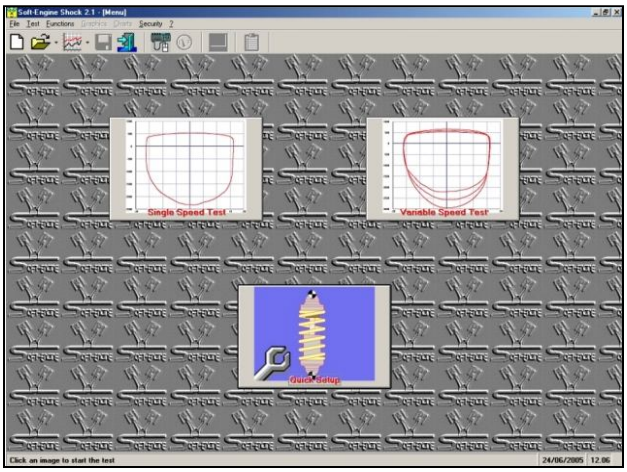
Soft-Engine - Data store software: Shock 3.1

Software description

The shock-absorber dynamometer software allows all typical tests The software is "friendly", because all data can be visualized/printed in few clicks of mouse: infact, software, obviously, works in WINDOWS© environment (all the versions).

The software allows these kind of tests:

- **SINGLE SPEED TEST:** this is a tipical test, only one speed (or frequency) is input at a certain stroke;
- **VARIABLE SPEED TEST:** several working cycle is available by this kind of test. The speed step can be constant or variable.
- **QUICK TEST:** sometimes is useful to test the correct working of the shock absorber or the dynamometer without create the diagrams. This test allows a great range of different speeds.



Shock 3.1: The main window

There are some **preliminary tests**, like

- **WARM UP:** the shock-absorber is warmed for a selected number of seconds, or until a selected temperature is reached;
- **GAS TEST:** during this preliminary test the gasseous component of force is measured;
- **SEAL DRAG TEST:** this test is automatically done when GAS TEST is running. This is a semi-static test to measure the friction internal to the shock-absorber during test .
- **THRESHOLD FORCE TEST:** by this test it's possible to input a force value (=the threshold) and a speed value. If the shock-absorber force (during the test) is bigger than the threshold, the software aborts the test. This test can be done during the main dynamometer working (=during the acquisition test) or it can be a preliminary test. It is useful to avoid possible shock-absorber breaking during particularly strong tests.

Stored quantities

The software gives these results, like diagrams and charts:

- **Force vs Displacement, Speed and Time;**
- **Force vs absolute Speed and absolute Force vs absolute Speed;**
- **Peaks of Force vs absolute Speed;**
- **Gas force vs Crank angle;**
- **Force, Displacement and Speed vs Time;**
- **Temperature vs Time.**

It is also possible to:

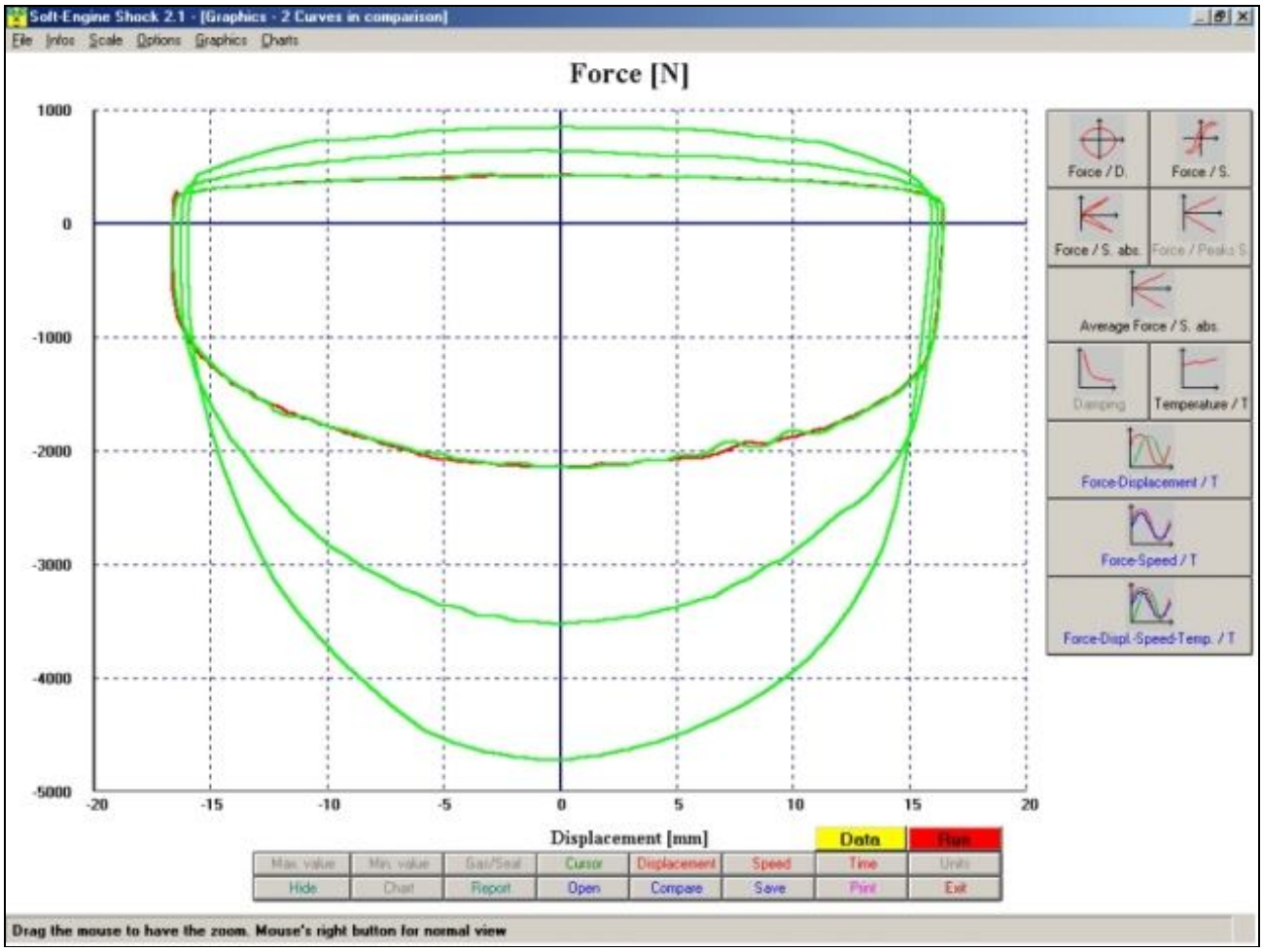
- **Load the shock-absorber** before test;

- **Compare** different tests.

