# YourDyno Software user manual

This user manual is an integral part of the YourDyno dynamometer controller system. This product and all its components are custom built devices designed for professional use, and to be used solely at research and development facilities for such purposes.



Manufacturer / Service / Warranty:

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For more information, visit yourdyno.com

# 1 Contents

# 2 Hardware setup

Please refer to YourDyno Data Acquisition system Installation and capabilities manual on how to install the YourDyno hardware.

# 3 Software installation

To install the YourDyno software please download the latest installation package from www.yourdyno.com website.

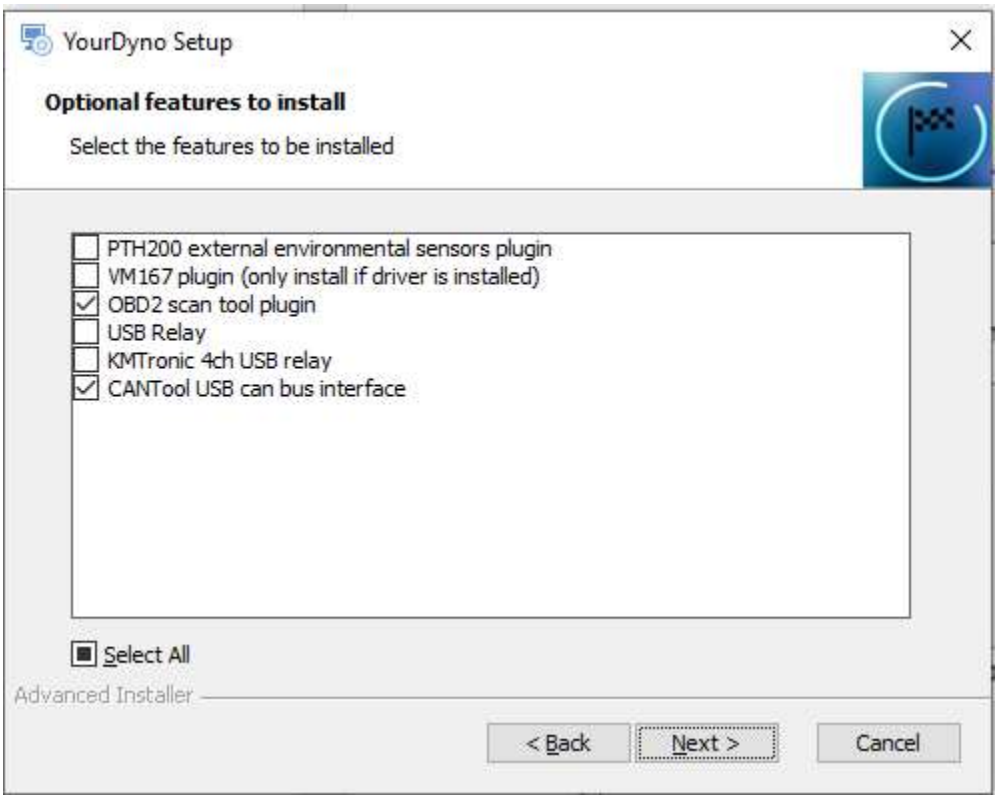
1. After downloading the installation package please execute the file "YourDynoinstaller_x.x.xx.exe".

NOTE: x.x.xx stands for version number.

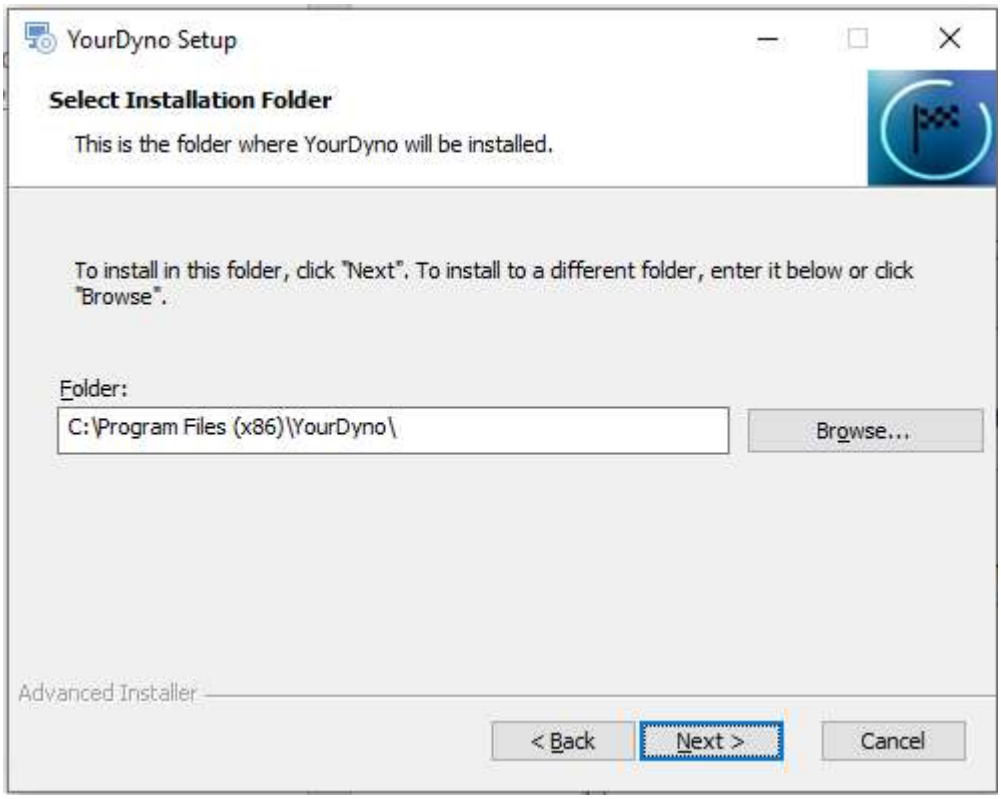
Press the button "Next" to start the installation wizard.


2. Please select the preferred plugins from the list. Do not install plugins you will not use, as they may consume CPU and memory resources.

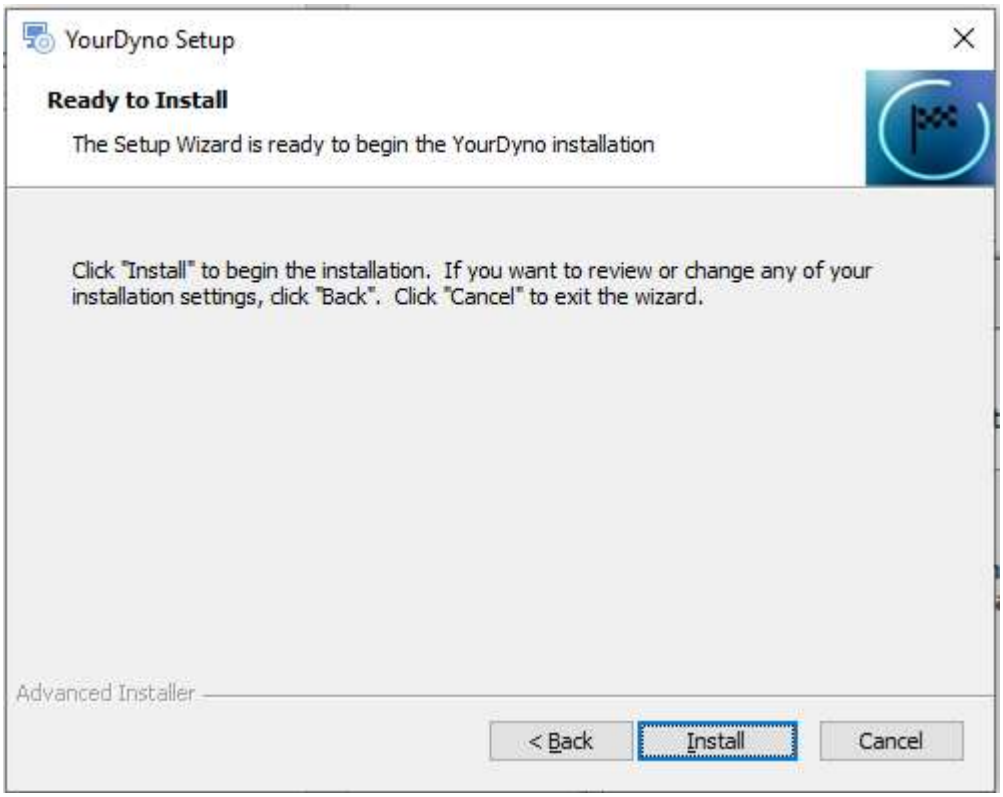
Press button "Next" to continue.



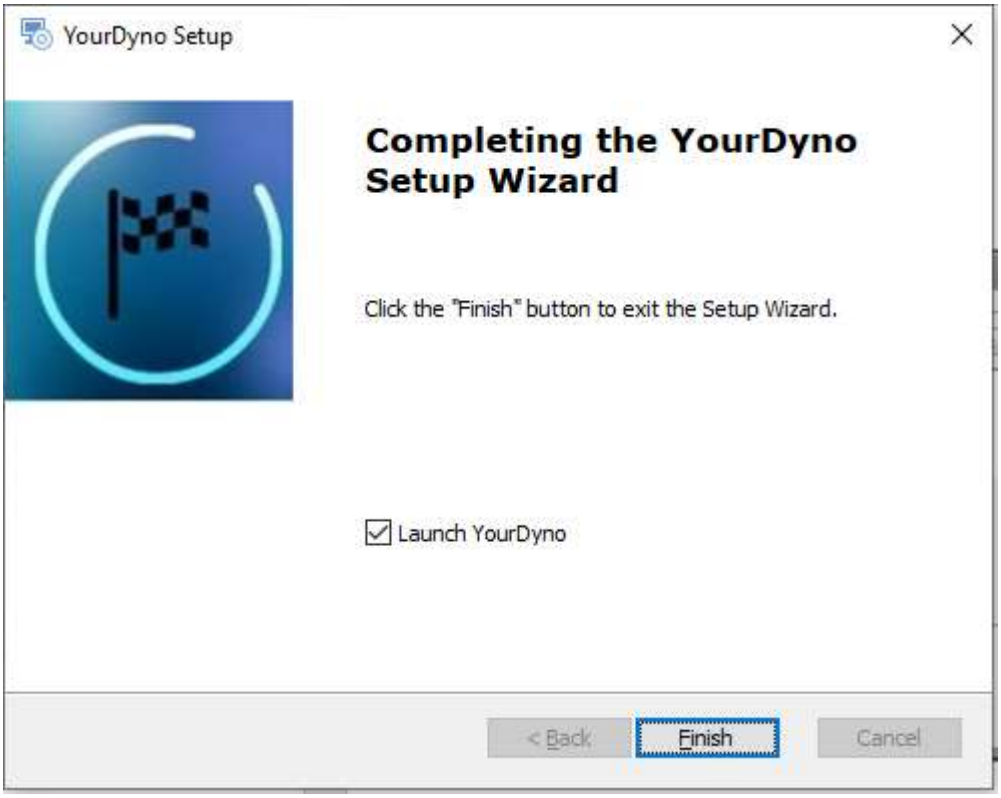

3. Select installation directory or keep default location.
Press button "Next" to continue.




4. Press the "install" button to start installation.



5. After the installer has completed the job please press button "Finish" to close the wizard.




# 4 What is the YourDyno software

YourDyno is a highly customizable dynamometer control, data acquisition and data analysis software. The YourDyno Software allows users to perform manual or half-automated test and measure various parameters of vehicles and engines. Additionally, to standard features the YourDyno Software offers ability to expand functionality using the built-in plugin system.

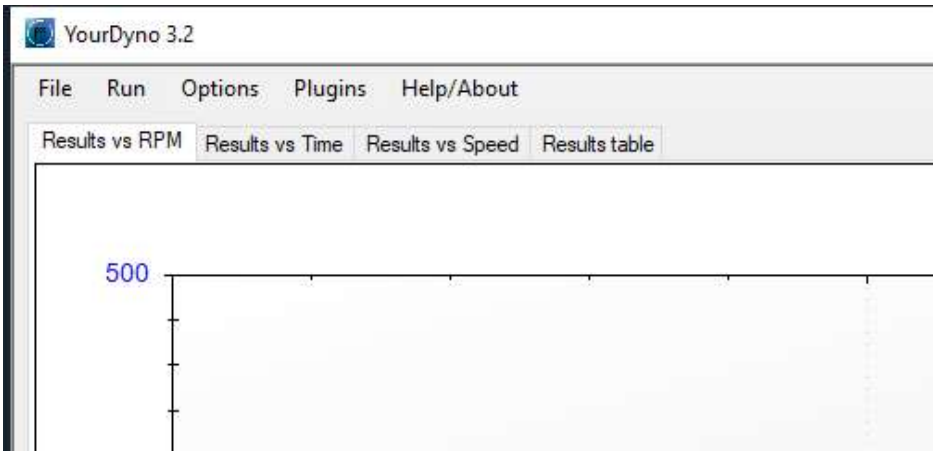
The YourDyno Software is under constant development and many new features are regularly being added. Please periodically review this manual and check for updates.

# 5 Main window

## 5.1 Overview

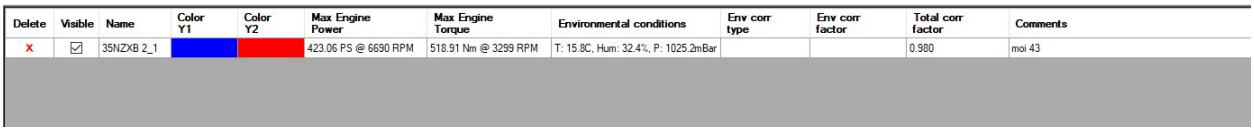
The main window consists of four main sections:

1. Top menu bar:

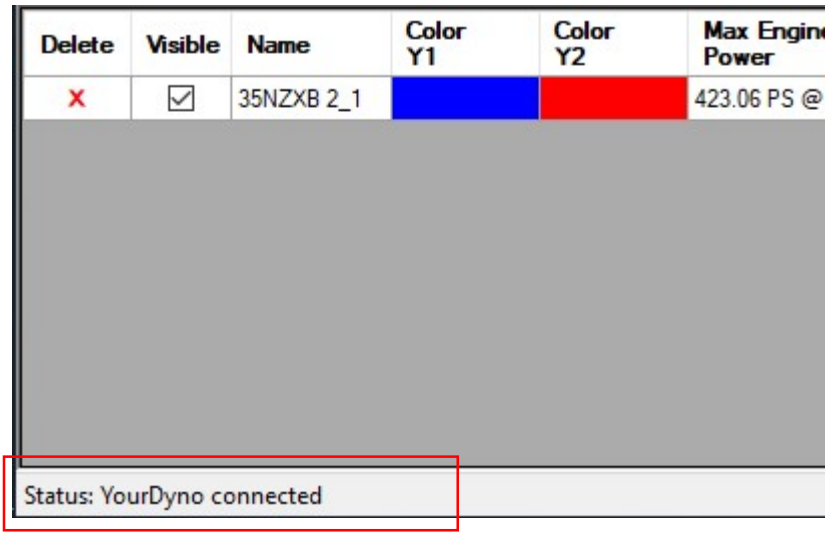



2. Graph area:


3. List of recorded test Runs:




4. Status bar:



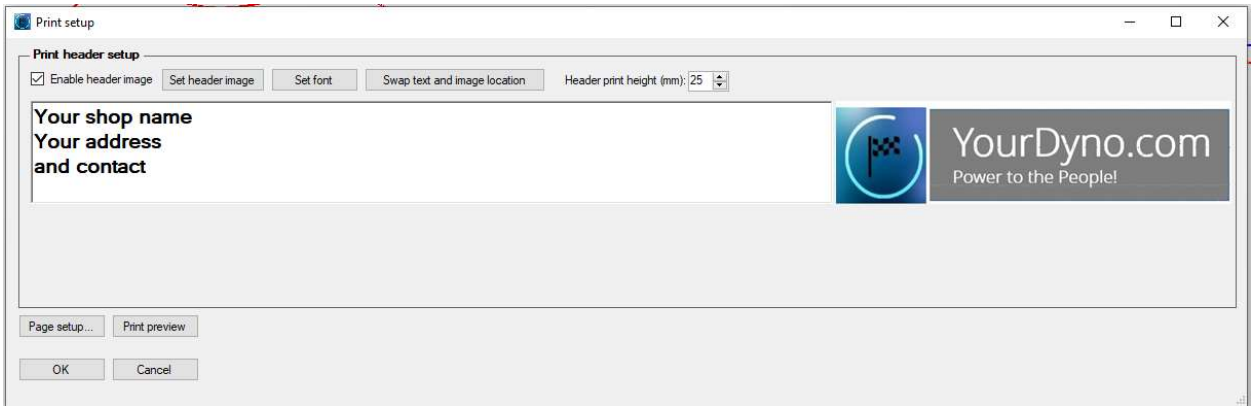

# 6 Menu: File

The following functions are available in this menu:

**Clear all runs** - this function will remove all test runs from the Runs List below the graph area.
**Open runs** - open previously recorded test.
**Save runs** - save file with recorded test runs.
**Print page setup** - opens dialog window with settings for graph print-out.
**Print...** - opens printer dialog.
**Exit** - close the software.

## 6.1 Print page setup

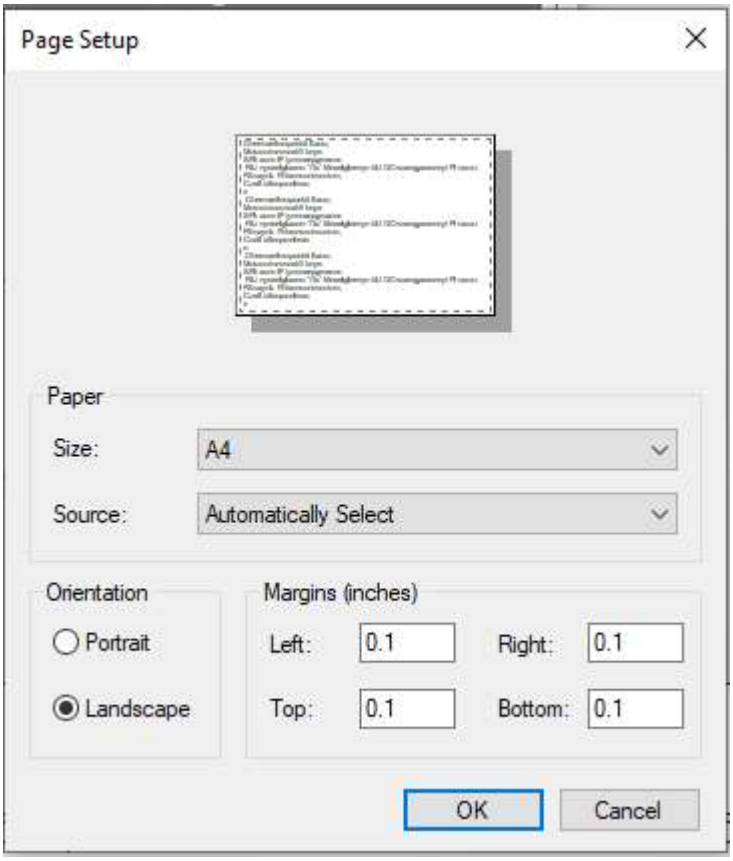
This function opens following setup window:



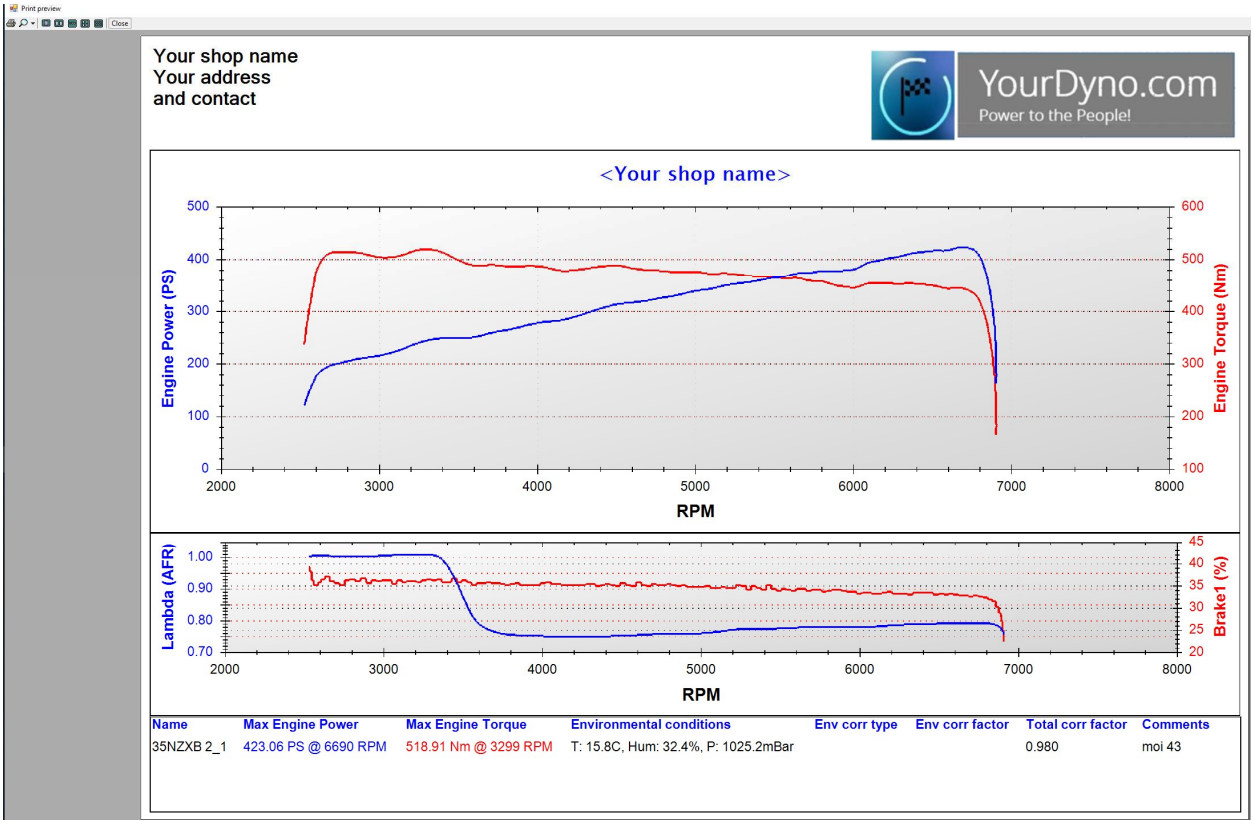

Use this window to adjust your print-out page.

### 6.1.1 Customizing print-out header. Company logo

1. To upload your logo please activate the check-box "Enable header image".
2. Click on "Set header image" and use the following dialog window to navigate and upload your image file with logo.
3. Use the "Swap text and image location" button to position the logo either on left or right side of the page.
4. Adjust the "Header print height (mm)" to your liking. The higher the header the more room for text and logo.
5. You may use the multi-line text box to enter your company name and contact details.
6. Click and move left or right the vertical divider to adjust the width of the text box and logo area.
7. To change page orientation (Portrait or Landscape) and adjust margins please press "Page setup..." button.




8. Use "Print preview" button to verify the settings.



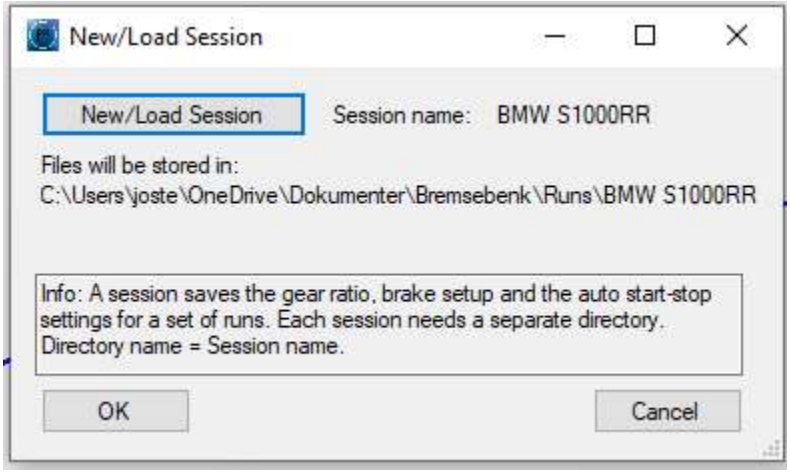

# 7 Menu: Run

## 7.1 New/Load Session

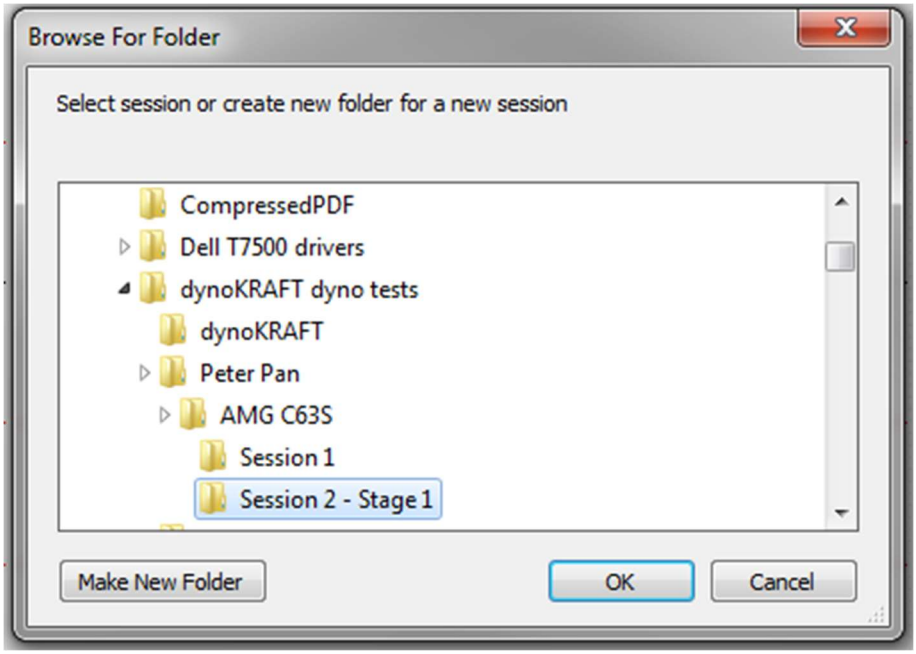
Use this function to start a new testing session. A session may contain multiple test runs. You typically use a separate session for every new car or engine.

A Session stores information about gear ratio, brake setup and auto start-stop settings for a set of test Runs. Please create a new directory for each session (Directory name = Session name). All test Runs recorded within one Session are stored in single .csv file on your hard drive under the directory you created. The raw .log files are also stored in the Session folder.

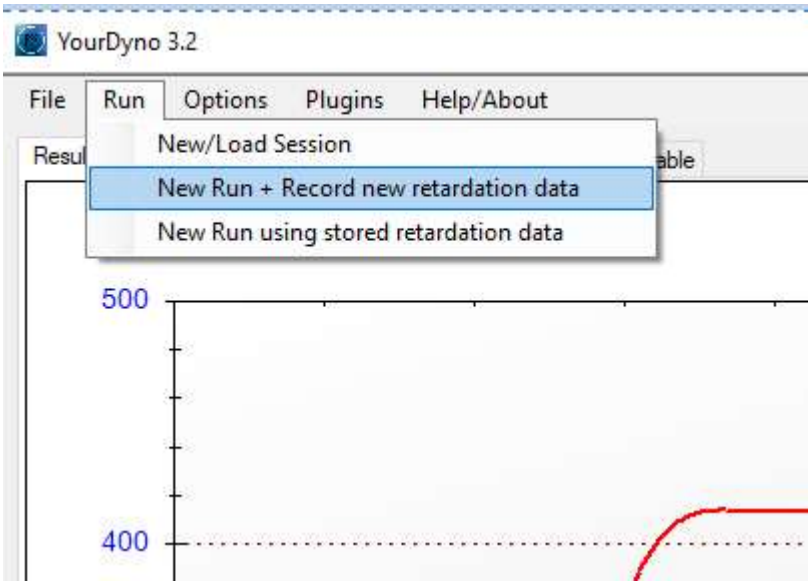
To start a new session / load existing one please open this window:




Press the "New/Load Session" button to set the directory where you want to save your file containing test Runs. You can create a sub-folder structure to organize your customers database, for example:




New Runs will be added to any existing Runs already open in main window. Whenever a new Run is started the software offers the option to use previously recorded Retardation data (friction losses) or record new Retardation data. It is recommended to record new Retardation data as long as the conditions are not stable (oil and tires heating up). When using stored Retardation data, the retardation phase can be shortened, since the brake can be on.



