Sportdevices Quick Dyno Guide

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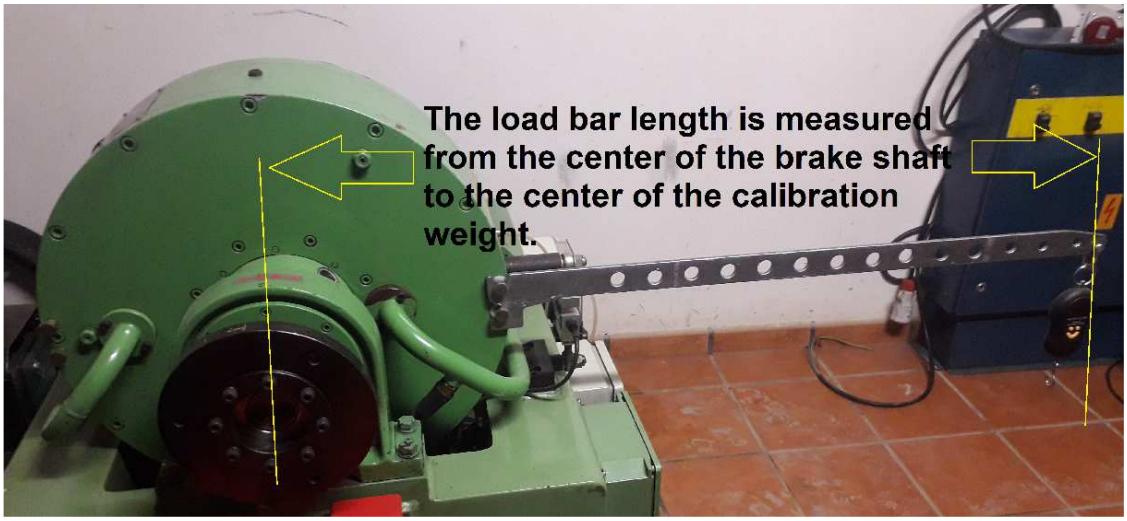
How to calibrate the load cell

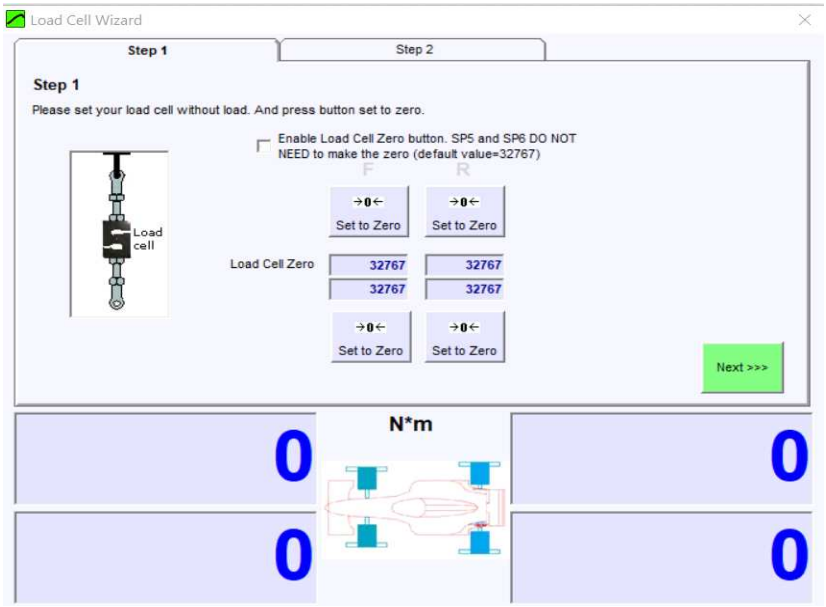
The load cell is one of the most important factors in HP / TQ calculations, it reads the brake torque converting it to a linear force. The procedure may be different depending on how the dyno is constructed. The most accurate method is consists of using a "calibration bar" and "Calibration weight".



