

dynoKRAFT

*dynoKRAFT
easyMAP
v. 0.9.x*

User Manual

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Original User Manual for dynoKRAFT easyMAP software.

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2. Warranty & Disclaimer

VISION ENGINEERING e.K., hereafter referred to as dynoKRAFT, Warranty obligations are limited to the terms set forth below.

dynoKRAFT warrants this product/software against defects in material and workmanship for the period of one (1) year. The warranty period begins with the date of original retail purchase (invoice date).

This limited warranty is made only to the original end user purchaser ("you") of the product and does not extend to any subsequent purchasers or owners of the product. The "original end user" is the first user to put the product into service in any fashion. It is your responsibility to establish the warranty period by verifying the original purchase date.

If you discover a defect, dynoKRAFT will, at its option, repair or replace the whole product or any part of the product with a new or reconditioned product or part at no charge to you, provided you will make your warranty during the warranty period. Please attach your name, address, telephone number, and a copy of the invoice as proof of date of original purchase, as well as a detailed description of the problem for which service is requested.

You are responsible for packing the product/part to be returned or repaired or replaced if you wish to execute the warranty claim by Post. If the repairs are covered by the Limited Warranty and if the product was properly shipped to dynoKRAFT, dynoKRAFT will pay the return shipping charges.




This warranty applies only to dynoKRAFT products. This warranty does not cover damaged resulting from accident, misuse, abuse, or neglect and/or damage during any type of transportation resulting from improper packaging; damage to any product which has been altered in any fashion, including damage resulting from causes other than product defects, including and not by way of limitation, lack of technical skill, competence, or experience of the user, and/or failure to use and service the product in accordance with the instructions provided in the User's Manual or Installation Manual; and service performance by an unauthorized person or entity. Any implied warranties including fitness for use and merchantability are limited to the period of the expressed warranty set forth above. The remedies provided under this warranty are exclusive and in lieu of all others.

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3. Warnings

3.1. Conventions used in this manual

The conventions used in this manual are designed to protect both user and equipment and to assure a safe work environment.

Convention / Symbol	Description
	Warning indicates potential hazard or harm which may occur to the person and/or dynamometer equipment while performing a procedure.
	Caution means that not performing or incorrectly performing the described procedure may result in dynamometer equipment damage.
	Advice gives user additional useful information.

3.2. Precautions and dynamometer safety

Your dynoKRAFT engine dyno is a safe and proven way to test the engines performance in a repeatable test conditions. To assure problem free operations you should note these precautions and use common sense at all times!

Engines exhaust gasses.

Always assure proper dyno room ventilation and use engine exhaust extraction system which is adequately scaled to remove all exhaust gasses from the room in which people are working. Fail to do so may result in serious hazard to dyno room operators and will impact engine's performance.



Carbon monoxide / Toxic gasses

Combustion engine exhaust gasses contain toxic carbon monoxide. Breathing it can cause death. Always operate the dynamometer in well ventilated area.
Always use exhaust gasses extraction system during test runs.

Noise and debris.

Keep in mind that running an vehicle test at high RPM and / or load will create a noisy work environment which may affect one's ability concentrate on task he's performing. Prolonged exposure to noise may result in head ache or nausea.

Always use eye protection to avoid eye damage from any debris or dirt which may be found in the air either because of extensive room ventilation or due to equipment or vehicle damage.



Excessive noise / Eye damage

Always use eye and ear protection while working with dynamometer. Fail to do so may result in serious health issues, hearing loss or visual impairment.

Rotating parts.

All rotating parts are potential source of serious accident. Therefore always operate the dynamometer with all coverings properly installed. Use additional covering or protection to secure any visible parts of the engine or dynamometer if required. Always wear tight sleeved clothes to avoid getting dragged by any rotating parts.



Rotating parts

Never operate an dynamometer without properly installed coverings. Always use cloths with tight sleeves. Fail to do so may result in getting dragged by rotating parts or components.

Heat.

During an dynamometer test and substantial amount of heat will be generated by both the engine and dynamometer equipment. The air temperature in the dyno room will rise gradually. Additionally some surfaces of the combustion or electric engine may get very hot.

dynoKRAFT is encouraging dynamometer operators to use an infrared thermometer to check if the surface temperatures are in safe range. Temperature above 55°C is considered harmful.



Hot surfaces

Avoid touching of hot surfaces during and after the dynamometer tests. Some areas of combustion engines such as exhaust system can get extremely hot and touching them may cause severe tissue burn.

Electric power, compressed air

The dynoKRAFT dynamometer are operated using electric power and compressed air. Do not remove any covering panes, perform any service or repairs or open any electric cabinets under power.

Any repairs or service which requires accessing the dynamometers electrical system must be performed by qualified electrician.



Potentially lethal voltages

Never perform any service or remove any protective panels or open electric cabinets without previously disconnecting the main AC power cord.

Always wait min. 15 minutes after turning off the dynamometer main switch to allow for complete discharge of electromagnetic coils of the Eddy Current Brake.

Fail to do so may result in lethal electric shock.

Before performing any service operation or repairs to pneumatic components always release the pressure from the pneumatic system. Please follow service procedures described below on details how to release the pressure.



Eye damage

Always use eye protection while working with dynamometers pneumatic systems. Fail to do so may result in serious eye damage and visual impairment.

General precautions

Always keep minimum safe distance while working with dynamometers so that in case of equipment or engine failure, fire or other hazard the risk of accident is minimized.

Excessive noise or vibration of dynamometer usually indicates serious fault and should be directly solved.

Always verify emergency brake operation before using your dynamometer.

Before performing any tests always verify if the dynamometer and vehicle you're about to test are properly secured.

Ensure that both the dynamometer and vehicle you're testing are sufficiently cooled.

