# MOTORCYCLE DYNAMOMETERS

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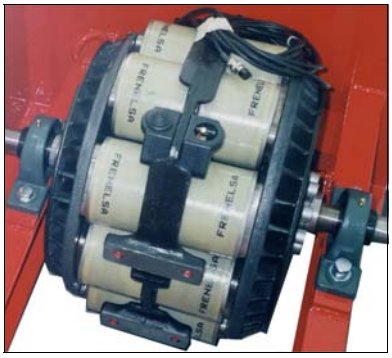

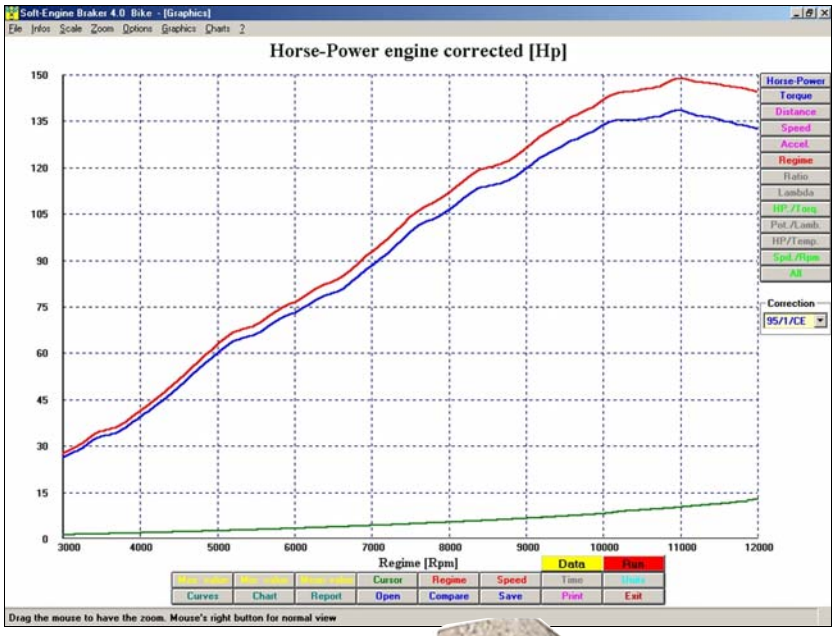


- Wheel horsepower, engine horsepower, and friction horsepower
- Wheel torque, engine torque, and friction torque
- Distance run on the drum
- Vehicle speed on the drum
- Road linear acceleration
- Instantaneous gear ratio
- Exhaust gas temperature
- Engine rpm direct acquisition
- Carburetion data acquisition by lambda sensor
- Gear ratio computation
- Graphic zoom
- Charts and Tables
- Units
- EC/95-SAE-DIN horsepower correction
- Variable air speed fan system, for airbox feeding
- Eddy current brake
- Inertial single gear test
- Engine horsepower test
- Variable gear test
- Mappings
- Engine running-in
- Road simulation
- Inertial-braked combined test

….AND MUCH MORE!

**THE RIGHT ITALIAN CHOICE!**


**SOFT-ENGINE: DYNAMOMETERS**

**Via del Consorzio, 2 60015 Falconara M.ma (AN) - ITALY**

**Tel.0039-0719156086 - Fax.0039-0719189118 E-mail: info@soft-engine.com**

## OUR COMPANY

*SOFT-ENGINE is an Italian company which became first famous for having "invented" computation software for automotive and mechanical engineering, designing, and building of engines Thanks to our commitment, everyone can find the software he/she is looking for at various levels and on many fields of application: mufflers and cams design, horsepower simulation, suspension systems and others.*
*Our deep knowledge of information technology and mechanical engineering are the key factors of our leading position in dynamometers engineering. Our wide production range consists of car dynamometers, motorcycle dynamometers, and kart dynamometers, both inertial ("Inertial" models) and Braked ("Braker" models) ones.*

# MOTORCYCLE DYNAMOMETERS

BRAKER 150

## WHAT IS IT FOR?

A dynamometer is used to measure engine performances, in fact the resulting performance data, both positive and negative, allows the engine **diagnosis**.

