



FA23 / FUEL Manual V3.08



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1 KMS (Kronenburg Management Systems)

Kronenburg Management Systems (KMS) is a complete line of programmable engine control units (ECU), that offers you an extremely reliable and user-friendly system at a very competitive price. It gives you the possibility to manage all turbo and naturally aspirated Otto engines (engines in which the fuel mix is ignited via a spark plug) up to 12 cylinders.

An engine control unit is a type of electronic control unit that determines the amount of fuel, ignition timing and their parameters which is needed to keep an internal combustion engine running. It does this by reading values from multidimensional maps which contain values calculated by sensor devices monitoring the engine.

The programmable KMS ECU doesn't not have a fixed behaviour, but can be (re)programmed by the user. Programmable ECU's are required when a significant modification has been made to a vehicle's engine. For example adding a turbocharger, changing the camshaft profile or a conversion to an alternative fuel. In these situations, a programmable KMS ECU can be wired in. The KMS ECU's can be programmed/mapped with a laptop connected using a serial or USB cable, while the engine is running.

The programmable ECU controls the amount of fuel to be injected into and ignition moment for each cylinder. This varies depending on the engine's RPM and the position of the gas pedal and/or the Manifold Absolute Pressure (MAP). This can be adjusted by bringing up a spreadsheet page on the laptop where each cell represents an intersection between a specific RPM value and a throttle position. In this cell a value corresponding to the amount of fuel injected can be entered. This spreadsheet is referred to as a fuel table or fuel map. The same way the ignition spreadsheet can be setup.


By modifying these values while monitoring the exhaust gas composition (best way is using a wide band lambda sensor) you can see if the engine runs rich or lean. This way you can find the optimal amount of fuel and optimal ignition moment needed for all possible combinations of RPM and throttle position/manifold absolute pressure. This process can be best carried out at a dynamometer, giving a controlled environment (without influence from outside) to work in. An engine or chassis dynamometer gives a more precise calibration for your (racing) applications. The KMS ECU range offers a complete self learning air fuel ratio control (lambda control) for most common types of oxygen sensors (broadband/narrow band).

In addition to lambda control, this management system also provides the following functions: load-dependent boost pressure control, water injection control, (variable) launch control, power-shifting, (variable) A.L.S., staged/banked injection, mapselector, odd fire, idle control, rpm limiters, engine diagnostics, 4mb datalogging, etc.

This FA23 management system can be used as an independent injection system for virtually all types of Otto engine (engines in which the fuel mix is ignited via a spark plug).

It can also be used in combination with a standard engine management system, to take over the standard injection at any desired engine speed, boost pressure or throttle valve position. For this purpose it is mainly applied in compressor or turbo sets.

We advice to read the manual complete before starting. The set-up of the system software is kept as clear and simple as possible, so that even people with little computer experience will be able to use this system. Working with the software is simple, but if the settings are incorrectly configured,

there is a serious risk of engine damage. In this manual there are warning signs  and notes that need your extra attention to bring this setup to a good end. We recommend you leave the programming to specialists.





WARNING:

Disconnect the battery cables when you're doing electrical work.

Disconnect the KMS ECU from the wiring harness connector when welding on the vehicle.

Make sure there are no fluid leaks and all connections are secured and/or tightened.

Wiring and fuel system components must be mounted away from heat sources or shielded if necessary.

Do not use a batterybooster or a 24V charger. Do not reverse the polarity of the battery or the charging unit. Do not change the battery with the engine running. The peak power supply could severely damage the KMS ECU and other electrical devices.

Avoid open sparks and flames near flammable substances.

Do not use unsuppressed spark plugs and leads. They can cause electromagnetic interference.

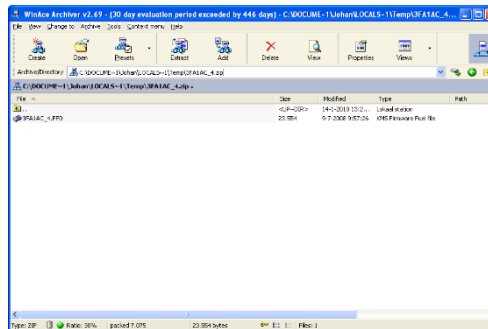


2 Software installation

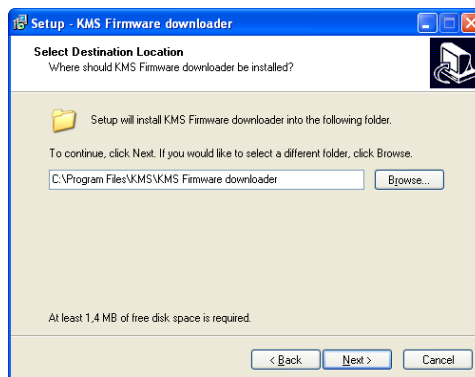
The software is supplied together with the system, on a CD-ROM. Installing the software is very easy. The CD-ROM carries the KMS installation program, which launches automatically when the CD is inserted.



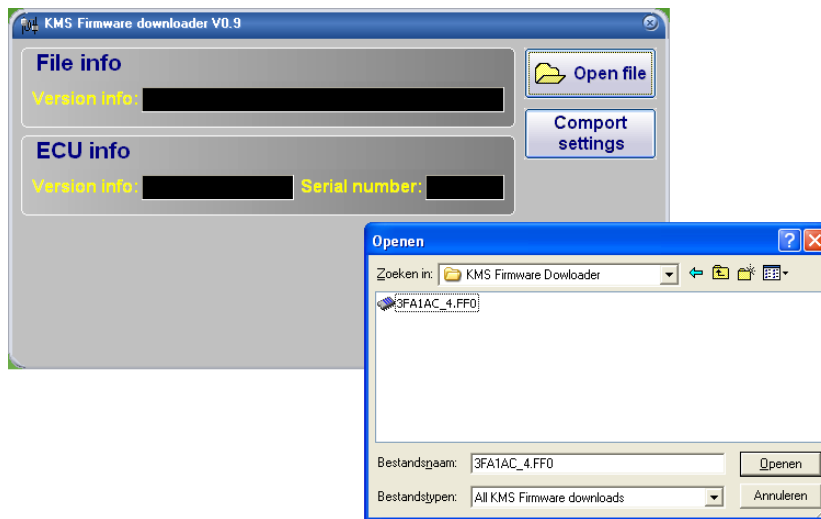
The program **KMS FIRMWARE DOWNLOADER** can be used to update the ECU. When there are new options available, they can be downloaded as a zip file from the [Van Kronenburg website](http://www.van-kronenburg.nl). The zip file consists of 1 file, see figure below.



Unpack the zip file on your computer in the KMS Firmware downloader folder. This is the location where you installed the Firmware downloader, see example below.



With the firmware downloader this update file can be sent to the ECU. (see figure below).



For the FA23 the update file name starts with the number 3 and has extension *.FF0. It's only possible to use this firmware downloader if you have an KMS ECU with serial nr. higher then 300000.

Once installed, the program is set to work via communication port COM1. If this port is already being used or not available, another communication port can be used. For the procedure to change the communication port, see [3.2.4.1.10 Communication port](#).

(USB connections have the most various numbers of communication ports, so make sure you've got the communication port right. For settings and finding the right communication port check paragraph [3.2.4.1.10 Communication port](#))

3 KMS software

When the program is started, the main screen will appear, which is composed of three parts:

- The main screen
- The function bar
- The communication bar

The following sections describe the possibilities and functions of the system.

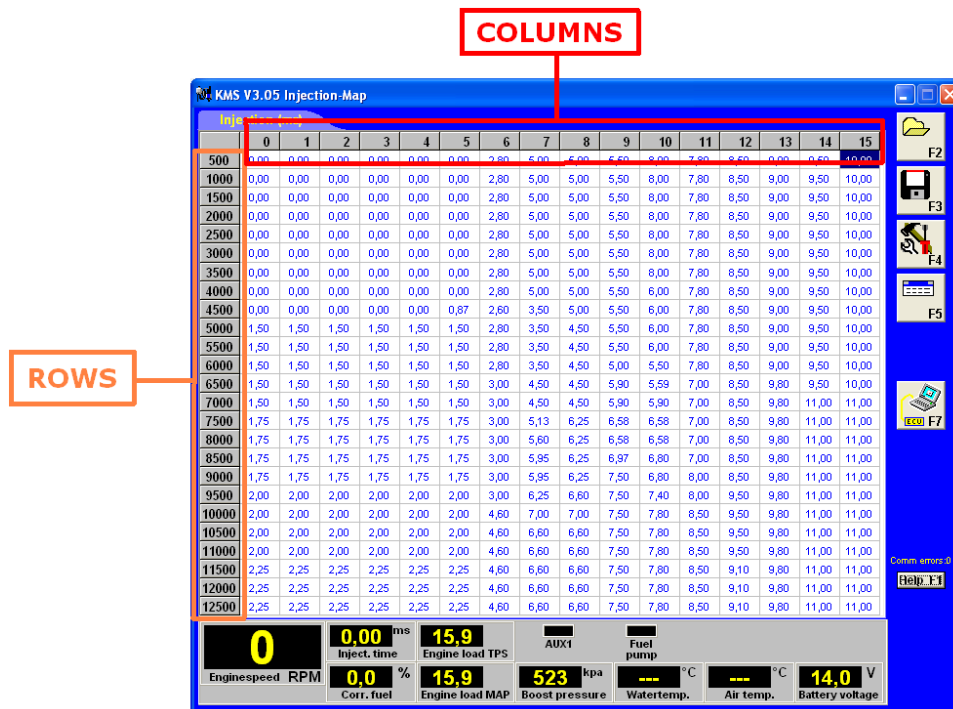
3.1 The main screen

The main screen consists of one spreadsheet, the injection spreadsheet. The spreadsheets are two-dimensional diagrams showing engine speed against engine load.