Never perform any servicing of the dynamometer unless explicitly recommended in manual.



Risk of equipment damage, potential safety hazard

Not obeying to these rules may result in equipment damage, potential safety hazard to dynamometer operators and can result in loss of warranty.

4. INTRODUCTION

4.1. What is easyMAP?

The dynoKRAFT easyMAP software was created as a response to the demand for efficient and easy to use mean of calculating required fueling correction based on lambda values analysis.

The easyMAP software is using data files (.csv) exported from SportDyno 4.x software to quickly calculate required fueling correction for any vehicle.

4.2. Lambda vs. AFR

The "Lambda" and "AFR" are both indicators of so called air-to-fuel ration. Although most people think they are interchangeable there's a vast difference between them.

The Lambda indicates a ration between fuel and air in mixture while AFR is directly defining the amount of air in correlation to fuel.

In other words the stoichiometric mixture for any fuel type will always have $\text{Lambda} = 1$ and $\text{AFR} = ???$.

Therefore it is much easier to work with Lambda values instead of AFR because you can use same lambda-targets regardless of what type of fuel you are running.

For that reason the easyMAP was designed preliminary with lambda in mind. Although the software is capable of calculating the AFR values dynoKRAFT is not supplying target maps in AFR scale.

AFR / Lambda table for different fuel types:

Fuel type	AFR (stoichiometric)	Lambda
Pump fuel	14,7	1
E85	9,765	1
E100	9,0078	1
VP Street Blaze 100	14,16	1
VP C10	14,53	1
VP C16	14,77	1
VP 110	15,09	1
VP MS109	13,41	1
Turbo Blue Unleaded (100 oct.)	13,9	1
Turbo Blue Unleaded Plus (104 oct.)	13,7	1
Turbo Blue 110	14,7	1
Turbo Blue Advantage	14,9	1
Turbo Blue Extreme	15,0	1
Sunoco MO2X UL	14,5	1
Sunoco 260 GTX	14,4	1
Sunoco 260 GT	13,9	1
Sunoco 260 GT Plus	13,7	1
Sunoco Standard	14,8	1
Sunoco Supreme	14,9	1
Sunoco MO2X	14,5	1
Sunoco HCR Plus	14,8	1
Sunoco Maximal	15,0	1
Sunoco MaxNOS	14,9	1

Although the basic idea of Lambda / AFR seems very simple – it's not. The main consideration is that the wideband lambda sensors are usually calibrated to 14,7 AFR (for pump gas) thus working with AFR will require you to re-calculate the true AFR based on what's your meter is displaying:

Shown AFR / 14,7 x Race fuel AFR

For example:

Your AFR meter (calibrated to AFR=14,7) is displaying 12,8. To determine actual AFR for VP MS109 race fuel you must recalculate the value:

$$12,8 / 14,7 * 13,41 = 11,76$$

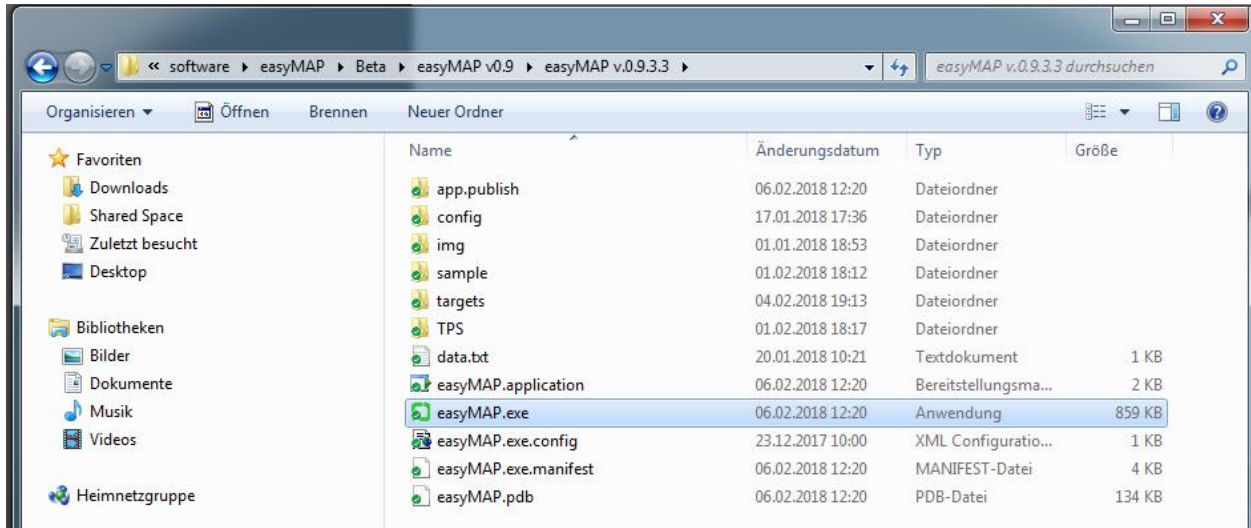
So the actual AFR is 11,76 and not 12,8 !