Step 1. Zeroing:

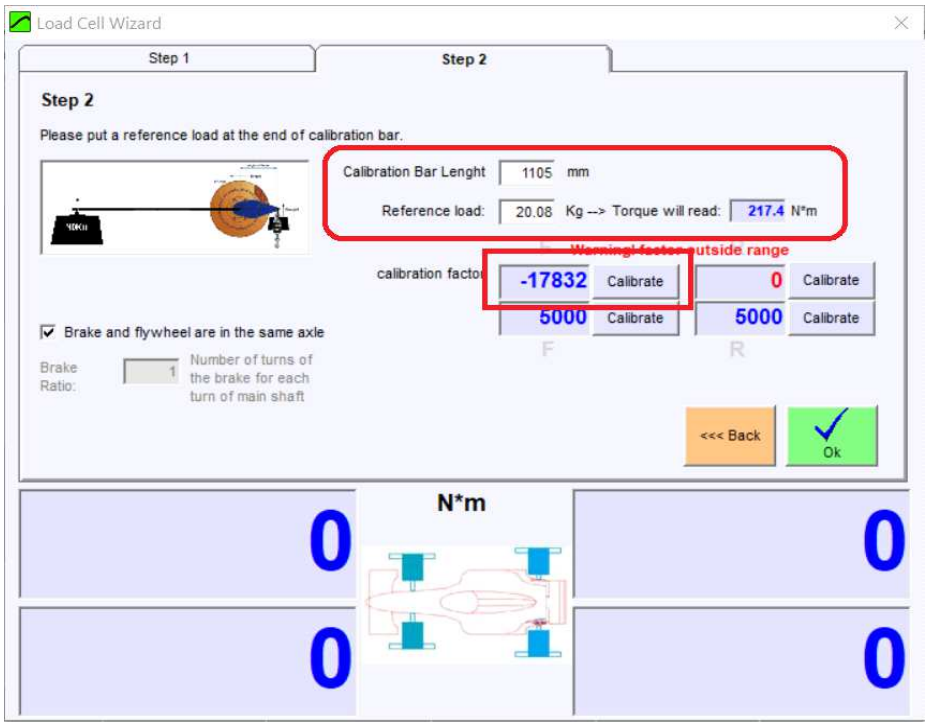
Calibration bar weight needs to be "zeroed" before doing the calibration

- **SP1+, SP5, SP6**: **(re)Start** the DAQ at this point so the startup zeroing process cancels the bar's weight
- **SP3 and SP4:** As those DAQs do not perform the zeroing at startup, use the Software "Set to Zero" button at the Load Cell Wizard



Step 2. Calibration:

- Enter the Calibration bar length and the calibration weight value in the Load Cell Wizard
- **Place your calibrating weight on the bar**
- **Press “Calibrate”**



Alternative Calibration Methods (Depend on the dynamometer)

Some dynamometers have a dedicated place at the same position that the load cell to perform the calibration directly over the cell, in this case the “calibration bar length” is the same as the load cell lever. Please check our manuals at the download page.

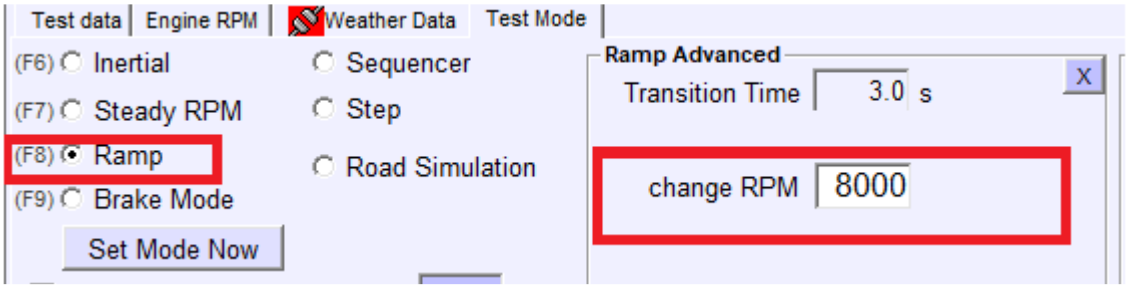
How to verify or calibrate the inertia

Double Ramp Test is an automated Ramp test in which the engine accelerates under load as usual, but once it reaches a certain speed value it starts a deceleration phase under a higher braking force until the starting speed.

It is recommended to use an aspirated engine or a low power engine to avoid differences in power caused by the turbo pressure or effects caused by a higher slippage at the different phases.

The Software will measure the sum of dynamometer's inertia + car apportion.