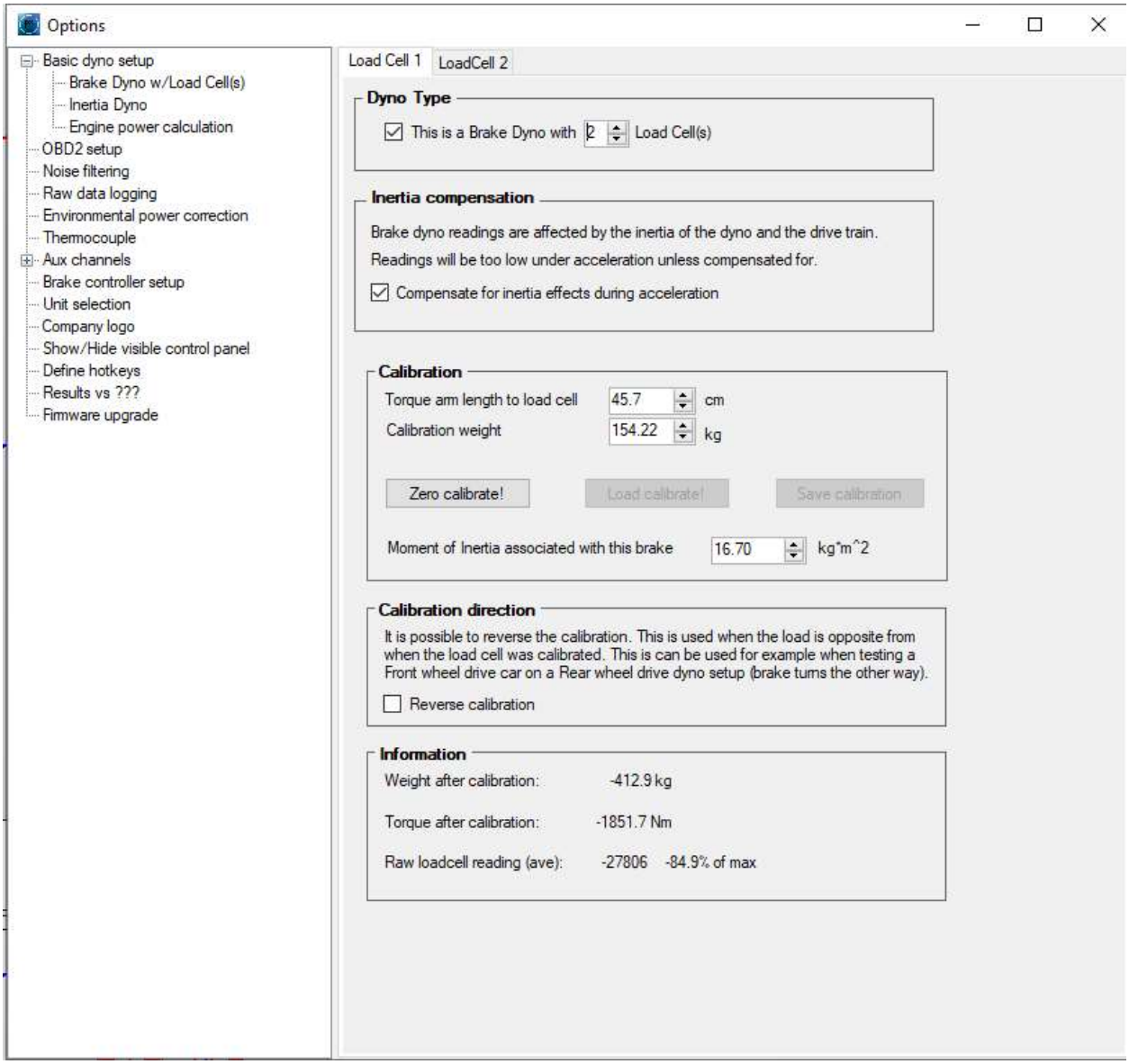

## 7.2 New Run

Use this function to record a new test Run using the current Session. This function will directly open the Run (gauges) window where you must manually check all relevant settings prior to recording the Run. The recorded Run will be added to the list of Runs.

# 8 Menu: Options

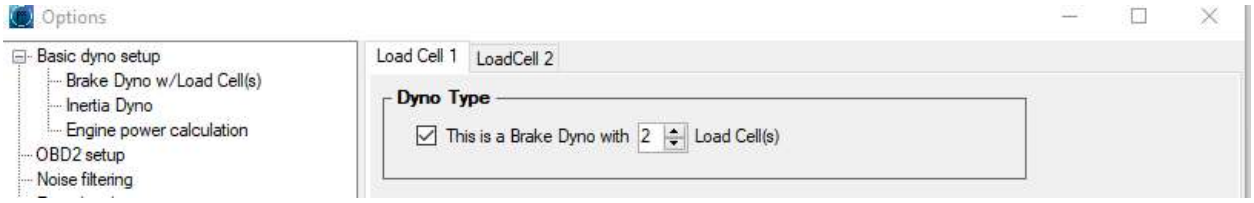
## 8.1 Basic dyno Setup

This function opens the main software settings window.




## 8.2 Brake Dyno w/Load Cell(s)

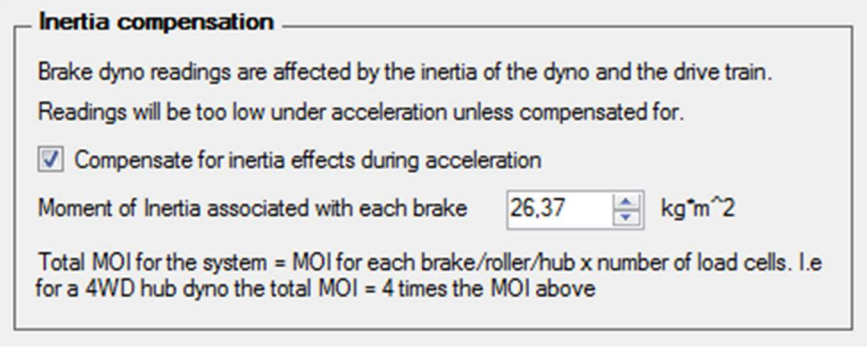
If your dynamometer is equipped with brakes (any type) activate the "This is a Brake Dyno with...." checkbox. Adjust the count of load cells in use using up and down arrows (1, 2 or 4 load cells). This value also defines the number of brakes in use.



### 8.2.1 Inertia compensation

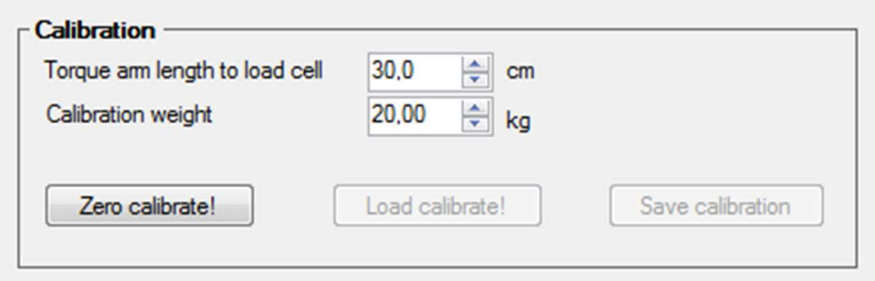
Use this section to setup the inertia of the dynamometer and all rotating components of the drive train. To enable the inertia losses compensation (typical on roller dynamometers) please activate the checkbox "Compensate for inertia effects during acceleration". Then enter correct value in the "Moment of Inertia..." filed in correct unit ($kgm^2$).

The inertia value needs to be entered under each load cell tab. The effective inertia is typically the same for each brake but does not need to be in case different brakes and or rollers are used on front and rear.

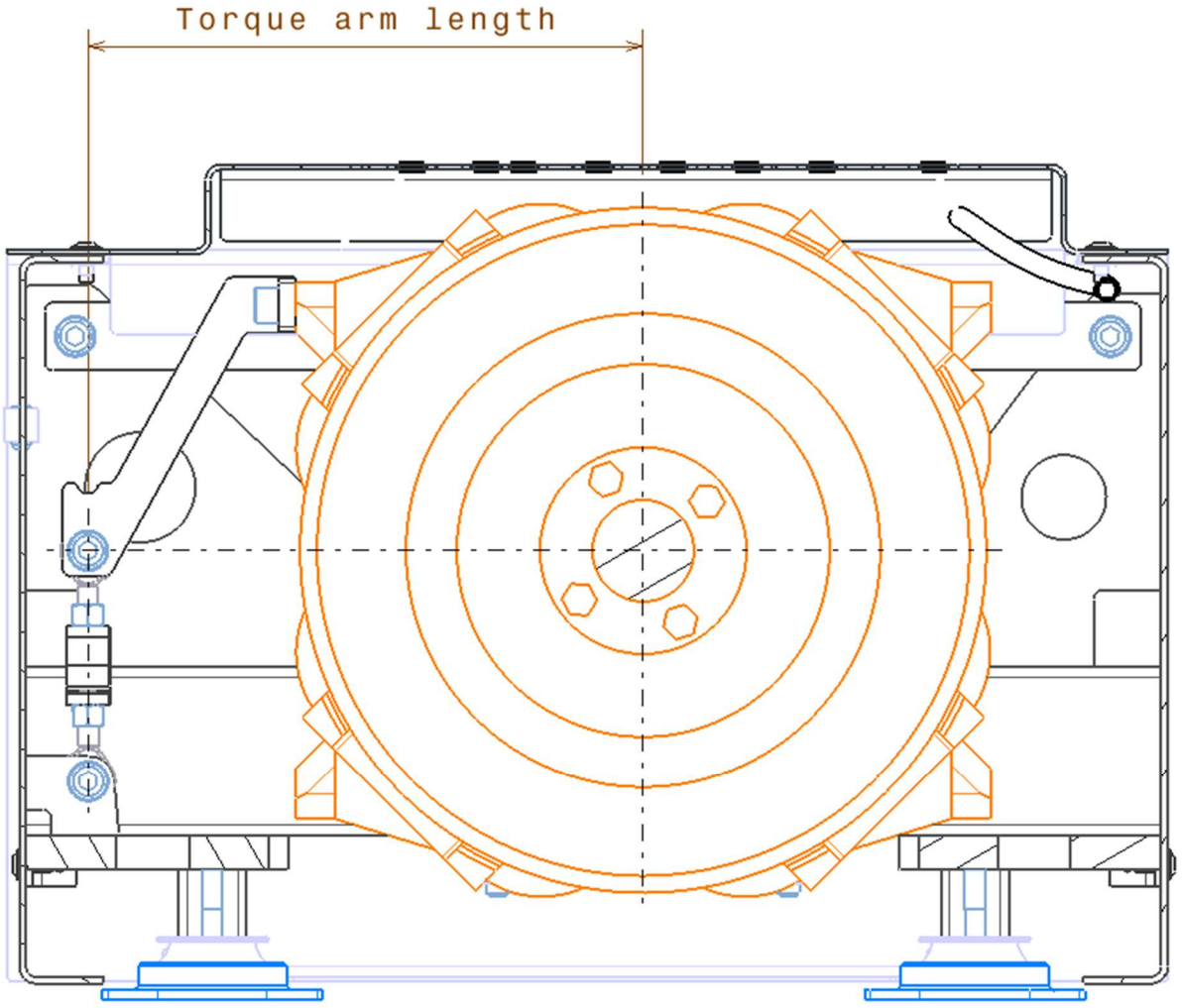



### 8.2.2 Load Cell calibration

Use this section to calibrate the load cells.




**Torque arm length** is the distance between the brake axis and the point where the torque arm is touching the load cell:




**Calibration weight** is the load you use to calibrate the load cell. The more accurate the values the more precise the wheel torque measurement will be. Aim for a calibration weight of minimum 20% of the max rating of the load cell for accurate calibration.

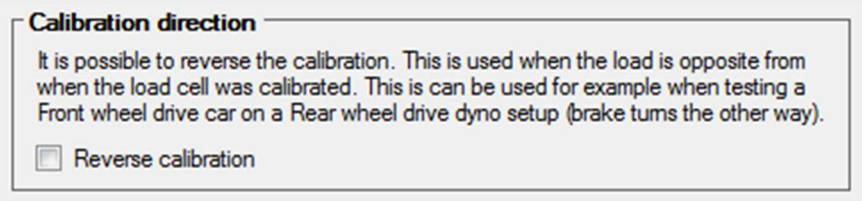
#### 8.2.2.1 Load Cell calibration procedure

1. Make sure that the load cell is correctly installed in the dynamometer and that nothing obstructs the sensor nor there are any parts laying on the Torque arm.
2. Press "Zero calibrate!" button to set Load Cell zero.
3. Install the Calibration Weight as per dynamometer user manual.
4. Press "Load calibrate!". You can now remove the calibration tool.
5. Press "Save calibration"

The calibration weight can be placed above the load cell, or further away from the brake axle. If placed further away, enter effective weight on the load cell, taking the arm length into consideration and the weight of the arm. This can be a good method when calibrating large load cells because it requires lower calibration weights.

#### 8.2.2.2 Calibration direction

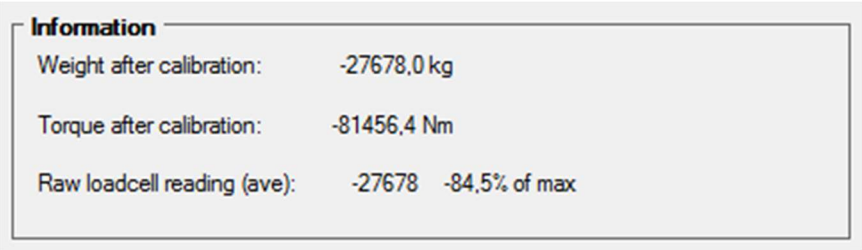
Use this setting to invert the calibration of the load cell.
This is useful when you would like to run the dynamometer in opposite driving direction.




Not all load cells are perfectly bi-directional and have exactly same calibration factors in both compression- and tension- directions. To assure highest possible measurement precision you should perform a "negative" calibration (use negative "Calibration weight" value).

### 8.2.3 Information

This section shows the current Load Cell reading and Raw data input.




## 8.3 Inertia Dyno

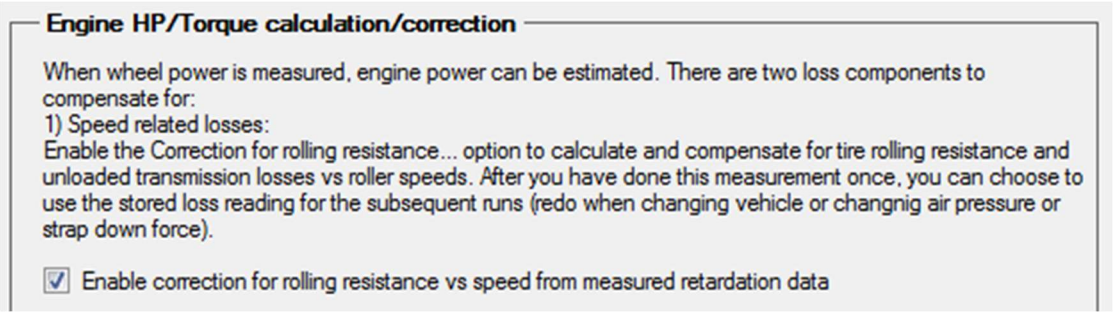
This section allows you to setup the Rotational Inertia for inertia-only dynos.

To use the inertia-only dyno type please activate the checkbox "This is an Inertia Dyno" and enter the correct Mass Moment of Inertia in the field below.:


## 8.4 Engine power calculation

⚠ A roller dynamometer is measuring power and torque at wheels. This is true for all roller dynos. There is no physical possibility to measure actual Clutch or Crank power on roller dynamometers.

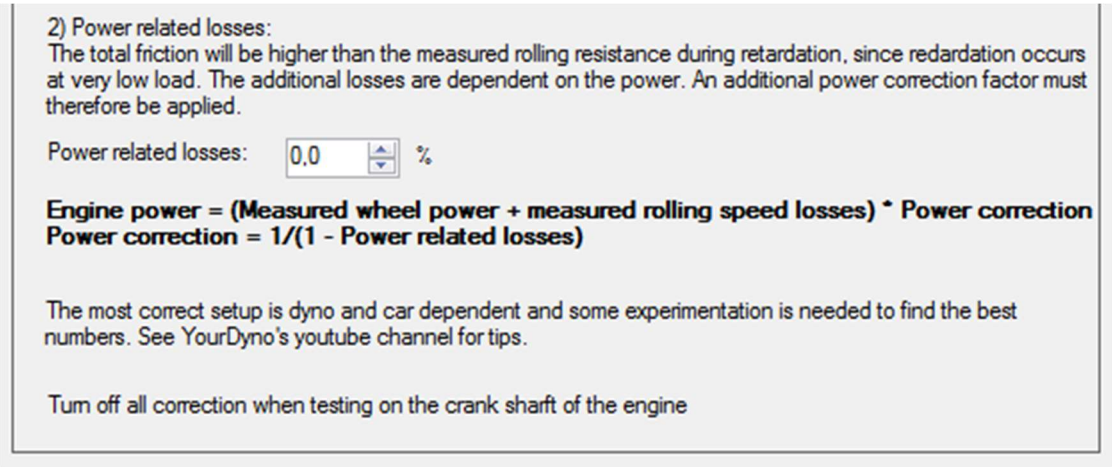
To be able to estimate the engine power, friction losses of the drivetrain must be measured during so called coast-down phase. To enable friction losses measurement please activate the "Enable correction for rolling resistance vs. speed from measured retardation data" checkbox.:




⚠ Please note that the power losses in the drivetrain cannot be measured during coast-down phase. The coast-down phase can measure solely coasting friction losses!

Measuring friction losses gives a good estimation of Clutch (or Crank) power, but it is still burdened with a measurement error since the drive train will have higher losses at full power compared with at coast down. A roller dynamometer can therefore only measure parts of the losses, the total losses will be higher than the measured retardation losses. To accurately determine these losses, it is necessary to compare power readings between engine and roller dynamometer.

To enable power-train losses correction, modify the "Power related losses" value:




## 8.5 OBD2 setup

The YourDyno YOURDYNO Software offers a built-in interface that supports OBD2 protocols using ELM327 adapter. This built-in system can be used with USB and Bluetooth OBD2 interfaces.

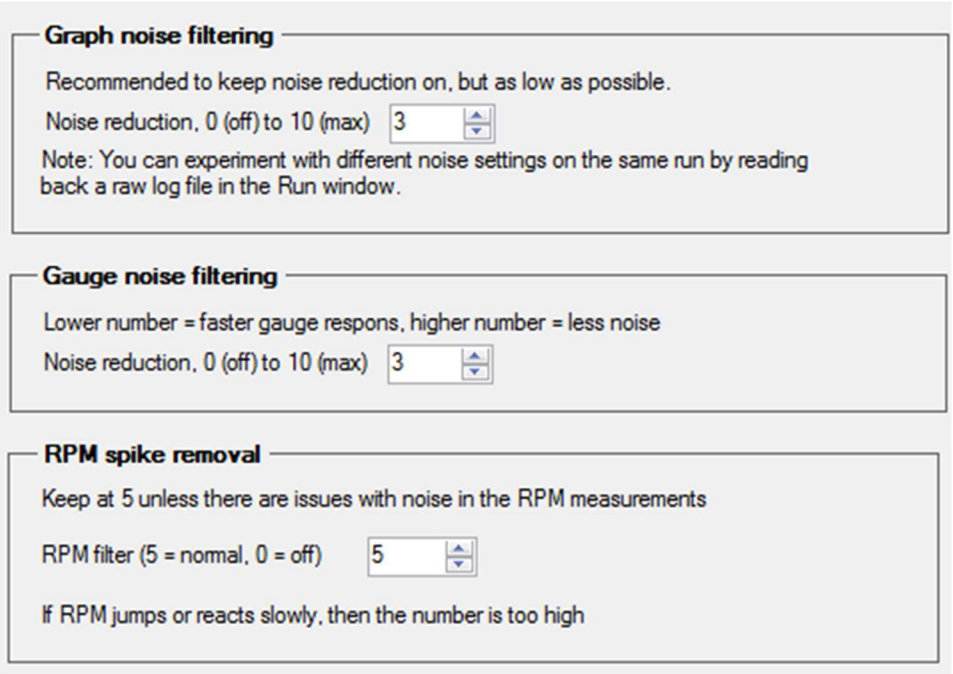
Please use the "Scan Tool" plugin instead of the built-in OBD2 solution.
**See: "Plugins"** in this manual.

## 8.6 Noise filtering

To modify the Noise filtering settings, adjust the three fields to desired level.

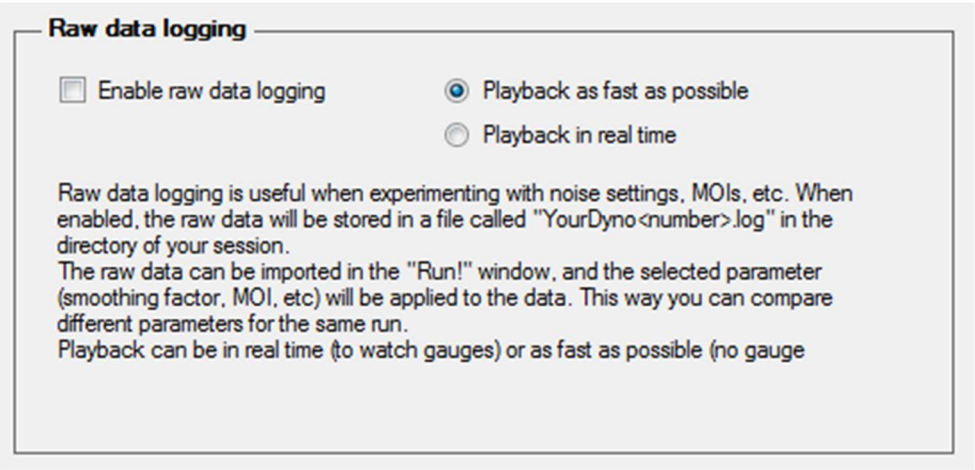
We strongly advise to use lowest possible settings that allow good results and graph smoothing.

Too smooth graphs will obstruct the ability to find faults in engine operation.




## 8.7 Raw data logging

This feature enables raw data logging capability of the YourDyno Software. It can be used to troubleshoot and adjust dynamometer settings after a recorded test Run. To use this feature please enable checkbox "Enable raw data logging".




## 8.8 Environmental power correction

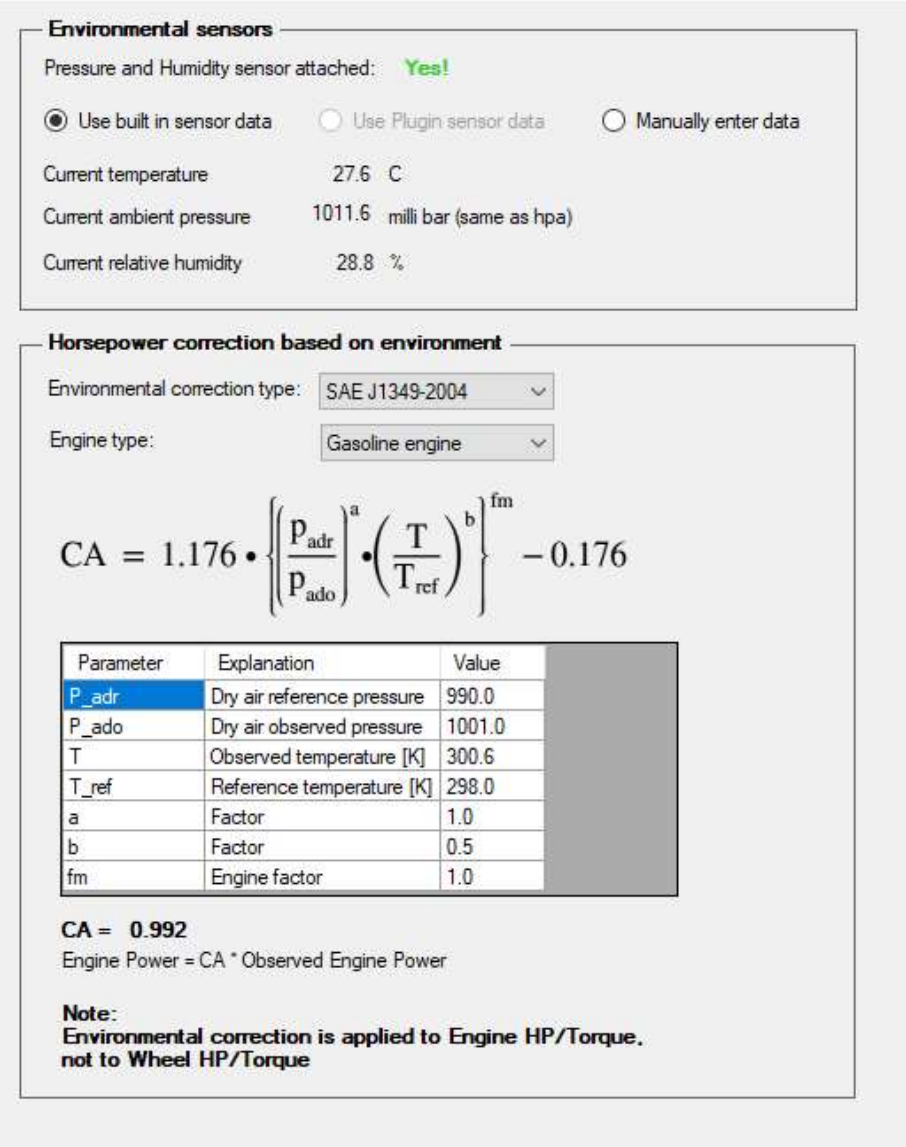
To enable power correction calculation based on environmental conditions please select the correction of choice. YourDyno supports:

- SAE J1394-2004
- DIN 70020
- ISO 1585-2020
- JIS D1001

- User defined

You can choose between the built-in weather station of the YourDyno controller, use external sensor (Dracal PTH200) or enter the values manually.

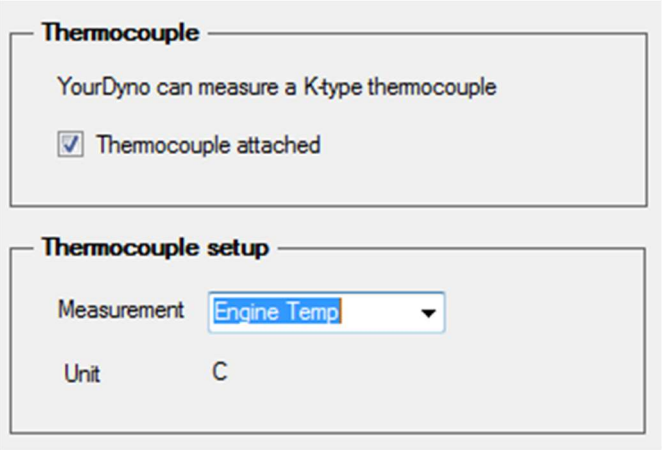
To use the PTH200 external environmental sensor please install the corresponding plugin first.




## 8.9 Thermocouple

The YourDyno controller offers one Thermocouple Type-K input. To activate it please enable "Thermocouple attached" checkbox. Select the Sensor Name from the

"Measurement" drop-down list in "Thermocouple setup" section or use <custom> and rename it to your liking.