On the other hand using lambda is much more simple – if you're tuning for 0,88 lambda you know that the AFR is exactly 11,8 ($13,41 * 0,88 = 11,8$)

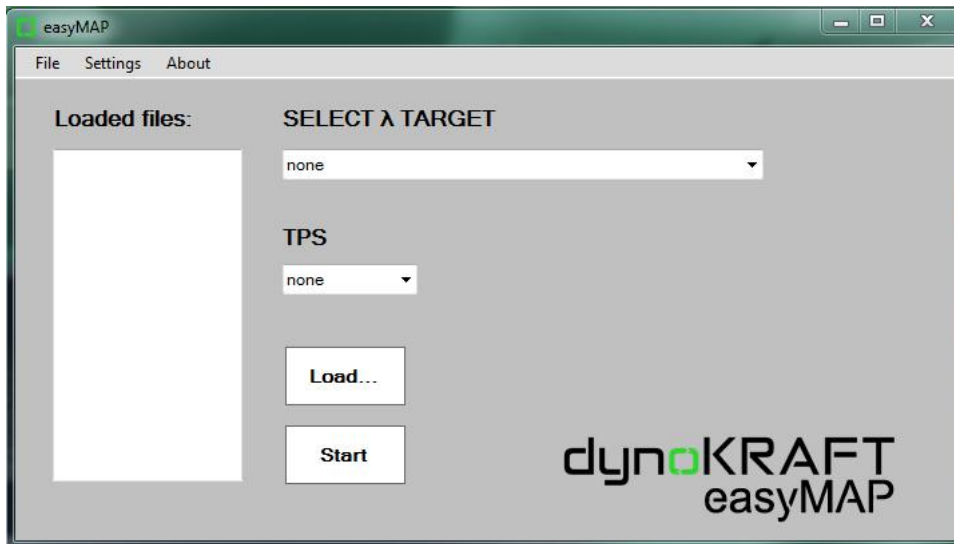
5. How to use easyMAP

5.1. Installation

The easyMAP software is delivered as ready to use application. Please unzip the .zip file content to location of your choice. After unzipping please navigate to easyMAP directory and execute the "easyMAP.exe" file.



After starting up the main window will appear:

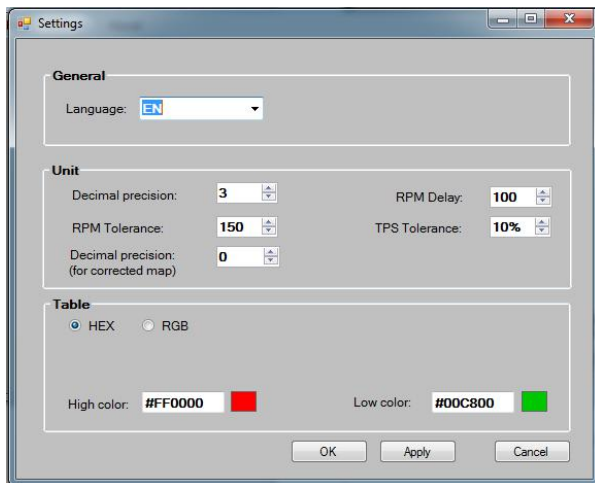


5.2. Menu and buttons

In the menu-bar there are three options to choose from:

File -> Load (ctrl + L) - this function will open the Load Files dialog box in which user can choose what .csv files should be loaded

Settings - this function will open the Settings window.



About - this function will open the "About" window with information about software developer.

5.3. Settings

The settings window contains 3 main areas: *General*, *Unit* and *Table*.

In *General* settings you may choose one of three languages of the user interface. To confirm the setting change press "Apply" button.

In *Unit* area you may choose following:

- "Decimal precision" is used to determine the number of decimal places of the imported lambda values. Recommended setting is 3.
- "RPM Tolerance" is used to define engine RPM tolerance range for which the lambda value will be imported. For example at 2000RPM with tolerance of 150RPM the software will read first lambda value which corresponds to engine RPM range between 1850 and 2150 1/min. Recommended setting is 100-150.
- "Decimal precision (for corrected map)" is used to determine number of decimal places in "Corrected Map" tab. This setting is dependant of tuning software you are using.
- "RPM Delay" is used to determine the time (expressed in RPM) that exhaust gases need to reach the lambda sensor.
Recommended settings are:
 - exhaust sniffer with 3 meter hose: 200-250RPM
 - exhaust sniffer with direct mounted lambda sensor **or** exhaust gasses extracted by vacuum pump using header mounted outlet: 150RPM
 - lambda probe mounted directly into header: 0-50RPM
- "TPS Tolerance" is used to allow for error margin in the throttle setting. The % value is calculated from the current TPS (it is not an absolute value). In other words for 2% TPS the tolerance of 10% will allow for 1,8-2,2 TPS. All other data which is outside this TPS range will be ignored.
For 100% TPS the tolerance of 10% will allow for 90-110 TPS.

In *Table* area you may choose coloring options for the "Results" table.

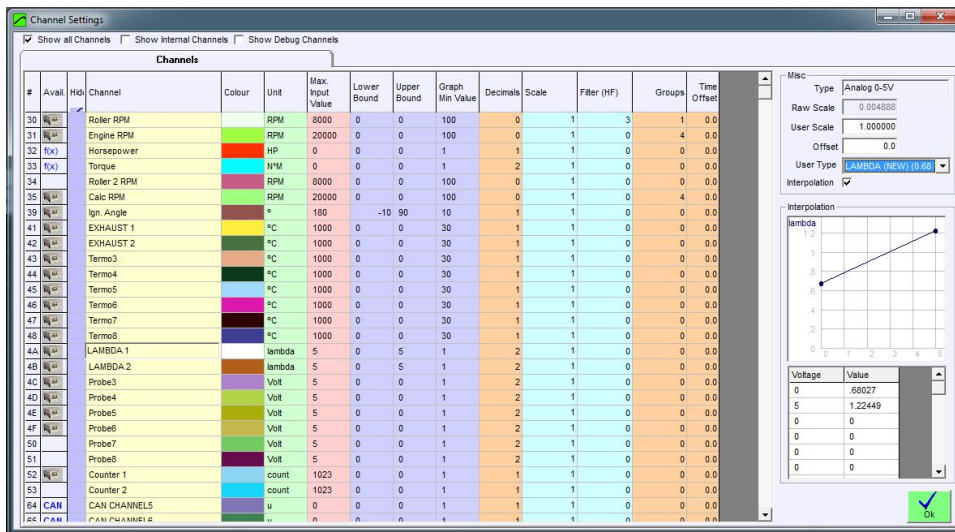
5.4. SportDyno settings

To be able to automatically calculate fueling correction for a given vehicle user must perform a series of test - one test per each TPS setting used in fueling map.