The engine speed range can stretch from 500 rpm to 20.000 rpm. Standard the screen stretches from 500 rpm to 12.500 rpm. This however can be changed (see 3.2.4.1.1 RPM pickup). The RPM range is divided over 25 boxes.

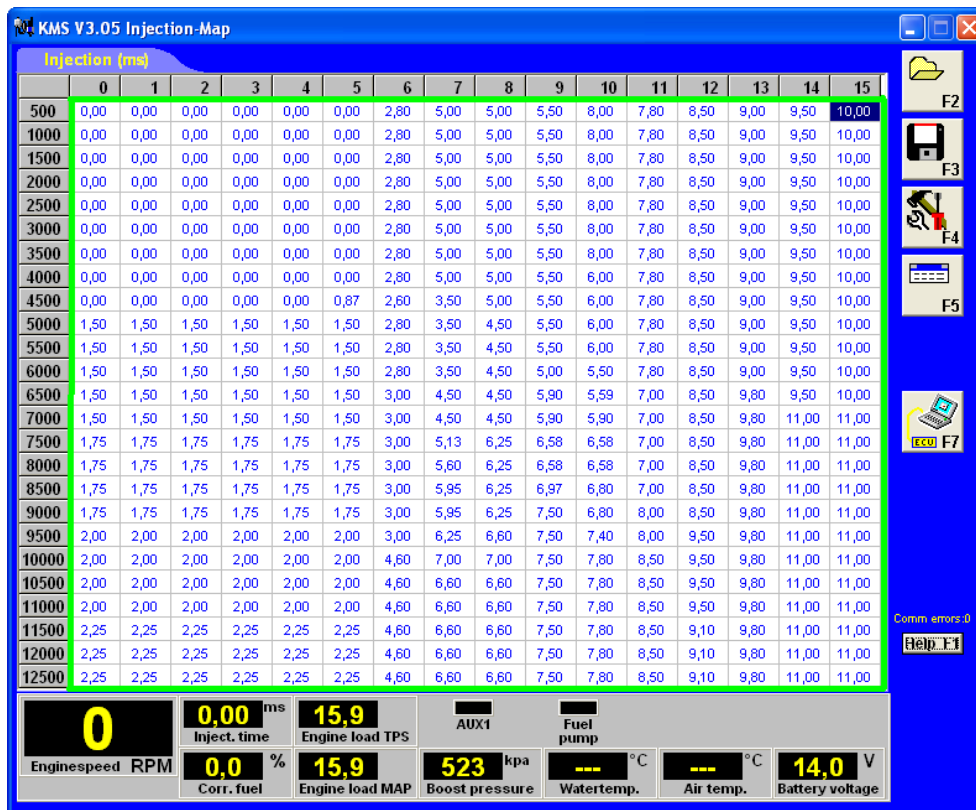
The engine load range is sub-divided into 16 boxes dividing the range that has been set for the engine load sensor. When no engine load sensor is connected only column 15 of the ignition spreadsheet can be used.

The rows and columns are shown in graphs (in the form of bar charts), when the left mouse button is clicked on an engine speed or a load value. For further information, see section 4. Programming.



3.1.1 The injection characteristic diagram

In the injection characteristic diagram, figures can be entered that indicate the injector opening time per injection in ms. This means that at any engine speed and any engine load, the desired quantity of fuel can be injected.



3.2 The function bar

The vertical bar on the right-hand side of the screen shows several function keys, which can be activated using the mouse arrow or the relevant function keys on the keyboard. An explanation on the different function keys is given in the following sections.


3.2.1 Function key F1



This function key gives access to the manual in Acrobat reader. Acrobat reader 3.0 or higher is required. Acrobat reader 4.0 can be found on the installation CD-ROM.

3.2.2 Function key F2



This function key enables a previously saved file to be retrieved from the hard disk, CD-ROM, USB memory key, etc. The files can be recognised by a blue floppy  icon and by the extension .F03

3.2.3 Function key F3

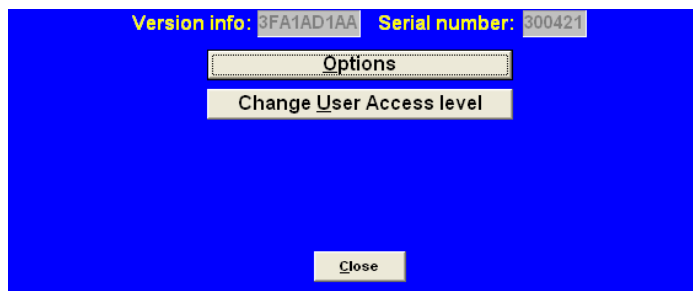


This function key is used to save modified files. The names of these files automatically receive the extension .F03.

3.2.4 Function key F4

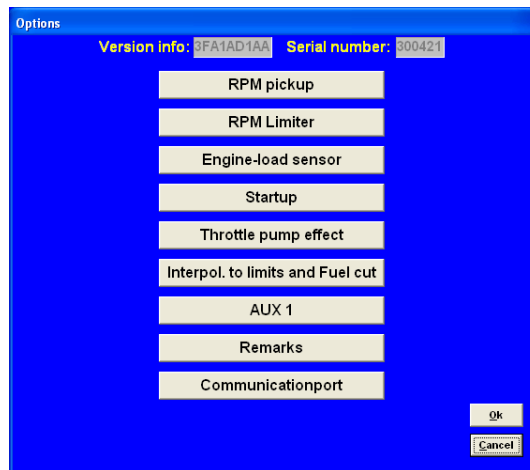


When this function key is activated, a pop-up screen will appear. The options will be explained in the following sections.



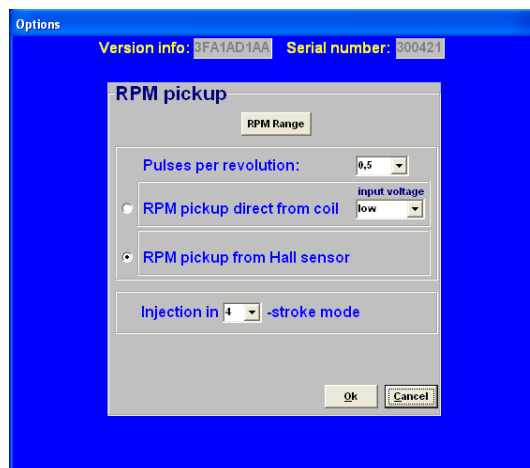
3.2.4.1 Options

If 'Options' is selected, a menu appears which lists several possible settings. These settings are described below.



3.2.4.1.1 RPM pickup

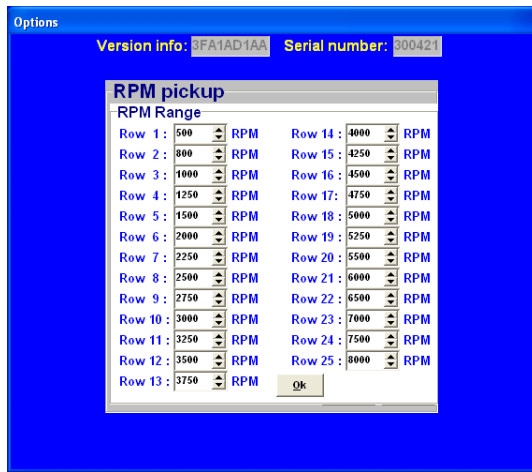
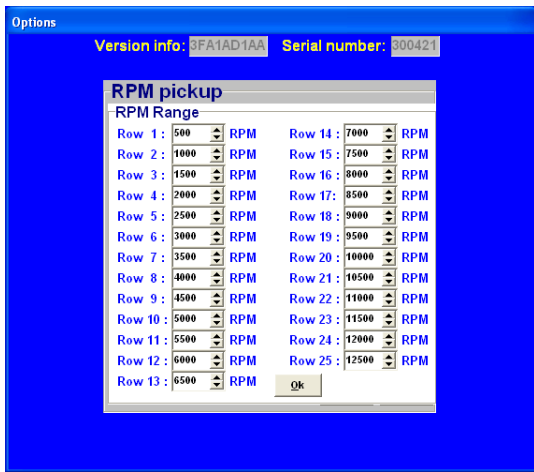
In this menu, the settings for the pickup signal and the injection frequency can be entered.



RPM Range:

By clicking on the function you can set the rpm range for the main parameter maps (minimum rpm is 500 and maximum is 20.000).

Standard the 25 rows are divided over a rpm range 12.500 rpm (example see left figure on the next page). If your engine doesn't make more than 8.000 rpm, you can divide the 25 rows over this 8.000 rpm (example see right figure on the next page). So the mapping will be more fine tuned for this engine rpm range.



Pulses per revolution:

This is the number of pulses from the hall sensor/coil to determine the engine speed. The number of pulses depend on the kind of engine, type of coil or distributor.

RPM pickup direct from coil:

To get a pickup signal from the coil, connect the right wire to the (-) pole of the coil.

