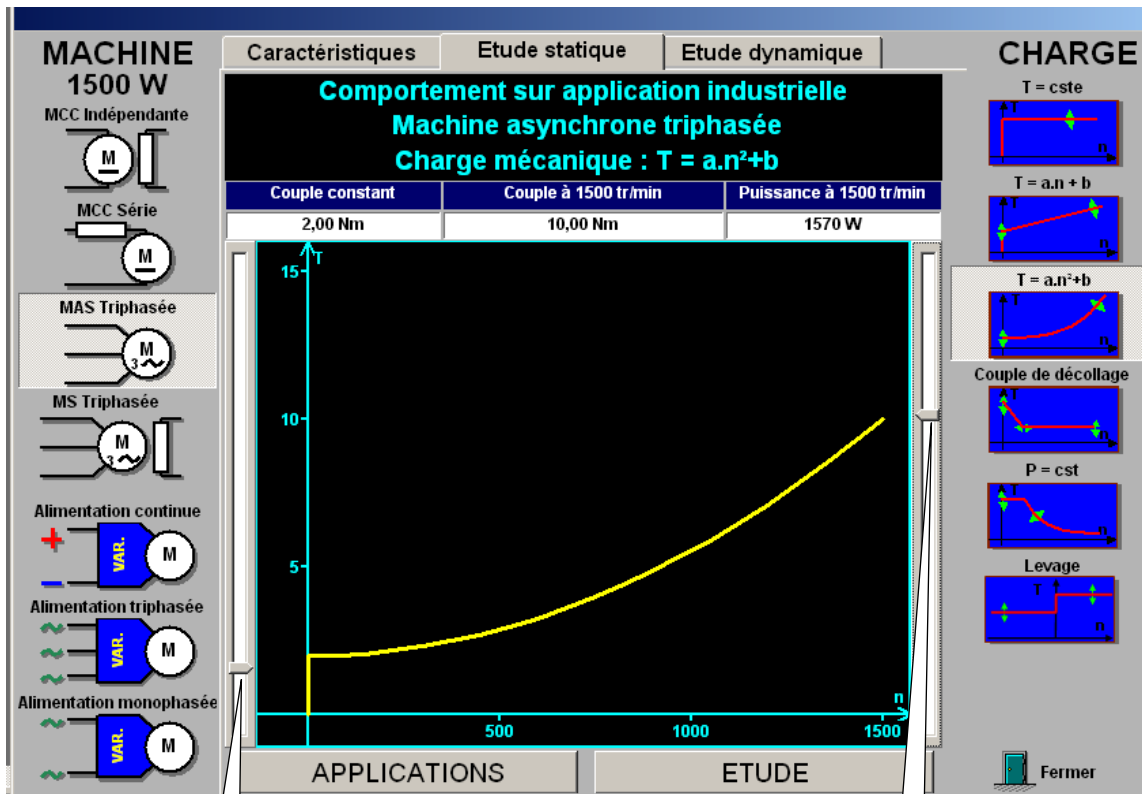
ACTIVE LOAD

Rotating machine test bench



Preparing the test settings:

The majority of industrial applications can be classified by type of behaviour in the Torque as a function of Speed characteristic. The types of resistive torque most commonly encountered are listed in the right-hand column on the ApILE screen. Before starting the test, this resistive torque must be selected. This operation displays an adjustment page in the centre of the screen allowing modification of the most significant parameters of a real industrial application.

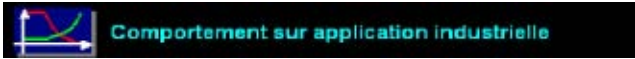


Adjustment of the resistive torque representing no-load losses.