Various road behaviours can be simulated on the test bench. It can also be used for engine **tuning** in order to achieve the best possible performances or an excellent setting up to reach a special performance. Moreover the true revolution is to be seen in full **safety** working conditions.

| BRAKE MATCHING |
|---|
| Eddy current brake |
| Air cooling |
| **It's possible to force the engine** |

| DATA SHEET | INERTIAL 100 Inertial dyno (moto, scooter) | INERTIAL 150 Inertial dyno (superbike) | BRAKER 150 Braked dyno (superbike) |
|---|---|---|---|
| Max. horsepower: | 150 CV | 300 CV | |
| Max. speed: | 280 Km/h | 360 Km/h | |
| Dimensions [mm]: | 2,150-1,410-420 | | |
| Full weight: | 530 Kg | 660 Kg | 880 Kg |
| Software: | Inertial 4.0 | | Braker 4.0 |
| Fan system: | —— | - Centrifugal fan system SE-402;<br>-Hi-pressure, air speed about 180 Km/h | —— |
| Mechanics: | - Composed frame, rear and front part are separable, very high thickness sheet, eddy current brake vain is included also in the inertial models<br>- Very high inertia drum, dynamically balanced | | |
| Electronic: | - Hi-accuracy encoder | | - Hi-accuracy encoder<br>- Electronic brake management |
| Eddy current brake: | -Suitable for eddy current brake setting-up | | - Included |
| Sensors: | -Meteo device | - Automatic meteo device | |
| Safety Devices:<br><br>Machines Directive EC 89/392/CEE | - Metallic barriers<br>- Rear safety gate, possibility to place exhaust gas evacuation collectors any position<br>- Drum's mechanic safety lock system<br>- Front wheel clamp<br>- Belts for rear motorbike part lock | | |

### SOUNDPROOFING ROOMS

The Soft-Engine makes **SOUNDPROOFING ROOMS** with ventilators by request. Existent rooms transformation.

SUZUKI ITALIA

**Soft-Engine** is proud to announce the official agreement with **SUZUKI ITALIA** about the Soft-Engine dynamometers distribution to dealers and service Suzuki's italian net.


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# DYNAMOMETER

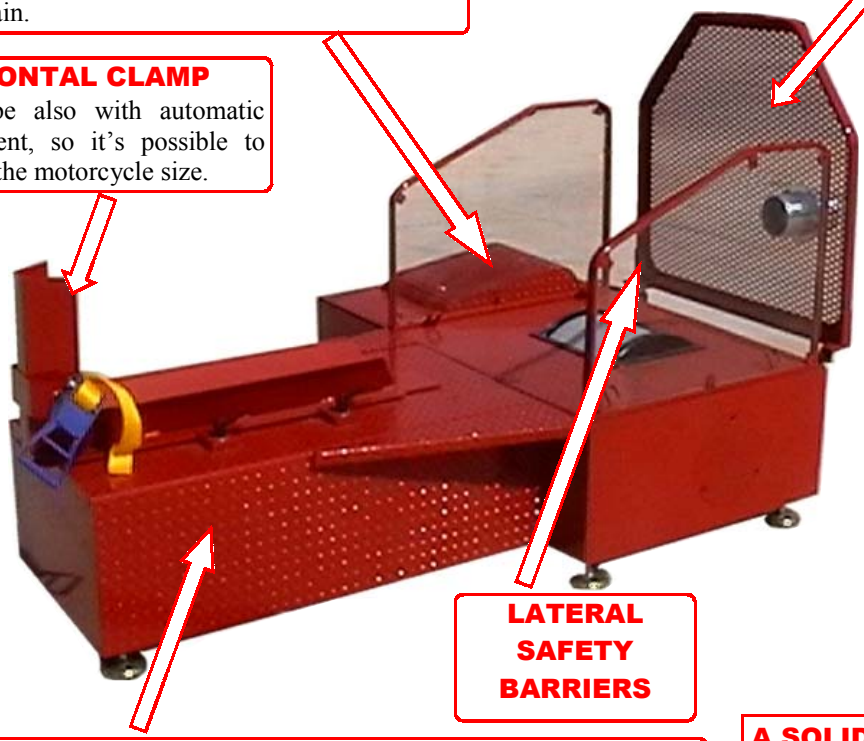
**A SOLID AND WELL-DESIGNED DYNAMOMETER FOR YOUR MACHINE SHOP!**

## MECHANICAL FEATURES

### EDDY CURRENT BRAKE
The eddy current brake is put into its suitable vain.

### REAR SAFETY GATE
It has an array of holes, in a way that the exhaust gas evacuation collectors can be placed any position, so the gas evacuation system becomes more efficient

### FRONTAL CLAMP
It can be also with automatic mouvement, so it's possible to regulate the motorcycle size.

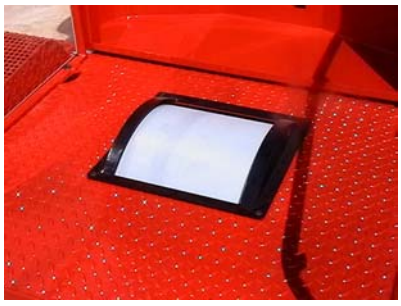


### LATERAL SAFETY BARRIERS

### THE FRAME
The dynamometer frame is maded by very thickness sheets and its upper part is covered by a sheet. It is possible to separate the frontal part by the rear one (drum and brake) to underground this one. It is varnished in a vivid red colour with a strong visual effect.