RPM pickup from Hall:

To get a pickup signal from the hall sensor, make sure that you connect the signal wire of the KMS ECU to the right signal pin on the Hall sensor. You can use a Hall sensor on the crankshaft only when 5 pulses per revolution isn't exceeded. For example 60-2 trigger pattern on the crankshaft can't be used with a Hall sensor.

Injection in "x" stroke mode:

The injection frequency (x) can be set to:

- 2 times per crankshaft revolution (x = 1)
- 1 time per crankshaft revolution (x = 2)
- 1 time per two crankshaft revolutions (x = 4)

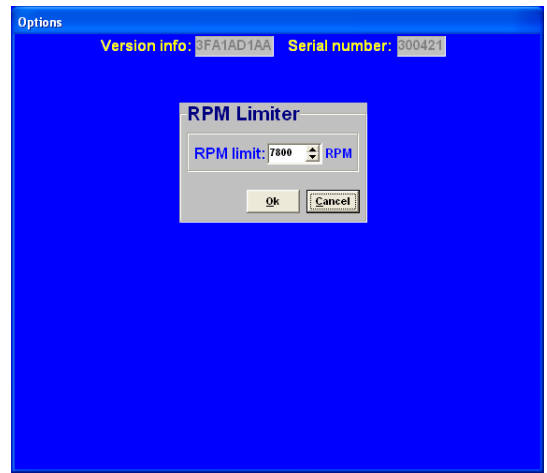
Normally, it is recommended to use the 4-stroke setting.

3.2.4.1.2 RPM limiter

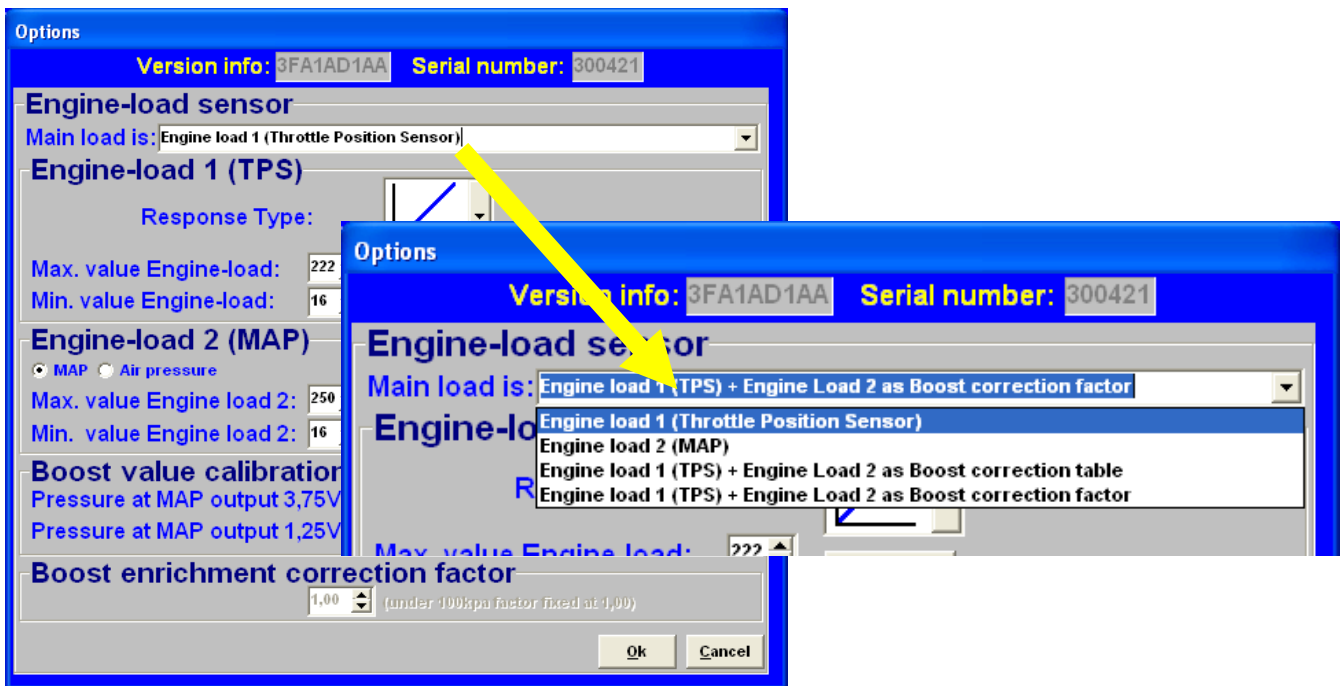
Not available on older Fuel system.

This menu can be used to set the rpm limiter.

When the RPM limit is reached, the limiter switches off injection completely.



3.2.4.1.3 Engine load sensor



On the older KMS Fuel systems, only a TPS can be connected!

Two engine load sensors called "Engine load 1" (for TPS = Throttle Position Sensor) and "Engine load 2" (for MAP = Manifold Absolute Pressure sensor) can be connected. Even a MAF sensor (Mass Air Flow meter) can be connected (not recommended). Please note that certain combinations will result in the exclusion of some options.

When no engine load sensor is connected only column 15 of the ignition spreadsheet can be used.

The use of two load sensors for most N/A and all turbo-charged engines is highly recommended. Some settings in the software are always related to TPS and some to the MAP-sensor. However there is the possibility to select on which sensor (TPS, MAP, combination TPS/MAP) the main load tables are linked to. In the picture above you can see all the possible combinations.

The possible combinations are explained below.

- Main Load is : TPS

All the load tables included lambda target are linked to TPS value. This is normally used for N/A engines with throttle bodies.

- Main Load is : MAP

All the load tables included lambda target are linked to MAP value. This is normally used for turbo/supercharged engines .

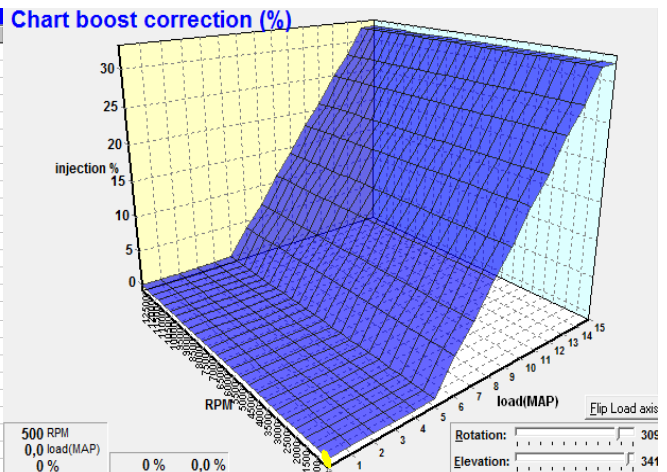
- Main Load is: TPS + MAP as boost correction table

The ignition load table and lambda target are linked to MAP value (The ignition table for a turbocharged and supercharged engine should always be linked to MAP). The injection table however is linked to TPS and works in combination with the boost correction table to determine the main fuel injection time.

KMS V4.13 Injection-Map										
Injection group 1 (TPS)		Boost correction (%) (MAP)								
3D	0	1	2	3	4	5	6	7	8	
500	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1500	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0

The values in the boost correction table stand for a correction percentage over the nominal correction ratio of 1:1. This means that if all values are 0 the fuel injection time will be calculated by the injection time set in the injection table (TPS v RPM) and corrected with 1% per 1 kPa of MAP pressure offset from 100 kPa. So if the injection time in the complete injection table is set at 10 ms and boost correction table is set on 0, the injection time increases with 10ms/100kPa. What results in a injection time of 20 ms at 200 kPa (1 bar boost) and 30 ms at 300 kPa (2 bar boost). If the engine runs on 50 kPa (0.5 bar vacuum) the injection value will be 50% of 10 ms = 5 ms. With the boost correction table set on 25% this will result in an extra 25% enrichment. So if MAP pressure raises with 100 kPa the enrichment will not be 100% but 100 + 25 = 125% which results in an injection time of 22.5 ms at 200 kPa (1 bar boost) and 35 ms at 300 kPa (2 bar boost). In theory an engine runs on lower loads lambda = 1.00 (A/F 14.7 on pump gas) to meet emission standards. However on higher loads it is recommended to run a richer mixture to keep the engine under the critical combustion temperature where engine damage can occur. Typically for a charged engine this would be a recommended lambda value between 0.75 - 0,85 (A/F 11.0 - 12.5). In theory this means 17.6% - 33.6% more fuel is needed. In the boost correction table you can set extra enrichment at every RPM and Map-load, see example in the figures below.