These tests are performed on dynoKRAFT dynamometers using SportDyno Software.

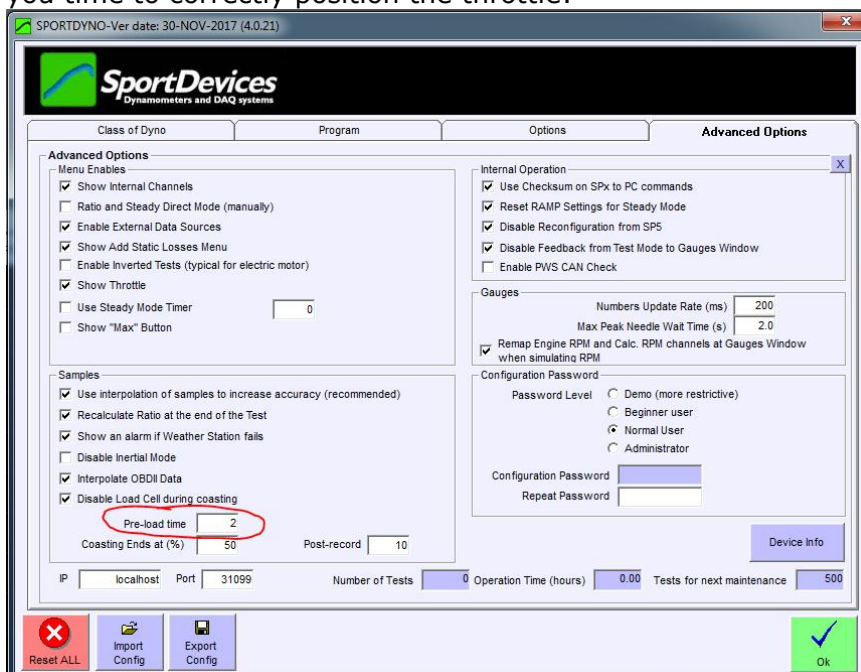
There are several points / settings in SportDyno Software that should be considered:

1. Setup your motorcycle on a dynamometer and prepare it for test runs as described in dynamometer operating manual.
2. Install wideband lambda sensor (for example twinLAMBDA) into vehicle and make sure the analog input channel in SportDyno -> Channels is correctly set up:



It is advisable to use two lambda probes simultaneously if you are working with V2 or V4 engines. These engines will require different fuel maps for front and back cylinders.

3. Increase the "pre-load" time in SportDyno settings to at least 10-15 seconds. This will give you time to correctly position the throttle:



Once the throttle is positioned correctly you can execute/start tests by using the "Test" button in your dynamometer (even if the timer is still running).

5.5. Test procedure. Preparing test data in SportDyno

The procedure is straight forward and with little exercise can be completed in about 30 minutes for average vehicle (i.e. motorcycle)

STEP 1

Determine TPS steps for which you must perform lambda/exhaust sampling tests.

If you are using piggy-back devices such as Power Commander you will usually have to perform one test for each TPS setting:

2, 5, 10, 15, 20, 40, 60, 80, 100% TPS

So in total there will be nine test runs to perform.

STEP 2

Make sure that your lambda probe is connected to SP5 unit and sending data. Make sure the lambda probe is at correct operating temperature (mind the pre-heating time)

STEP 3

Start a test procedure in SportDyno by pressing either F5 or "Test" button on your dynoKRAFT dynamometer and choose following test program:

The screenshot shows the SportDyno software interface with the 'Test data' tab selected. The 'Ramp' test mode is chosen. The 'Starting RPM' is set to 2000 and 'Ending RPM' is set to 6000. The 'Do Not Hold at Max RPM' checkbox is checked. The 'Time' is set to 40 seconds. The 'Acceleration' is set to 100 RPM/s. The 'Stop' section shows 'STOP When Lower' selected. The 'Record' section shows 'Max. Number of Tests' set to 15. The 'Start' button is highlighted in green.

Test mode: RAMP

Starting RPM: 1500-2000 RPM (depending on your vehicle)

Ending RPM: redline

Acceleration: 300 RPM/s

STEP 4

If possible use either OBDII or xDS interfaces to read the TPS values directly for vehicles ECU. If not possible you must find other means to determine current TPS setting (for example by plugging into TPS analog output or using external software - like Power Commander - that will display current throttle position)

Press the "Start" button (or "Test" button) on your dynamometer and open the throttle at 2% (as in example in STEP 1).