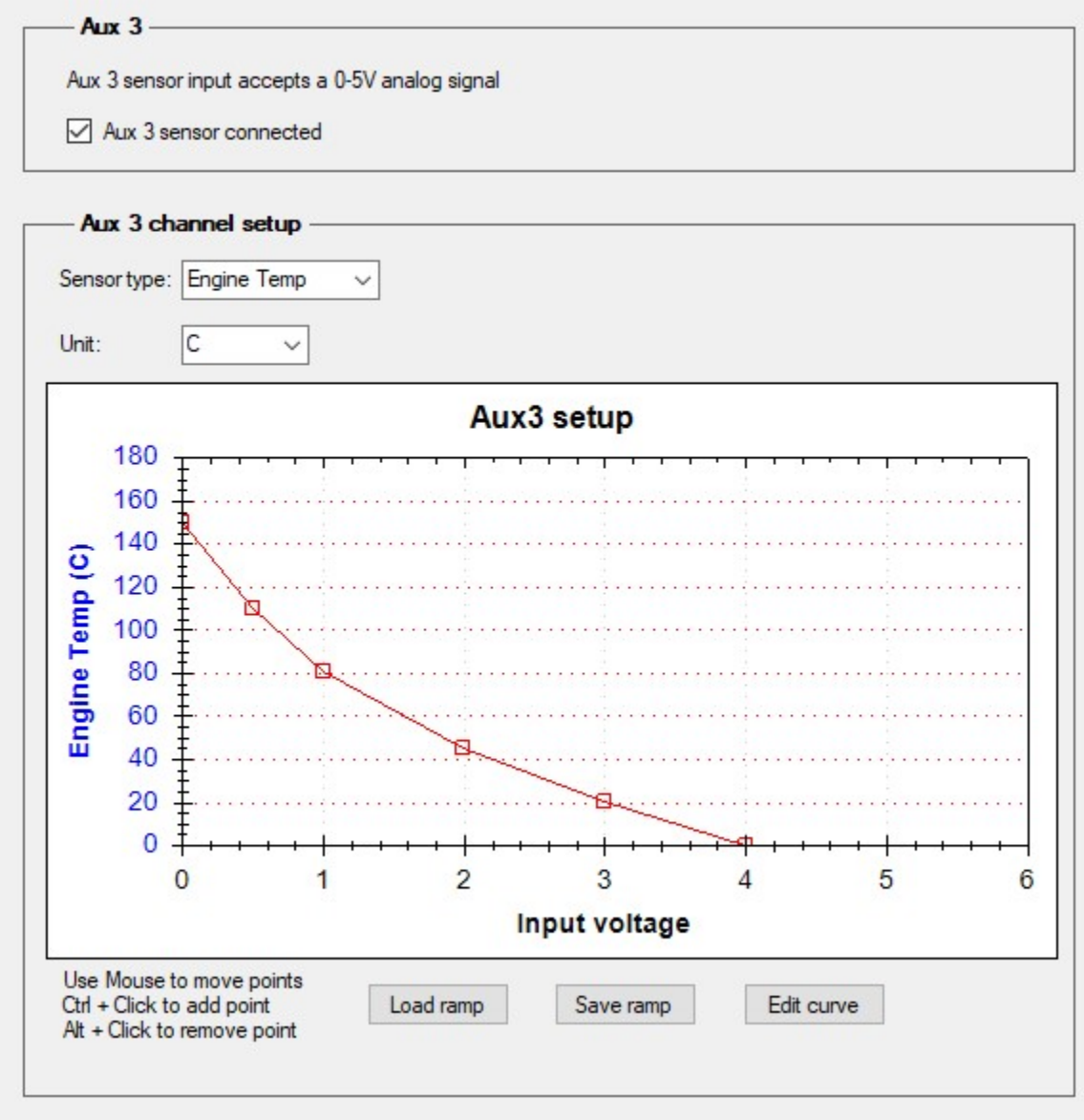

## 8.10 Aux channels

The YourDyno controller offers three analog input channels (Aux 1 … Aux 3).

⚠

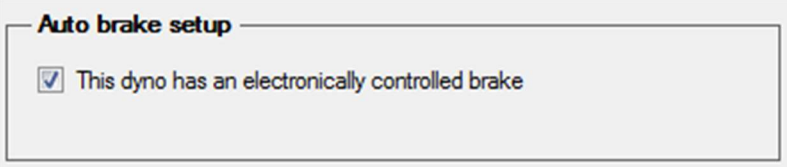
All Aux channels can accept max. 5V DC. Connecting higher voltage to any of these inputs will damage the electronic circuit board and void warranty!

To activate each channel, enable the checkbox "Aux … sensor connected). You can configure each channel separately and specify the analog input interpolation curve (relationship between input voltage and sensor reading). Sensor type and Unit are free text, and anything can be written here.

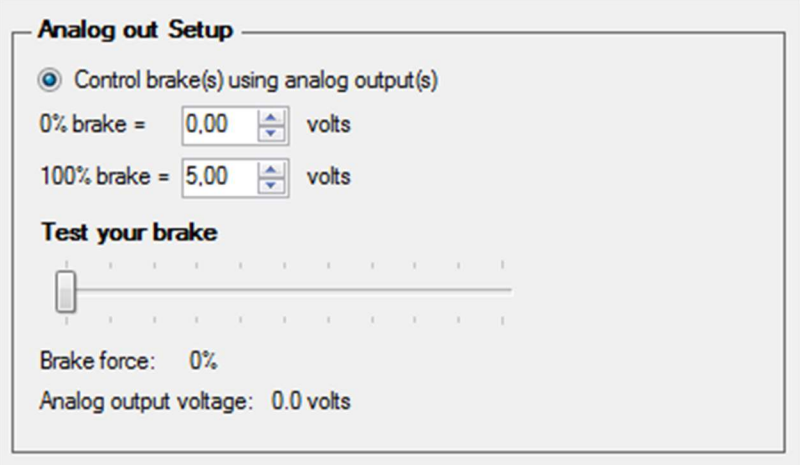



## 8.11 Brake controller setup

To use automatic brake control, enable the checkbox in section "Auto brake setup":




The default setting for Analog out Setup is:




You may use the "Test your brake" slider to manually set the brake output control signal and verify retarder operation. When powered up the Retarder is making characteristic "whining" noise.

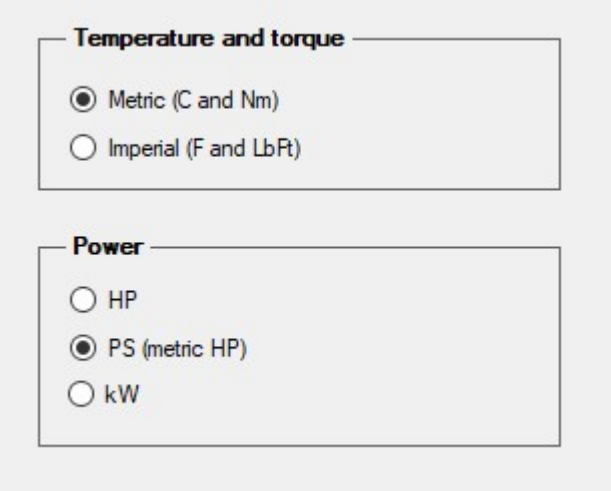
⚠

Please note that his procedure will directly apply the output voltage regardless of current condition of your dynamometer.

WARNING: Potentially lethal voltages!

## 8.12 Unit selection

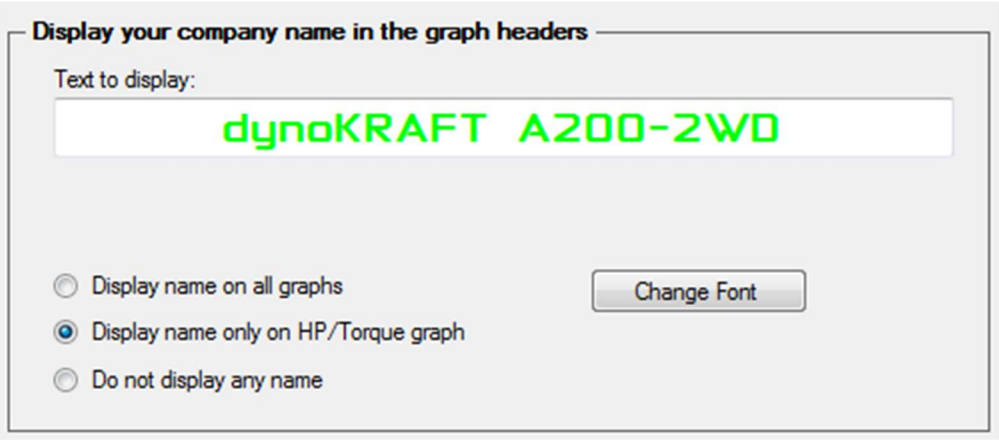
You can choose between different units in this section:




## 8.13 Company logo

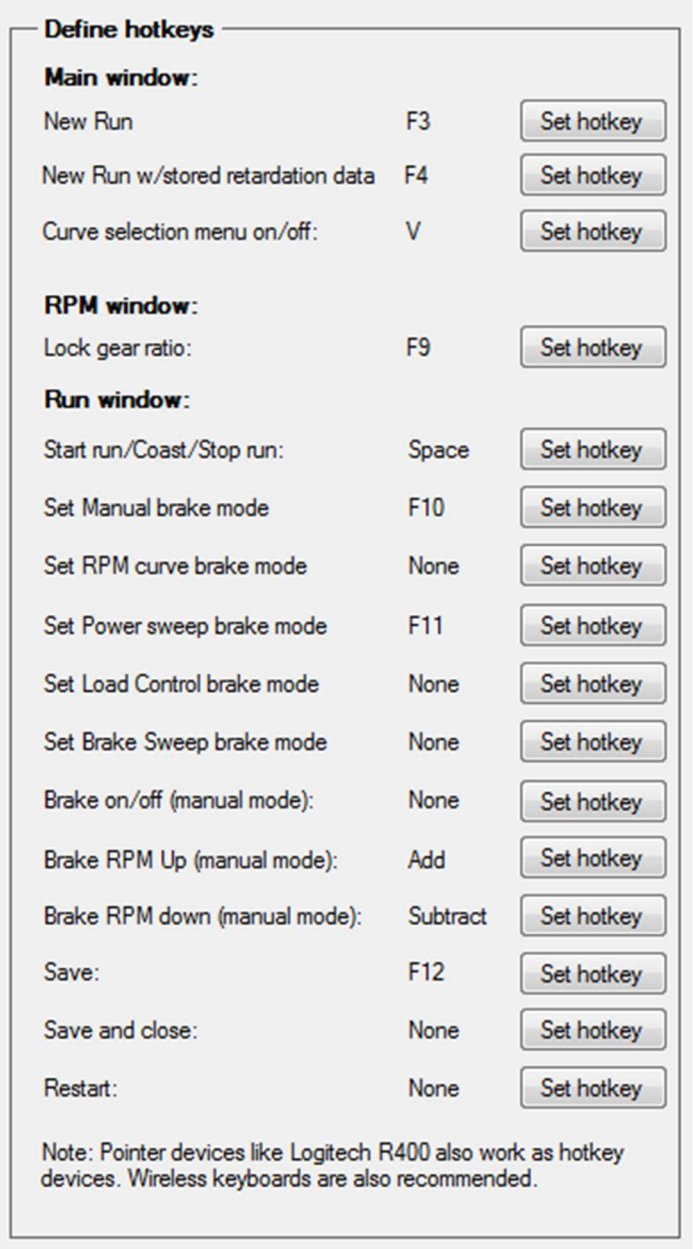
You may choose to setup your company name or any other text to be displayed above Graph Area.

This text will also be visible on print-out.




## 8.14 Define hotkeys

Use this section to define hotkeys on a keyboard.

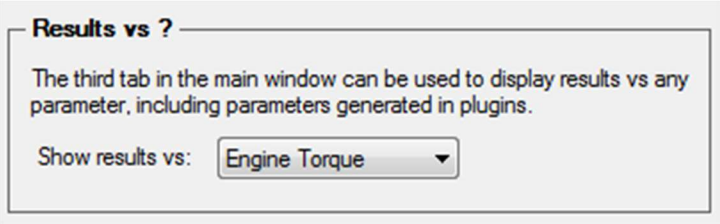



A wireless keyboard or wireless “clicker” such as the Logitech R400 is recommended, and its buttons can be configured with hotkeys.

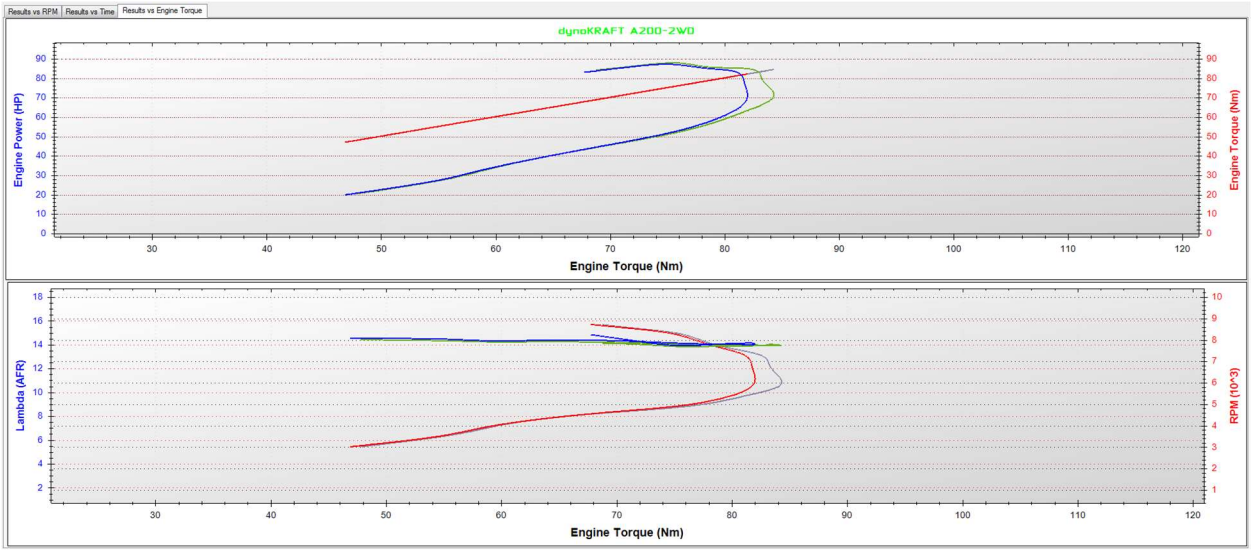
## 8.15 Result vs ???

The YourDyno Software is a powerful data analysis tool that allows users to quickly and efficiently tune their engines. One of the most important features is the ability to plot any recorded value in function of any other value. For example, it is possible to plot boost pressure, lambda, ignition timing (or any other channel) as function of Engine Torque (or any other channel).

To enable this feature please select desired channel from the drop-down list:

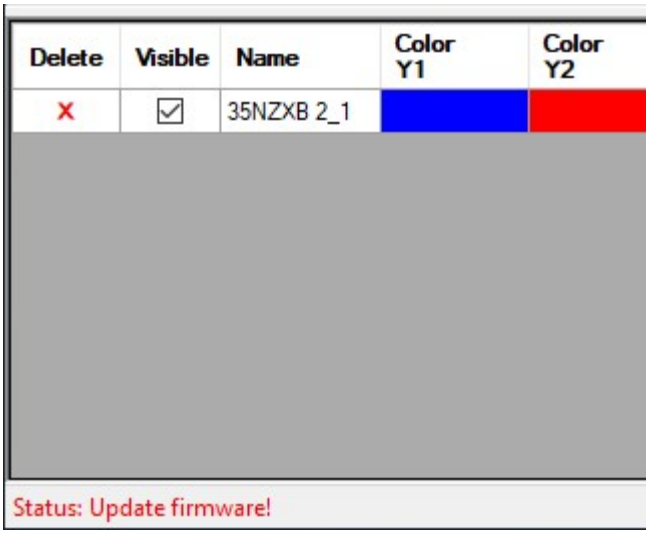



### 8.15.1 Example: Engine RPM and Lambda vs Engine Torque




## 8.16 Firmware upgrade

This section allows you to perform Firmware update of the YourDyno controller.

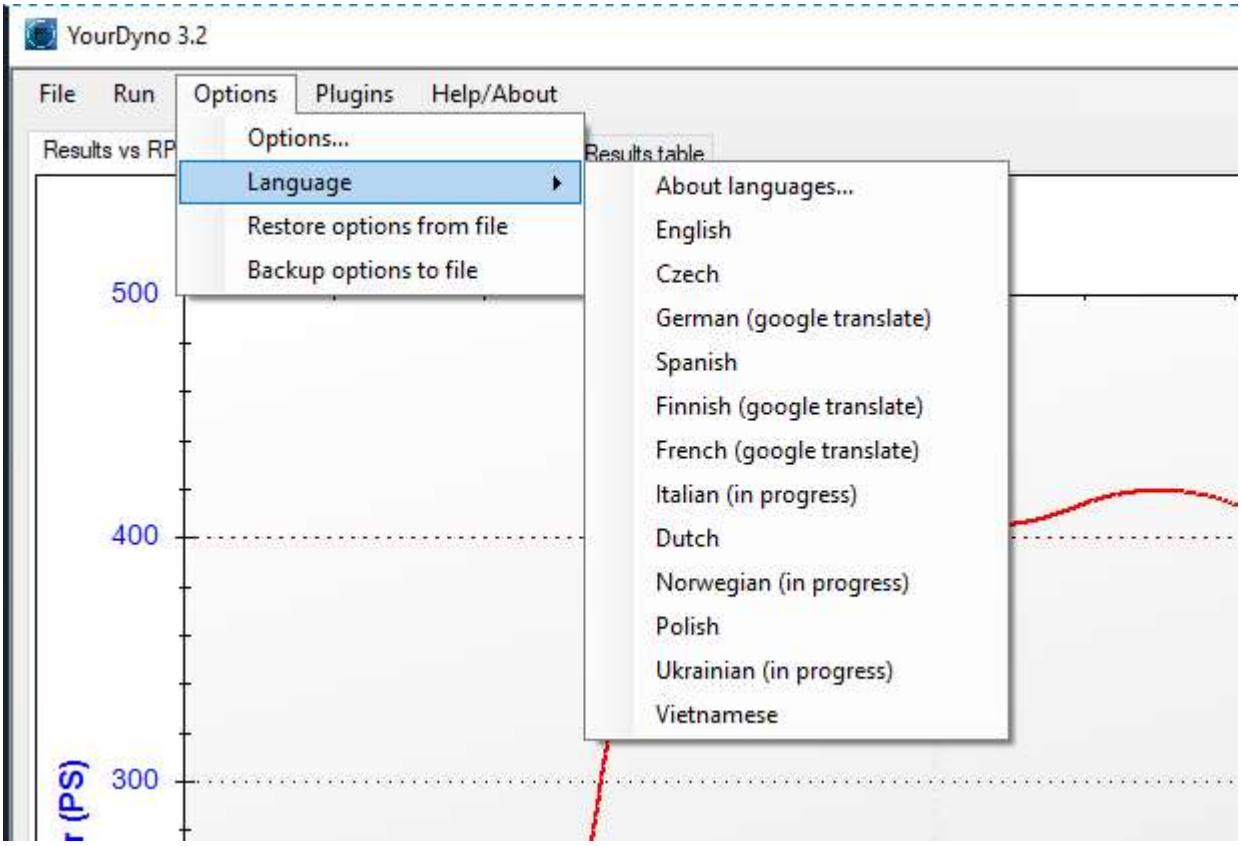


Whenever “Update firmware” is shown in the status bar at bottom left, you must update the firmware. The firmware update system includes a failsafe mode such that it will revert to the previous firmware if an update was unsuccessful. There is also a second failsafe option; a button inside the box that can be pushed to force the unit into bootloader mode such that it is ready for firmware download in case a firmware upgrade failed.

## 8.17 Language

To change the interface language please select it from the menu list.

The YourDyno Software will restart automatically.



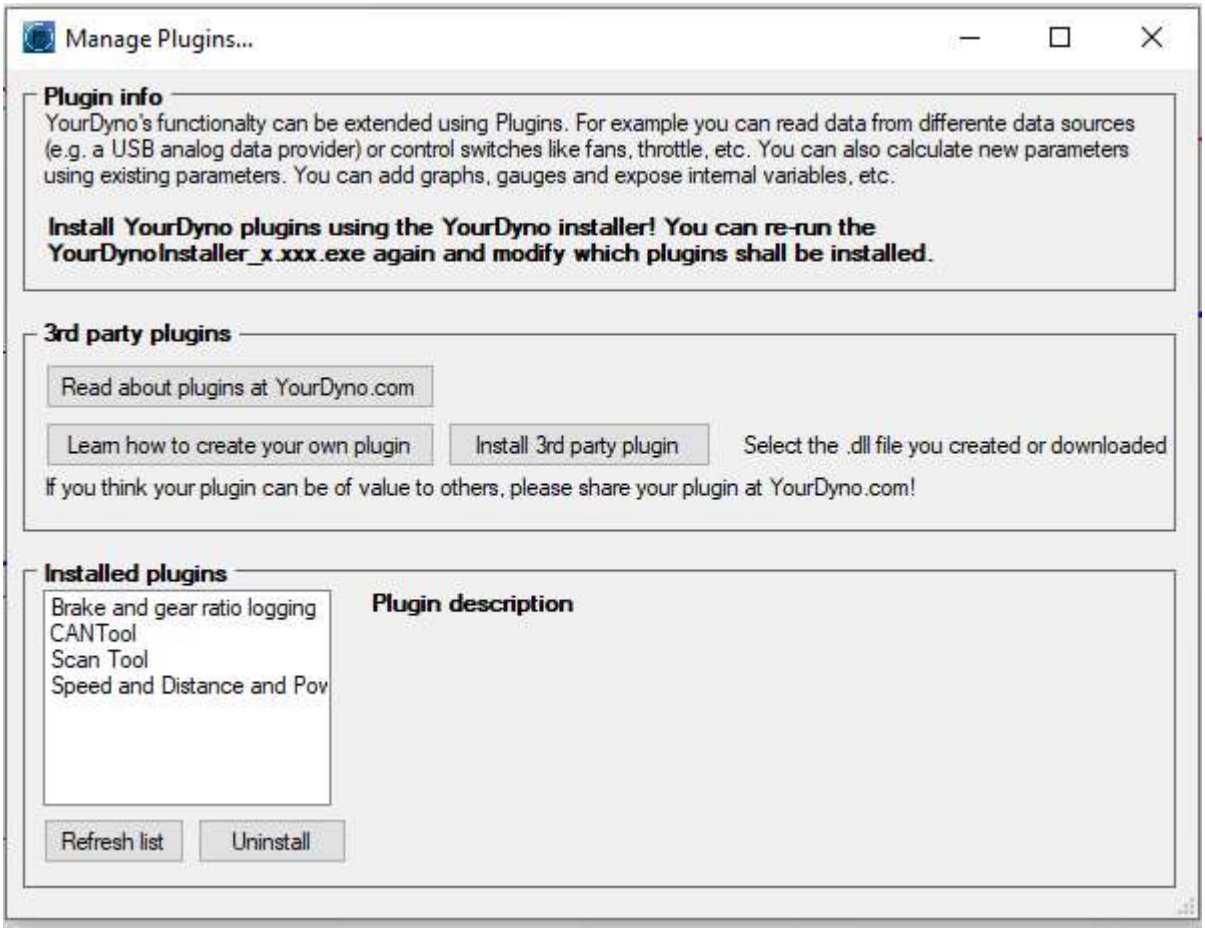

## 8.18 Restore and Backup options

All settings in the YourDyno software are stored in an internal configuration file. You can “Backup the options to file” and use "Restore options from file" function to load the configuration file.

# 9 Menu: Plugins

## 9.1 Mange plugins...

This window allows users to add or delete plugins.




All plugins are complied .dll files and stored in: C:\ProgramData\YourDynoPlugins

## 9.2 Installing new plugin

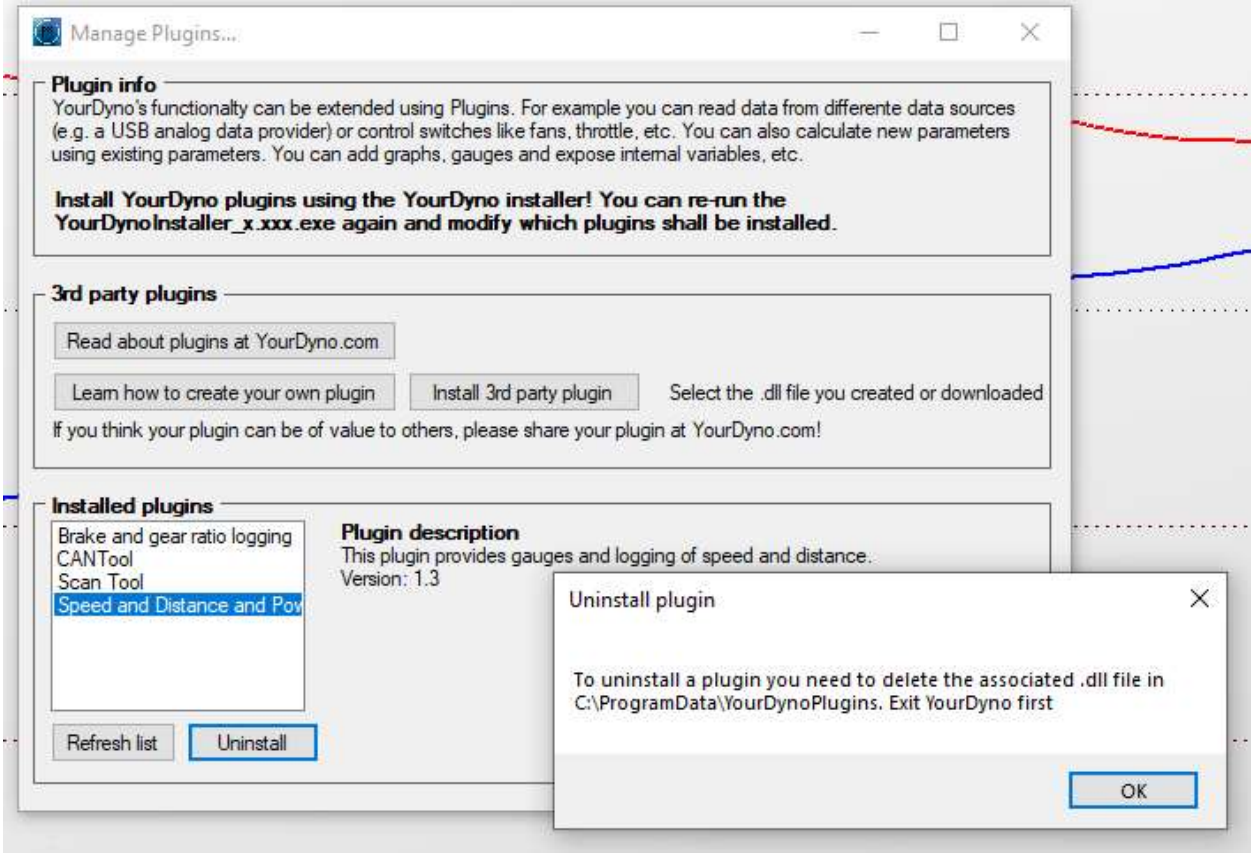
Installing official YourDyno plugins are done during installation of YourDyno. Do not download .dlls and install manually, since they are version dependent.

To install 3rd party plugins please press the "Install plugin..." button in "Install new plugin" section. Then navigate to folder where your .dll file is saved. Select the file to install and press "Open"

Your Plugin is now installed and ready to use.

