



KMS ETC Manual V1.5



**KING OF ENGINE
PERFORMANCE**

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1 KMS (Kronenburg Management Systems)

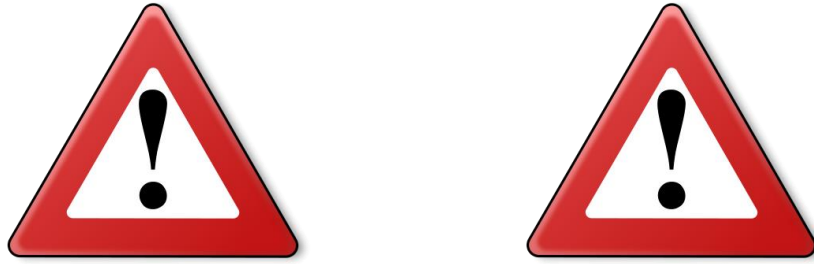
Thank you for purchasing the KMS Electronic Throttle Controller (ETC). KMS is a complete line of fully programmable engine control units, that offers you an extremely reliable and user-friendly system at a very competitive price. It gives users the possibility to manage all naturally aspired and turbo charged Otto engines up to 12 cylinders.

The KMS ETC is a controller which allows users to control all kinds of electronic throttle valves. It uses the double potentiometers in both the throttle pedal and valve, for maximum safety and reliability. The specially designed KMS ETC software enables users to get the maximum performance from the electronic throttle system, in the safest and most reliable way.

Setting up the KMS ETC is very straight forward thanks to an automatic calibration procedure and user-friendly designed control software. In addition to the automatic calibration, the ETC offers a wide range of available options such as launch control, anti-lag (ALS), high idle, etc. It is possible to use the ETC both stand-alone or in combination with a KMS ECU. The ETC can communicate with the KMS ECU through CAN-bus or via analog signals.

We strongly recommend users to read the complete manual before using the product. Mapping of the software is kept as simple as possible, but an error in the configuration can cause permanent engine, component or vehicle damage. Please pay extra attention to the sections in this manual

which are marked by the safety warning sign , in order to prevent any damage.



WARNING:

Disconnect the battery cables when working on the electronics.

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

Do not use a battery booster or a 24V charger. Do not reverse the polarity from the power supply or charging unit. Do not change the battery with the engine running. The peak power caused by this can damage the KMS ETC and other electrical devices.

Do not place the KMS ETC near heat sources and avoid direct contact with water.

Manually changing the ETC settings parameters can cause serious damage to engine and vehicle. Manually changing the ETC settings parameters is only allowed by specialists with knowledge of the KMS ETC.