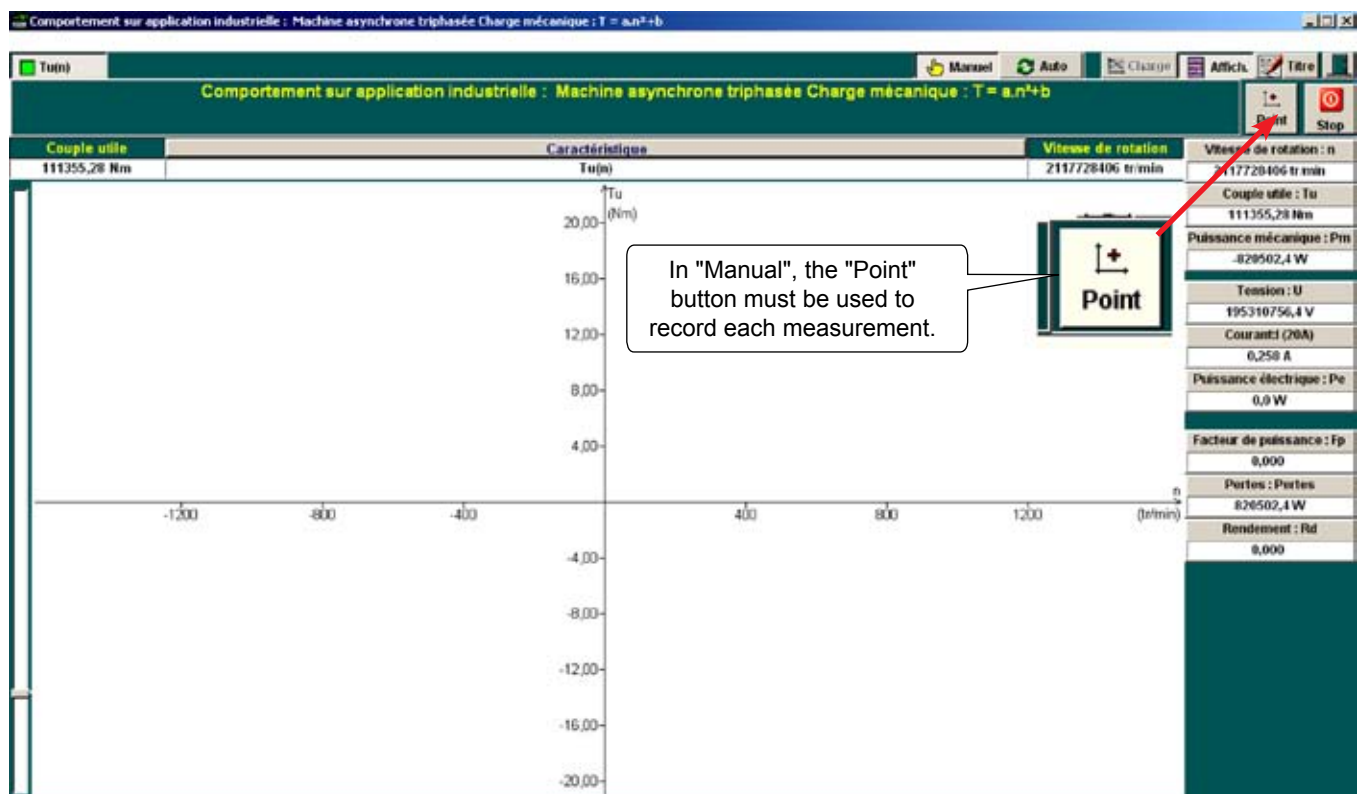
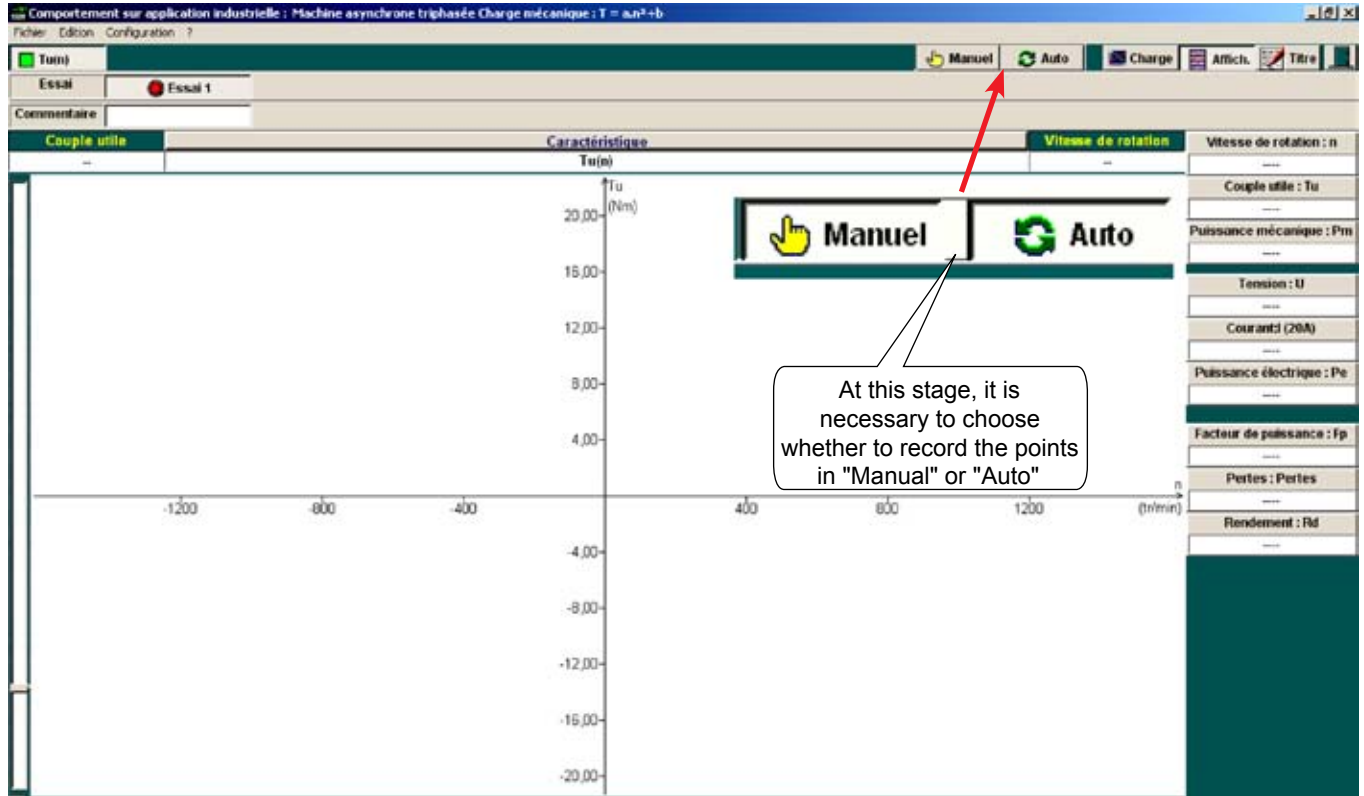
Adjustment of the resistive torque at the rated operating speed.
Caution, there are risks of overload in any industrial application; Active Load permits 150% of resistive torque for a 300 W or 1500 W drive.