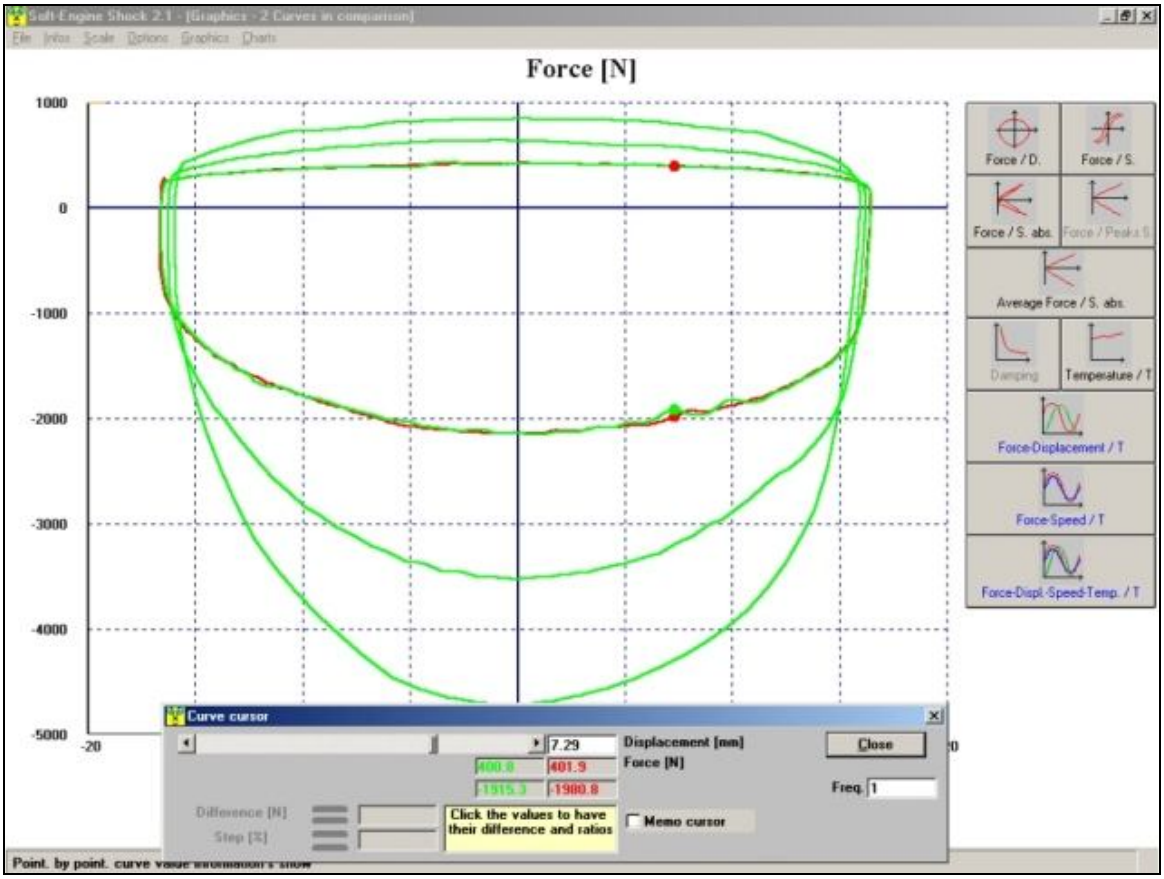
Data analysis is complete, there are a lot of analysis tools, and so it's possible, for each measured quantity:

- Visualize **diagrams** and **chart**;
- Each quantity can be displayed vs **Displacement**, **Speed** or **Time** (if this is significant from a phisic point of view);
- To have the **zoom** on the displayed diagram;
- To read the curve using a **cursor**, view of X-Y diagram values for each quantity, accuracy: 0.1 mm) The cursor works cycle by cycle;
- To read the basic results for each cycle;
- To read the **peak values**;
- To invert the vertical scale of diagrams (expansion on the top, compression on the bottom and vice-versa);
- To **change units (International, British and Tecnical)**;
- To print diagrams and chart on paper. The diagram print can be customized;
- To customize the diagram.

In this software it is immediately possible to choose the right test type (Single speed o variable speed test, a simple click of mouse on the correct icon), and, in the diagram window, it is possible to run the different option using the button on the right (for diagram choice) and on the bottom (for analysis functions) part oe window. See the following pictures:



Comparison among different tests



The diagram cursor

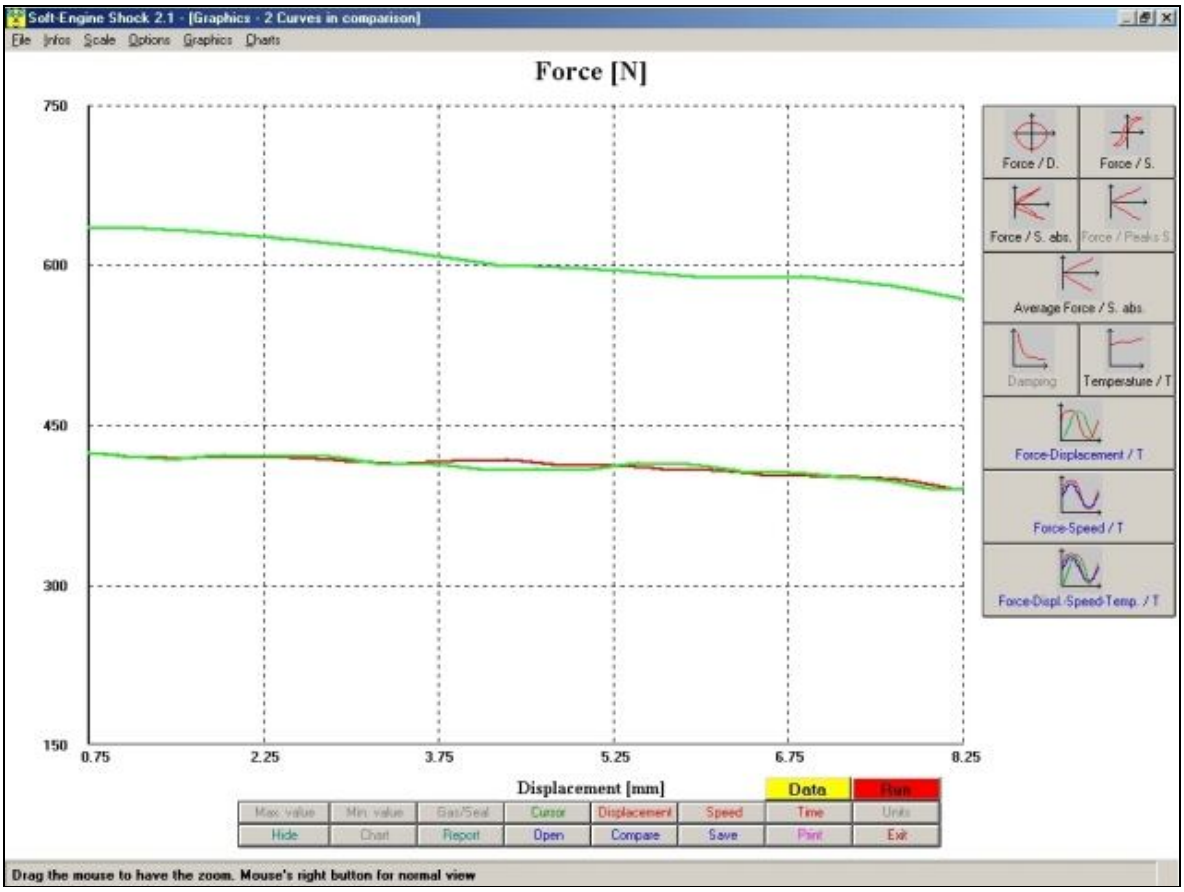


Diagram zoom effect

Kind of test

Here are the different test types:

Single speed test:

This test allows the data store for a single speed (mm/s) or frequence (Hz) input.
It is used to value the shock-absorber setting, vs shick-absorber stroke and knowing a value of speed. So, it is possible to correctly value the hidraulic working of device and to find possible problems: infact the diagram "Force/Displacement" must be usually like an ellipse.

Variable speed test:

By this test it's possible to test shock-absorber inputing a series of progressive speeds (or working frequences). You input a max and a min value of frequency (or speed), a step, and a number of cycle for each imposed frequency. So, during test, the working frequency variates and it will be possible to value the shock-absorber compression behaviour conresponding to different speeds.