Injection group 1 (TPS) Boost correction (%) (MAP)																
3D	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
1000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
1500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
2000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
2500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
3000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
3500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
4000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
4500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
5000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
5500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
6000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
6500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
7000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
7500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
8000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
8500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
9000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
9500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
10000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
10500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
11000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
11500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
12000	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32
12500	0	0	0	0	0	0	4	7	11	14	18	21	25	28	32	32



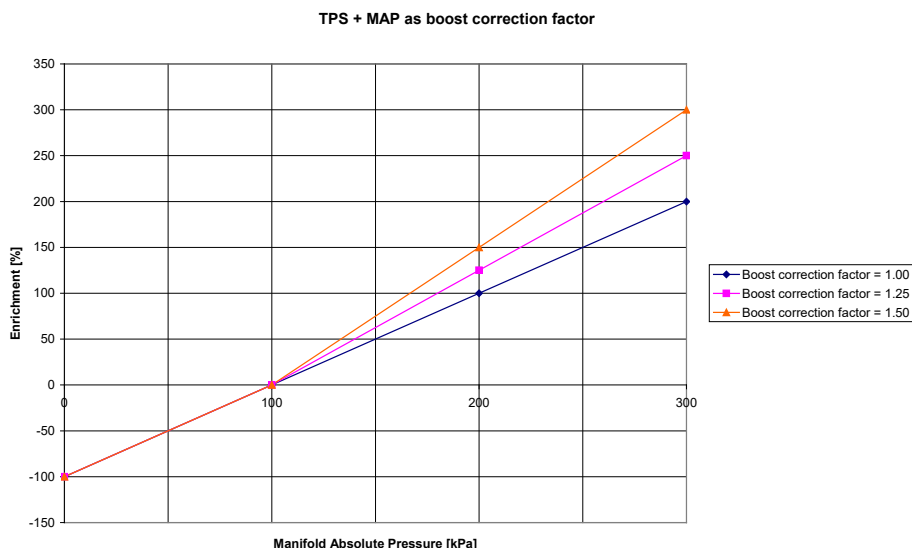
- Main Load is : TPS + MAP as boost correction factor

The ignition load table and lambda target are linked to MAP value (the ignition table for a turbocharged and supercharged engine should always be linked to MAP). The injection table however is linked to TPS and works in combination with the boost correction factor to determine the main fuel injection time.

Boost enrichment correction factor

1,25 (under 100kpa factor fixed at 1,00)

The injection table however is linked to TPS and works in combination with the boost correction factor to determine the main fuel injection time.



In the figure above, you can see an example of how different boost correction factors influence the enrichment percentage and injection time. So if the injection time in the complete injection table is set at 10 ms and correction factor set on 1.00 the injection time increases with 10ms/100kPa what results in a injection time of 20 ms at 200 kPa (1 bar boost) and 30 ms at 300 kPa (2 bar boost). With the correction factor set on 1.25 this is $1.25 \times 10 \text{ ms} = 12.5\text{ms}/100\text{kPa}$ and thus giving an injection time of 22,5 ms at 200 kPa (1 bar boost) and 35 ms at 300 kPa (2 bar boost). Unregarded the correction factor the negative fuel enrichment (under 100 kPa) will always be at a 1:1 ratio.

So if engine runs on 50 kPa (0,5 bar vacuum) the injection value will be 50% of 10 ms = 5 ms.

TIP: Try to start the engine with the complete fuel map at the same injection time (4 - 12 ms depending on the injector size) and the boost correction factor set on 1.25. Try to get the engine running smooth with changing the complete fuel map (all cells at once) with positive or negative percentage (using the edit menu). If lambda control is active and the engine is at normal operating temperature you can start programming (the separated cells in) the fuel map with the boost pressure (set) as low as possible. After the injection table is mapped at low boost, the next step is to raise the boost level in steps to the desired boost pressure. Check your fuel correction again. Now don't correct the injection table with this percentage but correct your boost correction factor with this percentage.

Engine load sensor calibration:

The engine load sensor connected to the system will have to be calibrated.

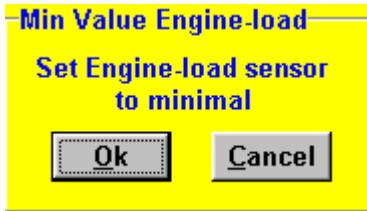
The range within which the sensor operates can be set here. A load sensor issues a voltage of 0 to 5V. The range is divided into 8 bits (256 steps). In practice a load sensor does not run through its full range. For this reason, the upper and lower limits must be set, so that the 16 columns in the spreadsheets can be best utilised.

There are two ways of calibrating the load sensor:

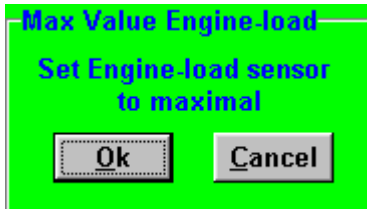
- Automatic calibration

➤ Manual calibration

Automatic calibration. When a throttle valve potentiometer is used, it is easy to opt for automatic calibration. Select 'Automatic cal.' and then keep the throttle valve in rest position, pressing 'OK'.

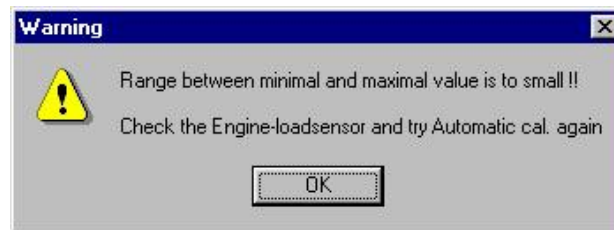


Then turn the throttle valve to full load and press 'OK' again.



The minimum and maximum values of the throttle positions will now be shown.

A warning will appear if automatic calibration cannot be finished correctly. For possible causes, see 'Fault tracing'.



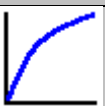


Manual calibration. When a map sensor or an air mass sensor is used, automatic calibration is not easy, because the minimum and maximum output signals of the sensor are not known before the engine has run. We recommend filling in the figures by hand, making sure that the output signal of the sensor under any engine operating condition is between the two figures set.

Tip: first set the minimum value 15 and the maximum value 250. If you use a KMS 400 kPa Map sensor there are recommended settings for the calibration on the datasheet of the sensor.

Not all load sensors emit signals that are linear with the engine load. For this reason the system offers the possibility to choose between three load characteristics. This enables the upper/lower areas to be made more sensitive or less sensitive.

The three load characteristics are linear, logarithmic and e-log and are explained in a overview on the next page.

Image	Definition	Function	Application
	Linear	The load steps are divided in proportion to the signal.	MAP-sensor
	Logarithmic	At lower loads the load signal is divided over a smaller number of steps and at higher loads it is divided over a larger number of steps.	Air mass sensor
	e-log	The action is opposite to that of the logarithmic parabola.	Single Throttle body setup

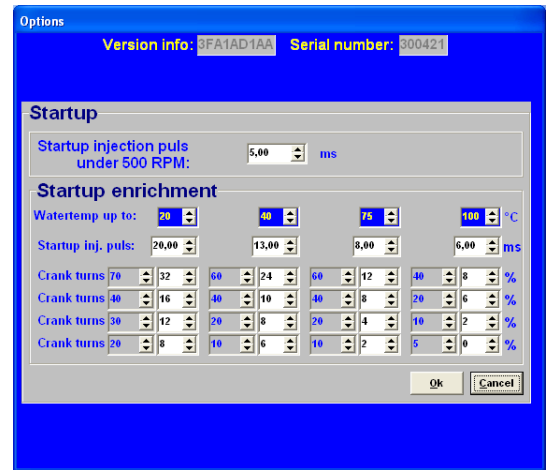


3.2.4.1.4 Start-up

When the engine is started, a certain quantity of extra fuel (in most cases dependent on the coolant temperature) will have to be injected to ensure proper firing of the engine. There is a possibility of giving a start-up injection impulse and start-up enrichment. The start-up injection impulse is given once, at the moment the first crankshaft signal is registered.

After the start-up injection impulse, the injection periods shown in the injection graph will be adhered to. As long as the engine speed is lower than 500 rpm, the quantity of injected fuel shown in the first row applies. Proper firing of the engine often requires more fuel (depending on coolant temperature) than the quantity needed when the engine is already running at the same engine speed. This extra enrichment can be entered in the table for the duration of a certain amount of crankshaft rotations.

There are four coolant temperature ranges for which an enrichment table can be completed. The additional enrichment (%) in the table can be set during the input of the rpm range. An enrichment map and a startup-pulse can be filled in for four coolant temperature ranges. Above the highest temperature the normal startup pulse will be used.



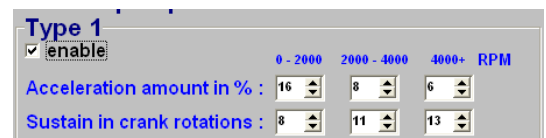
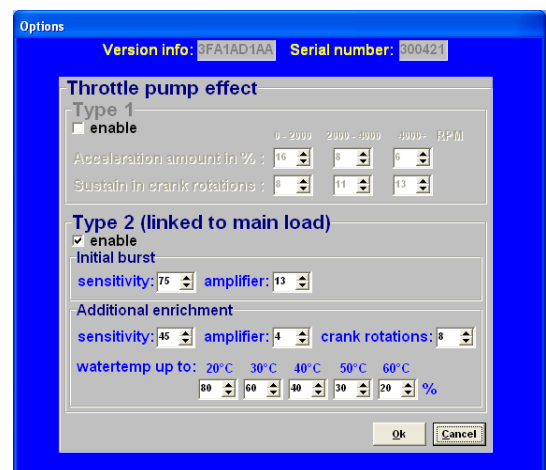
3.2.4.1.5 Throttle pump effect

When the throttle valve is opened, the engine will draw in more air and therefore need more fuel to keep the mix ratio at a constant level. As air is a gaseous substance, it will reach the inlet valve earlier than the liquid fuel, which because of its higher inertia needs more time to accelerate. As a result, there will briefly be a weak mix, causing the engine to 'hesitate'. The faster the throttle valve is opened, the greater this effect will be. To neutralise the effect of fuel having a higher inertia than air, acceleration enrichment can be applied. This means that, depending on the throttle valve opening speed, extra fuel is injected. This prevents the formation of a poor mixture.