ACTIVE LOAD

Rotating machine test bench

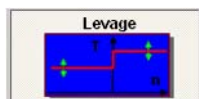
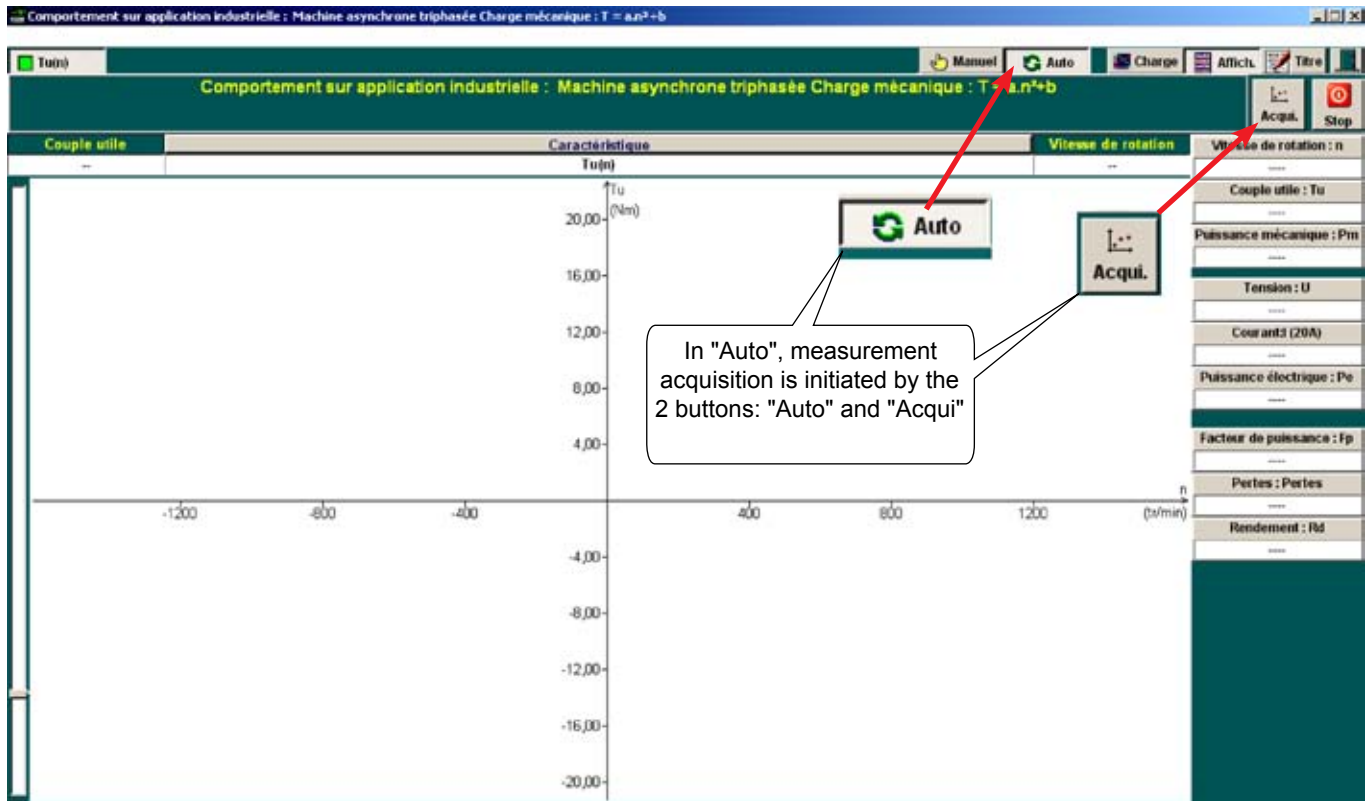
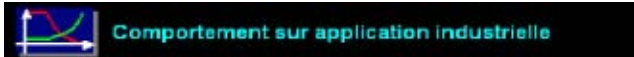


The **ETUDE** button opens the acquisition page



ACTIVE LOAD

Rotating machine test bench



Hoisting application:

In a vertical movement industrial application, the drive motor is almost always fitted with an electromechanical failsafe safety brake. In applications where people are carried (lifts, cable cars, chair lifts, etc.), the safety brake is situated directly on the cable winding drum.

In the hoisting movement study, the Active Load will behave in 2 different ways depending on the configuration of the motor coupled to it:

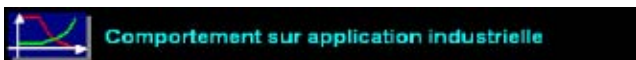
- When a brake motor is used, the "Function Input" terminals must be shunted.
- When a motor without a brake is used, the function input is open in the stop phases and closed in the upward and downward phases.

The use of a Leroy-Somer frequency inverter configured to control the power supply of a failsafe brake coil on the internal relay provides an easy-to-use solution.