## 9.3 Removing plugins

To remove any plugin, the associated .dll file must be manually deleted from the C:\ProgramData\YourDynoPlugins folder. Exit the YourDyno software first:

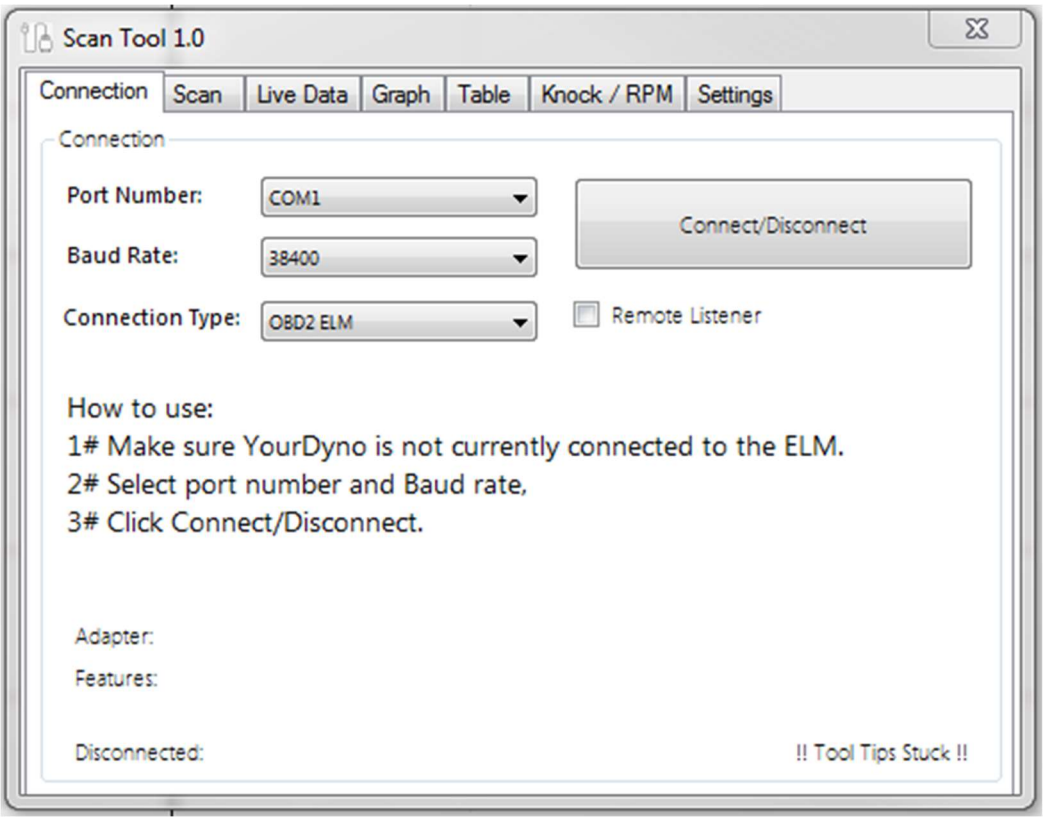



## 9.4 Scan Tool (OBDII plugin)

To use the Scan Tool plugin make sure that the built-in OBD functionality is deactivated (**see: Menu: Options -> OBD2 setup**)

An ELM327 Bluetooth or USB OBD2 adapter can be used. First install the software if any that accompany the adapter. If the ELM327 adapter is Bluetooth based, then connect to it first. Verify that you can see the adapter in the Device Manager. They appear as COM ports.

Open YourDyno Software and navigate to Plugins -> Scan Tool. In the Connection tab please select which COM Port is in use, select Baud Rate (use 9600) and Connection type (OBD2 ELM) and press Connect. It may take up to one minute to connect to car's OBD interface.




### 9.4.1 Logging OBD parameters during test run

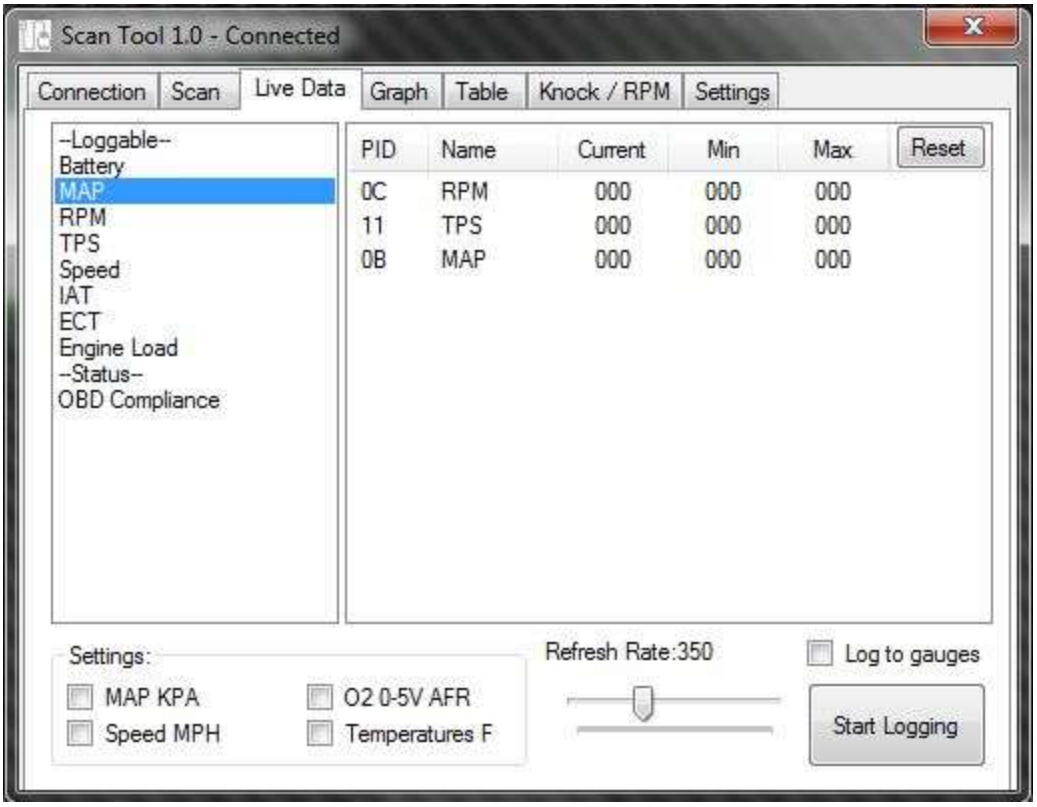
1. Please navigate to "Live Data" tab in Scan Tool Plugin and select which channels you wan't to record (double-click)

2. Activate checkbox "Log to gauges"

3. Press "Start Logging" button. You may now close the Scan Tool plugin window.

4. In Run window you may now add new gauges with respective OBD channels.

Please note that the data logging from OBD-Adapter will work only with YourDyno hardware connected to PC.




## 9.5 Speed and distance

This plugin is adding new data channels: driving speed and driving distance. This is installed by default.

To use the speed and distance channels setup the roller circumference (i.e. diameter in meters * 3.14).

## 9.6 More plugin information

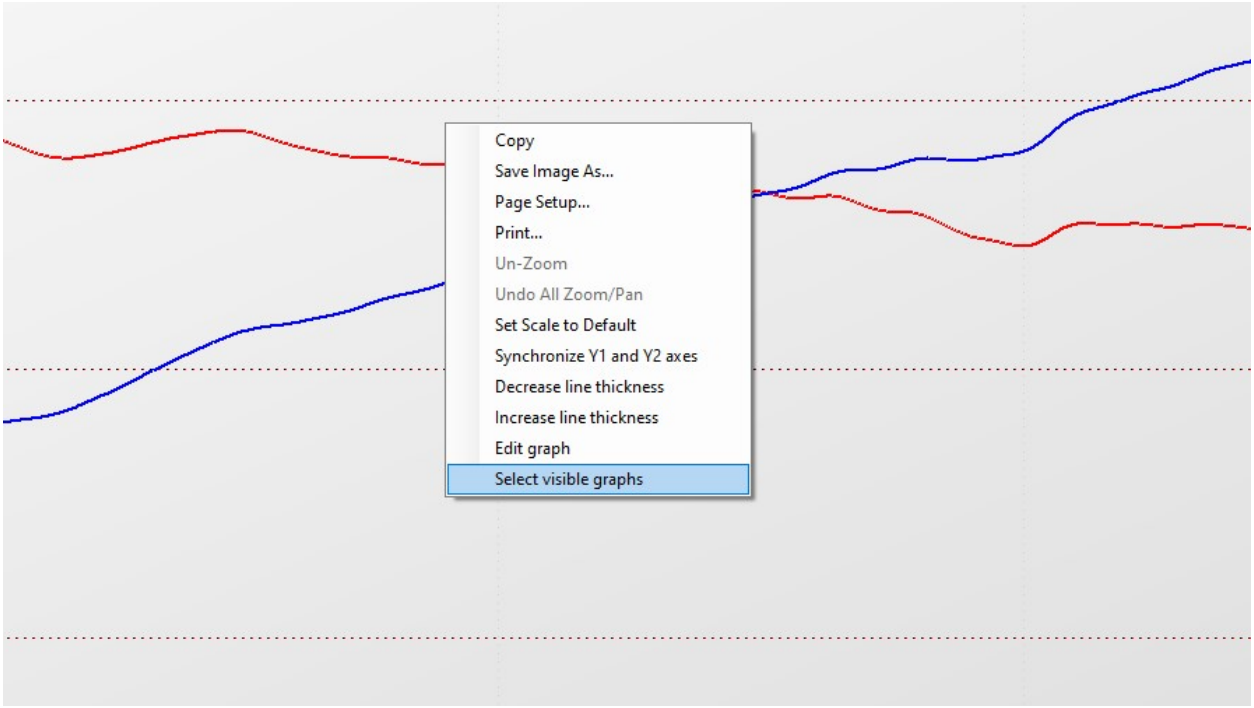
Information on how to create your own plugins can be found here:
https://yourdyno.com/plugin-system/

# 10 Graph area. Data analysis. Test Run list.

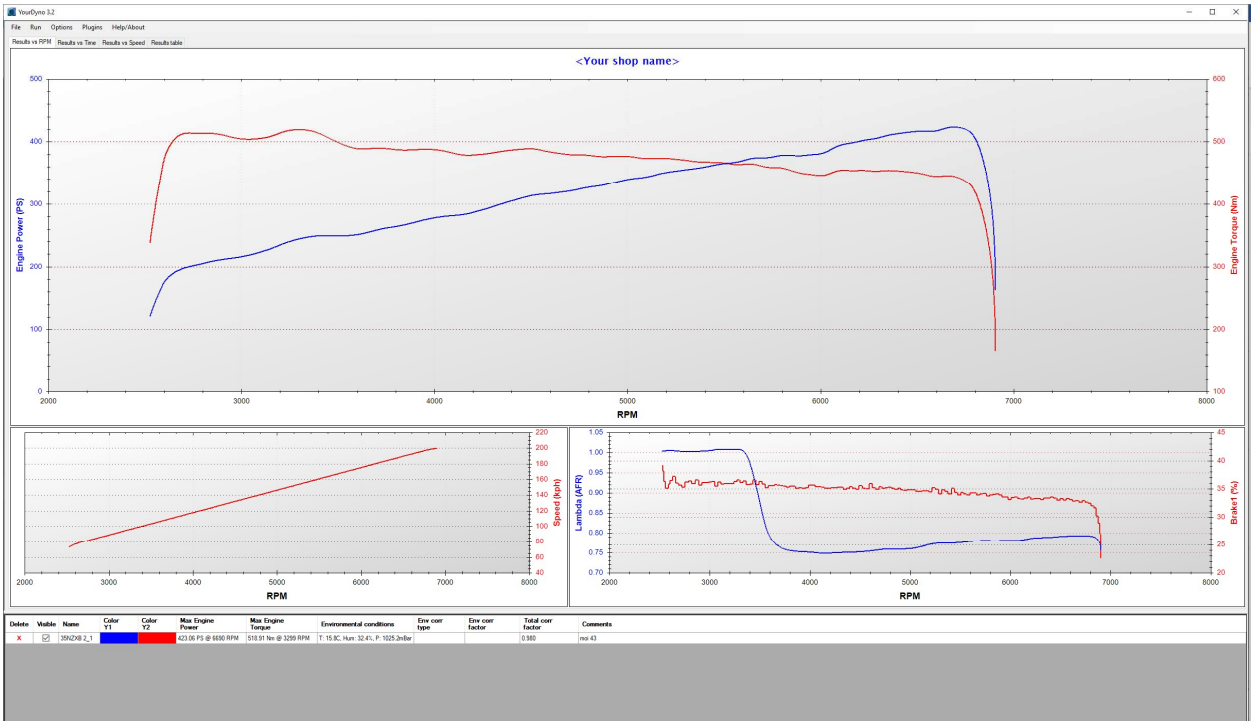
## 10.1 Multi-graph view

The Graph area can be divided into max. three sections. The main section is the Engine Power and Engine Torque diagram.

To add and remove channels to the graph areas, press the ‘v’ button or right-click and select “Select visible graphs”. To split the graph area, add new channels into view.:

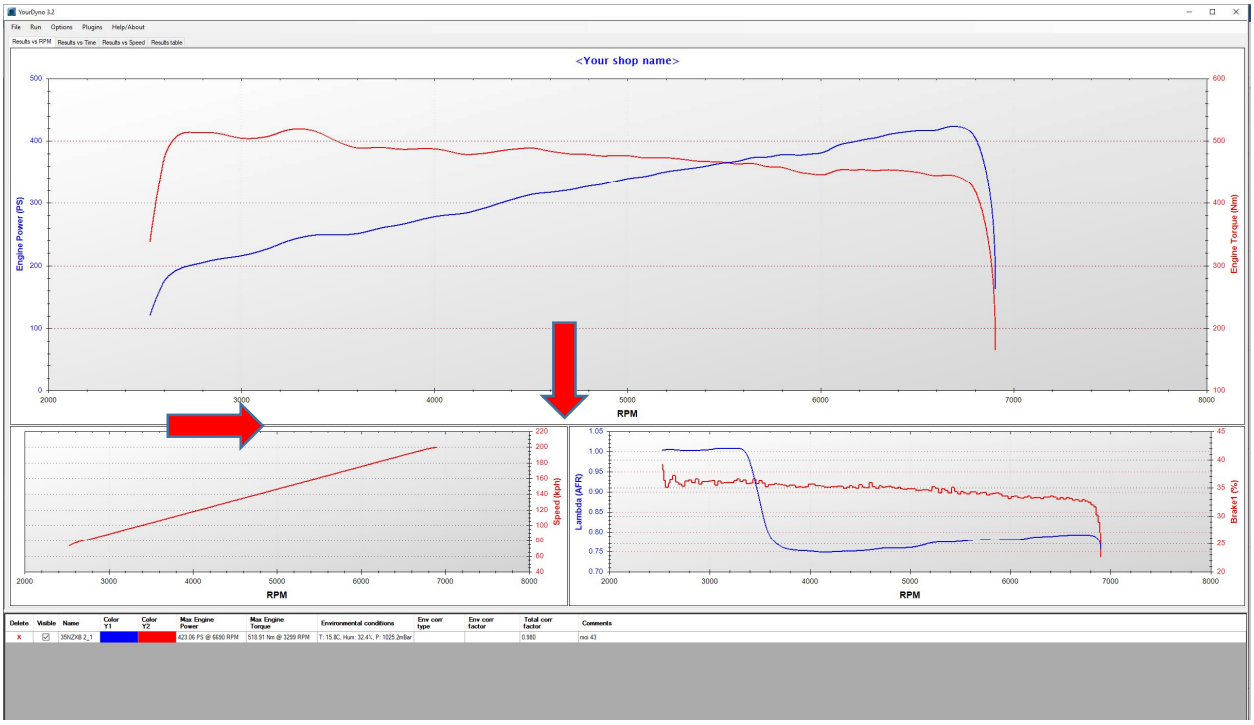



After adding additional channels like Lambda the Graph area is split horizontally:



To relocate the channels between graphs use "Drag-and-Drop" technique. LFB on the label and drag it over to another graph/axis.

You can adjust the size and position of the horizontal and vertical dividers by dragging them with mouse cursor.:




## 10.2 Manipulating the graph area. Context menu.

LMB - LEFT mouse button
MMB - MIDDLE mouse button
RMB - RIGHT mouse button

1. **Quick reference guide:**
   1. To move/drag the graph use MMB.
2. Press and hold LMB to drag an Zoom-Area rectangle.
3. Press RMB to open context menu.
4. Use mouse wheel to Zoom In and Out.

## 10.3 Context menu

**Un-Zoom / Undo All Zoom/Pan** - use this function to reposition the graph back to normal view.
**Set Scale to Default** - changes the channel scale back to standard value

**Synchronize Y1 and Y2 axes** - synchronizes Y-axis for all channels in the selected graph
**Increase / Decrease line thickness** - use this function to change graph thickness. The changes is applied only in the section where the RMB menu was activated

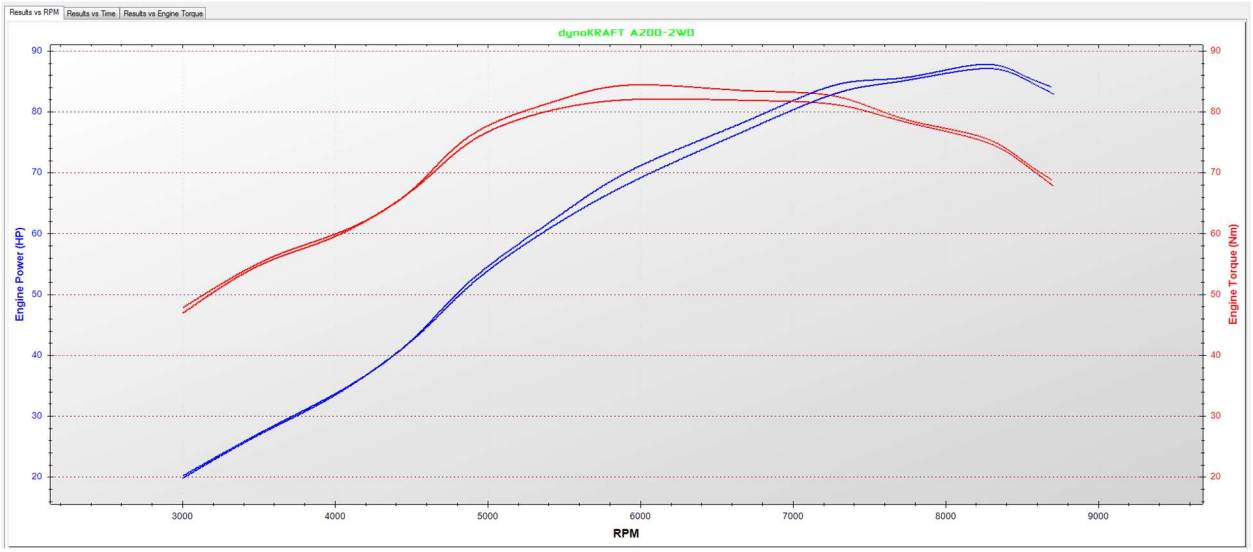
**Edit graph -** Use Ctrl key and LMB to select which graph area you want to cut. This change cannot be undone thus it is strongly advisable to make a copy of the file prior modification. Use Esc key to cancel.

The software will lineally interpolate the graph if you remove a center portion of it.

## 10.4 Results vs RPM

This is the most typical use scenario for Power Test runs. In this view all channels are plotted against the Engine RPM channel. Use this view to print dyno sheets for customers.

When Retardation Data is used the frictional losses are accounted and clutch power is shown. **See: Options -> Engine power calculation**

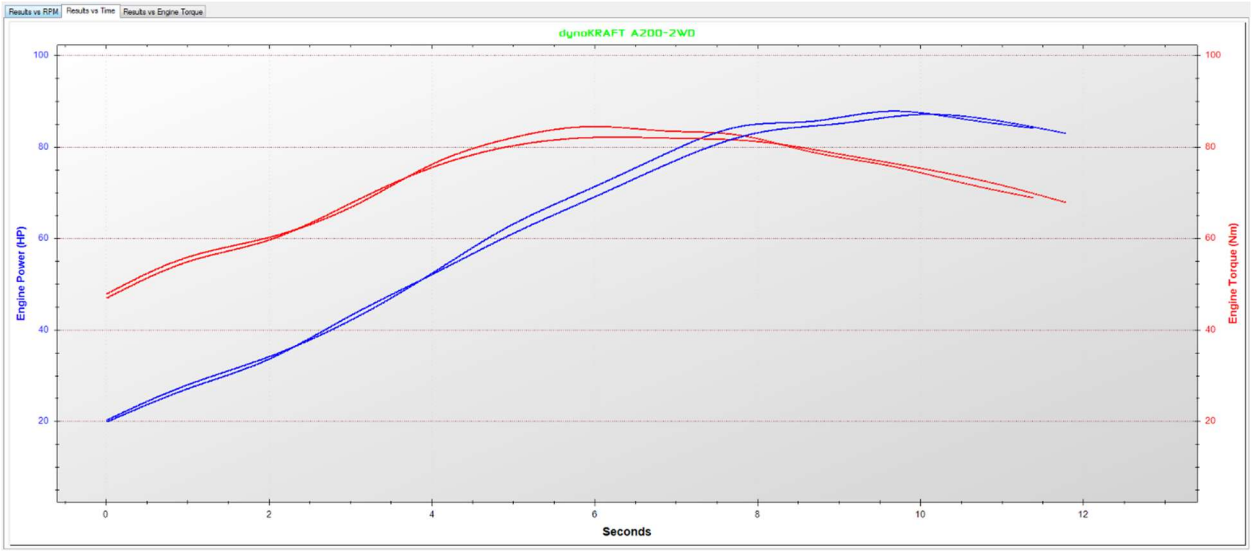



## 10.5 Results vs Time

Time is the only absolute Physical Size. It cannot be modified, slowed down, stopped.

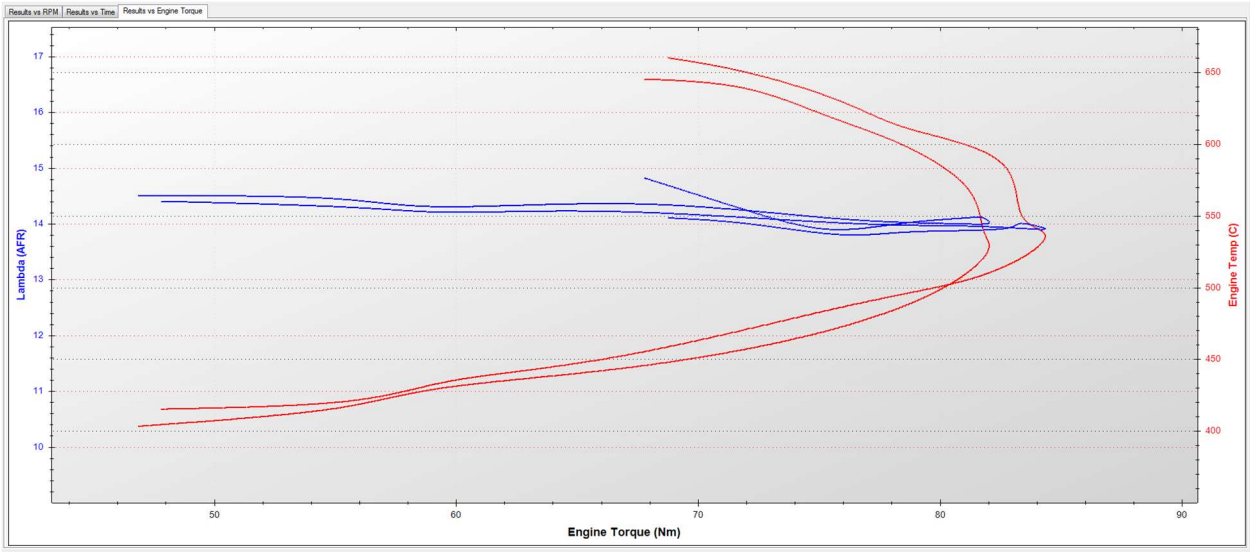
All channels in every Run are recorded in Time function.

This view is very useful to analyze any variations in recorded channels during the test, regardless of Engine RPM changes.




## 10.6Results vs ???

Depending on the selected channel in the Options -> Result vs ??? all recorded data will be plotted against any other selected value. This view is very useful to find best possible calibration of the tuned engine (for example when using Engine Torque as function):

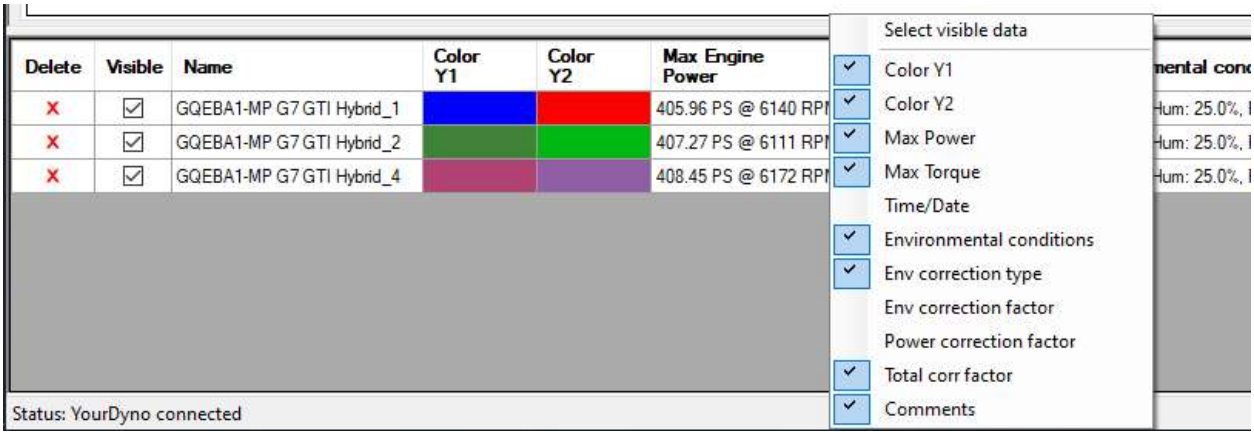



## 10.7Test Run List

Below the Graph Area you'll find list of Runs.
You may change the Name and comments by clicking and editing the respective field.

| Delete | Visible | Name | Color Y1 | Color Y2 | Max Engine Power | Max Engine Torque | Environmental conditions | Env corr type | Total corr factor | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| X | ☑ | GQEBA1-MP G7 GTI Hybrid_1 | | | 405.96 PS @ 6140 RPM | 487.20 Nm @ 5496 RPM | T: 32.5C, Hum: 25.0%, P: 900.0mBar | None | 0.000 | |
| X | ☑ | GQEBA1-MP G7 GTI Hybrid_2 | | | 407.27 PS @ 6111 RPM | 503.84 Nm @ 5365 RPM | T: 32.5C, Hum: 25.0%, P: 900.0mBar | None | 0.000 | |
| X | ☑ | GQEBA1-MP G7 GTI Hybrid_4 | | | 408.45 PS @ 6172 RPM | 504.39 Nm @ 5298 RPM | T: 32.5C, Hum: 25.0%, P: 900.0mBar | None | 0.000 | |

Different columns shown/hidden by right-clicking:

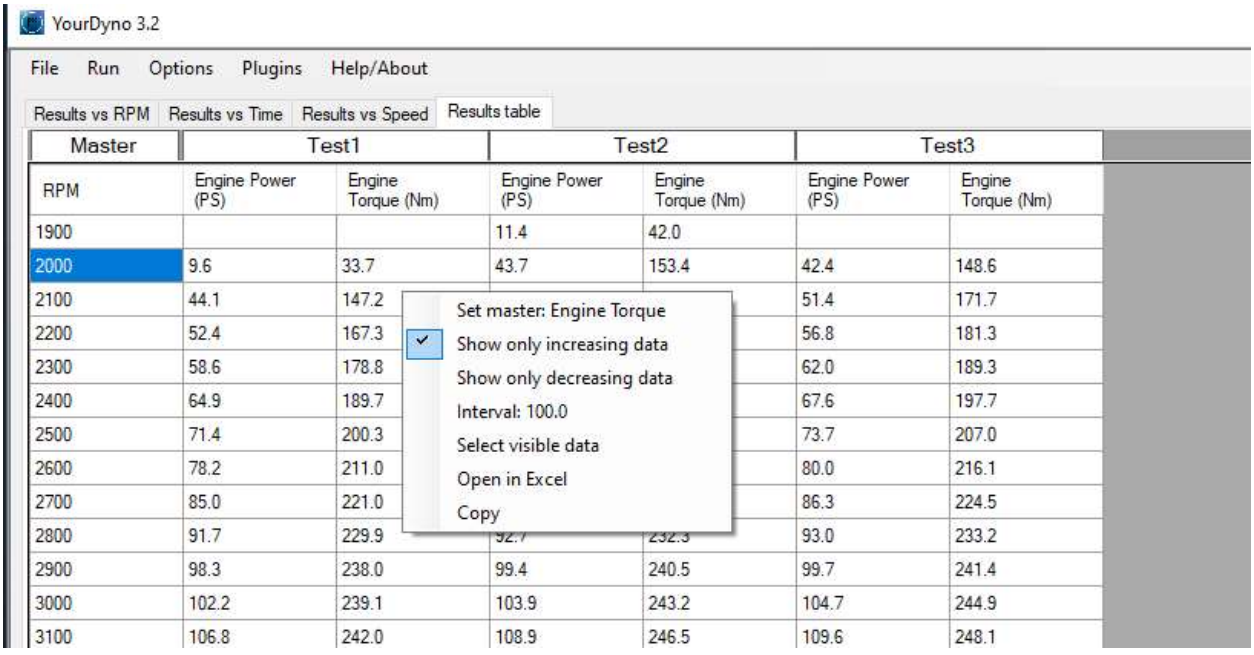



Rows can be sorted by clicking on the header.