Some preliminary tests are possible, like:

Warm up:

This test allows the shock-absorber oil reachs the correct working temperature before test beginning. In-fact, during the real shock-absorber working, its oil increases the heat. So, by dynamometer, it's possible to test the hidraulic shock-absorber behaviour to an imposed temperature.

Gas test:

This test allows the measure of shock-absorber's gas inertia: the load cell measures the gas force, depending on its inertia. These data will appear in special diagrams and charts, vs the electric motor crank angle. The speed of gas test is very low, but it's possible regulate it.

Seal Drag Test (Friction test):

This is a semi-static test to value the shock-absorber body friction caused by its keeping. It is used to value the friction effect at the first shock-absorber piston separation. The measured force is the sum between the friction and the hidraulic. It is included in the GAS TEST.

Threshold force test:

This test can be preliminary or not (that is it can become active also during the main test): a threshold force is input at a certain speed (also input in the software). During test, if the shock-absorber force is bigger than the threshold, the test itself aborts. It is suitable to avoid shock-absorber breaking during particularly strong tests.

The measured quantities

Software allows to measure some quantities like:

Force vs displacement diagram

This diagram (fig. 1a and 1b) is the most used one, because it is immediately known the force values related to the conresponding shock-absorber stroke. It os possible to watch only a cyle (fig. 1a) or more (fig. 1b) at one or more frequences. There are some topic points: the **Zero** is usually measured at compression half stroke; When the con-rod is at **Bottom Death Center** (**BDC**) the shock-absorber is completely stationary and completely expanded, so, its resistance is zero. When con-rod displaces, theshock-abosrber works in compression and its resistance force increases. Then, the con-rod reaches the **Half Stroke Compression Center** (**HSCC**). The shock-absorber is compressed to a speed equal to the flywheel rotation speed: the shock-absorber reaches the max compression. Later, the con-rod reaches the **Top Death Center** (**TDC**): the shock-absorber is totally compressed and stationary, so, its resistance is zero. Finally, when the con-rod is at **Half-Stroke Extension Center**, (**HSEC**), the shock-absorber is extended to a speed equal to the flywheel rotation speed, the resistance force value is minimum. Later, the con-rod reaches the **BDC** and a new cycle begins. The conresponding diagram has an elliptical shape, and it is immediately recognizible. The negative force means "**compression force**", the positive force means "**extension force**"; the negative displacement means "**Compression**" and the positive displacement means "**Extension**".