Example with the DIGIDRIVE SK DID configured with parameter 12.41 = 1. This setting causes the state of the internal relay to change on a FWD or REV command above a frequency threshold and with an observed current level in the motor.

ACTIVE LOAD

Rotating machine test bench



Hoisting application:
Specific adjustments for this application.

MACHINE
1500 W
MCC Indépendante

MCC Série

MAS Triphasée

MS Triphasée

Alimentation continue

Alimentation triphasée

Alimentation monophasée

Caractéristiques Etude statique Etude dynamique

Comportement sur application industrielle
Machine asynchrone triphasée
Charge mécanique : Levage

Couple de descente	Couple de montée	Masse
5,83 Nm	9,86 Nm	125 kg

Vitesse linéaire à 1500tr/min: 1,0 m/s Rendement : 85%

APPLICATIONS ETUDE

CHARGE

$T = cste$

$T = a.n + b$

$T = a.n^2 + b$

Couple de décourage

$P = cst$

Levage

Fermer

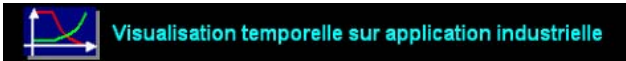
Possible action on the linear speed of the movement.

Modification of the overall efficiency of the transmission.

Adjustment of the weight lifted in kg.

ACTIVE LOAD

Rotating machine test bench



This version of Active Load operation makes it possible to work with all the loads already used in the previous section, adding a cyclic application such as a piston pump.

The "Study" button calls up the page opposite which offers time on the X-axis by default. If this choice is confirmed, only 3 possibilities remain for displaying the operating quadrants.

New proposal

ACTIVE LOAD

Rotating machine test bench



Visualisation temporelle sur application industrielle

Functions of the "Time Display on an Industrial Application" page:

Active load allows industrial applications to be studied through a time display of measured parameters.

This section contains the main generic applications already looked at with the behavioural studies, with machine cycles added, such as the example given which depicts the operation of a piston pump. In this application, the periods of operation at low torque and at high torque are linked to a number of revolutions of the motor and not to a time.

Adjustment of the low value torque in Nm

Adjustment of the high value torque in Nm

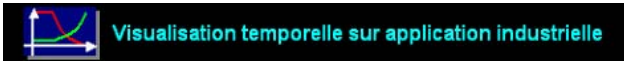
Reduction ratio between the motor and the load. This value defines the number of revolutions travelled by the rotor of the load machine before changing to the other defined torque value.

Adjustment of the inertia of the moving weights. The adjustment range for the inertia of the Active Load in the 1500 W range goes from 0 to 1 kg. M², i.e. 200 times the inertia of an induction motor.

Adjustment of the slope to change from low torque to high torque. Adjustment range between 0% and 100%.

ACTIVE LOAD

Rotating machine test bench



Measurement acquisition page as a time display.

The screenshot shows a software interface for monitoring a rotating machine test bench. The main window displays a graph of torque (T_u) in Nm over time (t) in seconds. The graph shows a green curve representing torque, a blue curve for speed, and a red dotted line for current. The interface includes a menu bar, a toolbar with buttons for 'Oscille', 'Attach', and 'Titrer', and a control panel with 'Configuration', 'Acquit', and 'Stop' buttons. A slider is used to adjust the acquisition time.

Callout boxes provide the following information:

- Check box for synchronising the oscilloscope on an event:** Speed, Torque, Voltage, Current.
- Activation of the load on the machine under test.** (Points to the 'Oscille' button)
- If the load is disabled, this button brings back the page for selecting the type of load applied to the machine under test.** (Points to the 'Configuration' button)
- Slider for adjusting the acquisition time from 5 to 120 seconds.** (Points to the 'Duree' slider)
- Start command for the acquisition phase.** (Points to the 'Acquit' button)

ACTIVE LOAD

Rotating machine test bench

NOTES



MOTEURS LEROY-SOMER 16015 ANGOULÊME CEDEX - FRANCE

338 567 258 RCS ANGOULÊME
Limited company with capital of 62,779,000 €

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