## 11 Results Table

The Data Table allows users to analyze the recorded data in spread-sheet form:

You can sort and manipulate the data in many ways. Please check RMB context menu for available options.

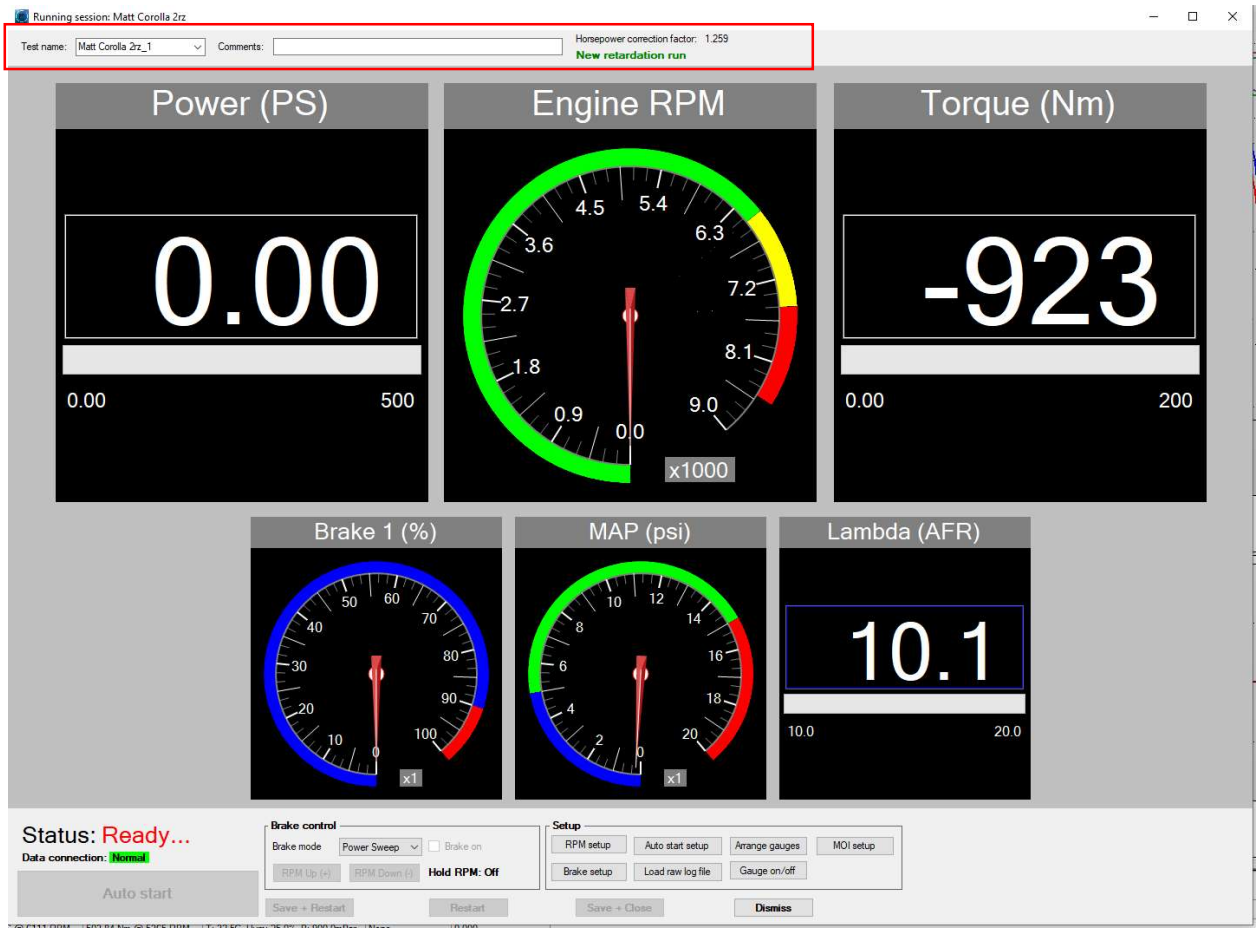


# 12 Run window

## 12.1 Overview

The Run window consist - like main window - of three main areas:

1. Test name and comments section




Use these fields to set Name for the Run and add Comments if necessary.

On the right side of the Comments field current you will also see the current "Horsepower correction factor" and type of Session (either with or without Friction Losses / Retardation data measurement)

## 2. Gauges

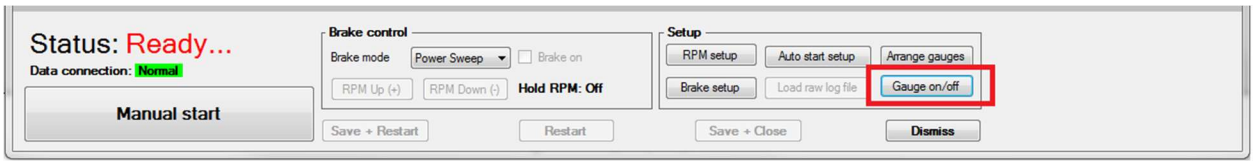

Running session: Matt Corolla 2rz
Test name: Matt Corolla 2rz_1
Comments:
Horsepower correction factor: 1.259
New retardation run
Power (PS)
0.00
0.00
500
Engine RPM
4.5
5.4
6.3
3.6
7.2
2.7
8.1
1.8
9.0
0.9
0.0
x1000
Torque (Nm)
-923
0.00
200
Brake 1 (%)
50
60
40
70
30
80
20
90
10
100
0
x1
MAP (psi)
10
12
8
14
6
16
4
18
2
20
0
x1
Lambda (AFR)
10.1
10.0
20.0
Status: Ready...
Data connection: Normal
Auto start
Brake control
Brake mode
Power Sweep
Brake on
RPM Up (+)
RPM Down (-)
Hold RPM: Off
Save + Restart
Restart
Setup
RPM setup
Auto start setup
Arrange gauges
MOI setup
Brake setup
Load raw log file
Gauge on/off
Save + Close
Dismiss

3. Controls:

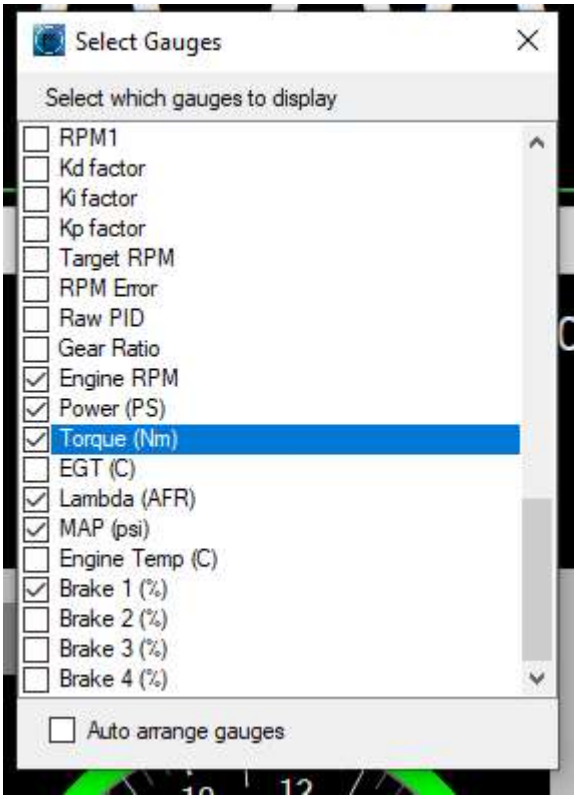

## 12.2 Configuring Gauges

### 12.2.1 Adding new gauges

The gauges can be arranged to suit any style of work.
You can add any recorded channel as gauge by pressing the "V" key on Keyboard or "Gauge on/off" button in the Controls area:




A new window will pop-up with list of available channel. To avoid the problem of "hidden" gauges please use the "Auto arrange gauges" checkbox.

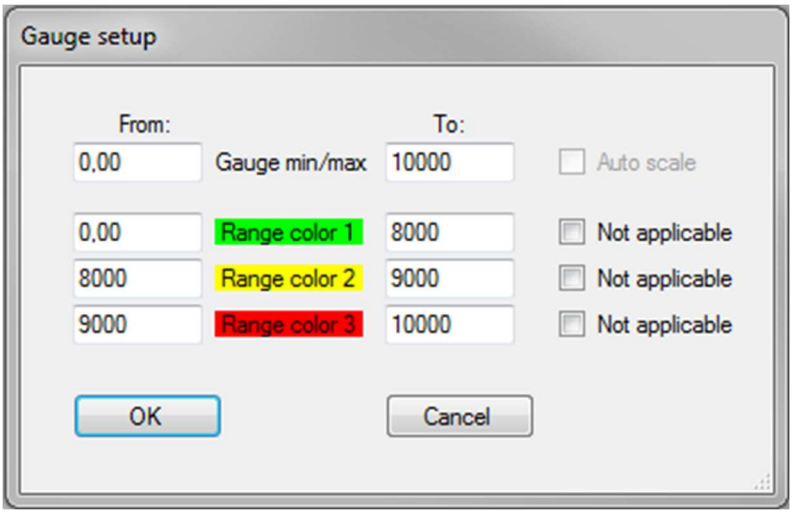



### 12.2.2 Types of gauges

**Analog**

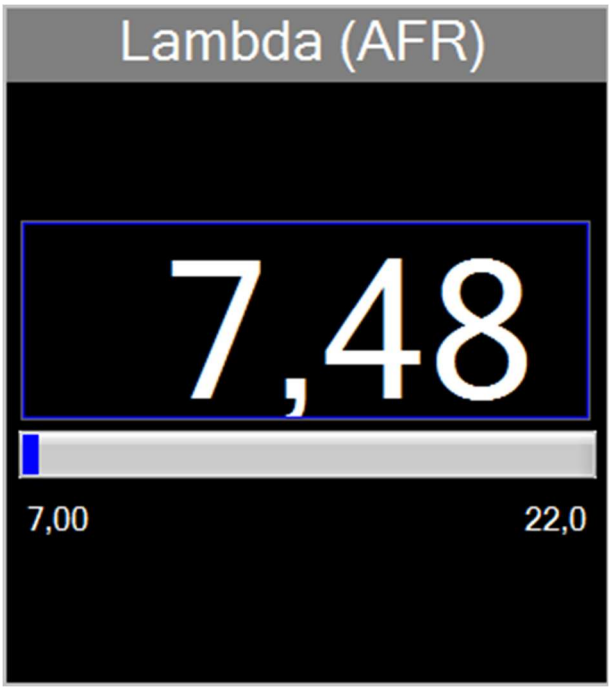
This is a typical "tacho" style gauge with definable Green, Yellow and Red area.

Use the "Gauge setup" function in context menu to setup the colors:




**Digital**

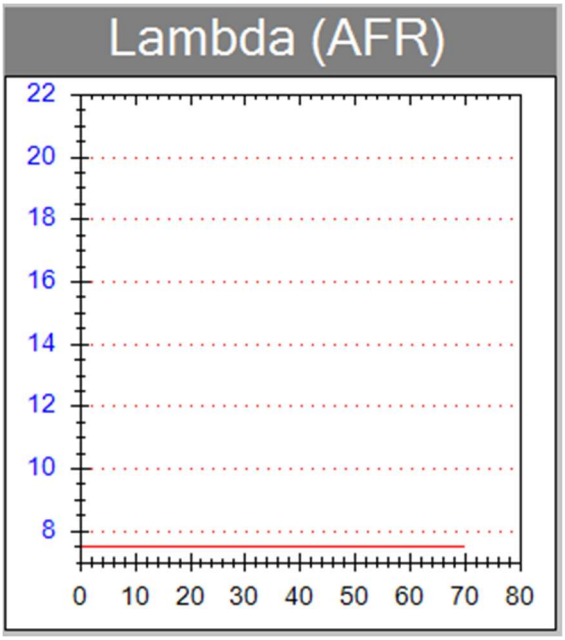
This is a standard "number" style gauge with an horizontal bar below the value showing the range of the gauge.



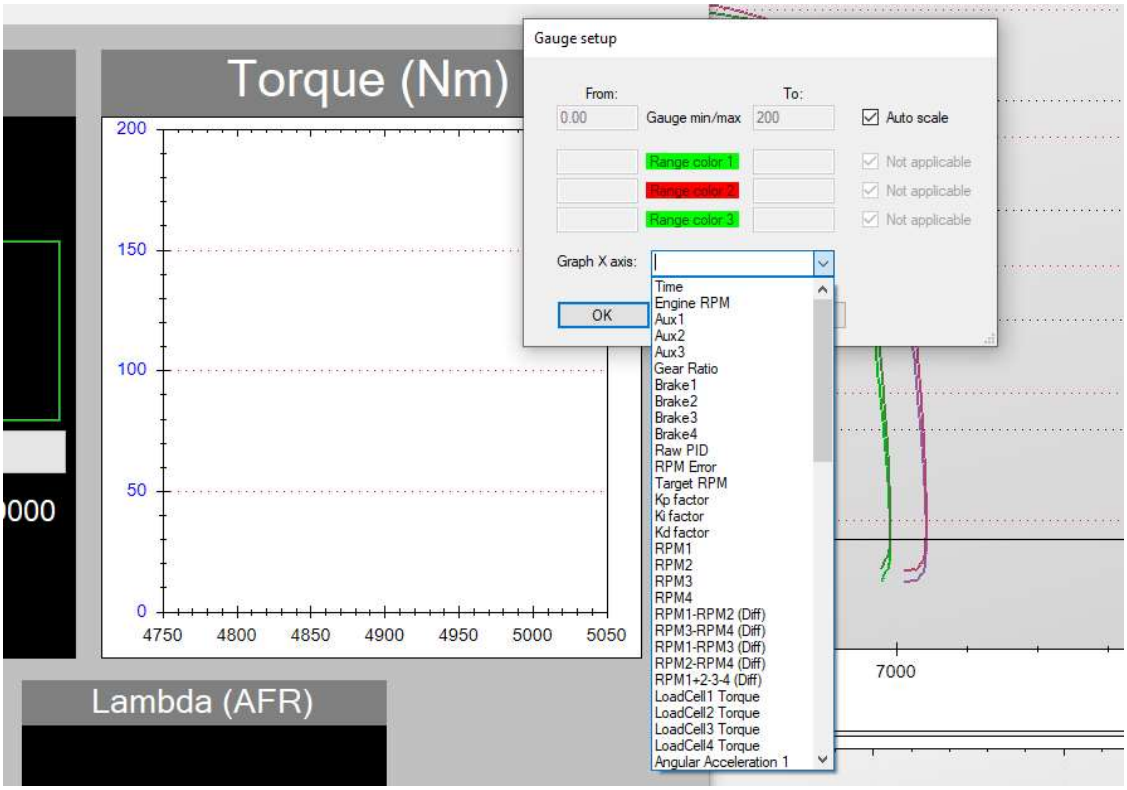

The colors for the horizontal bar are defined with the "Gauge setup" function as well.

**Live graph**

This type of gauge is a live-time graph with automatically adjusted X-axis. No color-code can be set for this type of graph.




Graph type gauges can use any channel as X-axis. This can be especially useful in steady state tuning, where you can get an instant Torque vs Lambda view or Torque vs Ignition angle view for example (assuming of course you have an Ignition angle channel from for example a CAN bus channel).



### 12.2.3 Example on one of possible gauges setup


## 12.3 RPM setup. Gear ratio. Drive mode

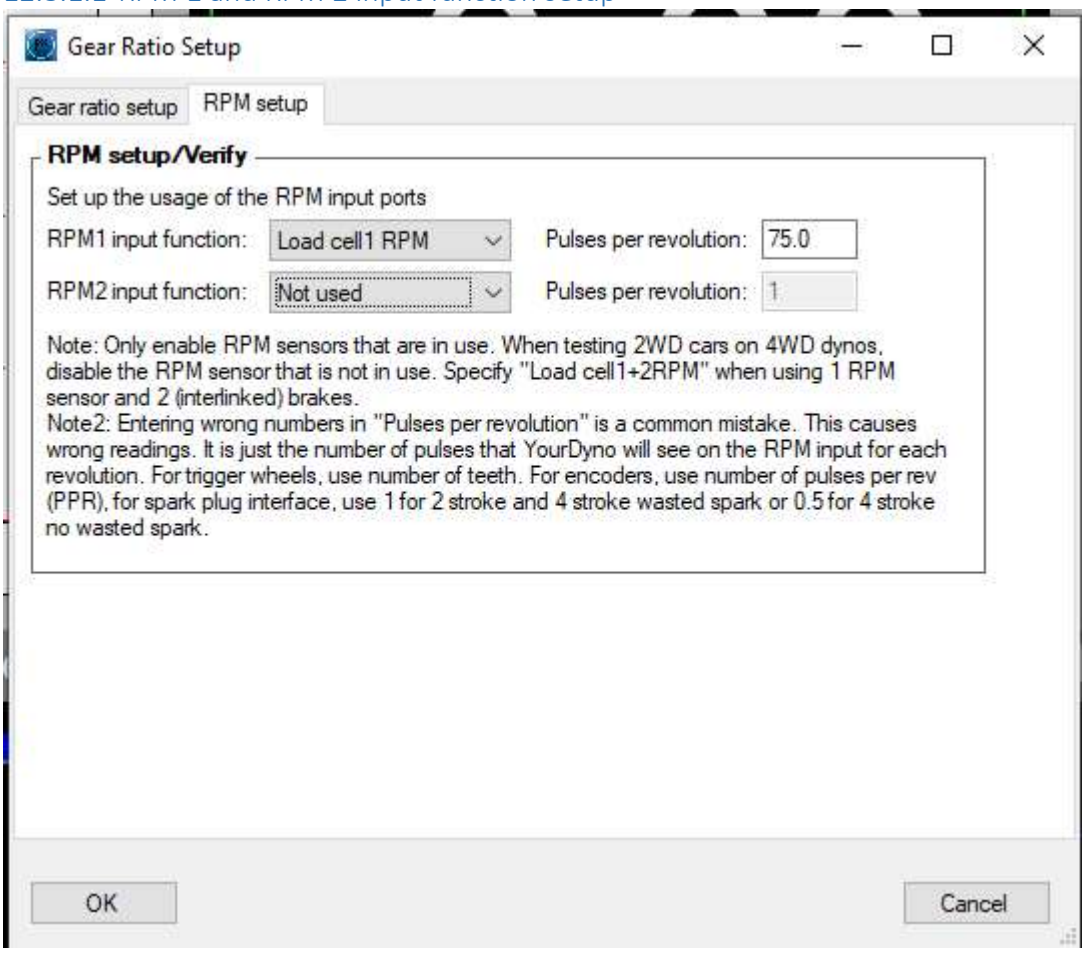
### 12.3.1 RPM setup

This is the main settings function for the two RPM 1 and RPM 2 input channels.

When selecting Load Cell 1 RPM as function for RPM1 input you will activate the Out1 output signal and operate the respective Brake. This applies accordingly to the Load Cell 2 RPM function.

The RPM1 and RPM2 input function setup is also determining which Brakes are in use! Take great care when setting these functions.

#### 12.3.1.1 RPM 1 and RPM 2 input function setup




RPM1 and RPM2 can be configured as:

- 1 Load cell RPM (RPM1 must be used for Load cell1 and Out1 and vice versa)
- Load cell 1 and Load cell 2 using one RPM sensor. This case is used when two brakes are interlinked so the RPM is the same.
- Engine RPM

Ensure to write the correct number of pulses per revolution. This is the same as the number of teeth on the trigger wheel. Getting this number wrong will result in wrong results (even if RPM correct)

#### 12.3.1.2 Engine RPM

In the RPM setup tab select this setting applied to RPM2 input function when using Engine RPM sensing clamp, see: **YourDyno Instrument Installation manual**.

Change the pulse count according to your ignition/engine type (typically 0.5 or 1).

### 12.3.2 Gear ratio setup

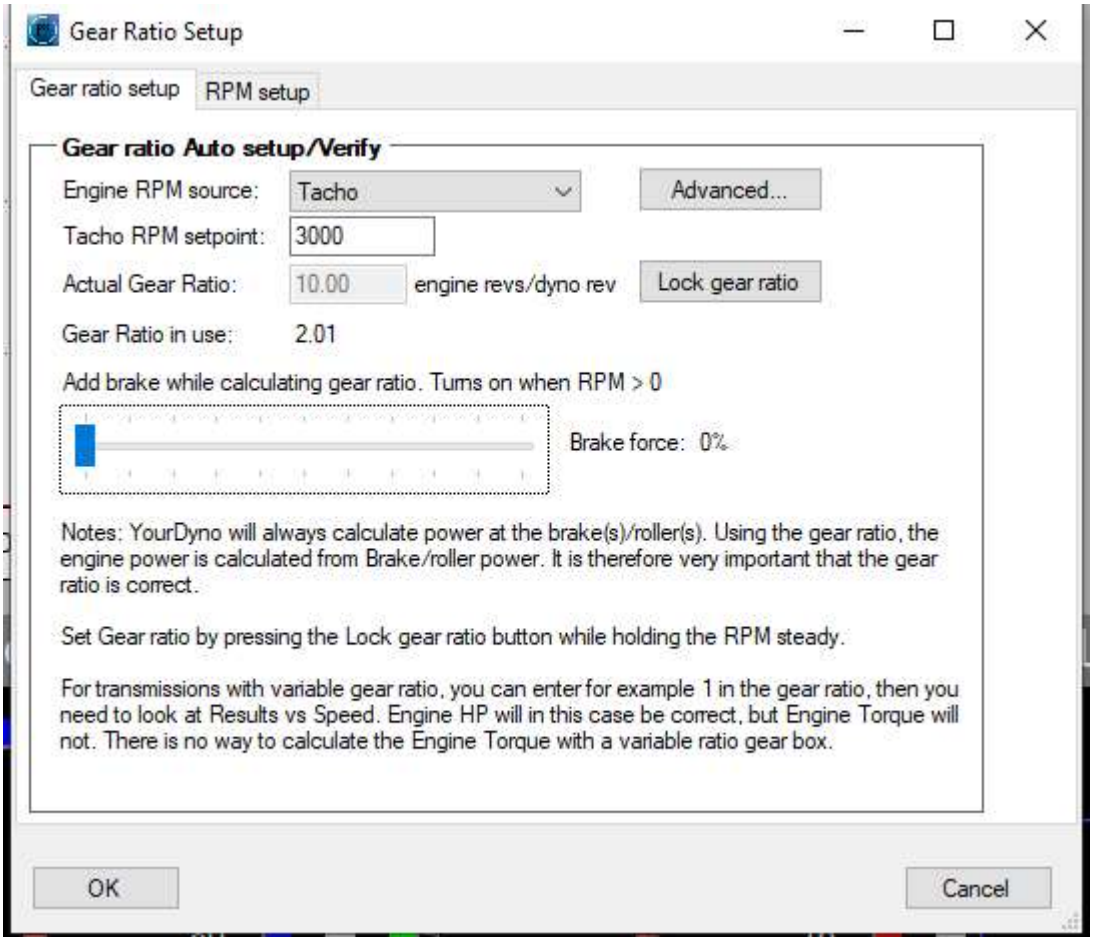
The Engine RPM control in YourDyno system is based on the Roller RPM signal from Hall-Sensor. There are many reasons why the actual Engine RPM (for example from OBD2 interface) cannot be used to correctly control the dynamometer. Mainly they are too slow. Since all roller dynamometers measure torque at wheels, it is important that the Gear ratio is correctly set. Otherwise, the Engine Torque reading will not be correct.

In the Gear Ratio Setup tab you may choose between multiple ways of determining the actual current Gear ratio.

#### 12.3.2.1 Tacho

Use this function if you have no other means of measuring or sensing the Engine RPM.

This is the fastest but also least accurate way of determining the Gear ratio.



1. Select Tacho RPM setpoint. It is recommended to use middle of the Tachometer range somewhere that is easy to keep the engine revving at constant revs.
2. Enter the vehicle and accelerate the car to reach the set RPM.
3. Make sure you are on the gear you wish to use later for the test Run. Usually, it's 4th or 5th gear.
4. Try to hold the engine RPM at setpoint RPM value as precise as possible.
5. When the RPM reading at vehicle tachometer is stabilized at setpoint value press "Lock gear ratio" button.

The YourDyno Software now "knows" what is the total Gear ratio between engine and rollers.

Please note that whenever you'll change gear the Gear ratio will be off and you need to repeat the procedure.

#### 12.3.2.2 RPM [Scan Tool] plugin

Use this option when you have an OBD2 adapter in use and setup correctly. Please refer to **Menu: Plugins -> Scan Tool (OBDII plugin)** for details.

Using OBD2 adapter is the most convenient and recommended way of determining Gear ratio.

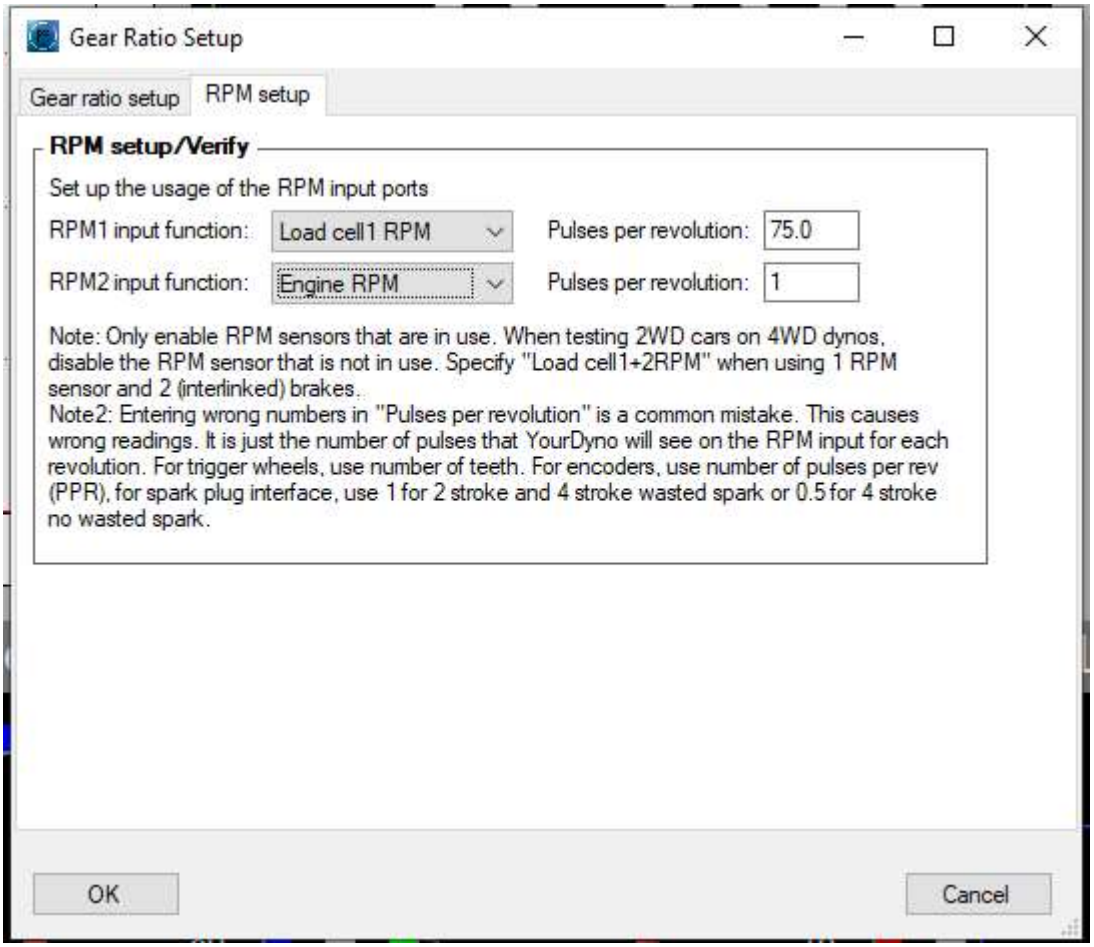
#### 12.3.2.3 RPM [CAN Tool] plugin

When using CAN bus adapter, the Engine RPM will be available to

#### 12.3.2.4 RPM2 input port. Engine RPM ignition clamp.

Select this setting (activate via RPM setup tab - see above: **Engine RPM**) when using external Engine RPM ignition sensing clamp.