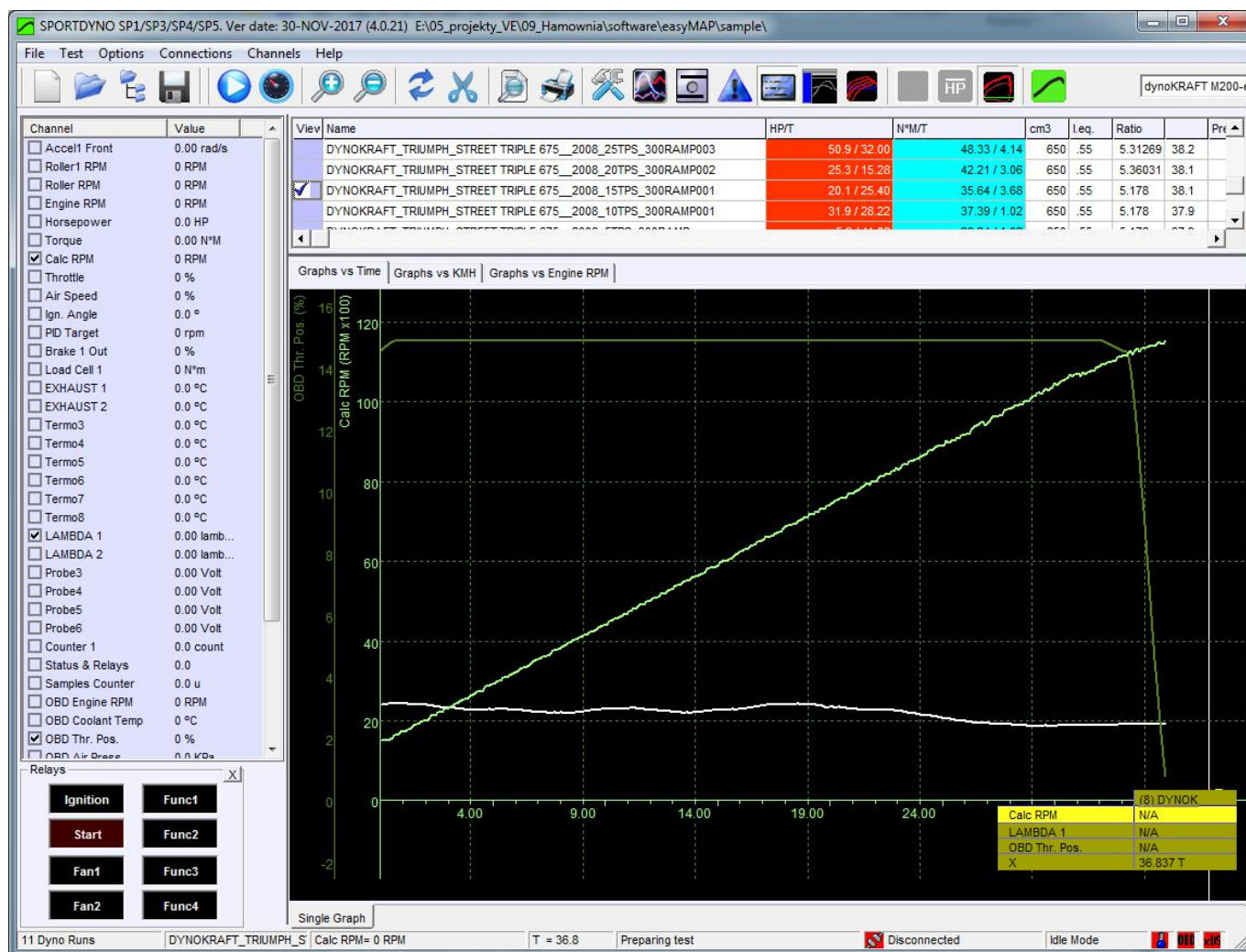
Once you have the throttle correctly opened execute the test by pressing "Test" button on your dynamometer.

The vehicle will slowly accelerate (300RPM/s ramp). You will notice that for low TPS settings (2, 5 and 10%) the engine will not reach it's redline - this is perfectly normal.

Once you notice that the engine no longer accelerates end the test.

Repeat this test procedure for next throttle TPS settings (as in example in STEP 1).

You should now have at least one test file per TPS setting which contains the Calculated Engine RPM, the TPS setting (for example OBD reading) and Lambda value, as in example below:



STEP 5

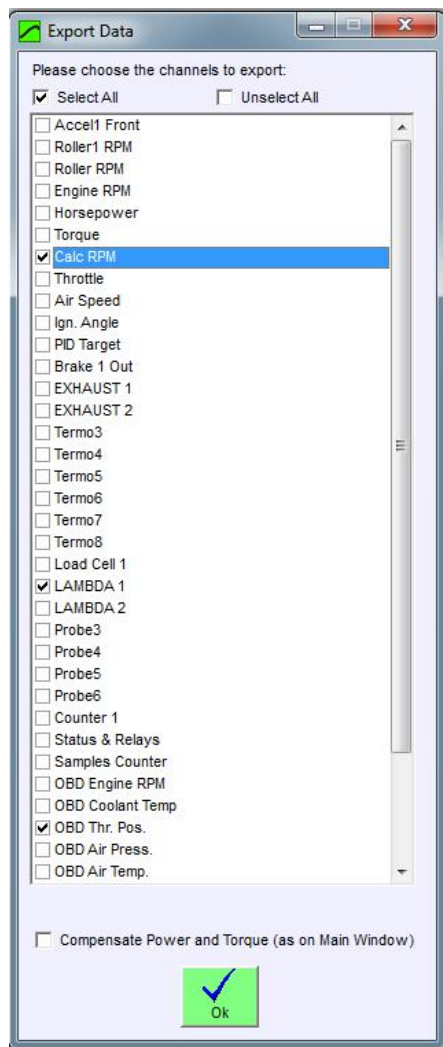
Select each test one-by-one and export the data using *File -> Export Data (text)* function.