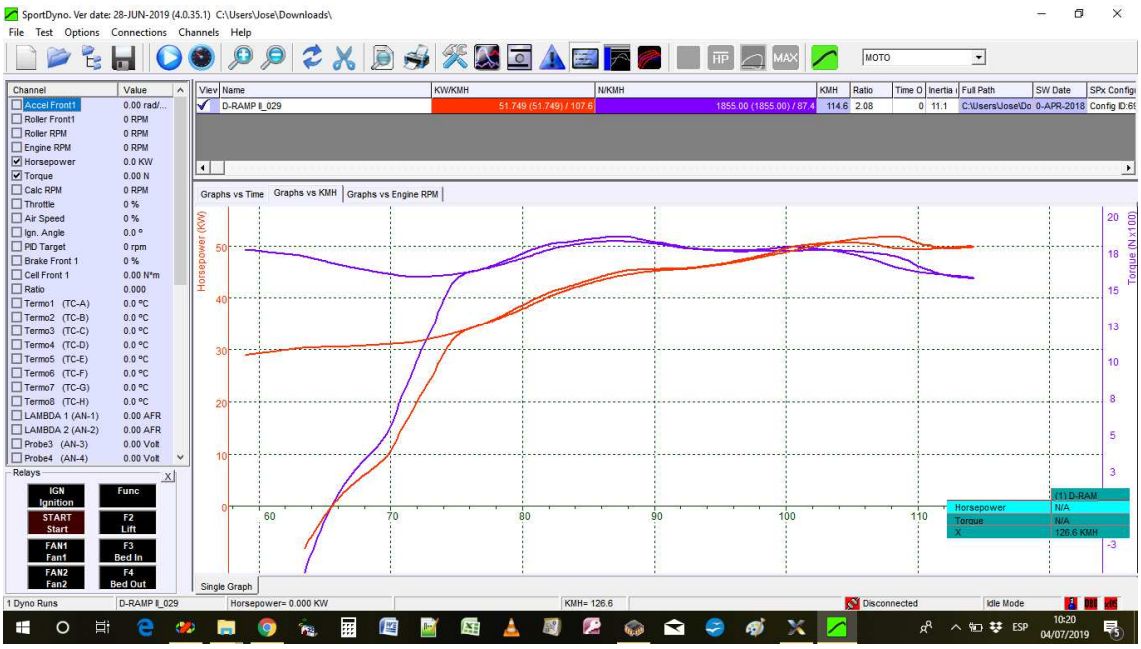
Enter the top speed for instance 8000 rpm at the "advanced ramp settings" fields.



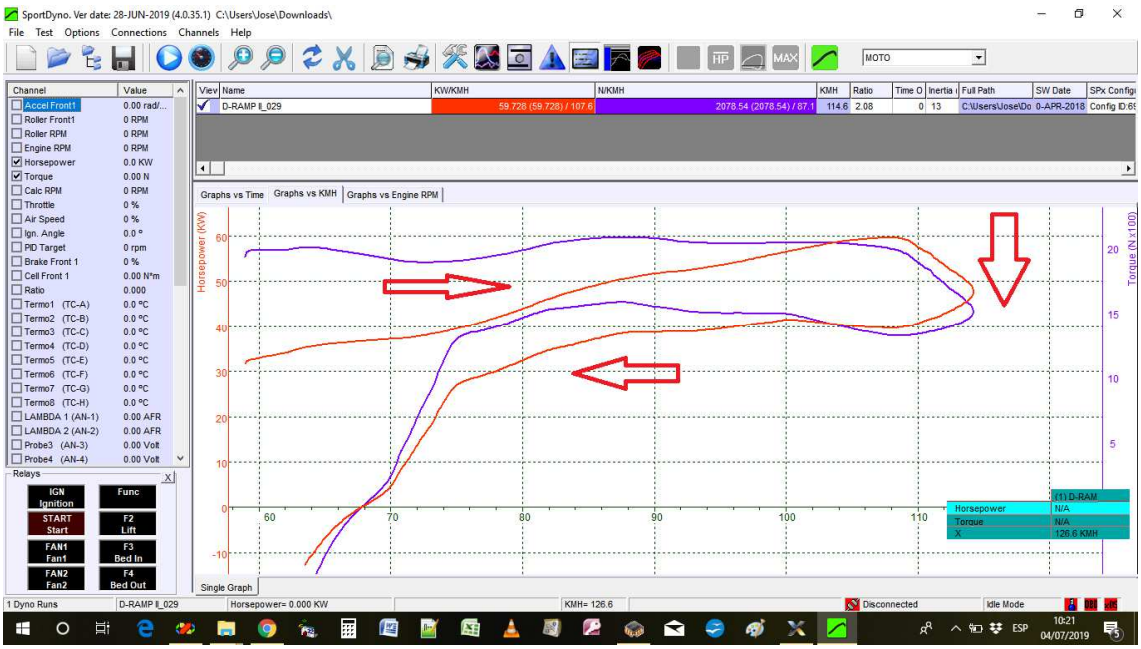
The ramp will start as usual, then will reach the top speed and will start to brake harder while still WOT (Wide Open Throttle). The user should use the clutch to avoid to stall the engine.