Depending on the cylinder count, engine type, ignition type and location on the sensing clamp adjust the "Pulses per revolution" value in the RPM setup tab.:




#### 12.3.2.5 Manual

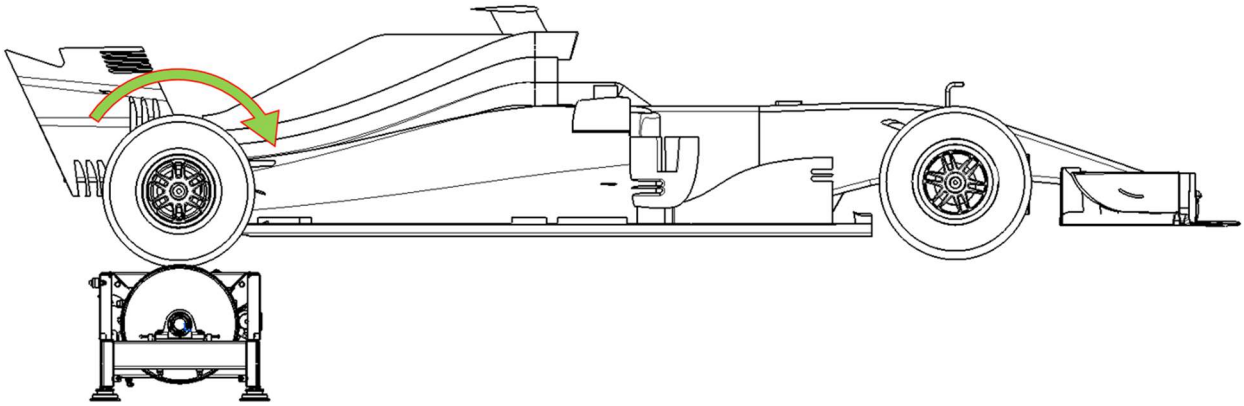
If you know the gear ratio, enter it in the manual mode.

## 12.4 Drive modes

### 12.4.1 Single axis dynamometer (2WD or motorcycle). Engine dynamometers

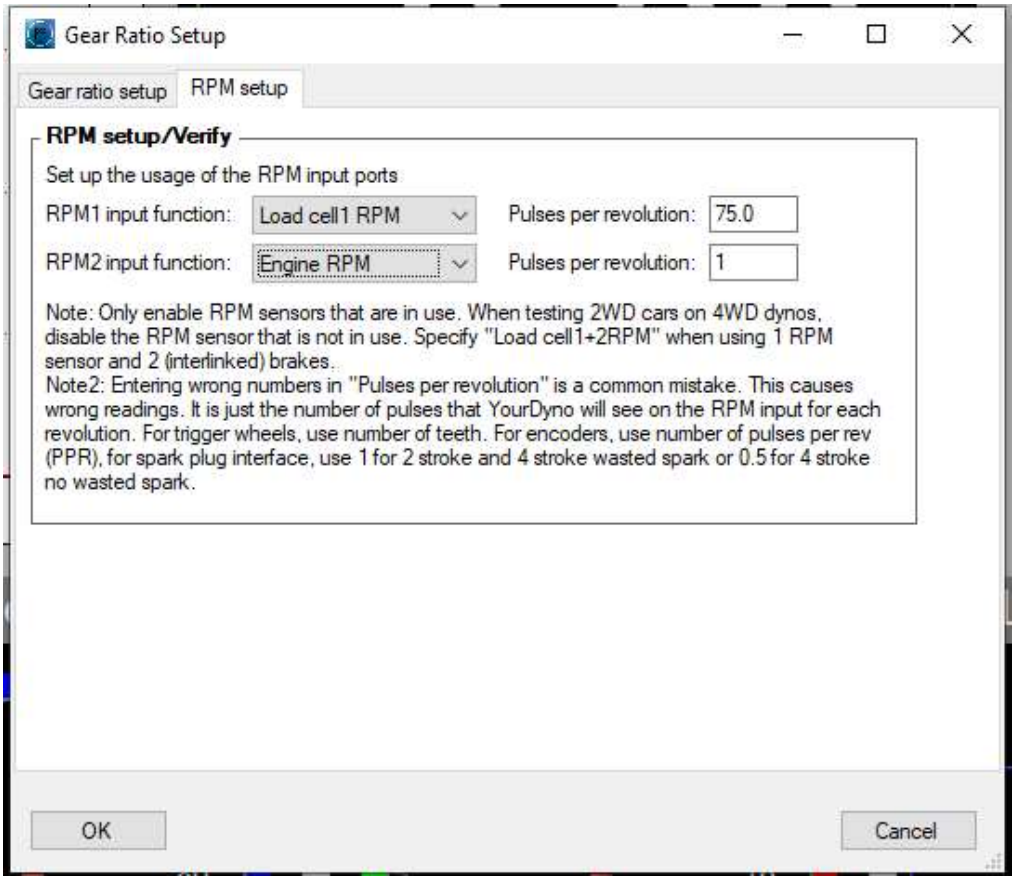
In this Drive Mode only one axis is driven by the vehicle. It does not matter if the front or rear wheels are driven because only one axis is braked and only one vehicle axis is rolling with the dyno.

This Drive Mode is applicable for all FWD or RWD cars, motorcycles and engine dynamometers.



In this use scenario the default settings are applicable without the need to change them at any time.:

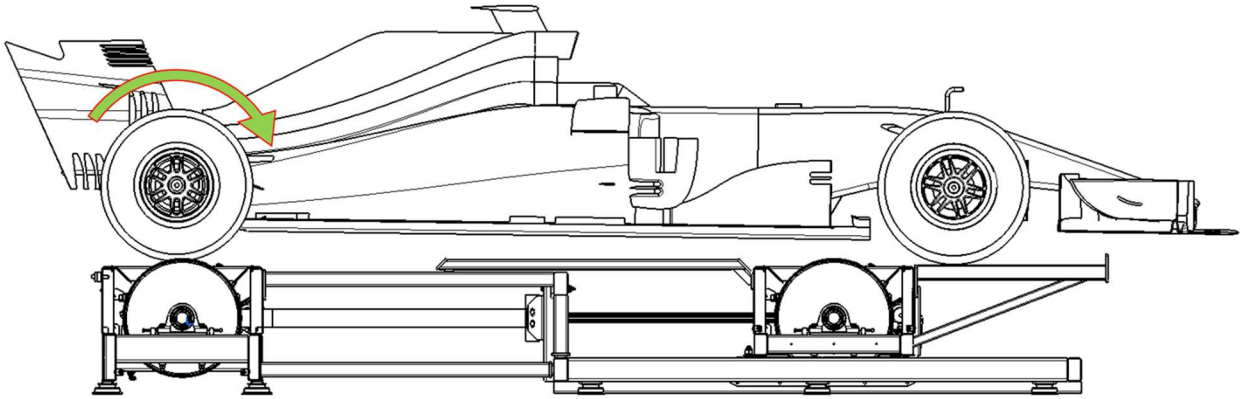
**RPM 1 input function** = Load Cell 1 RPM
**RPM 2 input function** = Not used or Engine RPM



### 12.4.2 AWD dynamometer –RWD Mode - only rear wheels are spinning

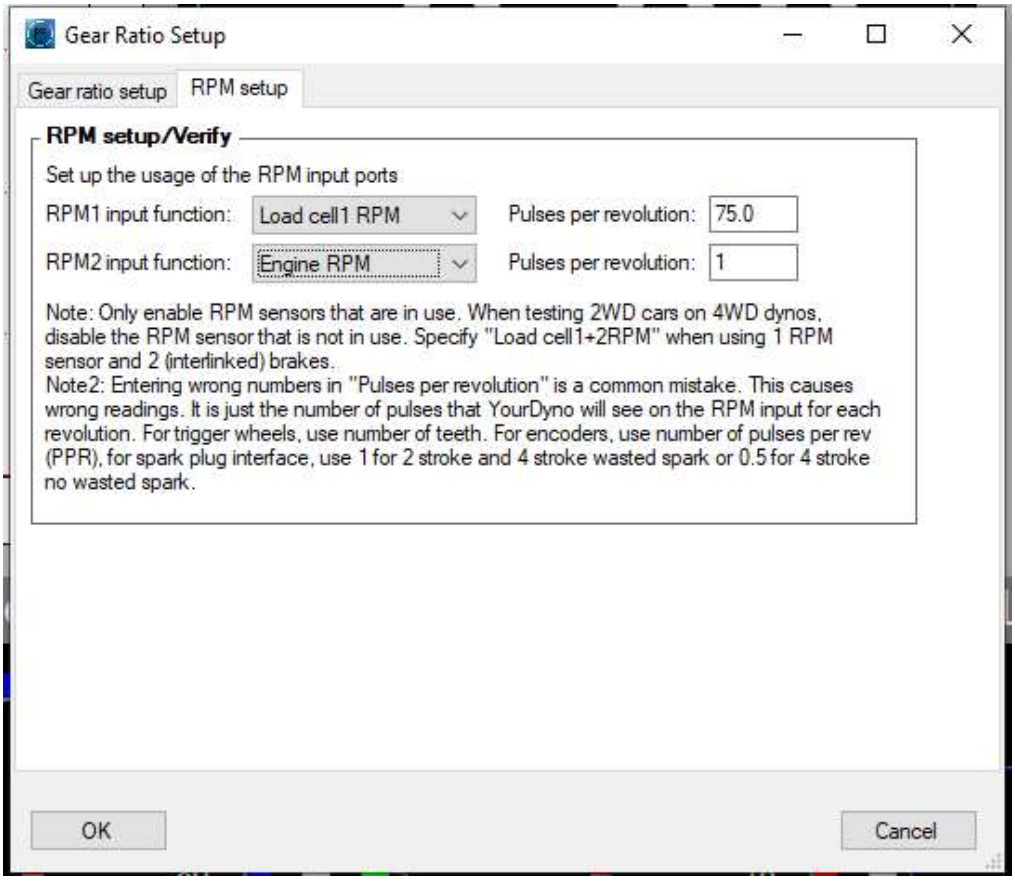
This applies to non-linked 4WD dynos

In this Drive Mode only the rear is driven by the vehicle and the other axis is not moving.



In this use scenario following settings are applicable (RWD):

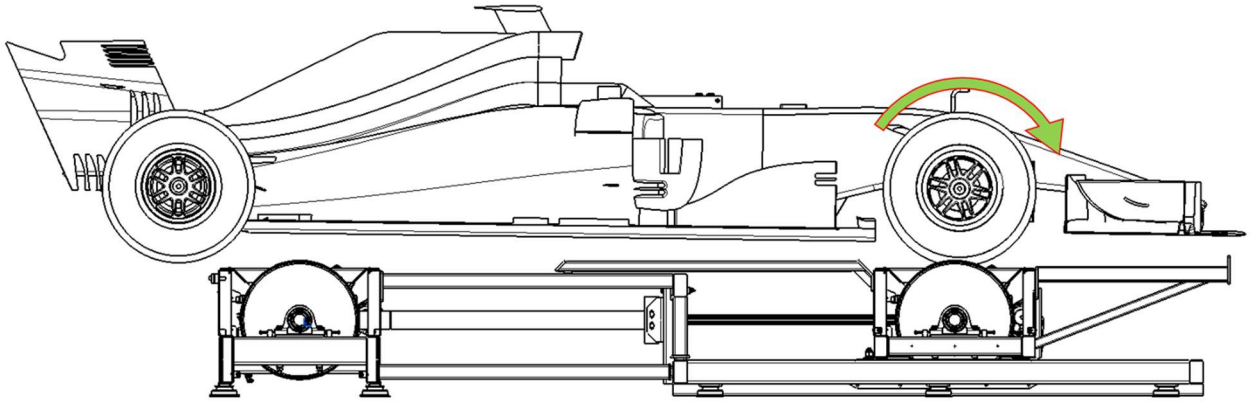
**RPM 1 input function** = Load Cell 1 RPM
**RPM 2 input function** = Engine RPM or Not used




### 12.4.3 AWD dynamometer - FWD Mode - only front wheels are spinning

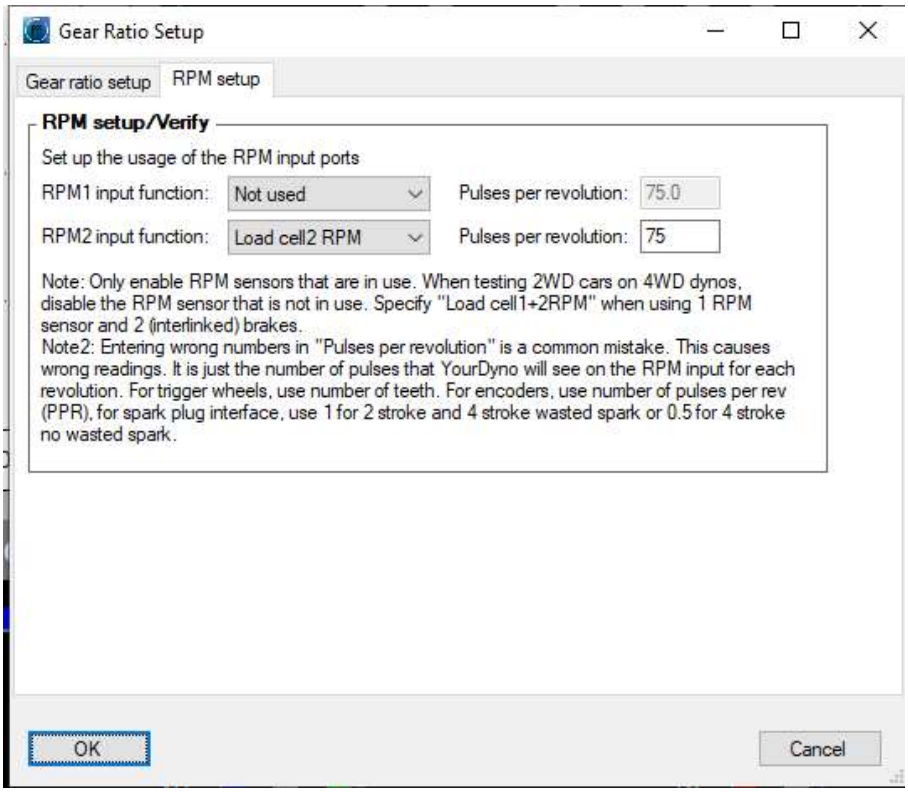
In this Drive Mode only the front axis is driven by the vehicle. The rear axis spins freely and is not braked. Rear wheels of the car are NOT spinning.

This Drive Mode is applicable for FWD-only cars.



In this use scenario following settings are applicable:

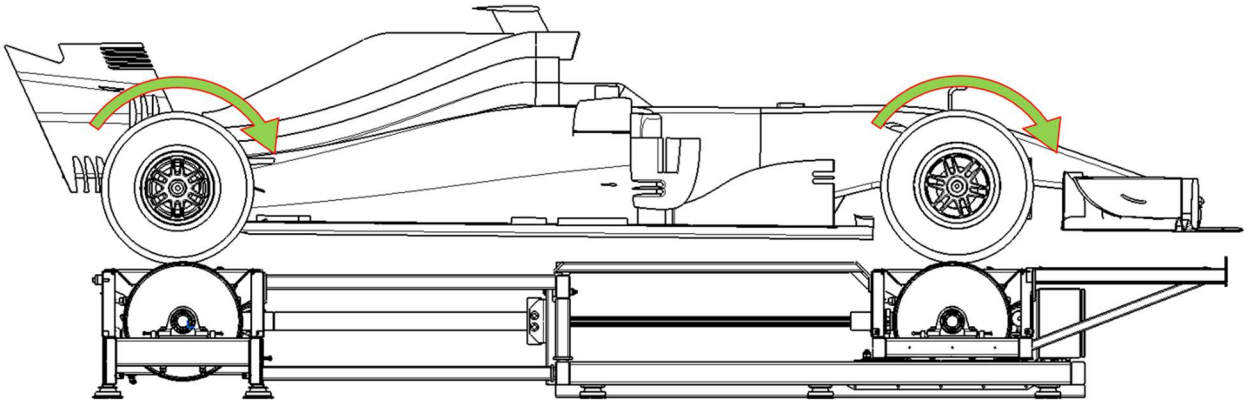
**RPM 1 input function** = Engine RPM or Not used
**RPM 2 input function** = Load Cell 2 RPM




### 12.4.4 AWD dynamometer - AWD Mode

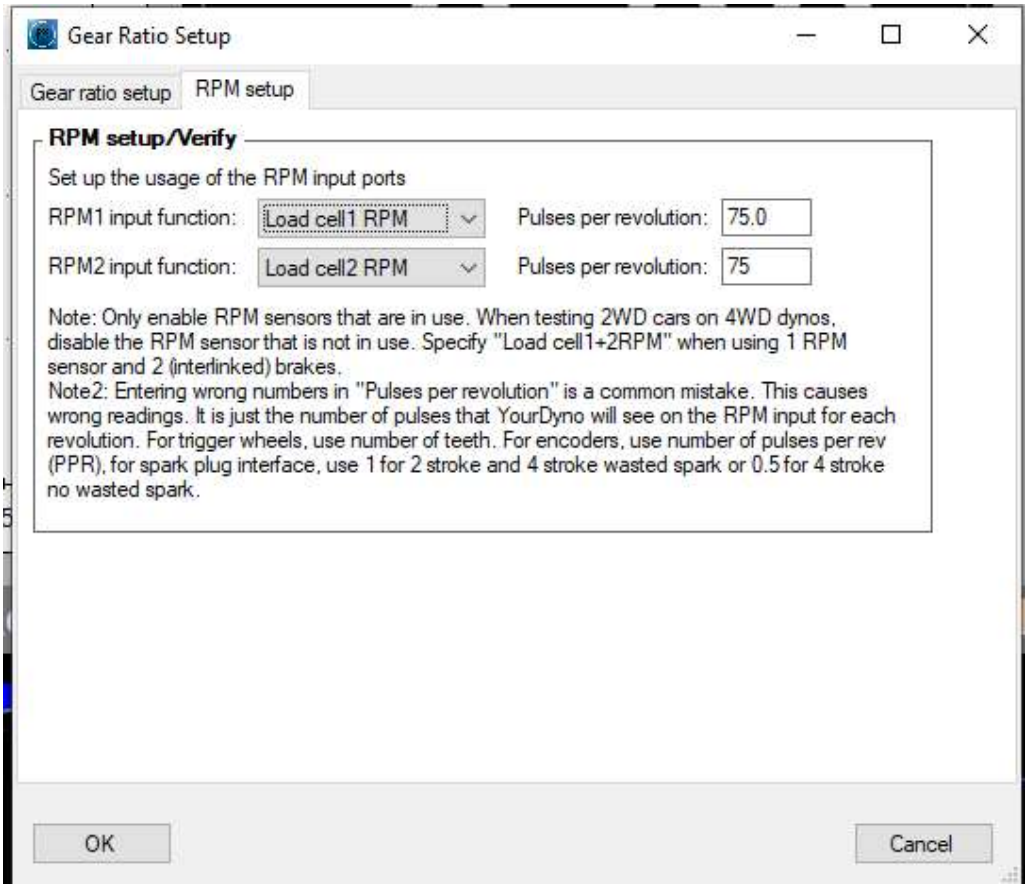
In this Drive Mode both front and rear axis is driven by the vehicle. Both dynamometer axles are braked. All vehicle wheels are spinning with the rollers.

This Drive Mode is applicable only for cars equipped with an AWD system.



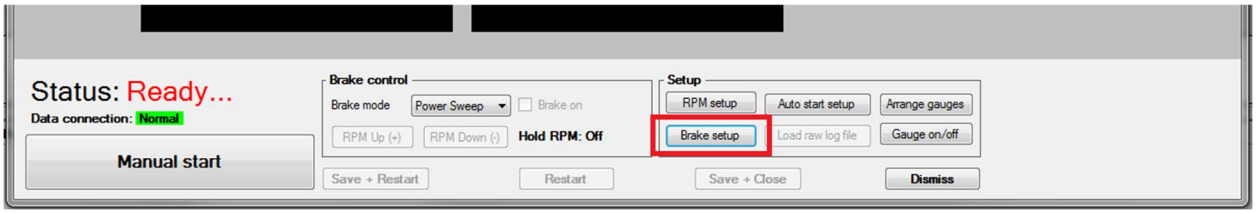
In this use scenario following settings are applicable:

**RPM 1 input function** = Load Cell 1
**RPM 2 input function** = Load Cell 2



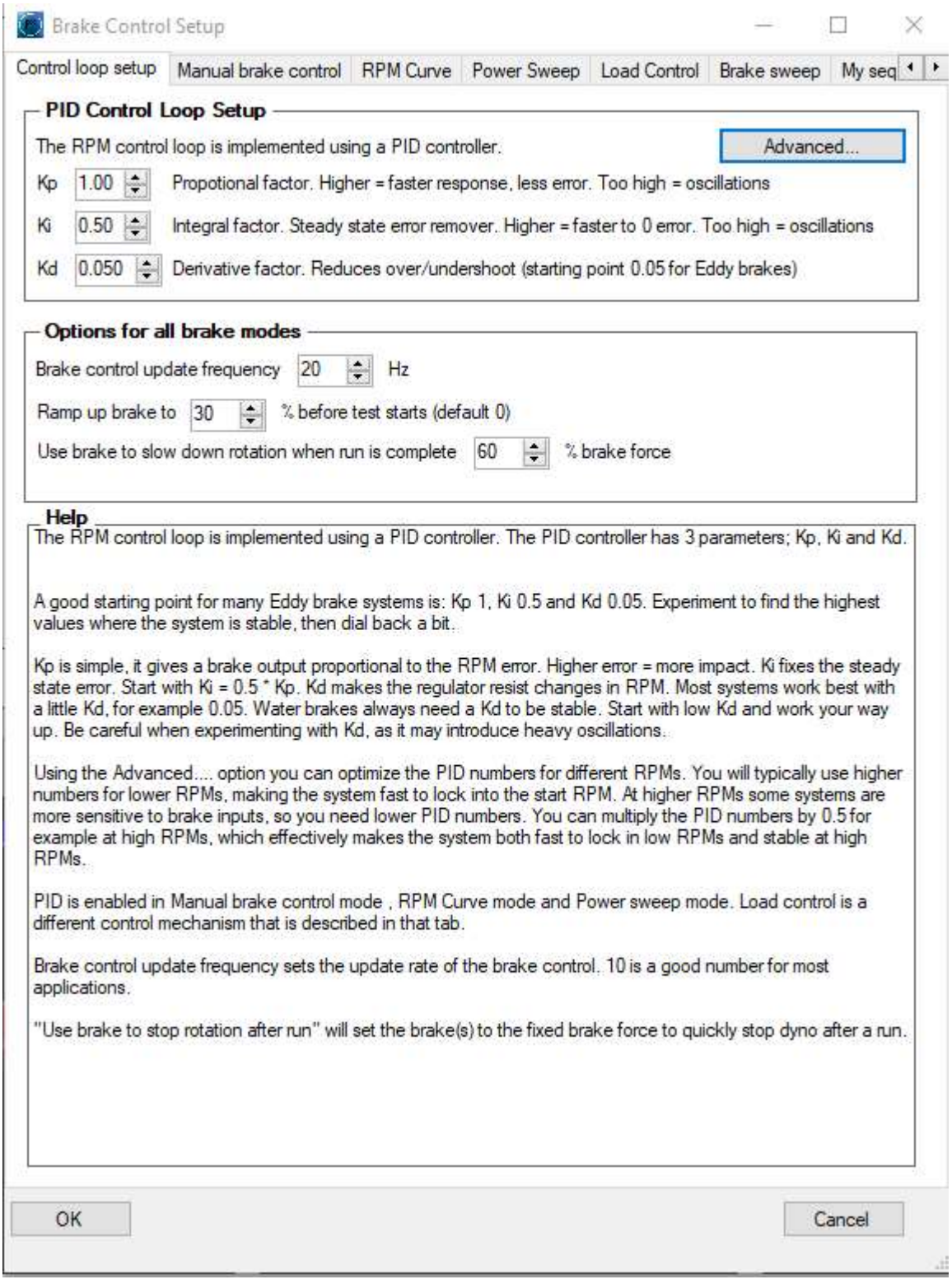
## 12.5 Brake Control Setup. PID settings

In this section you can setup the PID-Control for the brakes and set properties for different Brake Control / Test Modes. To open the Brake Control Setup please the "Brake setup" button in Run window:




### 12.5.1 PID control

To adjust the PID settings please navigate to "Control loop setup" tab in "Brake Control Setup" window.

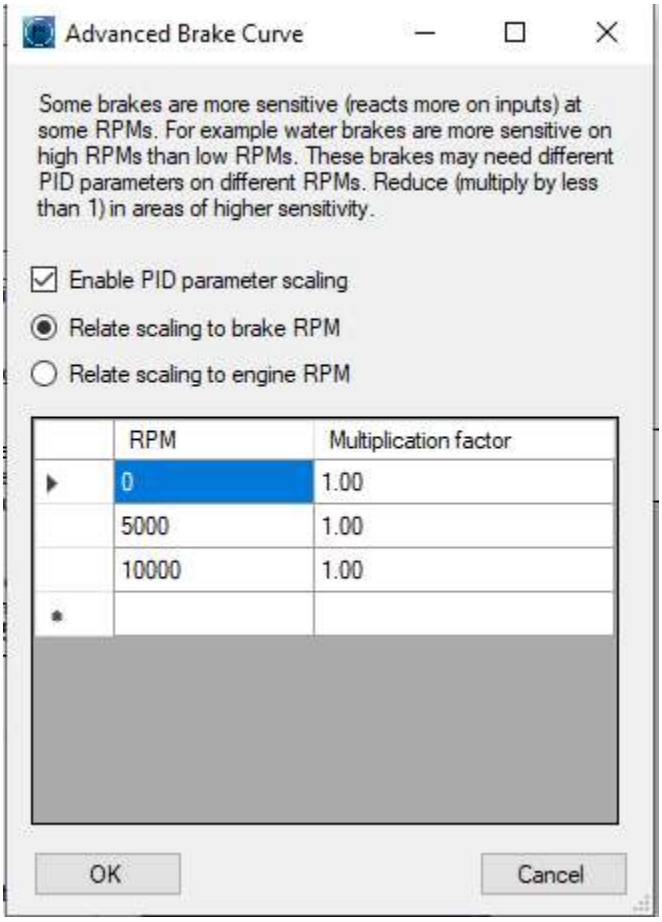

Brake Control Setup
Control loop setup
Manual brake control
RPM Curve
Power Sweep
Load Control
Brake sweep
My seq
PID Control Loop Setup
The RPM control loop is implemented using a PID controller.
Advanced...
Kp 1.00 Propotional factor. Higher = faster response, less error. Too high = oscillations
Ki 0.50 Integral factor. Steady state error remover. Higher = faster to 0 error. Too high = oscillations
Kd 0.050 Derivative factor. Reduces over/undershoot (starting point 0.05 for Eddy brakes)
Options for all brake modes
Brake control update frequency 20 Hz
Ramp up brake to 30 % before test starts (default 0)
Use brake to slow down rotation when run is complete 60 % brake force
Help
The RPM control loop is implemented using a PID controller. The PID controller has 3 parameters; Kp, Ki and Kd.
A good starting point for many Eddy brake systems is: Kp 1, Ki 0.5 and Kd 0.05. Experiment to find the highest values where the system is stable, then dial back a bit.
Kp is simple, it gives a brake output proportional to the RPM error. Higher error = more impact. Ki fixes the steady state error. Start with Ki = 0.5 * Kp. Kd makes the regulator resist changes in RPM. Most systems work best with a little Kd, for example 0.05. Water brakes always need a Kd to be stable. Start with low Kd and work your way up. Be careful when experimenting with Kd, as it may introduce heavy oscillations.
Using the Advanced.... option you can optimize the PID numbers for different RPMs. You will typically use higher numbers for lower RPMs, making the system fast to lock into the start RPM. At higher RPMs some systems are more sensitive to brake inputs, so you need lower PID numbers. You can multiply the PID numbers by 0.5 for example at high RPMs, which effectively makes the system both fast to lock in low RPMs and stable at high RPMs.
PID is enabled in Manual brake control mode , RPM Curve mode and Power sweep mode. Load control is a different control mechanism that is described in that tab.
Brake control update frequency sets the update rate of the brake control. 10 is a good number for most applications.
"Use brake to stop rotation after run" will set the brake(s) to the fixed brake force to quickly stop dyno after a run.
OK
Cancel

#### 12.5.1.1 Advanced PID settings

Almost all types of brakes/retarders have non-linear brake characteristic. This advanced PID control is especially useful on engine dynamometers as it allows implementation of non-linear PID control strategies of the brake.