You must choose only following channels:

"Calc RPM"

"Lambda"

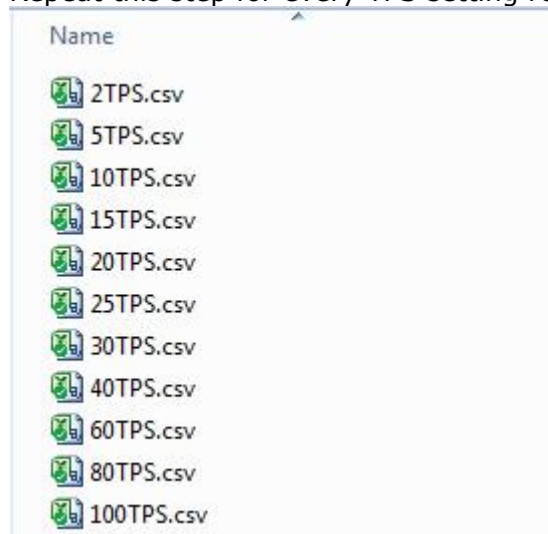
"Throttle position sensor" (OBD Thr. Pos. In our example)



Press "OK" and save the generated .csv file into hard drive under following naming convention:
xTPS.csv

Where "x" stands for TPS %

Repeat this step for every TPS setting required:

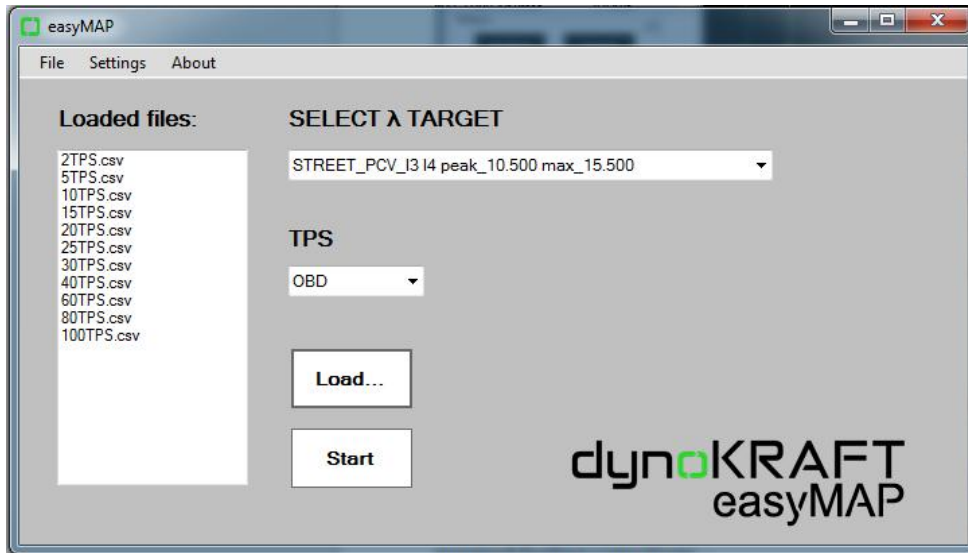


5.6. Importing data to easyMAP. Calculating fueling correction

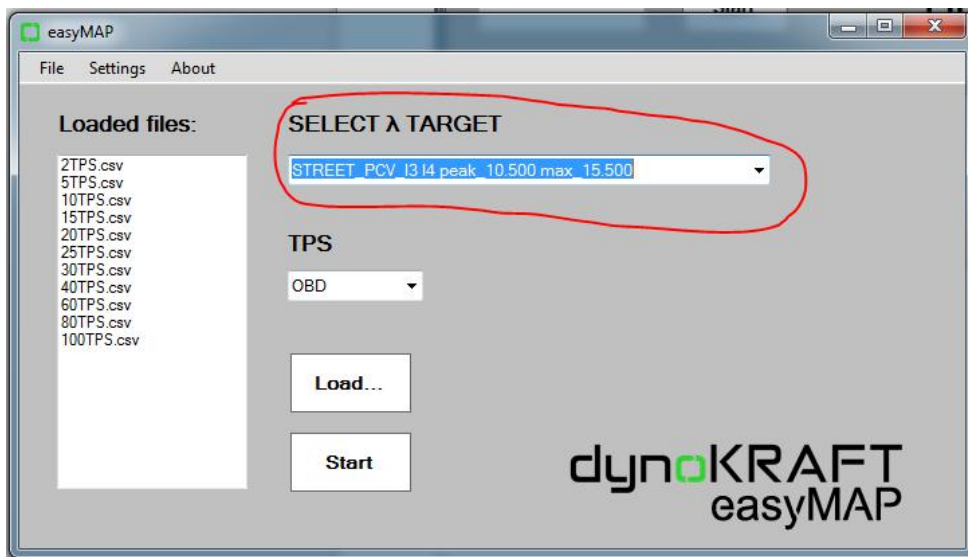
The previously exported .csv files can now be easily imported into easyMAP software and be used to quickly calculate required fueling corrections.

STEP 1

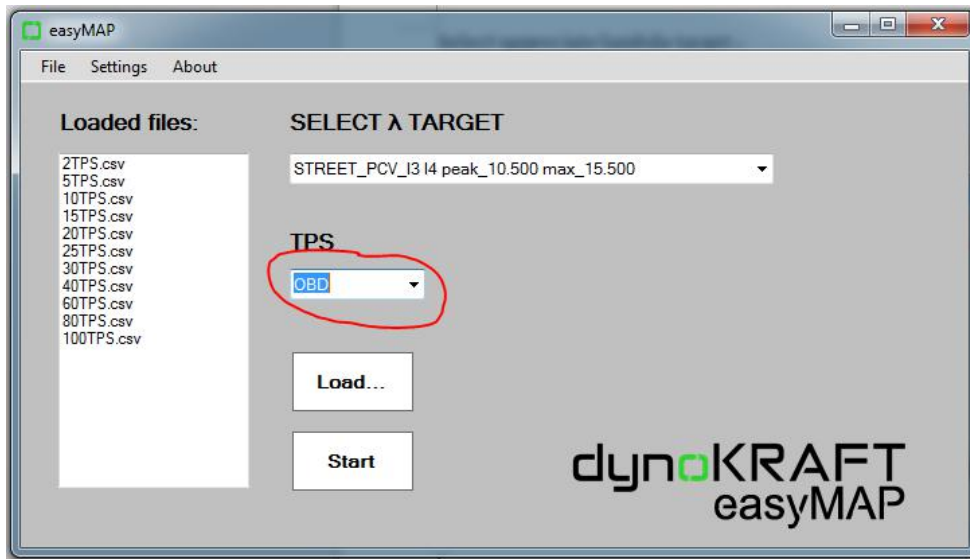
Load .csv files to easyMAP (use "Load" button)



Select appreciate lambda target:



Select if you were using either OBDII or xDS interfaces to confirm TPS position (see Settings -> TPS Tolerance)



Press "Start" button.