### UNDERGROUND DYNAMOMETERS
The dynamometers is usually external, with a rear footboard for the motorcycle climb. But sometimes the typical mechanic workshop don't have the suitable space for dynamometer placement. The Soft-Engine can satisfy all your demands! In-fact we make an underground dynamometer having very short dimensions. Obviously we give also the front wheel safety clamp.

### A SOLID DRUM
Motorbike dynamometers by **Soft-Engine** have a **solid drum** with a **high inertial value** and a big diameter so that motorcycle tyres are submitted to the lowest possible wear. If dynamometers work exclusively as an inertial system, the great roll inertia (weight more than 400 Kg) allows you to measure very high values, beyond 300 Hp, so that the engine works under almost quite realistic road conditions. This means that the engine can reach a good temperature, as in case of a 2 stroke engine where the exhaust "tuning" is very important. The high weight of roll allows to test also the Superbikes.



## EDDY CURRENT BRAKE

A quite reliable electric air-cooled brake (eddy current). It opposes a torque to contrast the engine horsepower and measure it.
A software electronic control device supplies the brake with power and thus creates a magnetic field which produces the torque contrasting the engine. The inertial models are suitable for eddy current brake setting-up.

By the use of a brake you can:
1) **Apply a load to the engine**;
2) **Simulate road conditions**, such as slopes;
3) **Map** injection and ignition at specific rpm values;
4) Make **duration tests.**
5) Make the **engine running-in**.

*Eddy current brake*

### ENGINE COOLING
During test is very important to cool the engine, Soft-Engine gives different solutions:
**S-E 560 axial fan system**, 8.000 $m^3/h$
**S-E 402 centrifugal fan system**, hi pressure, air speed 180 Km/h. It is included in the "Inertial 150" dynamometer, suitable for airbox feeding also.
**S-E 86 centrifugal fan system**, two speed, very performing fan. Suitable for "hard" test, like the braked ones.

*S-E 402*

*S-E 86*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# WORKING PRINCIPLE

## INERTIAL MODE

Under this setting the working principle is inertia: if we measure acceleration supplied by the engine to the roll, we obtain the instantaneous torque value. This system is based on an absolute principle and guarantees excellent precision and repetitiveness. It can be applied to engines of any horsepower level. You can test the whole vehicle, both with automatic gear and manual gear. The 'sequential gear' test is available too: you engage all vehicle gears, from the first one to the last one, and simulate a road behaviour. In fact a vehicle behaviour, above all in case of a bike, mainly consists in accelerating and braking. This kind of test bench can perfectly simulates this behaviour. The mechanics make a wide use of dynamometers in their inertial working setting to assess repairs and/or modifications. You can also carry out a so-called 'deceleration test' to measure gear mechanism and tyre (friction) losses to obtain the flywheel power besides the wheel power. It is very important not to omit the fact that this setting allows a minimum wear of tyres and engine, as it is not submitted to long lasting stresses, and this is quite important for customers.

## BRAKED MODE

Under this setting the working principle and use are quite different from the previous one. The electric brake can block engine revolutions or vehicle speed so that you can carry out any tuning operation requiring engines at fixed rpm or under stress. The typical tests you can carry out under this setting are: injection-ignition mapping, simulation of slope or stress the engine. You can obviously carry out the horsepower test too, but in this case it is a 'braked' power, meaning that it is obtained at preset values, compared to the inertial mode described above. These tests are much more intensive and stressing compared to those ones you can carry out under the inertial mode setting. A combination of both working principles makes the use of this dyno quite reliable and exhaustive.

## WHAT IS OUR DYNO FOR?

### DIAGNOSTIC

A dynamometer is quite necessary to all highly professional work-shops wishing to carry out precise and absolutely scientific engine tests. It is the only equipment where certain same conditions can be repeated, without any external or human influence. For example, an engine power loss can be due to a carburetion fault, an ignition problem or even to a clutch slip. All these problems can be observed in graphs and tables displayed by our software. In these cases the power or torque diagrams are influenced by these factors and the vehicle cannot reach its top performance. Thanks to dynamometers, a repairer can see at which precise rpm or speed the problem appears and therefore he can know how and where to make repairs.