The result is a power chart that "goes up" through a path, and "goes down" on the same path **if inertia is ok against load cell** readings.
If **inertia is too high** then it "goes up" on a higher path than when "going down", and if **inertia is too low** it will "go up" below the area used for "going down"

Good inertia:



Inertia value is too high (acceleration shows more power than braking)



How to load the Car (Car Dyno)

Normally all dynamometers (especially the single roller dynos) have some blocking mechanism to hold the rollers during the loading operation. Although there are a few dynamometers with small rollers or narrow gap (twin rollers), in which the loading is performed only by inertia and with some help from the electric brakes (which cannot fully block the rollers)

All our car dynos have a pneumatic blocking mechanism. Ensure that there is enough air pressure, and activate the electric valve. Wait until the mechanism is totally engaged (in twin roller dynos there is a surface which is lifted, and in single roller dynos the mechanism is inside the frame)

Load the car carefully climbing the rollers and adjusting the wheel base for AWD dynos. In single roller dynos the car must be perfectly aligned as it is much more complicated to correct the alignment after the car is strapped. While in twin roller dynos the car can be driven slowly before strapping it to reach a correct alignment

In single roller dynos it is necessary to strap the car **before** the blocking mechanism is released, otherwise the rollers will rotate and the car will be “drop” to the dyno frame.

Deactivate the blocking mechanism. The air pressure will be released and the rollers will be free, Wait until the mechanism is totally disengaged before running the car.

For motorcycles, it is necessary to install the front wheel clamp and adjust the wheel base

On a car dyno, due to the high inertia normally only one rollers row is used (in twin roller dynos the front row, which is the braked one), and if there is any AWD link, the link should be disengaged. The software should be configured with the suitable profile for the amount of rollers that are going to be used.

In single roller dynos, the inertia of one row of rollers can still be high, then it may be necessary to use a low gear for the test (4^{th} or 3^{rd})

The motorcycle will be loaded manually, and the **front wheel installed in the front clamp**. If there is any pneumatic or automatic holding system it has to be activated. And if it is manual it has to be fixed too.

Some dynos allow the possibility of using straps in the footrests to increase the **down force,** especially for steady state tests. But in general it is not necessary to strap the motorcycle in the rear direction, the rear wheel tends to self align with the roller, and all force is pushed against the front wheel clamp.

How to Strap the car

Strapping is critical during the execution of the dyno run. High forces are involved and the car can easily get out off the dyno causing important damage in the tyres, bodywork, installations and even severe personal injuries.

Dyno area must be clear during the run, nobody should be allowed to stay close to the car, and behind the car (small parts could be thrown at high speeds)

Before strapping the car it is important to align it when it is possible to avoid excessive friction and minimize the lateral forces.

- In **twin roller** dynos it is easy to drive slowly over the dyno to allow the car to self align, helping and feeling with the steering wheel to check when the car is totally aligned with the rollers
- In **single roller** dynos this normally is not possible, the car has to be loaded carefully, then strapped, and then the alignment could be verified, some straps partially losen, and other tightened until everything is perfectly aligned and tensioned

Front drive cars

Front drive cars tend to move to any side direction during the dyno run, especially in single roller dynos which are much more unstable than twin roller dynos. Anyway both need at least two straps at 45º, one to each side

Rear drive cars

Rear drive cars tend to self align with the rollers, but usually they can provide much higher power than FWD cars, thus at least a double strap in cross pattern has to be installed in the rear side

AWD cars

For AWD cars, both FWD and RWD cars straps have to be applied.