There are two types of acceleration enrichment (these can be set on/off separately). We recommend to use 'Type 2' acceleration enrichment.

Type 1:

The quantity of extra fuel to be injected can be set for the three engine speed ranges indicated. The duration of enrichment can be set by entering the number of crankshaft rotations. The acceleration enrichment will automatically decrease at lower throttle valve opening speeds. Acceleration enrichment type 1 is always linked to 'Engine load 1'.



Type 2:

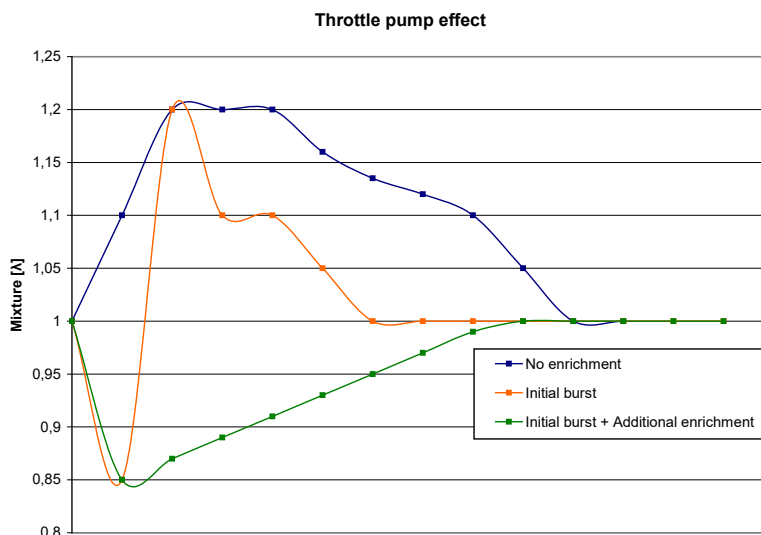
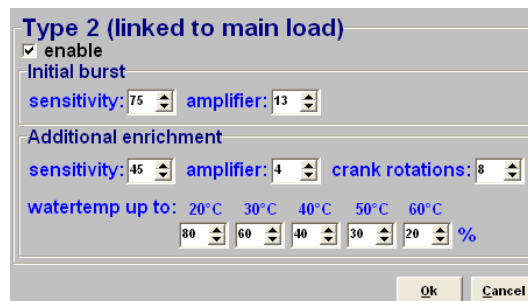
With most engines it is recommended to use only this acceleration type2. However type 2 can be combined with type 1 (for some engines useful).

Acceleration enrichment type 2 is always linked to main engine load.

The initial burst is one pulse that is directly injected when needed no matter what crank position and will intervene to avoid a short lean mixture. The sensitivity is linked to opening speed of the throttle. A low value for sensitivity means that the initial burst won't occur fast, a high throttle opening speed is needed. For a high sensitivity value a lower throttle opening speed is needed for initial burst enrichment to occur. The amplifier is more or less a factor for the amount of fuel injected. A higher amplifier results in more enrichment.

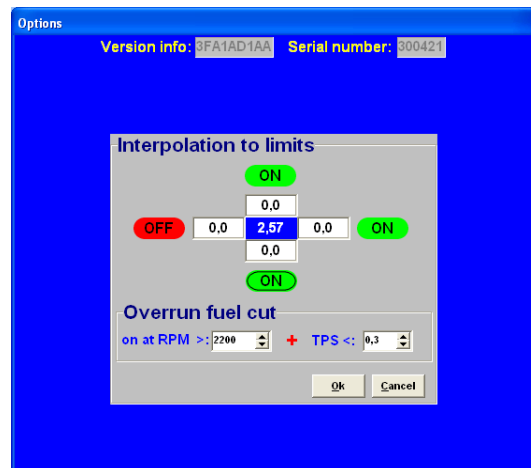
Additional enrichment follows after the initial burst. After the initial burst, the mixture briefly can get lean again. More enrichment is needed. You can choose how many rotations the additional enrichment is needed. The amount of extra fuel will slowly decrease during these rotations. Sensitivity and the amplifier function the same as they do with the initial burst. The additional enrichment can be increased by a percentage for the water temperature. More enrichment is needed with a low water temperature.

The figure on the right gives an indication of how these two types of enrichments affect the mixture, when suddenly the throttle valve is opened.



3.2.4.1.6 Interpol. to limits and Fuel cut

This function enables the interpolation within the outer limits of the graphs to be switched on or off. This enables a safe engine speed limiter to be set or to stop injection entirely when the accelerator is released. In the case of the speed limiter, the engine can be prevented from running on an increasingly poor fuel air mix, which might cause engine damage. This does not apply when the speed limiters are set to a lower maximum engine speed. We recommend to use the standard limiters (see also section: [3.2.4.1.2 RPM Limiter](#)).

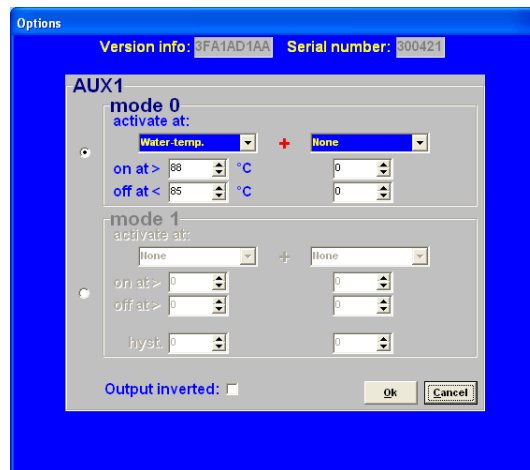


3.2.4.1.7 AUX 1 / Second Stage

AUX1 is 'Second stage' on older Fuel systems!

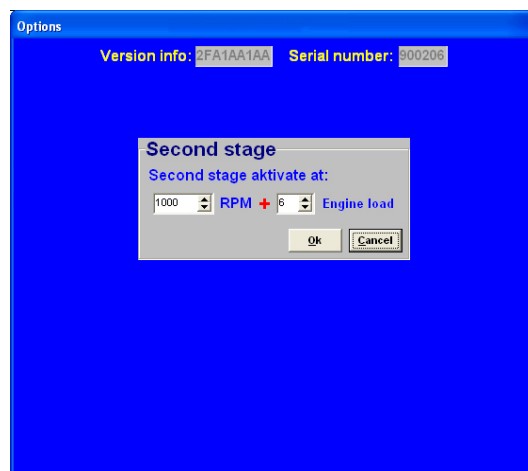
The system features one extra output. This extra output can be separately activated via direct ground (up to 1A) or via relay. They can be used for shift indicators, water injection, cooling fan, etc. There is a choice of several combinations of input quantity to activate the AUX output. The AUX output is activated when both the values set are exceeded. If 'none' is selected, this channel will be ignored.

A hysteresis can be set for each AUX output. This means that the switching ON value can be set higher than the switching OFF value. The advantage of this is that the output does not need to be switched on and off unnecessarily. An example is a cooling fan that activates at 88° Celsius and deactivates at 85° Celsius.



Second stage on older Fuel systems :

This menu enables a second stage to be activated at a certain engine speed or engine load. So an extra output can be activated, providing an ground-switching output directly (up to 1A) or via a relay. This can be used for a shift light or water injection, for example.



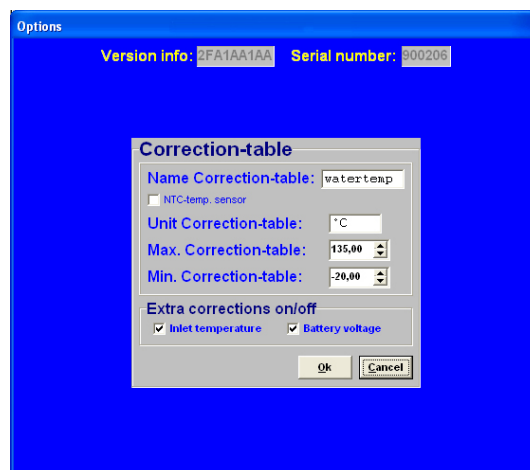
3.2.4.1.8 Correction-table

Only for the older fuel systems!

This menu offers the possibility to calibrate a sensor to which corrections can be made. Normally, a water temperature sensor is used for this purpose, to enable cold start enrichment to be set. Cold start enrichment is required at low engine temperatures, because the fuel then condenses against the cold cylinder walls and is forced out of the exhaust without having been burned. As a result, the mix becomes too poor, so that the engine will hesitate. To compensate for the loss of fuel at low engine temperatures, more fuel will have to be injected.

When a 2-pole Bosch water temperature sensor is used, the only thing to do is click the box next to the text 'NTC-temp. sensor'. As this sensor is pre-programmed in the software it does not have to be calibrated. When another sensor is used, the range can be set manually.