### ENGINE TUNING

A motorcycle tuner, not only on superbike, can make some changes to optimise performances. It is obviously necessary to observe the effect of such modifications. Our dyno can carry out **sequence comparative testing**. A tuner can thus measure and assess the engine performances before and after his intervention. Duration performance diagrams, such as speed, space and acceleration, show the 'dynamic effect' of modifications.

### SCREENING OF REPAIRS

Thanks to our dynamometers repairers can assess the effects of a repair or intervention on an engine and thus give the customer **any kind of quality printing and tables** to avoid complaints, if any. That's a professional attitude!

### ASSESSMENT OF VEHICLES

Dynamometers supply a reliable parameter for a thorough assessment of a used vehicle. A motorcycle bought 5 years ago, for example, may show a mileometer at 30,000 Km but the future buyer must know the engine wear conditions. Through a comparison between max power data given by a dyno and the ones given by the manufacturer you can establish the engine performances decrease due to ageing factors and therefore you can make a precise assessment of this vehicle.

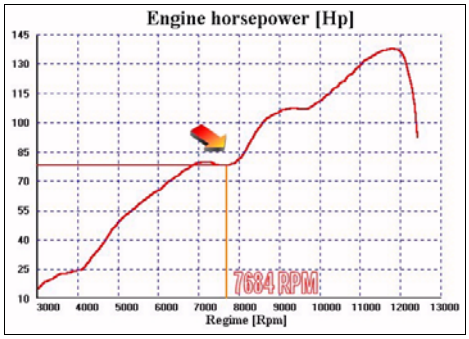
***Dynamometers*** *by* **SOFT-ENGINE** *are the result of long studies and research carried out by our team. Our dynos are the final product of our rich experience in a decade of software development. As regards mechanics we guess on* ***solidity, functionality*** *e* ***plain construction****. The harmonious combination of these features results in a solid, precise, reliable, and well-performing product for* ***tuners*** *and* ***repairers****.*

### QUITE EASY TO USE!

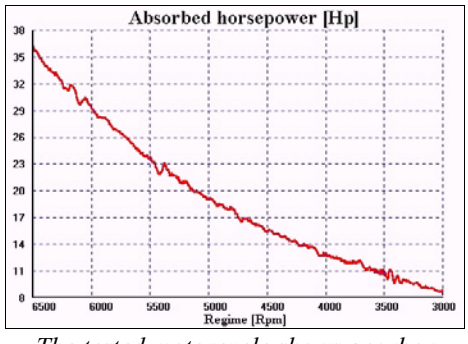
Our dynamometers are quite easy to use! We preferred to develop a highly professional product but addressed to everybody. Just place the motorcycle on the dynamometer following safety instructions, insert a few data in the console and accelerate. The software can carry out a **thorough engine check-up in less than ½ minute**! The program is well explained and described in each single section: a detailed on-line help is available.

### REMOTE CONTROL

**Soft-Engine** supplies a remote control device with accessory, to control software and its optional utilities, such as ventilation and exhaust smoke, so as to allow comfortable testing operations, without any additional operator.




*This motorcycle has a clear torque and power loss, near its max rpm: at 7,864 rpm exactly.*




*The tested motorcycle shows gearbox vibrations*

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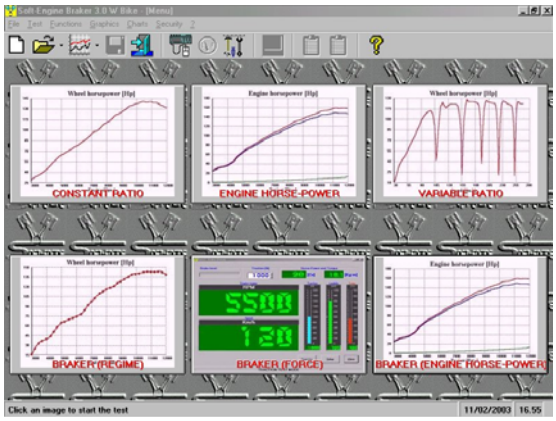
# SOFTWARE