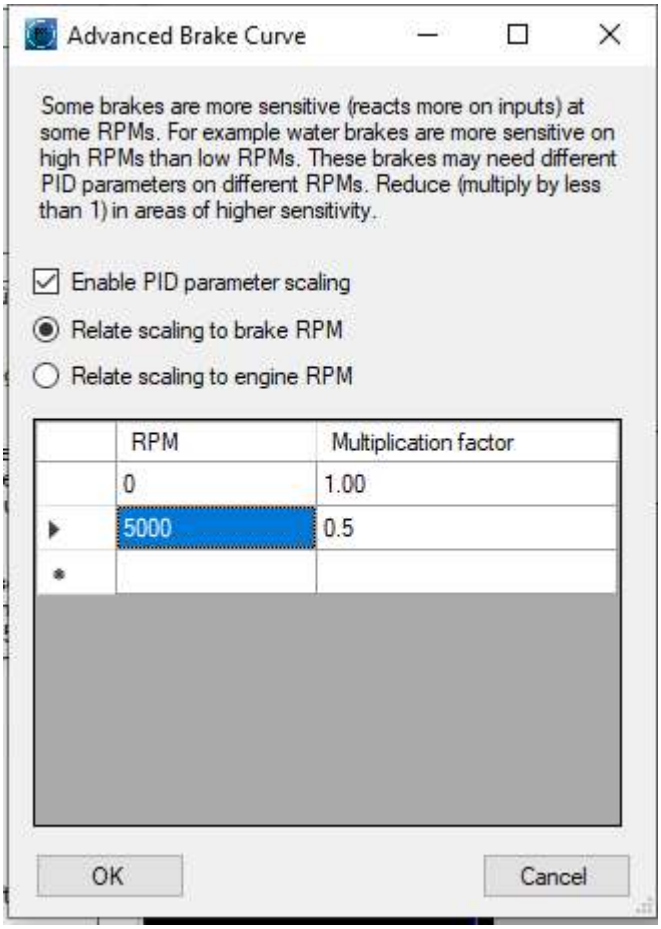
To enable Advanced PID control please press the "Advanced" button. A new window will appear. In this window you can set "Multiplication factor" for specific RPM-range thus changing the actual PID parameters "on the fly".

To use this feature please "Enable PID parameters scaling" checkbox.




**Example**

Setting "Multiplication factor" as follow:




will result in following PID parameters:

in range from 0 to 4999 RPM
Kp = 1
Ki = 0.5
Kd = 0.05

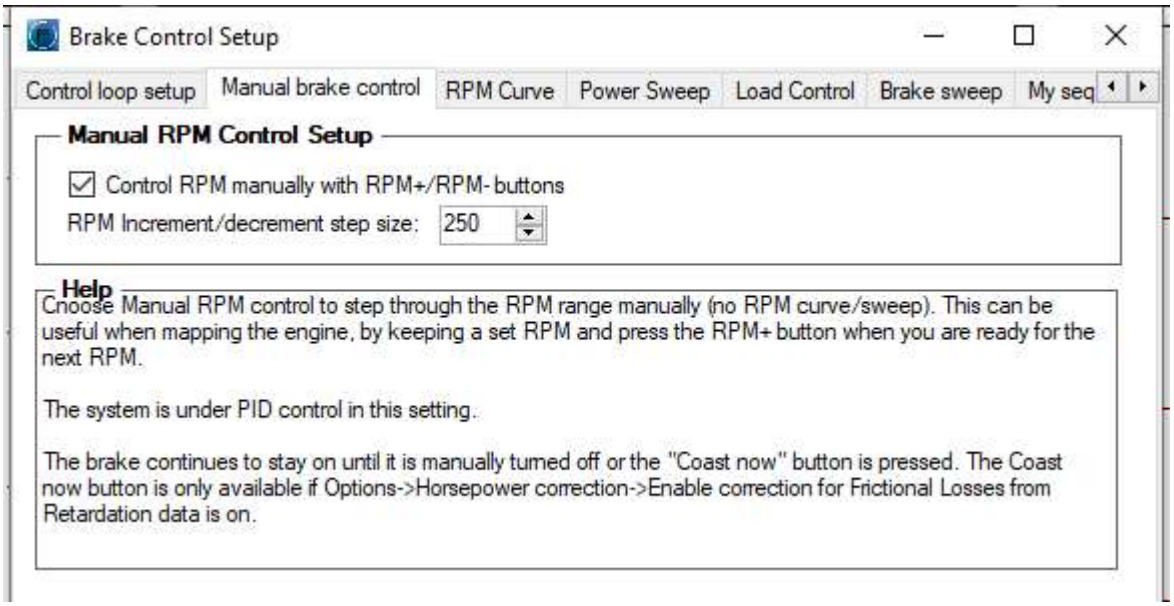
and in range from 5000 RPM onward the PID parameters get scaled to:
Kp = 0.5
Ki = 0.25
Kd = 0.025

## 12.6 Test Modes

### 12.6.1 Manual brake control. Manual RPM step test.

In the "Manual brake control" mode the YourDyno Software will hold the set target engine RPM regardless of engine load (throttle opening). Adjust the RPM increment / decrements step using the corresponding field.

How well the YourDyno controller will hold the target RPM depends on the PID settings used. Adjust the PID parameters if needed.



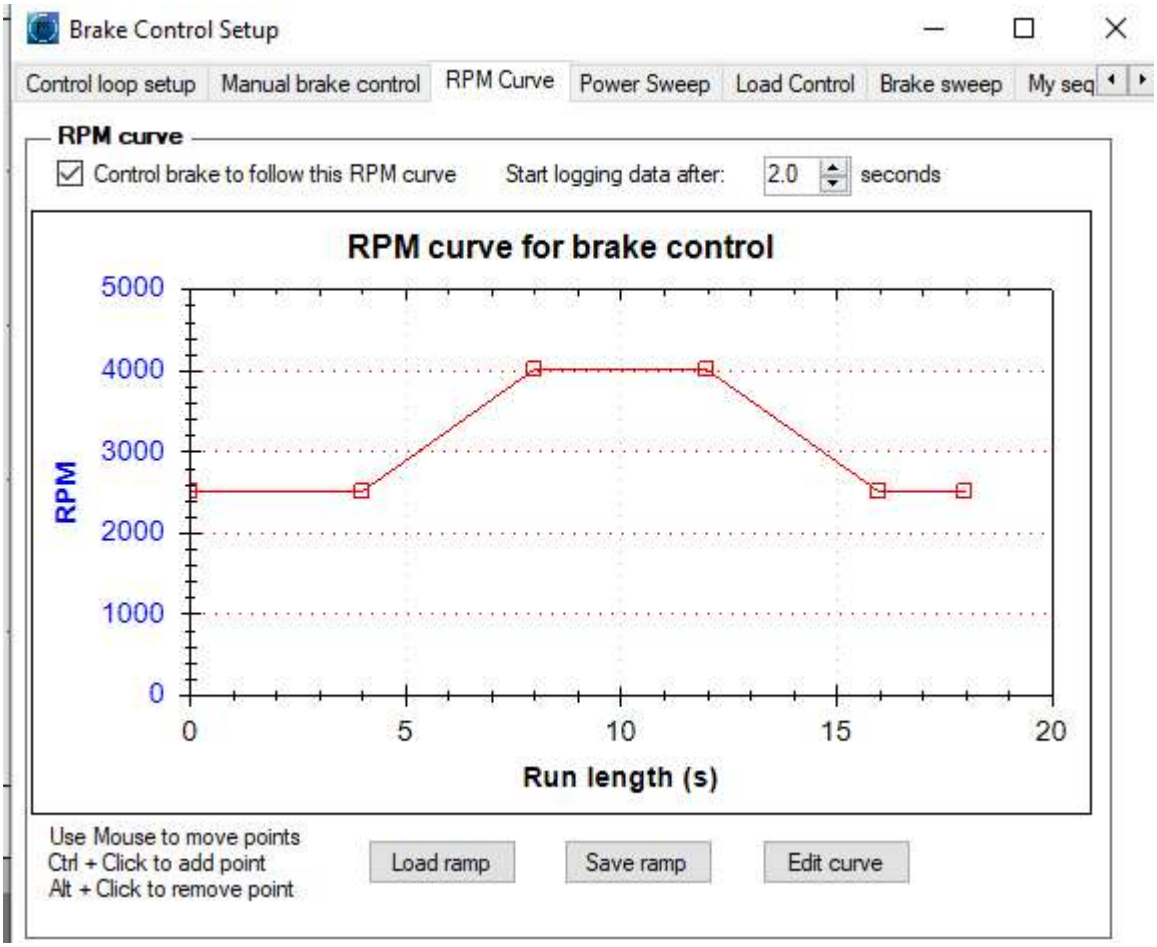

## 12.6.2 RPM Curve

### 12.6.2.1 Overview

In this test mode the YourDyno Software follows predefined Engine RPM target curve.

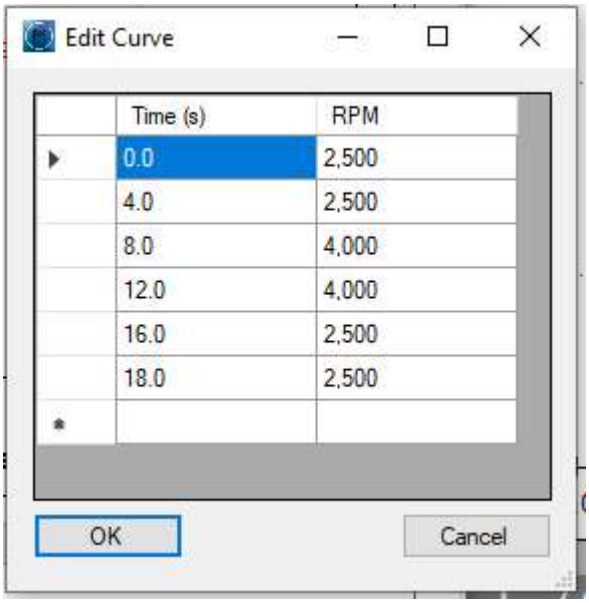
You may add multiple RPM targets to create a test profile.

Use mouse cursor to drag the RPM target points on the diagram.




Press "Edit ramp" button to open an RPM setpoint table and edit it manually.

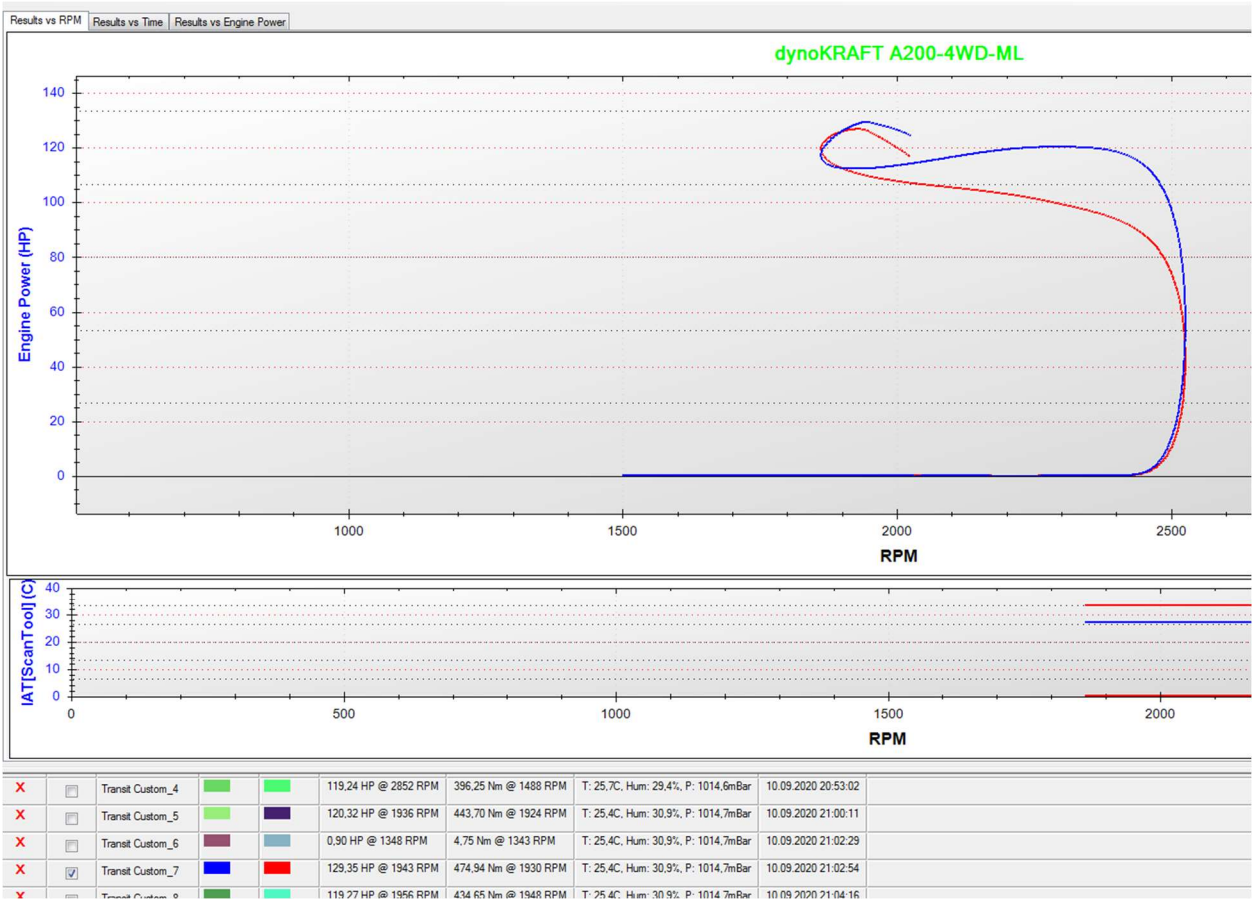
When editing the Time field use dot "." as decimal separator. When editing the RPM filed use only integer numbers.




Use "Load ramp" and "Save ramp" buttons to save and load RPM setpoint profiles from your hard drive.

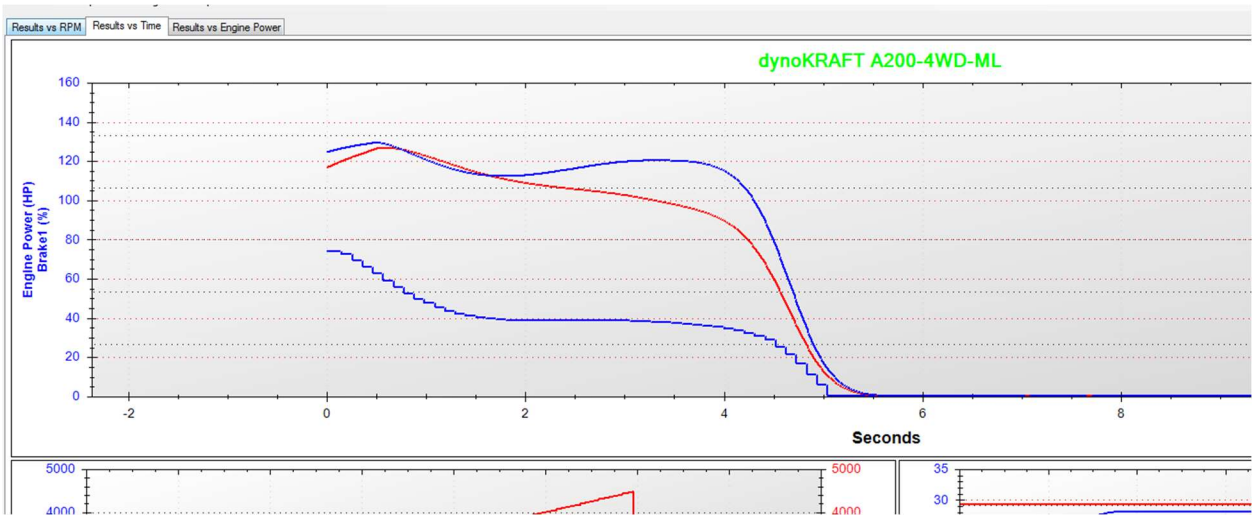
#### 12.6.2.2 Using RPM Curve to test diesel engines. Loops in RPM graph

Most diesel-powered cars will show significant torque at very low engine RPM. When testing such cars with standard Power Sweep with stabilization time it is not uncommon, that a characteristic "loop" will be visible in RPM-graph:




The reason for such graph shape is easy to explain.

In this example the tested car/engine delivers peak torque at 1500 RPM. During standard Power Sweep at the beginning of the test the engine RPM will be stabilized at Starting RPM setting. This stabilization normally is done under WOT condition. In other words, the stabilization phase is nothing more than constant RPM at WOT where the inertia effect is marginal. As soon as the sweep starts the brake releases the engine to allow acceleration (lower blue line in graph below):



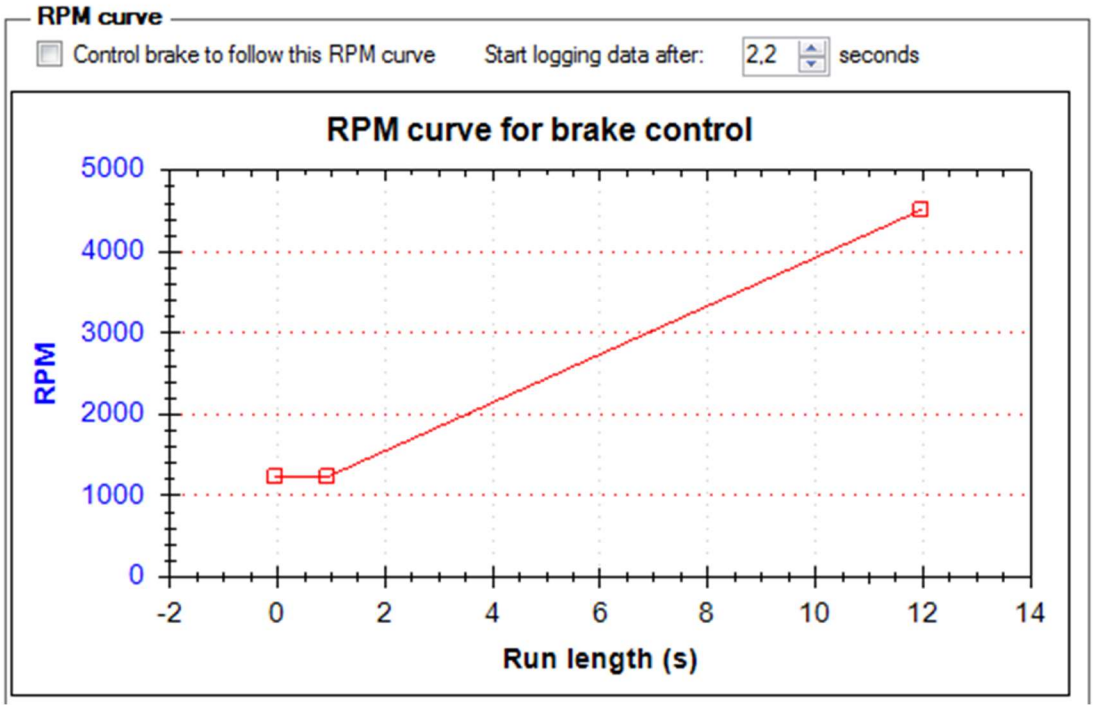

Allowing the car to accelerate introduces inertia effects - in other words power must be used to accelerate the rollers of the dynamometer and all rotating components of the car.

See: **Inertia compensation** chapter for more information.

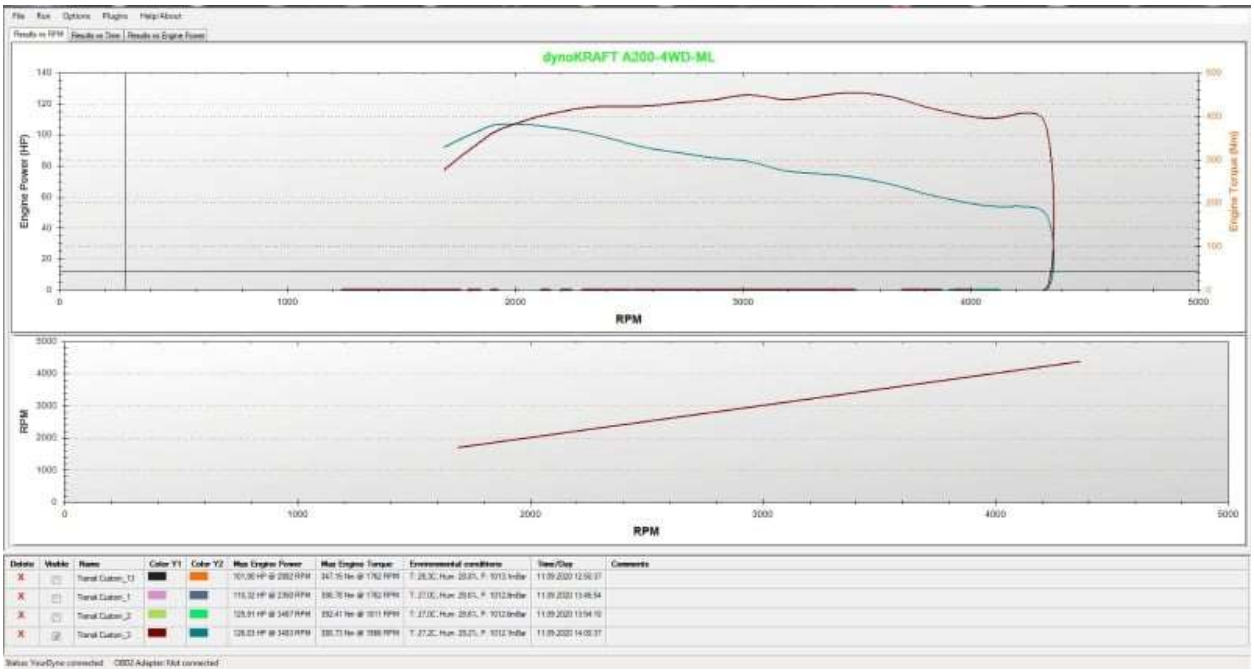
As a result, the power and torque reading will drop because part of the kinetic energy / power is transferred to rotating system. It is then measured as "negative" power/torque during coasting and measurement of friction losses. Because the Power and Torque drop is also accompanied by Engine RPM drop this characteristic loop is generated.

Avoiding such graph shape is possible when using RPM Curve instead of standard Power Sweep mode. Set the RPM Curve to desired Starting RPM and Sweep Rate, then postpone Logging of the Run to 2,2 seconds - in this example:
**Stabilization RPM at 1250 for 1,5 seconds**

Logging start at 2,2 second

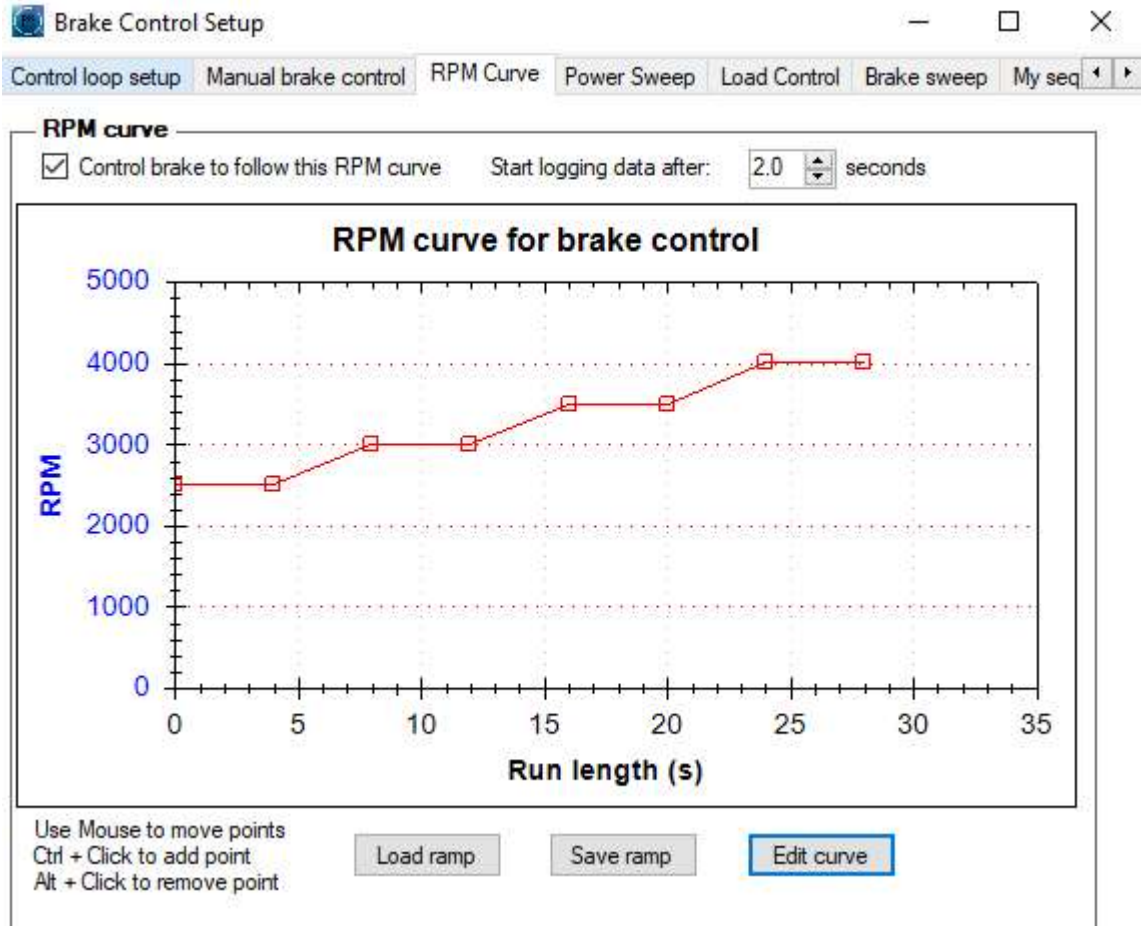



Such settings will result will postpone the logging of the Run to actual Sweep bypassing the Engine RPM stabilization phase and generate clean graph:




### 12.6.2.3 Automatic RPM Step test

You can use the RPM Curve mode to perform semi-automatic RPM Step tests where the YourDyno Software will increase the Engine RPM target after specified time.