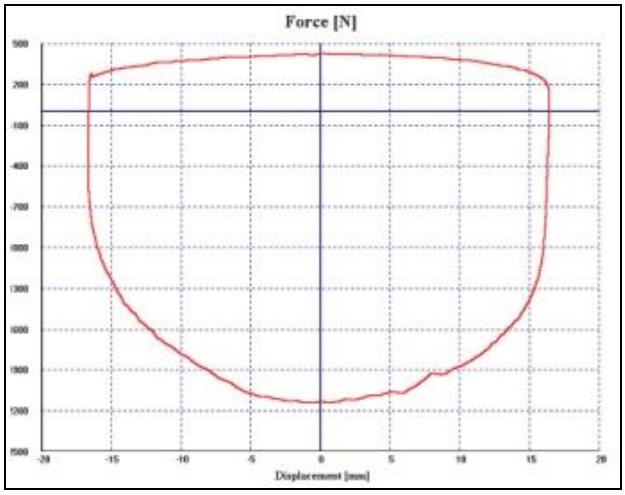


Fig.1a: Force vs Displacement diagram (one working cycle), constant speed

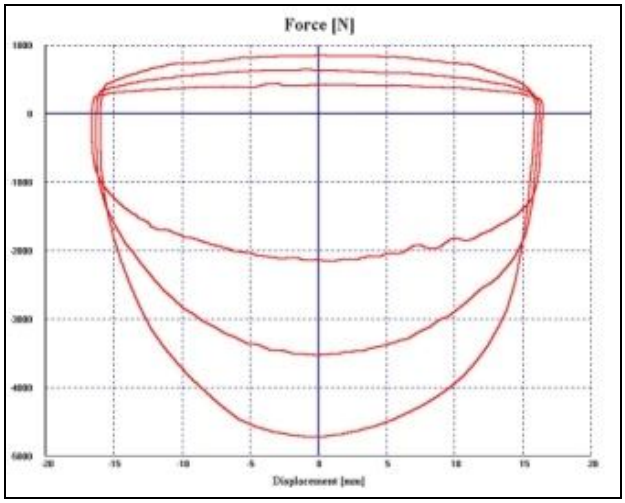


Fig.1b: Force vs Displacement diagram variable speed (one working cycle each frequency)

Shock absorber force vs speed diagram

This diagram (fig. 2a and 2b) indicates how the force variates in the time, because the speed is the variation of displacement in the time. It is possible to consider one cycle (fig. 2a) or more (fig. 2b).

During test a curve creates, both in compression and in extension. The two curves does not coincide because of valve systems inertia and gas (or air) compression influence. They are more complicated diagrams, so they are used seldom.

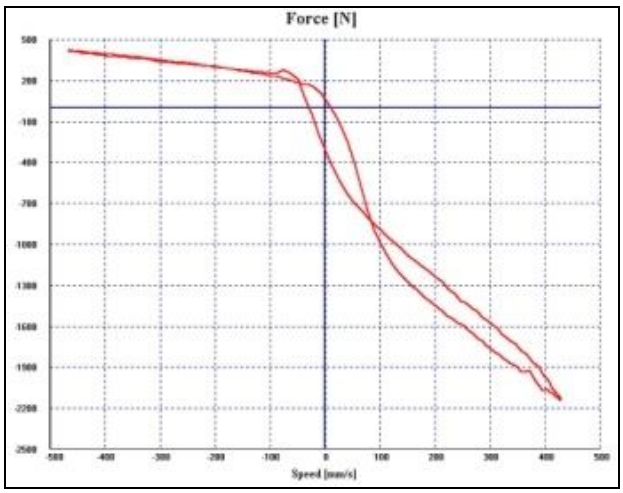


Fig.2a: Force vs Speed diagram, constant speed (one working cycle)

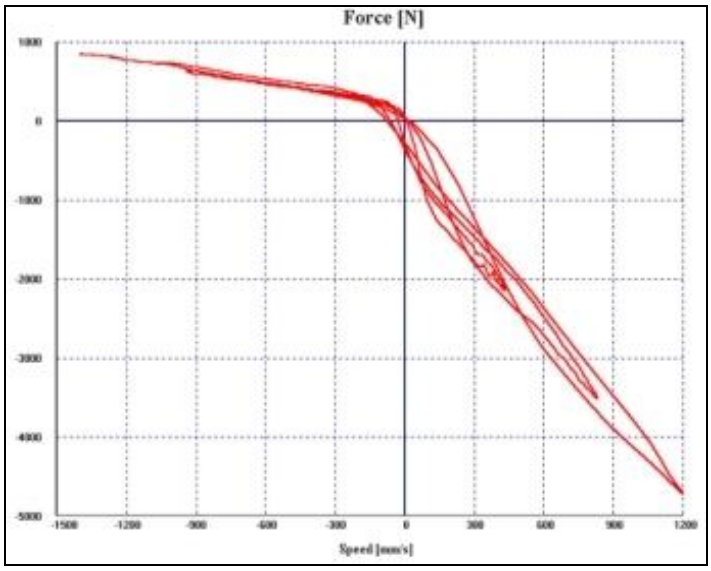


Fig.2b: Force vs Speed diagram, variable speed (one working cycle for each frequency)

Shock absorber force vs absolute speed diagram:

It is a Force vs speed, but speed is always upper than zero. In this way, the F/S diagram becomes easier to read.