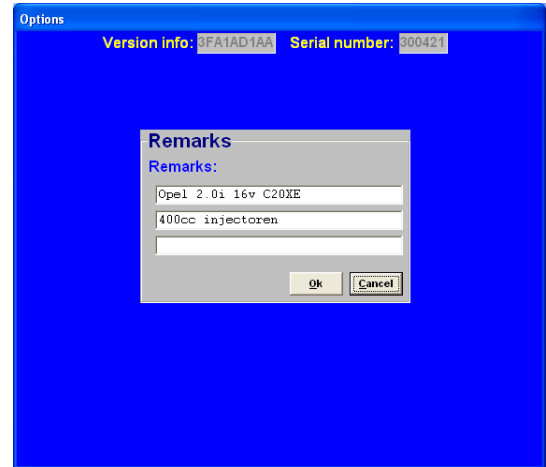
This menu also offers the possibility to make a correction to the air temperature and/or the battery voltage. The air temperature correction is a fixed table and cannot be changed with the PC software. This air temperature correction can only be made if an NTC temperature sensor is used. The battery voltage correction is used to make corrections for the opening loss time of an injector.



This opening loss time is dependent on the battery voltage and may vary from 1.8 ms at 8V to 0.4 ms at 16V. For instance, 0.68 ms will be added to the duration of injection when the battery voltage is 12.6V. The table can be used for injectors with a resistance of 12Ω to 15Ω. If the air temperature and battery voltage correction functions are not activated, this will be shown in the communication bar. The two relevant readings will then turn grey.

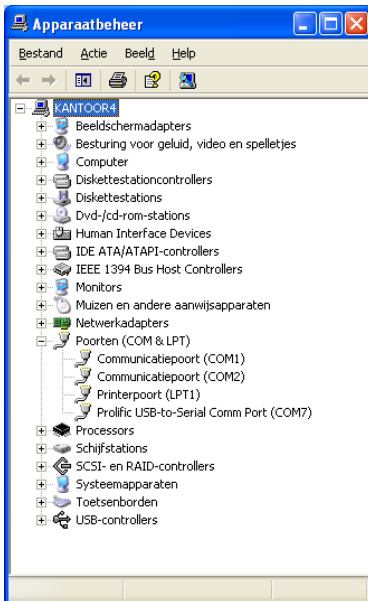
3.2.4.1.9 Remarks

This is room for making notes, for instance; engine specifications.



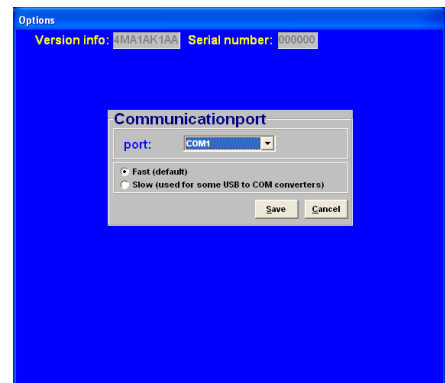
3.2.4.1.10 Communication port

Select the required communication port and save using the 'Save' button.



The KMS FA23 system only has an serial port connection. If you want to use this ECU on newer PC's with only USB then you will need an USB to serial converter. In this example on the left (start→control panel→system→device manager) you can see that the USB-to-serial connection has set to COM 7.

(make sure that USB serial converter will be dedicated to a COM connection between 1 and 8. If this number exceeds 8, sometimes the converter will not function properly. At the advanced settings of the COM port you can change the port number of your converter to a number between 1 and 8).



3.2.4.1.10.1 Communication with a Windows Vista based desktop/laptop

Windows Vista uses a different kind of communication then for example Windows XP. The KMS software must be modified to the compatibility of Windows XP.

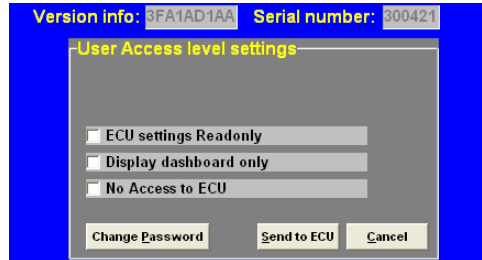
To modify the KMS software to a Vista computer, look for the 'KMS motormanagement.exe' file. (if you installed the KMS software the standard way, you can find this file at c:/program files/KMS/KMS Motormanagement). Press with the right mouse button on this file and select 'properties'. You will now see a screen with some tabs. Select the tab 'compatibility' and set the compatibility mode in this screen to Windows XP SP2. Don't forget to click the box above it to select the compatibility modes.

The KMS software will now 'see' the different communication ports and you will be able to connect the ECU to the desktop/laptop.

3.2.4.2 Change user access level

Determines security level and access restriction by setting a password.

- ECU settings read only: Settings are displayed but not adjustable
- Display dashboard only: Only the communication bar is displayed (no maps)
- No access to ECU: No access to ECU




The standard password in the system can be changed to a password you like.

To save the changes made 'click Send tot ECU'

3.2.5 Function key F5



By clicking this function, correction tables are displayed that allow you to correlate injection to certain sensor values.



Water-temp in °C															
-20	-15	-10	-5	0	5	10	15	20	25	30	35	40	45	50	55
0,0	46,9	46,0	44,0	42,0	40,0	36,0	32,0	28,0	24,0	20,0	16,0	12,0	8,0	4,0	0,0

Air-temp in °C															
-20	-15	-10	-5	0	5	10	15	20	25	30	35	40	45	50	55
10,1	8,8	7,6	6,3	5,0	3,8	2,5	1,3	0,0	-3275,5	-3274,2	-3272,9	-3271,6	-3270,3	-3269,0	-3267,7

Battery voltage in V															
8,000	8,250	8,500	8,750	9,000	9,250	9,500	9,750	10,00	10,25	10,50	10,75	11,00	11,25	11,50	11,75
1,95	1,80	1,66	1,58	1,48	1,38	1,27	1,14	1,04	0,97	0,91	0,87	0,83	0,78	0,75	0,70

Air-Pressure in mBar															
750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900
0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Coolant temperature correction:

This table is used to enter figures that indicate the relative richness or weakness (over the entire injection diagram in %) at readings that are within the range of the coolant temperature sensor. This enables cold start enrichment to be achieved and it can also be used as a safeguard against overheating, by providing enrichment at unduly high coolant temperatures. Cold start enrichment is essential at low engine temperatures, because the fuel condenses against the cold cylinder walls and is forced out of the exhaust without having been burned. As a result, the mix becomes too weak, so that the engine will hesitate. To compensate for the loss of fuel at low engine temperatures, more fuel will have to be injected.

There is also an option to completely cut off the injection so no fuel will be injected. If you insert exactly -100% in the water temp. correction fields, fuel will cut off.

Air temperature correction:

Here figures can be entered that indicate the relative richness or weakness (over the entire injection diagram in %) at readings that are within the range of the air temperature sensor. As air density is dependent on temperature, the quantities of fuel to be injected will at low temperatures be larger than at high temperatures. This table can also be used to offer protection when the inlet temperature is excessively high, by providing extra enrichment.

Battery voltage correction:

The battery voltage correction is used to compensate for the opening loss time of an injector. The opening loss time is dependent on the battery voltage and may vary from 1.8 ms at 8V to 0.4 ms at 16V. When battery voltage correction is not applied, the mix will weaken when the battery voltage decreases, with the risk of engine damage. In this table this effect can be compensated for by matching the injector opening time to the battery voltage. The correction values are indicated in ms per injection. For instance, 0.68 ms will be added to the duration of injection when the battery voltage is 12.6V. The table is suitable for injectors with a resistance of 12Ω to 15Ω.

Atmospheric pressure correction:

If you use an internal or separate atmospheric pressure sensor, you can set correction percentages for ambient pressure levels in this table.

3.2.6 Function key F7



When data is changed or downloaded to the system, the screen will show the text 'DATA IS NOT LOCKED !!!'. At the same time, the silver-colour bar of the diagram will change to a yellow colour. This is to indicate that the changes have not been saved yet. Save the changes by pressing the F7 function key.

KMS Injection-Map		DATA is NOT LOCKED !!!														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
500	6,49	9,12	11,20	11,60	12,60	13,20	13,40	13,40	13,35	13,50	13,45	13,40	13,45	13,30	13,05	12,80
1000	5,05	6,85	9,94	10,82	11,80	12,44	12,69	13,00	12,95	12,96	13,13	12,86	12,82	12,85	12,65	12,85
1500	4,70	6,70	8,79	10,34	11,19	11,45	12,08	12,47	12,37	12,43	12,52	12,53	12,41	12,49	12,47	12,79
2000	4,22	6,55	8,79	9,75	11,00	11,70	12,67	13,27	13,26	13,49	13,31	13,24	13,31	13,28	13,15	13,43
2500	3,72	6,09	8,51	9,40	10,91	11,87	13,00	13,60	13,77	13,84	13,81	13,86	13,89	13,73	13,87	13,78
3000	3,39	6,26	8,42	9,34	10,45	11,69	12,90	13,64	14,17	14,40	14,43	14,46	14,39	14,42	14,45	14,72
3500	1,00	5,90	8,04	9,07	10,11	11,54	12,68	13,72	14,36	14,50	14,85	14,69	14,73	14,77	15,11	15,59



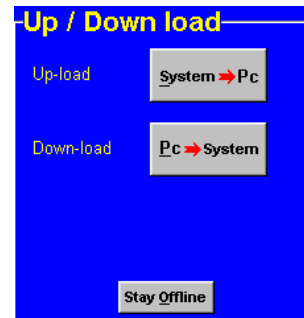
When the **Unlocked** box is clicked, the changes will be saved. If saving is successful, the box will automatically change to **Locked**. Once again, if UNLOCKED is not clicked after the program has been changed, the changes in the system will be lost when the power supply to the system is broken.