**EXTREMELY EFFICIENT, RELIABLE, AND EASY TO USE. IN A WORD...: REVOLUTIONARY!**

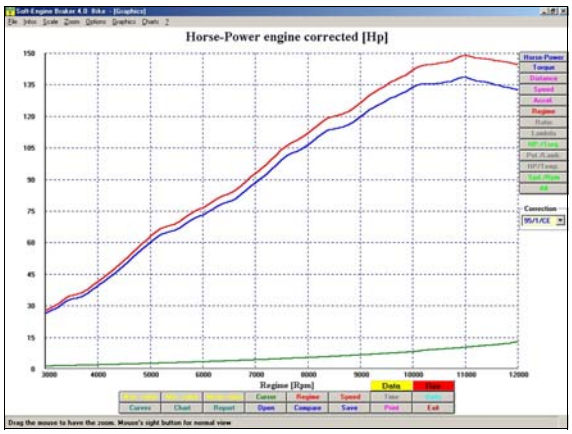
## SOFTWARE DESCRIPTION




**INERTIAL & BRAKER** is the acquisition and computing software of our dynos obtained through long studies and research carried out by **SOFT-ENGINE**. It is a very efficient software, a revolutionary product for data analysis and quite dynamic in tests typology. Nevertheless it is quite **easy** to use as it runs on WINDOWS®. It is equipped with an especially nice and functional graphic interface and our engineers did their best to make its use extremely easy, so that all its functionalities are displayed at one time on the screen. A simple "click" with your mouse on control buttons is sufficient to select any functions available.

**Remote control**

Thanks to the remote control device the software use is even more simple and immediate. You can control your software and the ventilation and intake systems, while sitting at the wheel!




**Input data** necessary for the software to run are quite few. Soft-Engine slogan is: "high quality and friendly products"!

Input data are:

- Test identification code
- Test starting parameters
- Test setting selection

### HOW TO CARRY OUT A STANDARD TEST

1) Place all barriers at their place and start the software.
2) Insert test data.
3) Click on "Run": a digital video revolution counter appears.
4) Warm up the engine, go under the minimum engine speed, then press the proper button and accelerate at full speed.
5) The test ends when a STOP appears on the screen. You can analyse the results, print the diagrams, store the test etc..

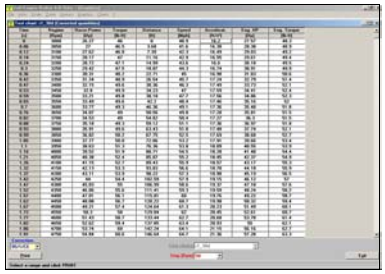
## DYNO TEST RESULTS

Our software measures:

- **Horsepower and torque**
  Horsepower and torque acquisition is on the wheel, but it is also possible to measure engine horsepower through the acquisition of the friction torque.
- **Performances**
  Speed, acceleration, and distance run on the rolls during the test.
- **Gas temperature and air/fuel ratio**
  By the proper sensors.
- **Gear ratio**
  By the rpm sensor for automatic gear vehicles and other ones.





### CORRECTION

This software allows Power and Torque values adjustment according to International rules in force, CE/95, SAE, DIN. This features is absolutely necessary to balance environmental variations.

### THOROUGH DATA ANALYSIS!

Our software supplies an excellent data analysis. All these useful utilities are available:

- **Diagrams** of any sizes for **Rpm**, **Speed** and **Time**.
- Quick computation of **maximum**, minimum and mean values of each parameter
- **Comparison** among the various tests
- **Reading** of each parameter displayed as a point contour: a useful utility for comparing different tests.
- **Units** (technical, international and British ones).
- **Zoom** on each graph up to the max degree to display even the smallest details
- **Tables** of any quantities with a variable selectable range.
- **Quality printings**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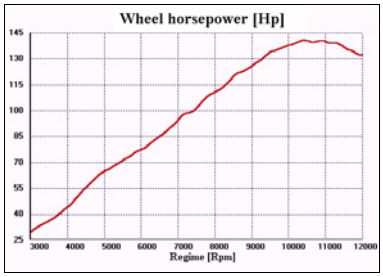
# INERTIAL MODE TESTS

**ALL MOTOR PERFORMANCE PARAMETERS IN ONE SINGLE ACCELERATION!**

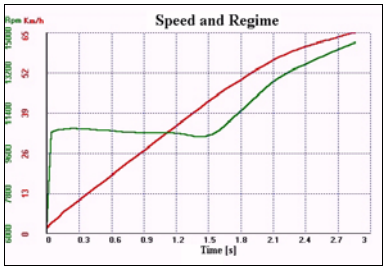
## IMPOSED GEAR TEST

This kind of test is usually simple and quick. Place the motorcycle on the dyno, according to safety norms, insert data, change into the selected gear (the fifth or the sixth one) and accelerate at full speed. Rpm and speed values are displayed on the screen to show progression till the maximum rpm value. Then the message STOP appears and the test is over. The imposed gear test provides the wheel power and torque values and all other parameters too.