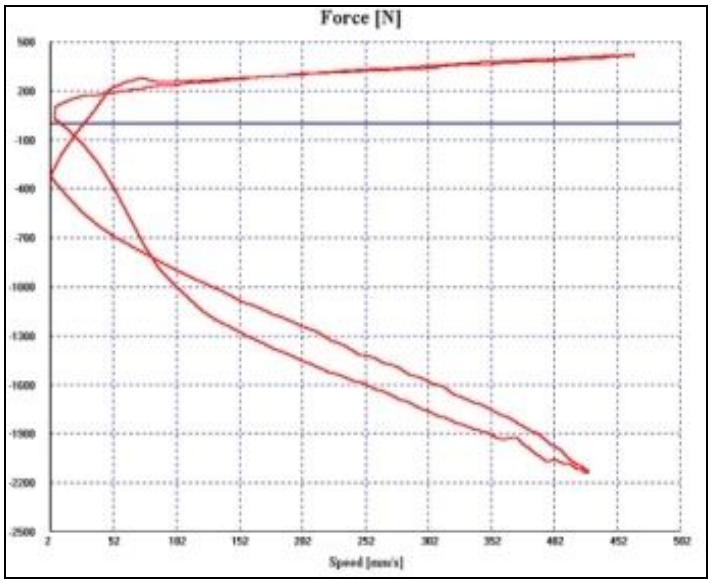


Fig.3: Force vs absolute Speed diagram

Shock-absorber peaks force vs speed diagram

This diagram also (fig. 4) is a variation of Force/Displacement diagram, one cycle or more, constant or variable frequency.
For each working cycle the max force is measured conresponding to the velocity, so a peak diagram displayes, then the points are connected by a line for an easier reading. These diagrams put in evidence the force vs peak speeds, and this is the best thing to do to make calibrations.

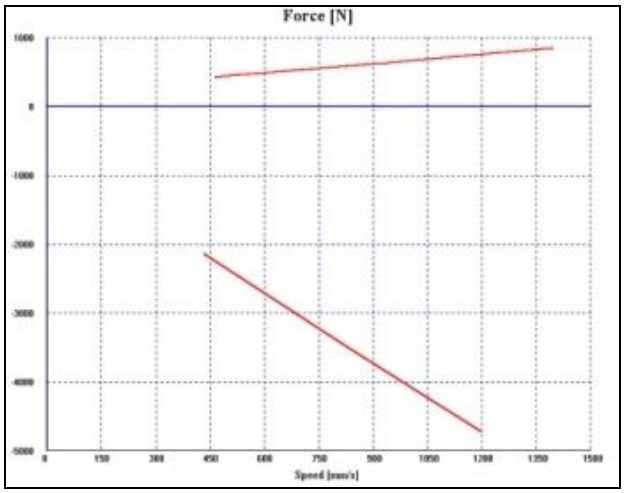


Fig.4: Peaks of Force vs Speed diagram

Temperature diagram:

This diagram is used to study the oil temperature variation vs time during the test.

PC minumum configuration

Feature	Description
Processor:	Any personal computer IBM compatible.
System:	Windows ME, NT, Xp, Vista, Seven, Eight, Ten. 32 or 64 bit systems.
Memory RAM and Hard Disk:	At least 1 GB RAM and 2 GB free in the hard disk (for best Windows performances).
CDrom or Dvdrom device:	Speed at least 52X.
Graphic card:	VGA, SVGA and compatible cards, set at least 32 bit, Min. resolution: 1024x768.
Miscellaneous:	Keyboard, mouse, at least 3 USB ports free (to connect the data store electronic unit, the USB hardware key and theprinter).
Printer:	Any ink-jet printer. Total compatibility with laser printers.
We suggest:	1) To remove the internet connection and the antivirus systems; 2) To remove the Blue-tooth connection; 3) To add an UPS to PC and data store electronic unit; 4) To make periodically the saved tests backup.
Total compatibility with notebooks and cases minitower PC.	