3.2.7 Function key F10



Function key F10 offers the choice of working off-line or on-line. It switches communication with the system on or off. Communication will also be stopped when the power supply to the system is broken. If there is no communication, a red bar will appear at the bottom of the screen. To resume the communication with the system, function key F10 should be pressed. A menu will appear offering a choice between loading the file on the PC to the system and loading the file in the system to the PC. There will still be the possibility of breaking the communication again.



Warning:

Make sure that the battery of the vehicle supplies more than 10V. If the battery doesn't exceed 10V the changes you made to the ECU will not be saved.

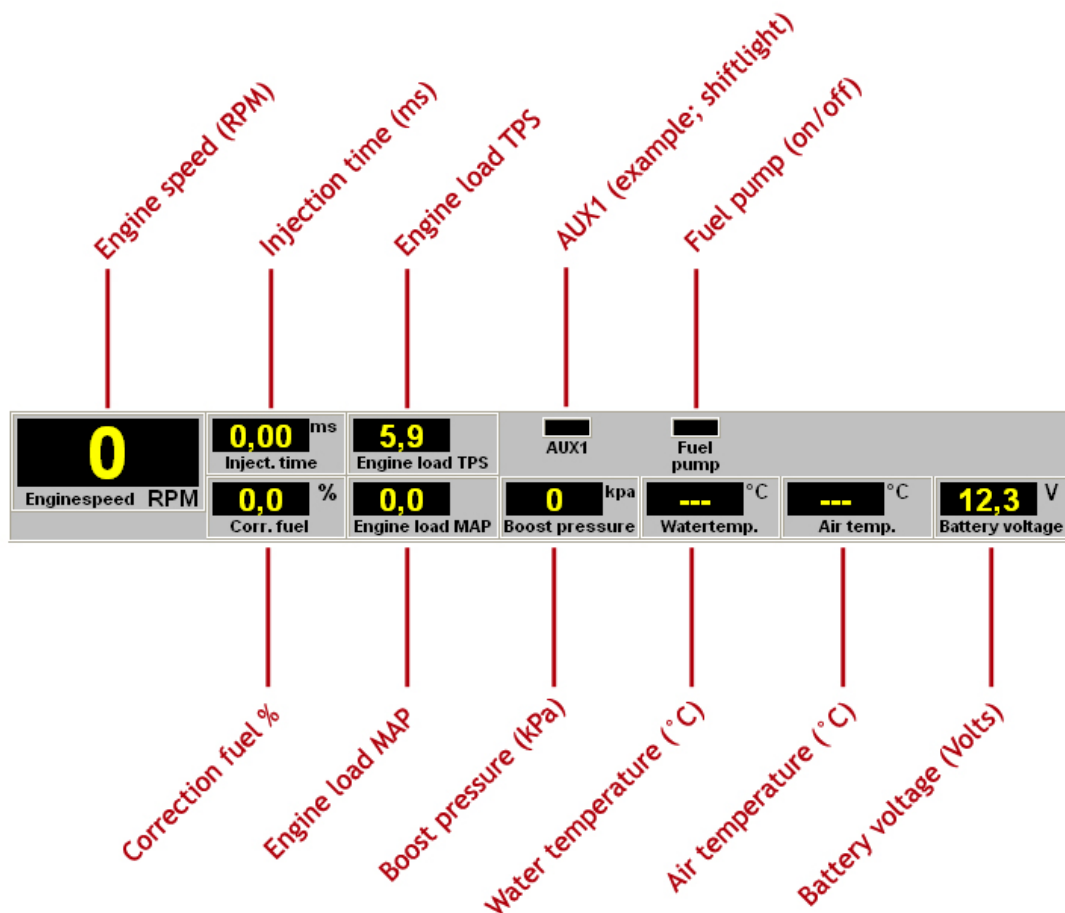
Tip: On vehicles with an ignition lock switched in such a way that the power supply to the system is cut off when the engine is started, always download the data from the PC to the system (as in the PC the modified data will not get lost when the power supply to the system is broken). This is of course only necessary if the data has not been saved to the system.

3.3 The communication bar

The horizontal bar at the bottom of the screen is the communication bar. If the system is connected to the COM or USB port of the PC and the power supply to the system is on, function key F10 can be used to activate the communication.

There are six check lights in the communication bar, which indicate the status of the relevant outputs.

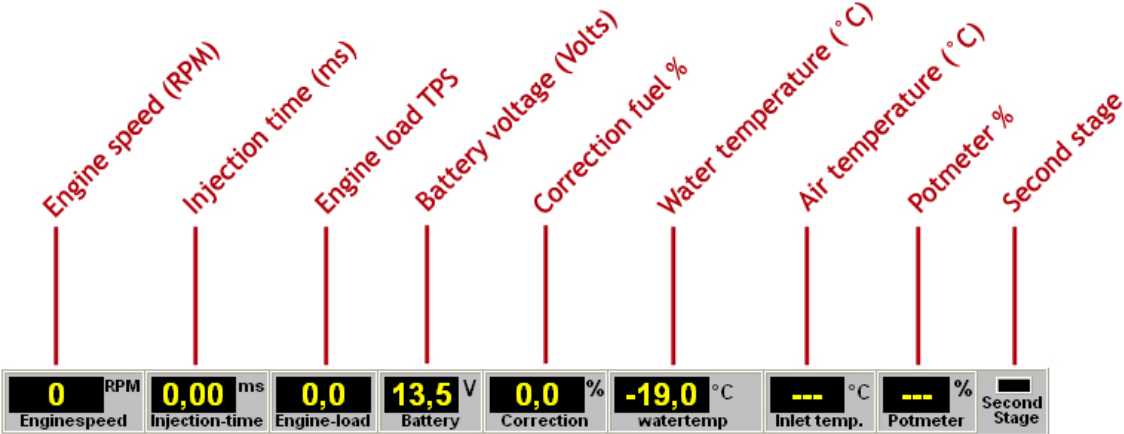
The following readings will be shown (only for the FA23 system, for older Fuel system look at the next page):



(Boost pressure will change into air pressure, depending on the hardware configuration)

These readings can be used to check whether the right sensors are being used and all settings are correct.

For the older Fuel systems the dashboard shows other values. See the picture below.



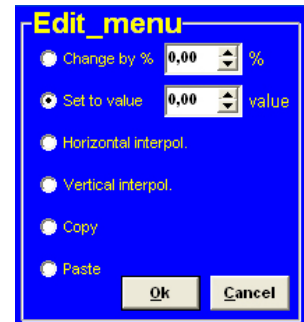
4 Programming

Before programming is started, all connections and sensors must be checked. Look at the communication bar to check the sensors for correct functioning and setting. If everything is in good working order, the programming of the diagrams can be started. There are two ways of changing the values shown in the diagrams:

- Filling in the data manually
- Changing bar charts using arrow keys

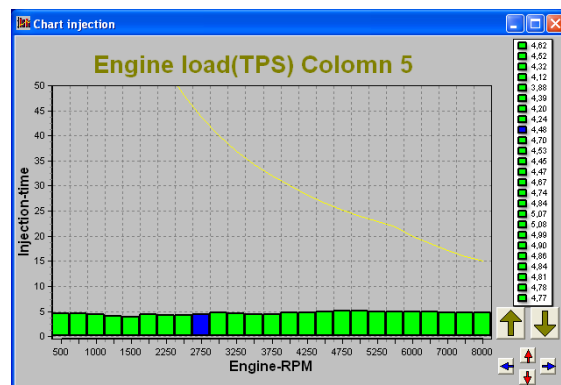
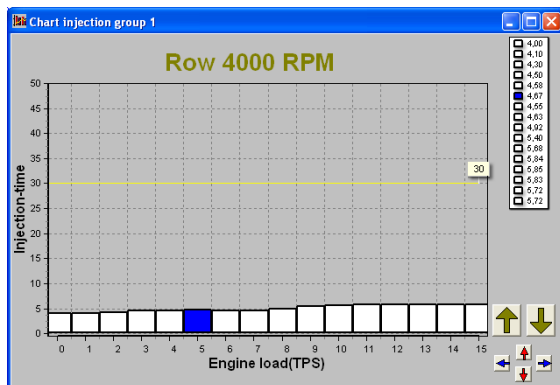
4.1 Manual changing

By checking a control box, the relevant parameter can be set manually. If a control box has been selected, an edit menu will appear that allows you to change the selected values in various ways.



4.2 Bar charts

The columns or rows of the diagrams can also be shown in the form of bar charts. The bar charts will appear when an engine speed or engine load value is clicked. If an engine speed is clicked, a bar chart will appear showing all the values related to that engine speed. If an engine load value is clicked, a bar chart will appear showing all the values related to that engine load value. Access to the bar charts can also be obtained by pressing the ALT + C keys or the ALT + R keys simultaneously. The thin yellow line in the graphs of the injection diagram indicates the maximum duration of injection for the engine speed concerned. If the yellow line is exceeded injectiontime overflow occurs.



You get overflow of injectiontime when one injection takes more time than the time for two rotations. The time of these two rotations is the maximum injection time because the upcoming rotation is for the next injection.

For example a injectiontime of 23 ms and a engine speed of 6000 rpm. The time of 2 rotations = $1 / (\text{rpm}/\text{minute}) \times 2 = 1 / (6000/60) \times 2 = 20 \text{ ms}$. The overflow is $23 - 20 = 3 \text{ ms}$.