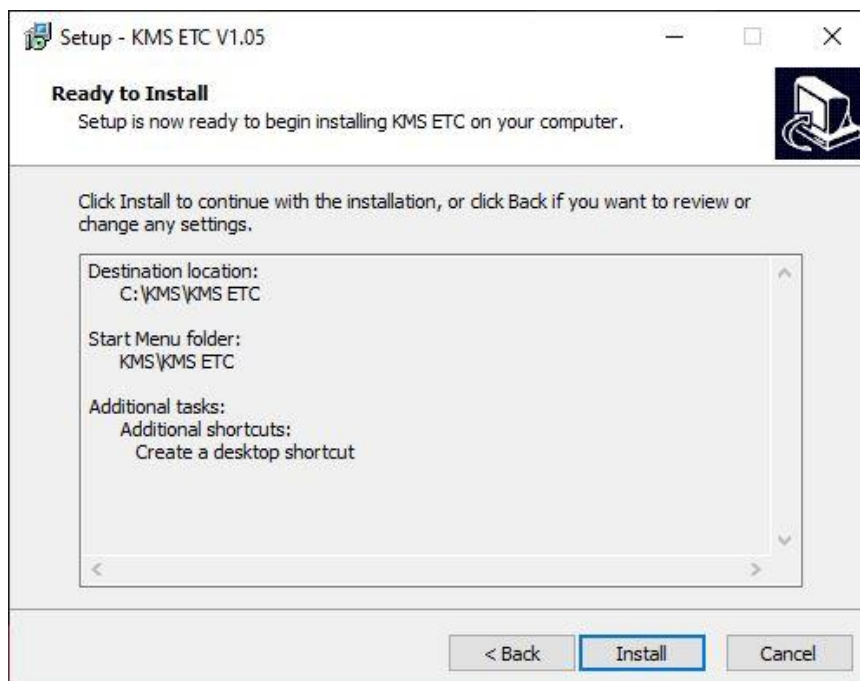
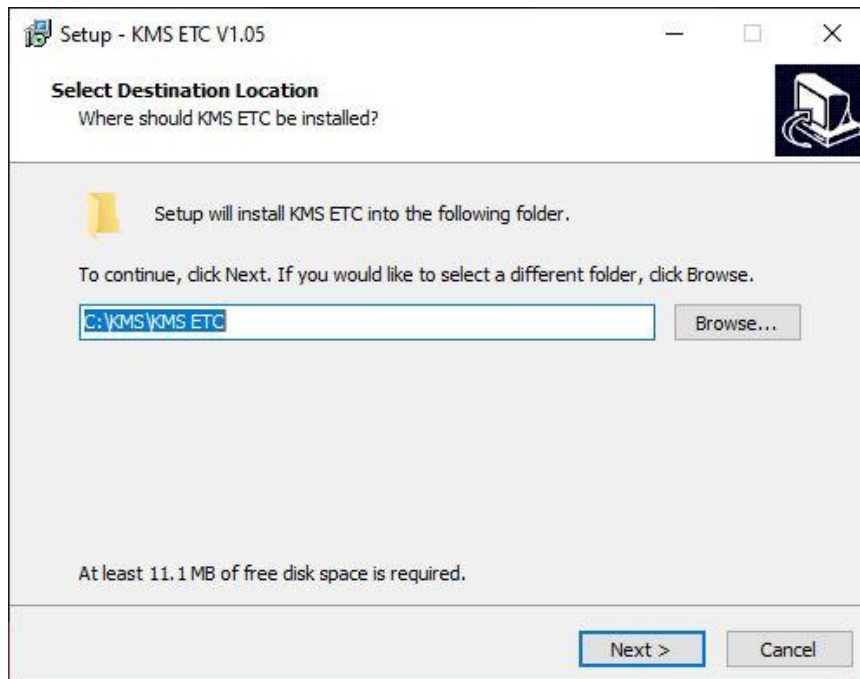
The electric throttle valve is very powerful and can cause serious injury. Stay away from the throttle valve when it is activated.

It is only allowed to use the KMS ETC for circuit/track use.

You expressly acknowledge and agree that KMS will not be liable for any direct, indirect, incidental, special, consequential or exemplary damages, including but not limited to: damages to vehicle, persons, data, goods or other intangible losses resulting from the use of the KMS ETC.

2 Software installation

The software is supplied together with the system, on a USB Stick. Installing the software is very easy.