STEP 2

The easyMAP software will analyse the loaded .csv files and import current lambda values. If some fields are empty it means that no values were found that are meeting the criteria:

Current λ values										
Results		Req. fueling correction in %				Original map		Corrected map		
RPM	2TPS	5TPS	10TPS	15TPS	20TPS	40TPS	60TPS	80TPS	100TPS	
750										
1000										
1250										
1500	1.161	1.081	1.037	1.006	1.033	0.884	0.89	0.862		
1750	1.127	1.075	1.039	1.005	1.03	0.893	0.888	0.865	0.891	
2000	1.17	1.082	1.045	1.049	1.03	0.935	0.888	0.865	0.81	
2250		1.079	1.001	1.036	0.993	0.917	0.872	0.834	0.812	
2500		1.065	0.979	1.005	0.989	0.907	0.874	0.839	0.823	
2750		1.048	0.972	0.995	0.995	0.901	0.864	0.832	0.831	
3000		1.047	0.958	0.972	0.997	0.95	0.924	0.904	0.906	
3250		1.078	0.969	0.995	1.004	0.977	0.959	0.935	0.922	
3500		1.045	0.977	0.991	0.996	0.955	0.937	0.906	0.876	
3750		0.997	0.967	0.961	0.967	0.928	0.905	0.879	0.842	
4000		1.034	0.963	0.954	0.941	0.92	0.9	0.877	0.844	
4250			0.968	0.949	0.947	0.927	0.896	0.897	0.848	
4500			0.983	0.979	0.961	0.933	0.912	0.908	0.851	
4750			0.993	0.996	0.975	0.945	0.917	0.929	0.88	
5000			1.003	1.007	0.987	0.945	0.92	0.919	0.87	
5250			0.983	0.989	0.989	0.919	0.868	0.865	0.83	
5500			0.975	0.974	0.97	0.925	0.866	0.85	0.817	
5750			0.965	0.953	0.955	0.927	0.871	0.87	0.85	
6000			0.979	0.971	0.964	0.932	0.878	0.875	0.863	
6250			1.01	0.985	0.978	0.943	0.886	0.882	0.856	
6500			1.042	0.998	0.983	0.944	0.895	0.881	0.855	
6750			1.049	1.031	0.991	0.941	0.884	0.865	0.847	
7000			1.046	1.035	1.001	0.956	0.876	0.867		
7250			1.051	1.047	1.014	0.947	0.88	0.862		
7500			1.039	1.043	1	0.931	0.872	0.83		

Cells separation symbol when copying.

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 ☐ semicolon
☐ comma
 ☐ space
 ☐ dot

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STEP 3

Go to "Req. Fueling correction in %" tab to see the calculated fueling correction for your vehicle, based on the selected "lambda target".

Current λ values

RPM	2TPS	5TPS	10TPS	15TPS	20TPS	40TPS	60TPS	80TPS	100TPS
750									
1000									
1250									
1500	13.09	6.66	3.57	1.59	5.23	-9.16	-7.08	-9.63	
1750	10.47	6.14	3.75	1.49	4.95	-7.95	-7.32	-9.13	-5.72
2000	13.85	6.84	4.4	5.72	4.95	-3.1	-7.21	-9.02	-16.3
2250		6.67	0.2	4.54	1.41	-5.02	-9.06	-12.95	-15.89
2500		5.54	-1.84	1.69	1.11	-6.06	-8.58	-12.04	-14.09
2750		4.2	-2.47	0.8	1.81	-6.66	-9.61	-12.86	-12.88
3000		4.11	-3.86	-1.54	2.01	-1.16	-2.38	-3.76	-3.42
3250		7.05	-2.58	0.9	2.79	1.74	1.56	-0.11	-1.41
3500		4.31	-1.54	0.71	2.11	-0.31	-0.43	-2.98	-6.39
3750		-0.3	-2.59	-2.39	-0.83	-3.12	-3.87	-6.03	-10.57
4000		3.48	-2.8	-3.04	-3.51	-3.91	-4.22	-5.93	-10.07
4250			-2.27	-3.48	-2.75	-3.02	-4.46	-3.46	-9.43
4500			-0.51	-0.2	-1.14	-2.14	-2.19	-1.65	-8.58
4750			0.7	1.61	0.41	-0.74	-1.31	0.97	-4.66
5000			1.69	2.78	1.62	-0.63	-0.87	0.11	-5.63
5250			-0.1	1.11	1.92	-3.37	-6.45	-5.78	-10.24
5500			-0.72	-0.21	0.1	-2.59	-6.35	-7.29	-11.63
5750			-1.66	-2.31	-1.36	-2.27	-5.51	-4.48	-6.94
6000			0	-0.31	-0.31	-1.5	-4.33	-3.54	-4.98
6250			3.27	1.22	1.23	-0.21	-3.16	-2.38	-5.61
6500			6.43	2.71	1.83	0.11	-1.79	-2.16	-5.38
6750			7.24	6.01	2.83	0.11	-2.38	-3.35	-5.55
7000			7.17	6.57	3.9	2.09	-2.4	-2.31	
7250			7.61	7.64	5.13	1.27	-1.48	-2.44	
7500			6.64	7.38	3.9	-0.21	-1.95	-5.78	

Cells separation symbol when copying.