When choosing injectors it's important that the flow is high enough so that injectiontime doesn't occur. When there is a correction on watertemperature, injectiontime overflow can occur when the injector flow is too narrow.

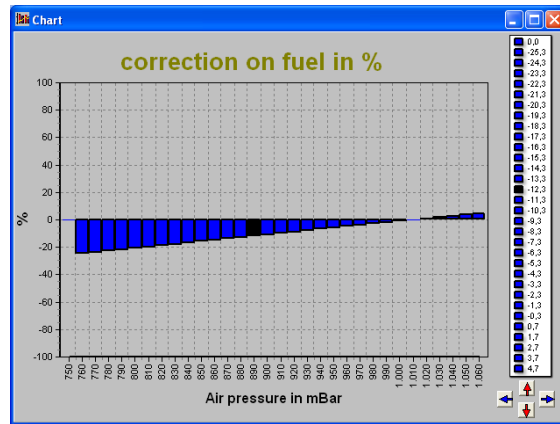
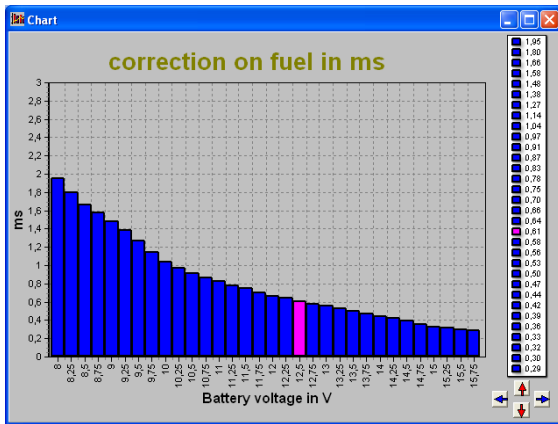
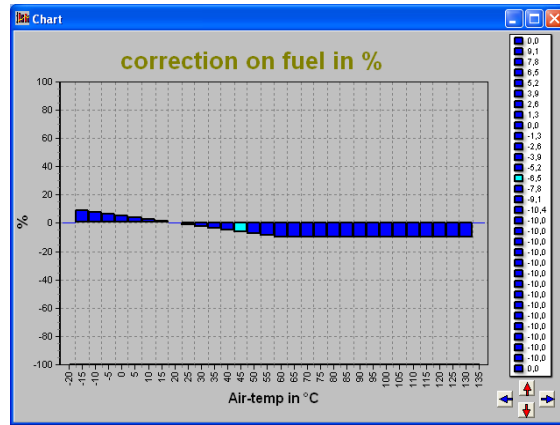
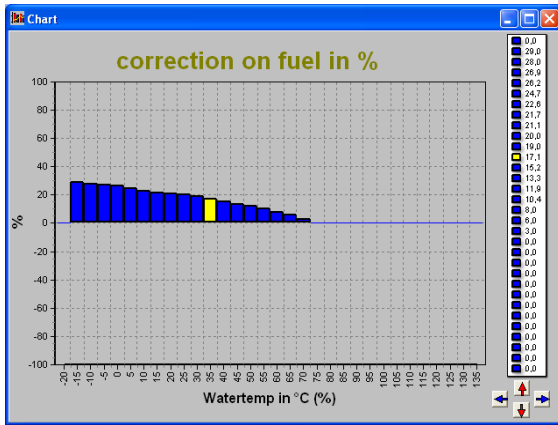
It is also possible to modify the diagram values in the bar charts by using the arrow keys, or the arrow keys in combination with the Ctrl or Alt key. The left/right arrow keys can be used to move through a column or row. When the upward or downward arrow key is used, the value will go up or

down 0.10 with each touch of the key. If the Alt key is pressed simultaneously, the value will change 0.01 per touch and if instead of the Alt key the Ctrl key is pressed, the value will change 1.00 per touch.

When the engine is running, the space bar can be touched to go automatically to the relevant value in the bar chart (matching the current situation of the engine), even when this value is at another engine speed or engine load.

To go to another engine speed or engine load, use the Page Up / Page Down keys.

The correction tables can also be shown in the form of a bar chart if a correction figure is clicked. And here can also the arrow keys be used to change the values.



5 Hardware installation

To guarantee that the system functions properly, it is of utmost importance to adhere to the instructions given below.

5.1 Fitting the ECU

It is important that the ECU should be fitted in a dry and not too hot place.

5.2 Connecting the communication cable

Attached to the included wiring loom of your KMS Fuel/FA23 system is a serial port. You can use this communication for your desktop/laptop and make a connection with the KMS Fuel software.

Warning:



Make sure that you know what kind of injectors you are using. Because of the fact that when you connect low impedance injectors, eventually the ECU will malfunction because of overheating. When using low impedance injectors, a high current will run through the ECU which will break down some components. Injectors above 10Ω are always right. If you have injectors below this impedance, please use an injector driver. (the ECU can handle up to 7A on the injector output, so you can make a calculation on the required current).

6 Fault tracing

Fault	Possible cause	Solution
No communication between PC and system	<ul style="list-style-type: none"> - No power supply to the system - Cable connected to wrong COM port (standard is COM1) 	<ul style="list-style-type: none"> - Switch the contact on or check the fuse - Connect cable to COM1 or select another COM port; For WINDOWS a COM port lower than 9 is preferred. See paragraph 3.2.4.1.10 Communication port
Engine does not start	<ul style="list-style-type: none"> - No engine speed signal - Start-up menu settings are not correct 	<ul style="list-style-type: none"> - Check the sensor and wiring - Set duration of injection to the correct value
Poor engine starting when the engine is cold	<ul style="list-style-type: none"> - Engine temperature correction table not correctly set 	<ul style="list-style-type: none"> - Set correction table correctly
Poor accelerator to engine response	<ul style="list-style-type: none"> - Incorrect setting of acceleration enrichment - Defective engine load sensor - Engine load sensor not calibrated 	<ul style="list-style-type: none"> - Adjust values in throttle pump effect menu - Check whether the engine load indicated on the dashboard changes evenly when the accelerator is slowly depressed - See paragraph 3.2.4.1.3 Engine load sensor
Temperature reading gives incorrect value	<ul style="list-style-type: none"> - Wrong type of NTC temperature sensor 	<ul style="list-style-type: none"> - Fit the correct temperature sensor
Temperature reading gives --- in the communication bar	<ul style="list-style-type: none"> - Sensor not connected or short circuit in sensor wiring 	<ul style="list-style-type: none"> - Check the wiring
Auto calibration gives message 'warning range too small'	<ul style="list-style-type: none"> - Sensor range too small or potentiometer connected incorrectly 	<ul style="list-style-type: none"> - Check the wiring - Fill in the values of the engine load sensor manually
Auto calibration gives message 'warning signal reversed'	<ul style="list-style-type: none"> - Throttle valve potentiometer turns in the wrong direction 	<ul style="list-style-type: none"> - Interchange the earth and 5V wiring of the potentiometer
Auto calibration gives message 'engine load sensor not connected'	<ul style="list-style-type: none"> - The engine load sensor signal does not change - Interruption in potentiometer signal wiring or potentiometer does not turn when the throttle valve is opened 	

7 Specifications

Minimum system requirements:

Windows 95,98,2000,NT,ME,XP or Vista
Internal memory 32Mb
Screen resolution 1024x768
Serial port or standard USB port
CD-ROM station
Acrobat reader 3.0 or higher (Acrobat reader 5.0 is included on the CD-ROM supplied)

ECU specifications:

Supply voltage 8.5 - 16V
Power consumption 200mA at 12V
5V supply to sensors can have a maximum of 100mA

Inputs:

Inputs are protected up to 50V.

Input for coolant and air temperature is suitable for an NTC-sensor as standard.
(2,2k Ω at 25° Celsius)

Input for engine load is suitable for potentiometers, air mass meters and map sensors with an output between 0 and 5V.

Outputs:

Injector output can deliver at most 7A at 12V (for instance 6 injectors with a resistance of 16 Ω)
AUX and fuel pump outputs: max. 1A at 12V per output

Dimensions:

KMS FA23

LxWxH: 85 x 85 x 40 mm

Weight: 280 gram

KMS Fuel

LxWxH: 111 x 67 x 22 mm

Weight: 200 gram

8 Wiring diagrams

8.1 Wiring diagram FA23

Standard colours KMS FA23 wiring-loom						
Pin nr. KMS	Colour	Length	Diameter: 0,5mm ²	Diameter: 0,75mm ²	Function	Details
1			*			
2						
3	white			*	Injector driver output	
4	blue		*		Aux out 1	
5	grey/black		*		Load signal MAP	MAP or air pressure sensor
6	black			*	ECU ground	
7	red			*	12V ECU supply	Use 5-10 Amp. Fuse on ignition key
8	green		*		Communication	Pin 2
9						
10						
11	orange/black		*		Coil / hall signal	(-) Coil or hall sensor
12						
13	grey		*		Load signal TPS	
14	black		Pin 5	*	Sensor ground	TPS/MAP/Water T/Air T
15	red		*		Communication	Pin 3
16	white/black		*		Fuel pump relay	Connect to ground of relay
17	brown			*	Ground	Extra ground together with ECU ground
18						
19						
20	yellow		*		5V Load sensor supply	
21	grey/blue		*		Water temperature signal	
22	red/blue		*		Air temperature signal	
23	black		*		Communication	Pin 5

8.2 Wiring diagram FUEL