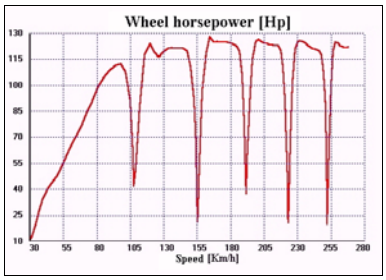

## VARIABLE GEAR TEST (SCOOTER)

This kind of test is usually used by scooter tunes. The scooters have an automatic gear and so the gear ratio varies continuously. You must select “automatic gear test” from setup page and the rpm sensor must be joined with PC. In this way the software can measure a variable ratio.
A very important diagram is the “Speed and Regime” diagram; you can watch the two quantities together and study the variator behaviour.



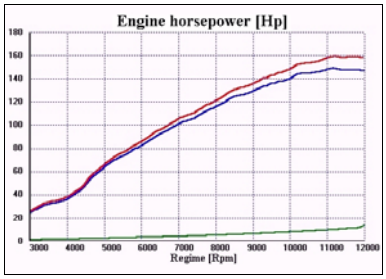

## SEQUENTIAL GEAR TEST

This test is called **sequential gear**. It must be carried out starting from a quite low speed rate (i.e. 20 Km/h, the bottom gear) and accelerating to reach the maximum speed rate, shifting up into a higher gear each time, as if you were on the road! In this case the power diagram will be displayed for each single gear. The other available diagrams show sequential gear time, rpm decrease, and all other values representing a road performance projection, such as: distance run, speed and acceleration.




## MEASUREMENT OF GEAR MECHANISM LOSSES

This test provides the biggest number of information and it is the most commonly carried out by car dyno owners. After the acceleration measuring the wheel power, the software displays an instruction to engage the clutch, the vehicle decelerates on the roll without braking down until the STOP message appears. During deceleration the software measures power and torque values lost by the vehicle in the gear ratio. The sum between wheel power (torque) and friction loss is equal to the engine power (torque). The various diagrams (wheel, friction, engine) can be displayed all together or separately to obtain a very detailed test result. A very high loss value may be due to some transmission faults.



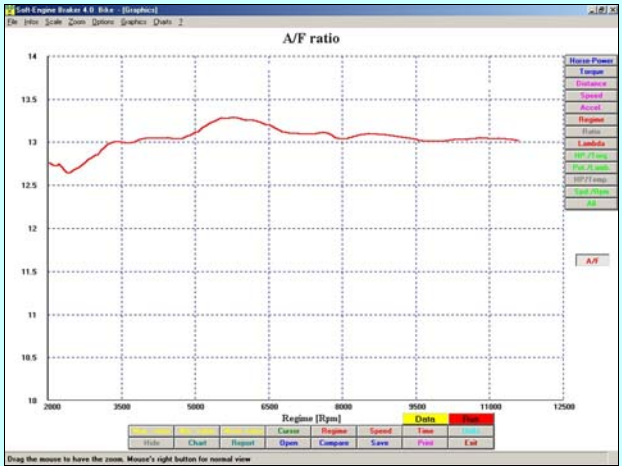

### GEAR RATIO CALCULATION

If the rpm ignition sensor is not available, the program needs the full gear ratio of the engaged gear for the test to be carried out. It is an extremely technical value and present in the vehicle’s manual. Nevertheless our program **can calculate the ratio** of the engaged gear **automatically**, by means of a simple preliminary test!

### LAMBDA SENSOR: CARBURATION DATA STORE

This device is very important for tunings. The **lambda device** gives the air/fuel ratio value during mappings. The lambda diagram is drawn by software, the rich or poor carburation status is marked. So, user can have immediately a valid parameter suitable for engine setup.

*The linear lambda sensor and the diagram*

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# BRAKED MODE TESTS

**LOADS, MAPPING, AND ROAD SIMULATION EVERYTHING CAN BE DONE!**

## MAPPINGS - CONSTANT SPEED BRAKING

Under this test mode we can block the engine rpm or the vehicle's speed on the selected points, e. g. at 5,000 rpm or 90 Km/h. Points blocking can be done on more than one point to study the engine. This test is to be carried out for power packs or ignitions **mapping**. An acquisition range value and a fixed range (i.e.: 9,000—12,000 rpm; range: 500) can be set too, in order to develop a power diagram.

## RUNNING-IN TEST

By this test you made the vehicle engine running-in. User input a series of rpm (or speed) values, and eddy current brake works at the imposed values automatically, like in the mapping test; but this procedure can be repeated several times, to create a **running-in cycle**.
Obviously, the user can decide how many cycles software must manage. So, by Soft-Engine dynamometers, a tecnician can make the running-in staying into his workshop.