☒ tabulation ☐ tilde ☐ semicolon
☐ comma ☐ space ☐ dot

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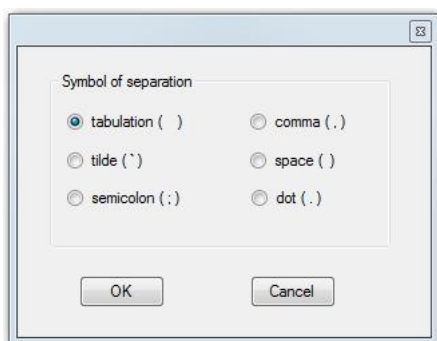
STEP 4

If you happen to use tuning software which allows users to copy and paste existing map into windows clipboard you may use the "Original map" and "Corrected map" tabs to quickly generate new fueling maps and simply copy-paste it into your tuning software.

To do this please select the table in your flashing software and copy it (Ctrl+C)

Go to easyMAP and activate the "Original map" tab and click anywhere in the white area.

Paste (Ctrl+V) the original map (an window where you can choose the data separator will appear):



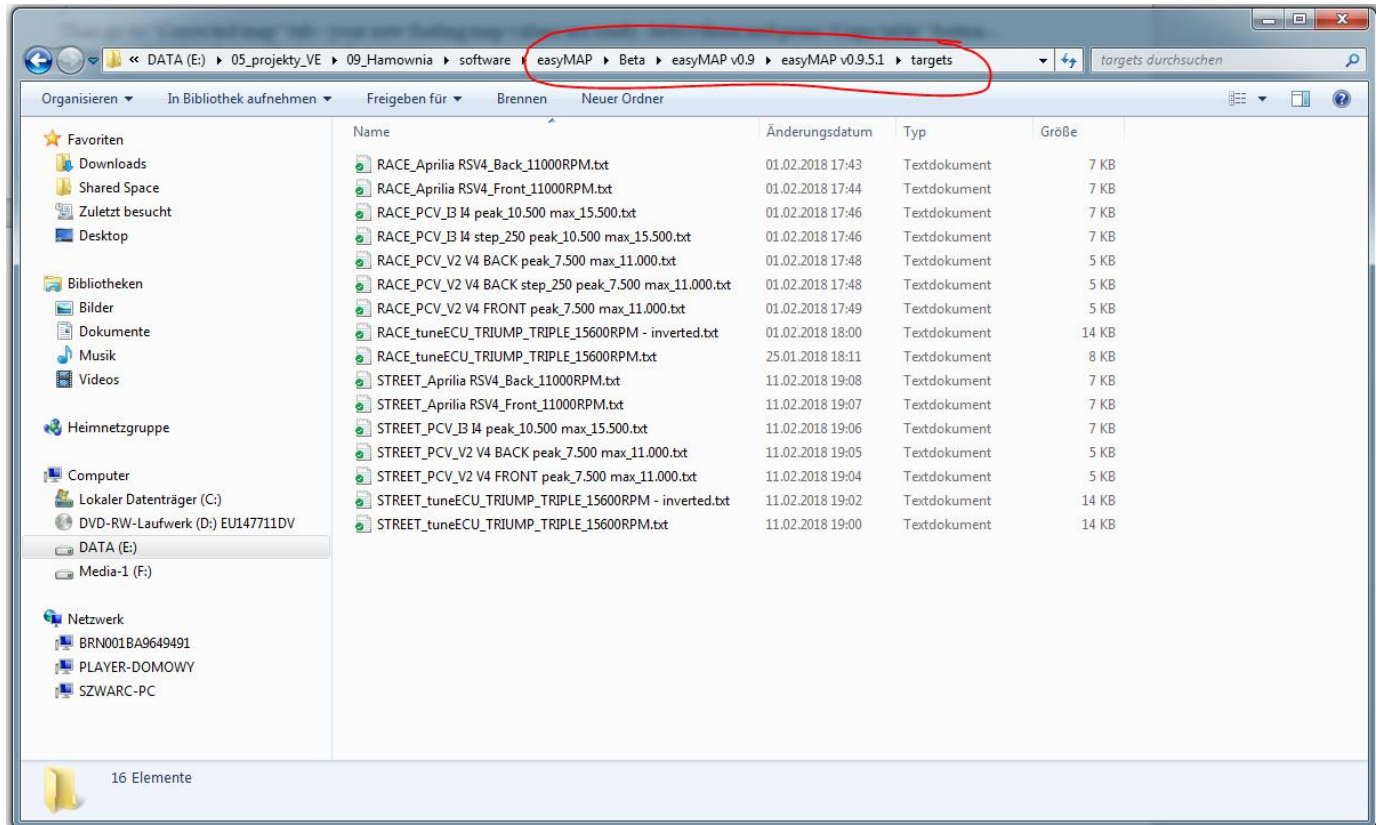
Then go to "Corrected map" tab - your new fueling map values are ready. Select them and press "Copy table" button.

Here you can also choose the type of separator.

5.7. Custom lambda targets

At dynoKRAFT we believe that every tuner has he's own way of tuning a vehicle for best possible performance. For that reason the easyMAP was designed to allow tuners to create their own custom "lambda target" maps.

The easiest way to generate new custom maps is to edit any existing lambda target map in Excel. To do so please navigate to easyMAP installation directory -> targets and open chosen file in MS Excel.



Re-work any lambda values per your requirement and export (Save as...) the file to .txt format. Please make sure to keep the data structure as in original file and don't add any comments or similar features.

Save the .txt file into "Samples" directory and restart the easyMAP - your new custom lambda target map will appear in the drop-down list.