Front side:

Additionally at least one or two straps are recommended in the front side to avoid that if braking the car or releasing the throttle the car can jump backwards due to the rollers inertia.

Car Dyno. How to load a Motorcycle

Install the front wheel clamp in the car dyno (if it was provided with the dyno). Follow the instructions for the motorcycle dyno below.

Motorcycle Dyno. How to load a Motorcycle

The motorcycle front wheel has to be installed in the front clamp.

If the dynamometer **has a pneumatic clamp**, it can be used very carefully only to hold the motorcycle until it **is secured with a strap**. The **pneumatic clamp** is intrinsically **unsafe**, a pressure drop or a power cut will lead the clamp to open and the motorcycle to get lose.

An additional strap is recommended for pushing down the footpegs to increase the grip. It may not be necessary in low power motorcycles as rear drive vehicles tend to align themselves with respect the front wheels, but it will **add extra stability** to hold the motorcycle position.

How to configure a Dyno Run (Inertial or Ramp)

Inertial and Ramp tests are similar, but the main difference is that during a Ramp test (where brake is available) is that the software can control the load and test duration, while in an Inertial test the load cannot be controlled and it depends only on the Inertia and the Gear selected for the test.

- Set the **test name**, and vehicle, brand, and other details
- Set the **starting and ending RPM.**
    - Typically **starting rpm** will be 1500 rpm for diesel cars, and 2000 rpm for petrol cars. For motorcycles it can be higher
    - Set **ending rpm** to a value slightly lower than the top engine speed, so the software can detect easily the end of the acceleration phase
- **Test duration** (for ramp tests) set 8-10 seconds for high power cars (more than 400 HP) and 12-15 seconds for lower power cars
- **Stop mode**: for a vehicle dynamometer the usual it will be “start when lower” so the software will stop the recording during coasting at a speed about 50% between the starting speed and ending speed
- **Ratio value** (read next section)

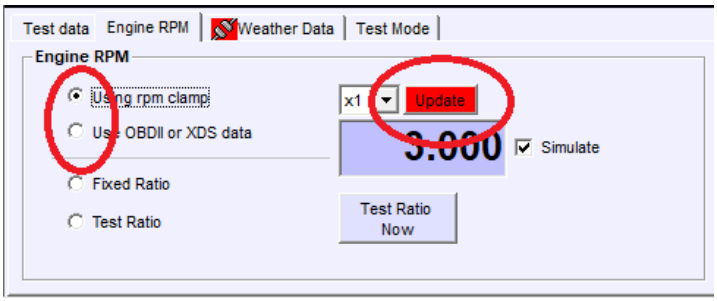
Calibrating the ratio

(with the gear to be used for the test)

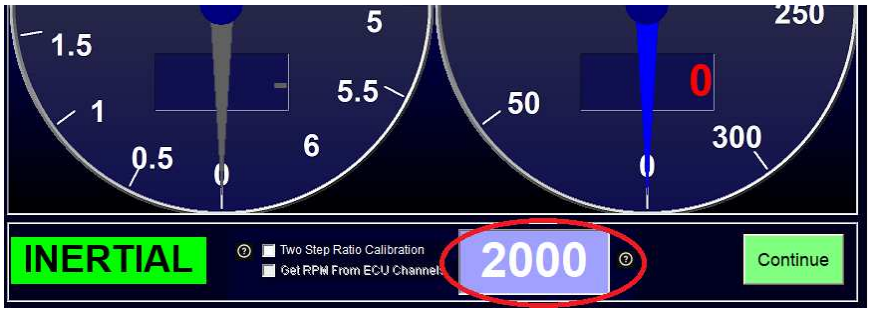
Important: the ratio value is used intensively in the braked modes (Steady and Ramp). **Ratio should be calibrated or obtained before using** those tests modes. The only exception is when performing a **Manual** Inertial test (when not using starting and ending rpm).

For all three options it is recommended to do the ratio calibration at **½ of top engine speed**. When measuring the engine rpm (clamp and OBDII), the calibration RPM is not critical, while when not measuring the rpm, the speed must be exactly the value entered in the SW for the calibration

- **With clamp or OBDII / XDS**: press the "update" button to enable it, and accelerate progressively up to ½ of top engine speed and the press the "update" button again to **disable it**. The updating cannot be active during the braked operation.