## CONSTANT LOAD BRAKING

This test mode simulates an engine loading. You can simulate the effect of a trailer hooked to the vehicle or a slope on horsepower. In fact the software asks for a 'Traction' value. This test is useful for applying a constant load on the engine and therefore for carrying out essays and strength tests.

## VARIABLE LOAD BRAKING

This test is used to simulate in the best possible way the real road behaviour, including drag resistance. Insert a value for drag resistance and rolls. The braking system will allow a braking which takes into account the drag resistance quadratic pattern. You can briefly obtain acceleration time and real max speed rate of the tested vehicle on the road.

## COMBINED "INERTIAL & BRAKER" TEST

**The "inertial & braker" combined test** is the real peculiarity of Soft-Engine braked dynamometers. This kind of test allow a truthful road simulation; in-fact it is possible to input a force real value corresponding to a particular vehicle speed value. In this way the software can create a quadratic resistant power, so the eddy current brake works following this resistance. User must only to accelerate the vehicle over the drums, like in a normal inertial test, but eddy current brake loads the engine while test: the resulting horse-power comprises the frictions and the aereo-dynamics loads, because the resistant power is a quadratic law, giving the horsepower and torque diagrams.

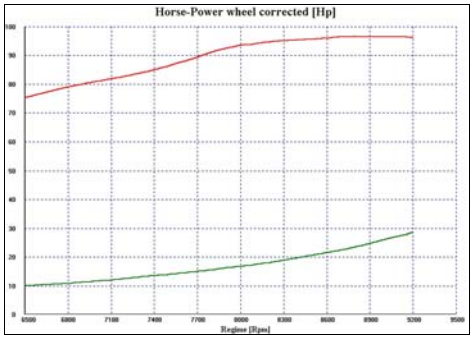
**The Inertial or Braker setup mode is selectable**

## SETUP MODE

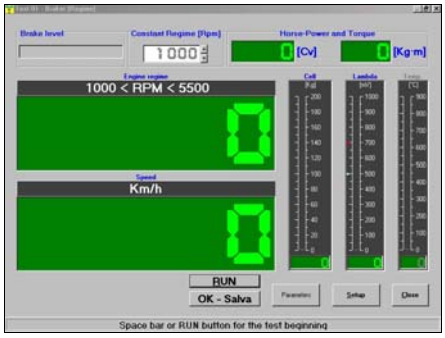
The program set up is a very performing control mode to customise the software use.
Utilities available:

1) Select the test mode:
   - imposed gear change
   - variable gear change
   - sequential gear test
   - deceleration test
   - constant speed braking
   - constant load braking
   - variable load braking
2) Sensors on/off
3) Automatic meteo device on/off
4) Speed testing
5) Select display mode (digital or analogic)
6) Select the graph to be displayed at test end
7) Set a permanent graph scale.

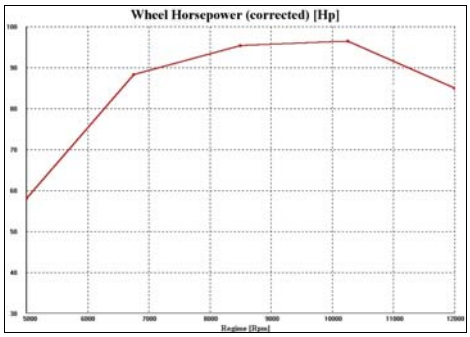
IN A FEW WORDS THIS SETUP OPTION ALLOWS YOU TO CUSTOMISE YOUR SOFTWARE !



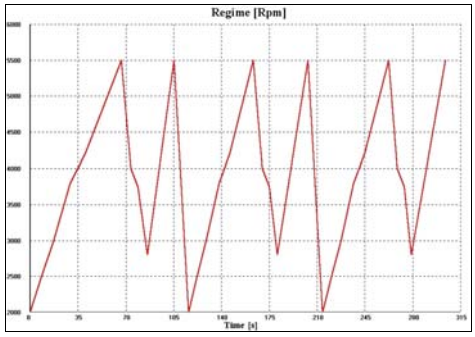

*A combinated test example: on the top, the wheel horsepower; on the bottom, the quadratic resistant load by eddy current brake.*