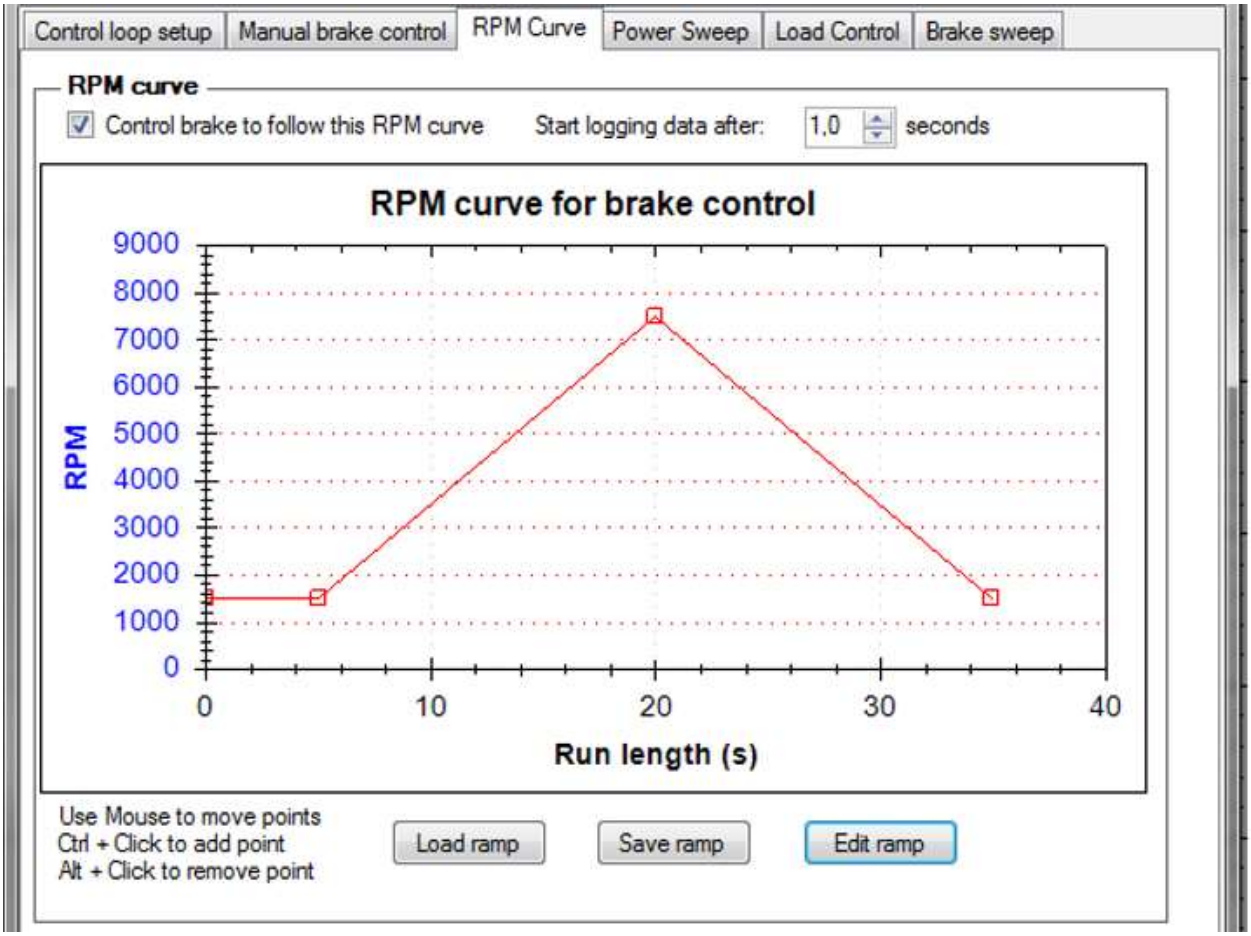

### 12.6.2.4 Double-Ramp test. Inertia compensation

A Double-Ramp test is used to perform MOI compensation for unknown dynamometer.

During this test the vehicle / dynamometer performs controlled acceleration and deceleration using same rate. As a result, an MOI (moment of inertia) compensation of the dynamometer + vehicle system can be performed.

Please refer to this video for more information:

https://www.youtube.com/watch?v=0RVmxpCk0SE



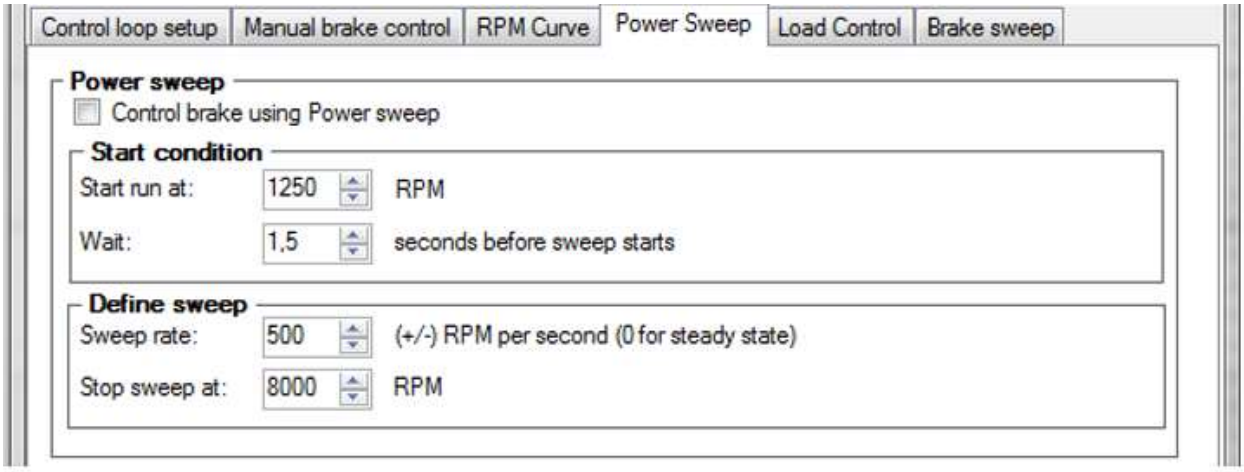

### 12.6.3 Power Sweep

The Power Sweep Test Mode is the typical acceleration test performed to measure the Engine Power and Torque and draw the known "normal" dyno graph. In this Test Mode the acceleration rate (Sweep rate) defines how fast the Engine RPM will increase.

In the "Start condition" section you can define the starting Engine RPM and wait time (preload time). The preload time is used to allow build-up of induction pressure in engines equipped with forced induction (super-charged / turbo-charged engines)

In the "Define sweep" section select the desired Sweep rate in RPM per second and Stop RPM.

Set the "Stop sweep at" RPM approximately 250-500 RPM below the vehicles RPM-limiter.



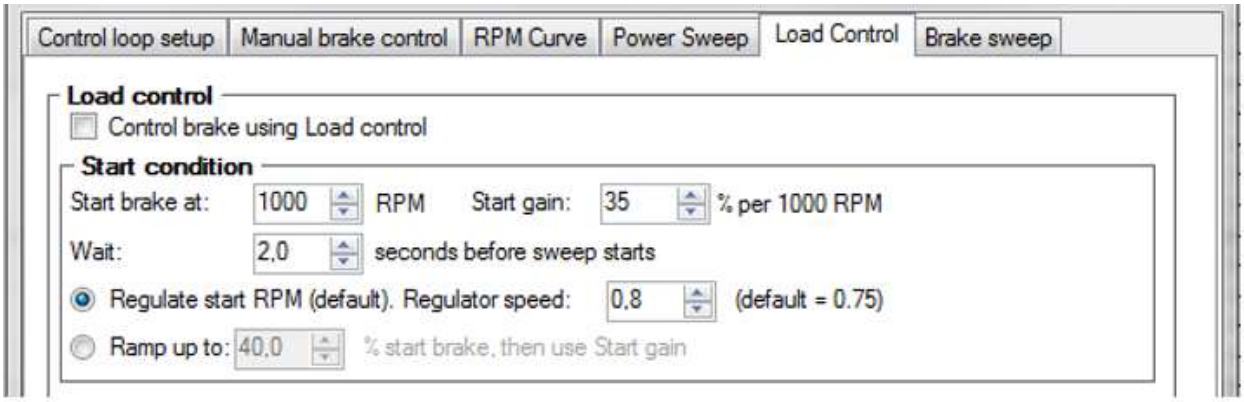

### 12.6.4 Load Control

This advanced Test Mode allows progressive Engine RPM control based on brake output gain and engine RPM gain speed factors. It is especially useful with Water Brakes or when the tested engine has very fast torque increase which can cause oscillations when using standard PID regulator.

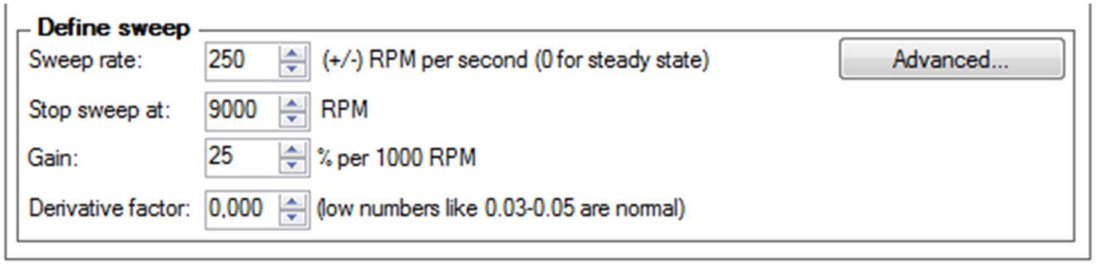
To use this mode set the "Start brake at" engine RPM target and "Start gain" brake output in %.

Set the "Wait" time (preload time) before Sweep starts.

Use the default "Regulate start RPM" setting, or use the Ramp up brake for non-regulated startup.



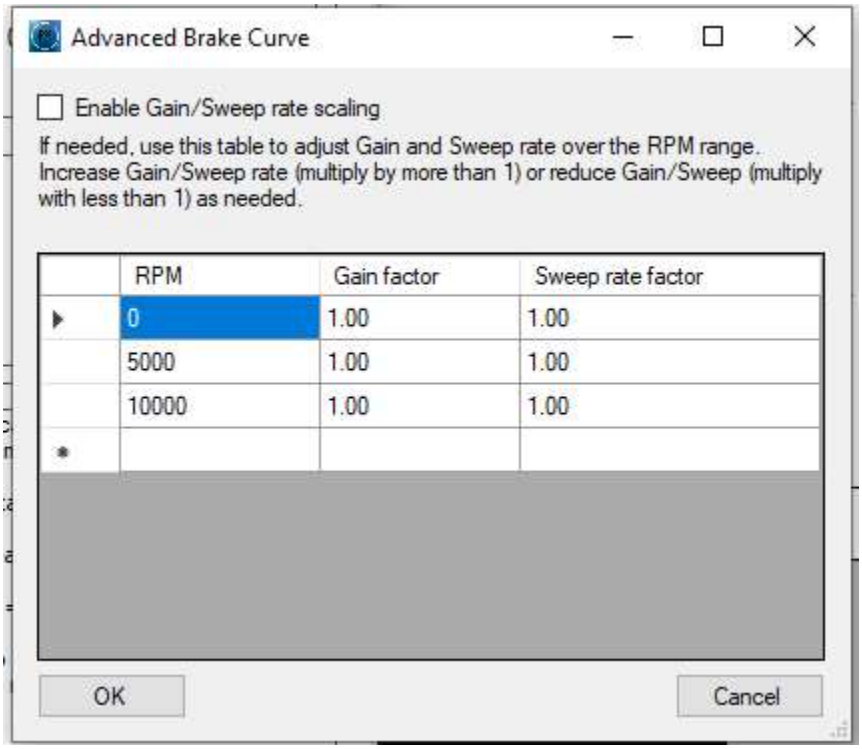

Adjust the sweep settings in "Define sweep" section.




The "Load Control" Test Mode will control the brake output according to selected "Gain" in %

This means that the brake output will increase by specified % when the engine RPM increases by 1000 RPM.

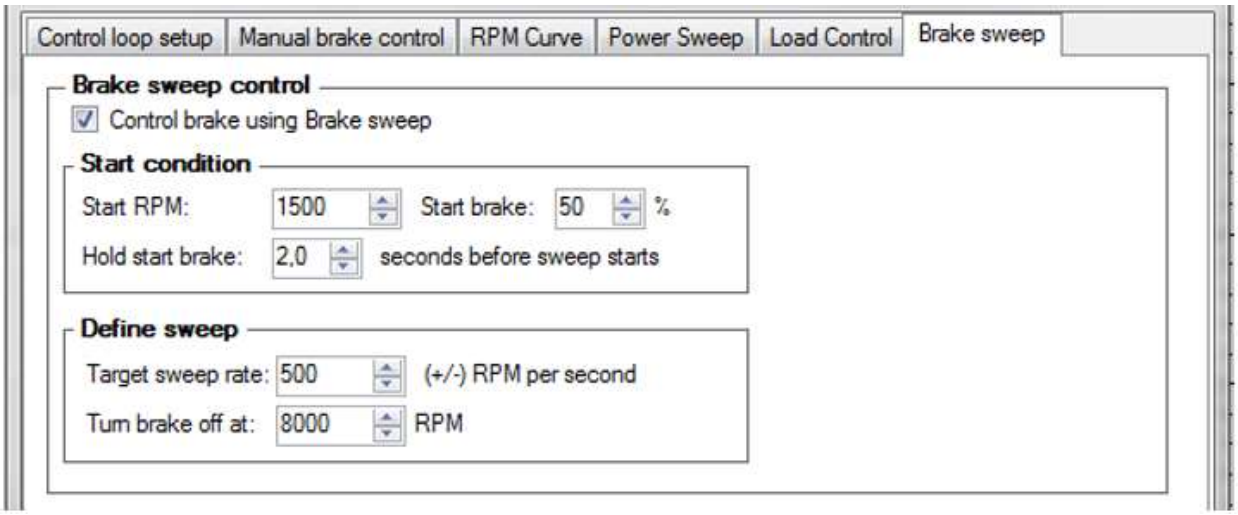
Under "Advanced" button you can change the "Gain factor" and "Sweep rate factor" multiplications - similarly as in "Advanced PID settings"




### 12.6.5 Brake sweep

This test mode was designed especially for hydraulic brakes. In this Test Mode the brake output is gradually increased or decreased without the use of PID control. This means that the target sweep rate and actual engine RPM may vary as the Brake Sweep mode will not try to stabilize the engine RPM - instead it will only gradually increase brake output from the "Start brake" value.

The benefit of this Test Mode is that because no PID control is in use the system will not generate any oscillations.



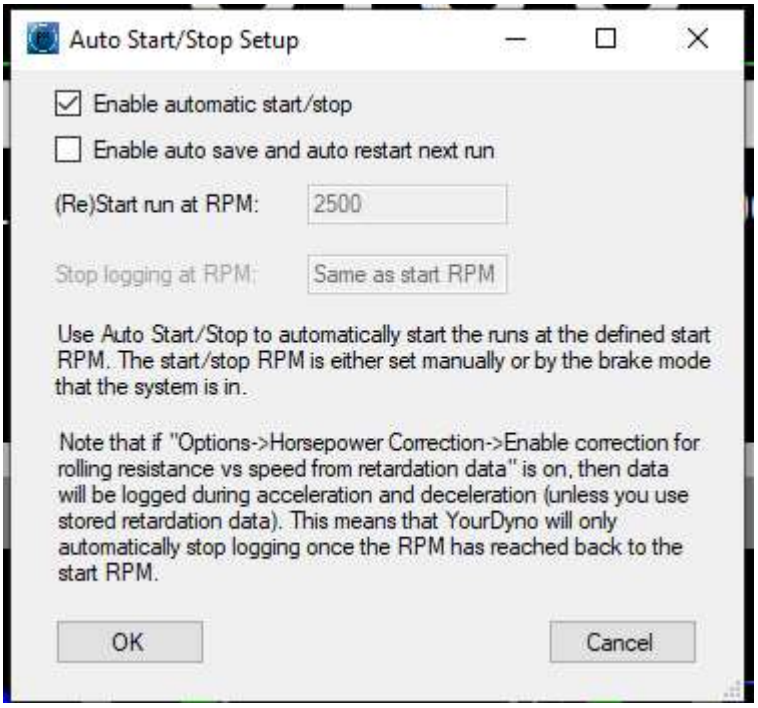

Note that most hydraulic dynos work best from high to low RPM. To enable this, set the Target sweep rate to a negative number, for example -500 RPM per second.

## 12.7 Auto start stop

### 12.7.1 Automatic recording of test Run

This function allows automatic recording of test Run. Use the corresponding tab in "Brake setup" window to adjust the "(Re)Start run at RPM:" value.

When Retardation data (Friction losses) measurement is ON the recording of the test Run will stop only after the engine RPM has dropped back to Starting RPM value.

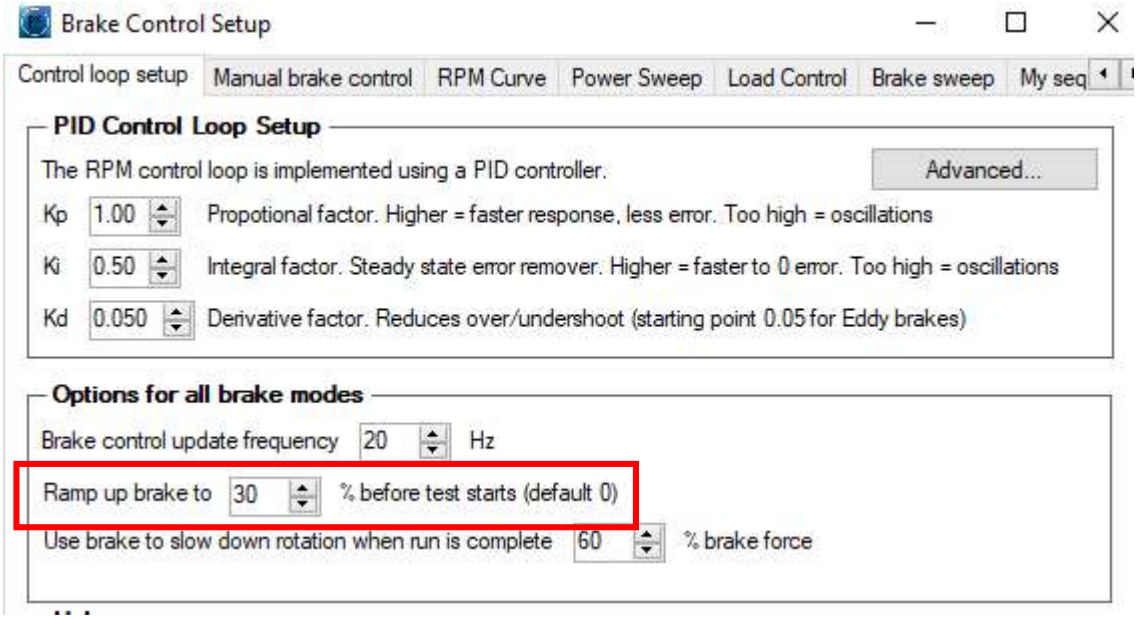



## 12.8 Brake control update frequency

The brake can be controlled (adjusted) up to 20 times per second. Higher frequency = tighter control but more CPU intensive.

## 12.9 Ramp brake up

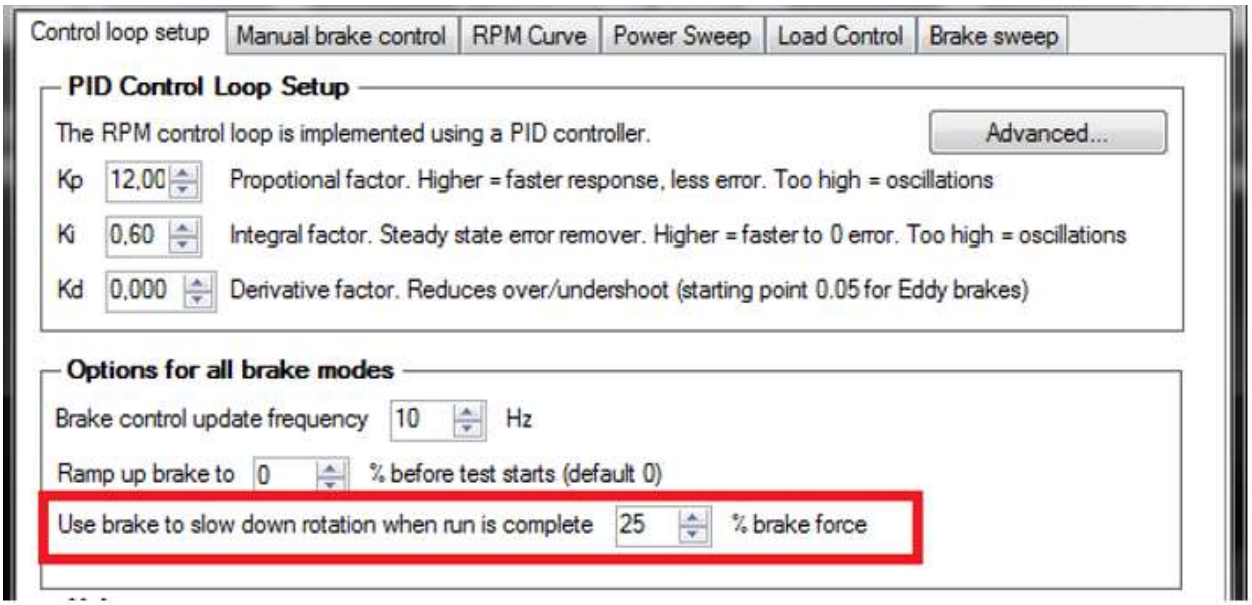
It is recommended to use ramp the brake up as it reaches the start RPM. This will ensure a lower overshoot since the brake that is already engaged. When the brake % is set roughly right, you don't need any stabilization period before the sweep and data recording start.




## 12.10 Use brake to slow down rotation after run

Using the brake to slow down the dynamometer after a run in is complete will have effect only when recording is complete. When measuring Retardation data, the brake will only turn on after the retardation recording is complete.

To enable this feature please set the desired Brake output in % in the "Control loop setup" tab in the "Brake setup" window.



## 12.11 Automatic MOI test

The automatic MOI (moment of inertia) test is used to determine the complete system inertia (dynamometer + vehicle).

The MOI setting is base for all result evaluation thus it is recommended for all users to perform the automatic MOI test for all vehicles prior to actual power test. This test is performed using two coast-down phases: first un-braked and second braked. From the difference in de-acceleration of the vehicle between these two tests the software will calculate the system MOI.

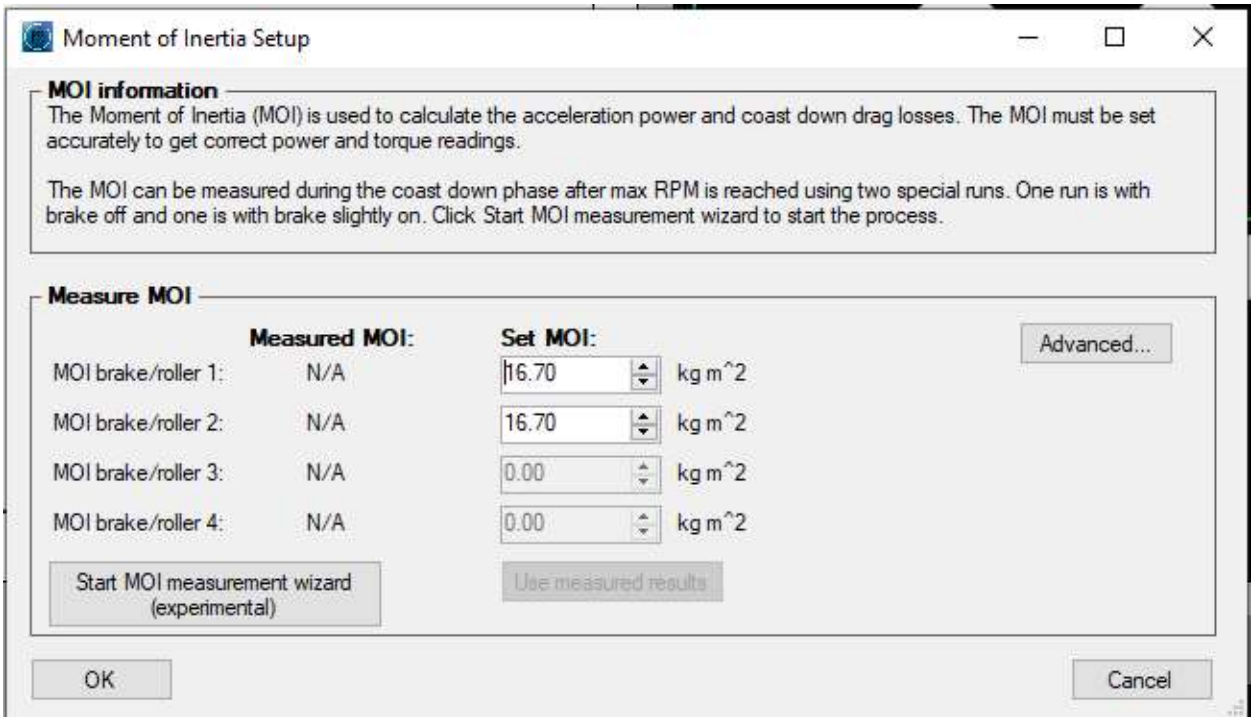
Please note that this calculated MOI takes following losses into account:

- friction losses in drive-train
- friction losses between roller and tire
- friction losses in dynamometer

As with any other roller-dynamometer there are still some losses which cannot be measured during such procedure (for example hysteresis of elastic components and power losses in drivetrain).

### 12.11.1 Automatic MOI test procedure

1. Start a "New Run + Record new retardation data".
2. Setup "Power Sweep" mode as you would do normally. Make sure that the "Stop sweep at" RPM is set below actual RPM limiter in vehicle. Setup sweep rate at 500 RPM/s. It is important that recorded test will end with the "Coasting" state at the end of the test run.
3. In the Run window please open the "MOI setup" wizard and press "Start MOI measurement wizard".



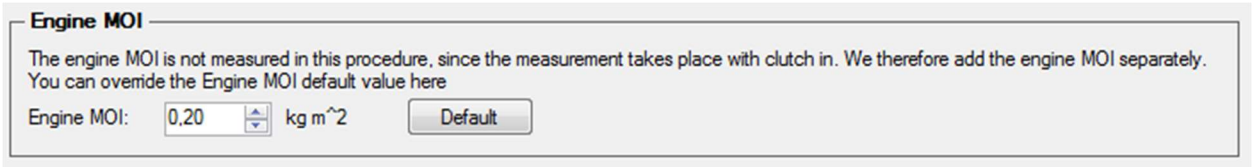

4. After pressing the start button the Wizard will ask you to perform two test runs. It is not necessary to perform these tests under WOT conditions. However, you **must** reach the "Stop sweep at" RPM such that the status change from "Logging" to "Coasting". Alternatively, press the manual Coasting button.
5. At the end of second test the wizard will show you determined MOI value. You can now decide if you want to use this value for actual power measurements.

It is recommended to use the Manual Coasting button (space bar) to ensure that the dyno goes into coasting mode exactly at the same time as the clutch is pushed in.

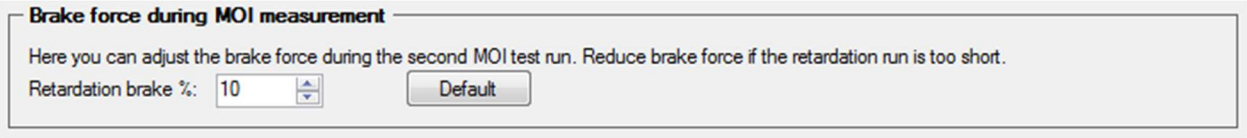
#### 12.11.1.1 Advanced options

Since the automatic MOI test takes place during coast down phase (clutch pressed or automatic gearbox in N) you can use the Advanced Settings to include Engine Inertia in the calculation.

If you are not sure what value to use, please leave the default setting.



Should the second coast down phase be too rapid or too slow please adjust the retarder output accordingly.




In case your dyno has substantial inertia (recommended is over 50 kgm²) you can use the single retardation run test. In this test version only one coast-down phase is needed to measure MOI - the first part of the coast-down phase is not braked while the second is.