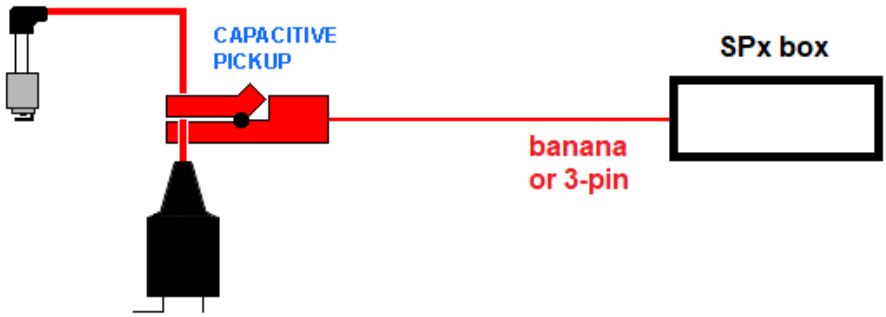
- **Without OBDII**: press the "Test Ratio Now" button, set a reference speed (typically ½ of max engine speed), and set the vehicle speed at the specified speed and **press continue**



Using the Capacitive Clamp (red)

Red clamp (capacitive) senses high voltage pulses, either 15KV + pulses at spark cable or 300V pulses at TCI but with **direct connection** to the wire. It is used typically with single cylinders and CDI igntions

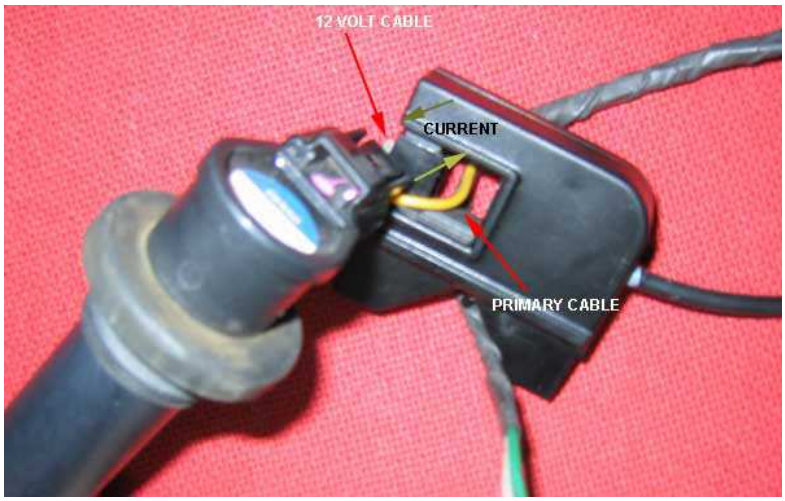
1) Isolated **Spark cable**, 15 KV + pulses



2) TCI Ignition (12V) with **direct connection** for sensing the 300V peaks (the cable is **punctured** to get direct connection)

Using the Inductive Clamp (black)

Inductive clamp senses peaks of CURRENT. It can be used at the spark cable but it is optimized for the **12V cables** (despite it has a picture of a spark on the clamp)



(note that the small clamp is no longer available)

ECU Tacho cable

ECUs normally have a cable that goes to the dash with a square 12V signal working at the same frequency of engine and can be acquired by the SPx sensing circuit.

How to perform a Dyno Run (Inertial or Ramp)

- Press the **start button**, or the start/stop button in the dyno (if any), or the "next" button in the remote. *{The software will show the starting "semaphore window"}*
- **Accelerate WOT** (wide open throttle) up to the starting speed, in inertial test the test will start immediately, while in ramp test it will perform the preload phase for a few seconds
- **Keep full throttle** during all the acceleration phase, as soon as the engine rpm reaches the configured ending rpm, the software will show the "clutch message", but the acceleration can continue a little up to the desired top speed (ignition cut off is not recommended as it will add peaks at the end)
- **Coasting:** as soon as the desired top speed is reached, the user must press the clutch and enter neutral gear (in automatic cars just enter N mode) without closing the throttle. Throttle should be released only when the engine is totally disengaged. This maneuver has to be practiced to be performed as fast as possible. It is likely that the engine will reach the cut off while the throttle is still open
- During coasting the speed will be decreasing slowly, and the test recording will stop automatically when it reaches the 50% point between starting speed and ending speed (this point can be modified for instance to reach 30% and having more accuracy when calculating the friction correction for the TQ peak value)