*Horsepower and torque store window*




*Braked horsepower diagram*




*Running-in test*

### FAST SERIAL ELECTRONIC & SOFTWARE VERSION 5.0

The serial electronic is linked to 5.0 software version, it can store the data at real time, also for inertial (very fast) tests. Moreover, all the devices can be added at the same system. The data communication to PC is by serial cable (serial or usb ports). Several sensors (temperatures, pressures etc…) are included.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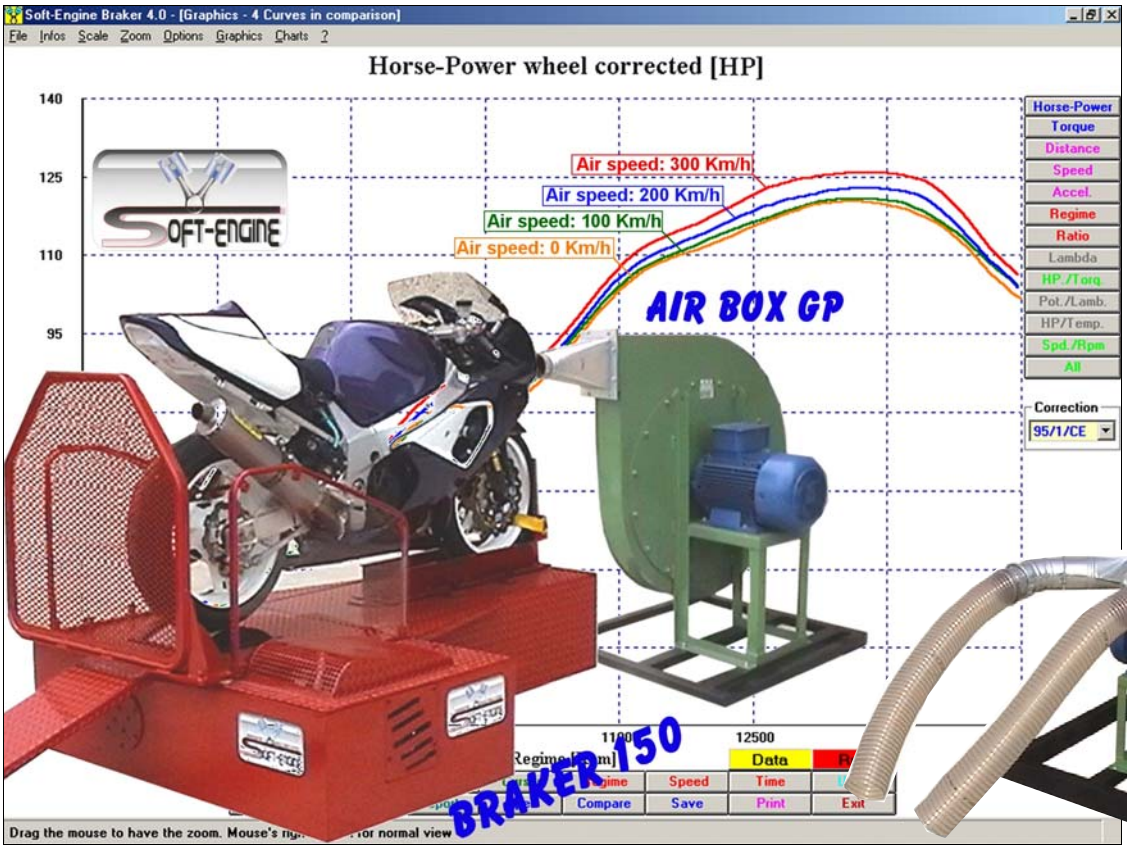
# ACCESSORIES

*Accessories can be purchased at any time, even after you already bought your dyno.* **SOFT-ENGINE** *dynamometers are* **SECTIONAL** *and* **ADJUSTABLE** *to meet all your needs!*




## AIRBOX GP ONE

AIR BOX GP ONE is the new Soft-Engine fan system for airbox feeding with variable air-speed. By this fan system the vehicle performances are similar to tracks one, because engine "inhale" like in the reality. By an electronic control, the air speed is the same of the drum one: so the carburation is more truthful and vehicle reaches the best performances. Look at this picture: when air speed is 300 km/h the horsepower is higher than air speed = 0 km/h case. The real horsepower curve is similar to the orange diagram at low rpm and to the red one at high rpm!



*Fan with double collector for airbox*

*Computer cupboard*

*RPM direct data store system*

*Temperatures and lambda device*

*Fans array*

*Automatic meteo device*

*Commands and devices consolle*

*Remote control*

*Centrifugal fan SE-402 to cool engine*

*EIA 232 serial electronic data store device*

*Soundproofed and double air speed centrifugal fan system for "strong" tests*

## Our Agents

The Manufacturer reserves the right to modify the accessories and attachments mentioned above without prior notice.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