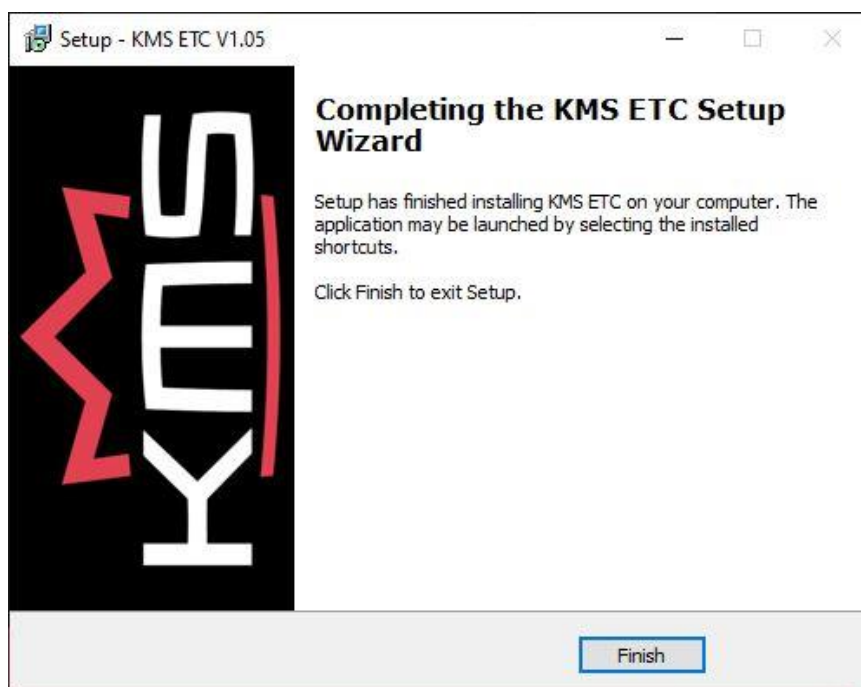


After this step the software will be installed on your computer.

During this install a popup window will occur, in which you can install the required drivers for communication with the KMS ETC.

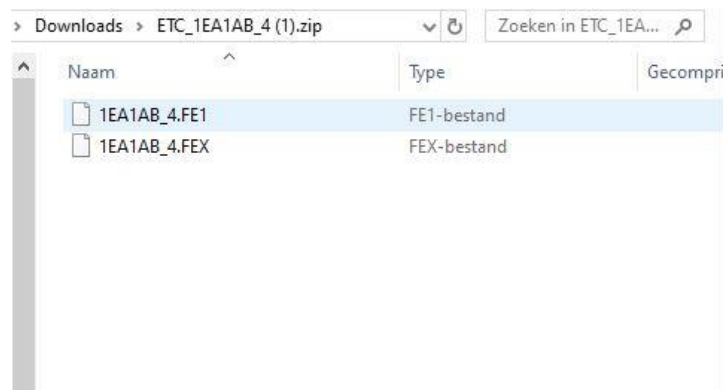


If everything is installed correctly the following screen will show.

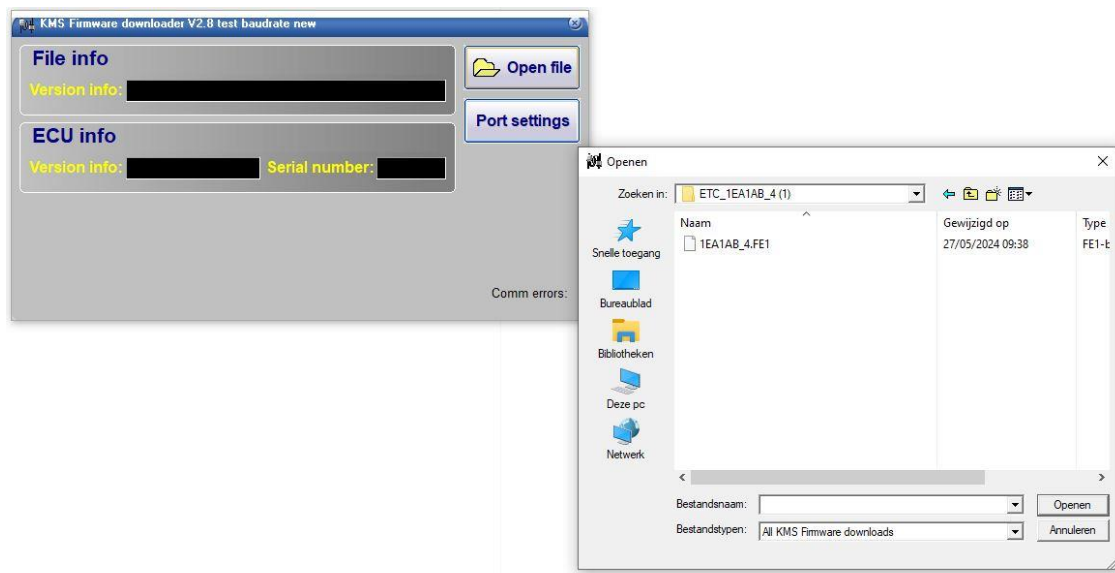


After you press finish the ETC software is ready for use.

The program **KMS FIRMWARE DOWNLOADER** can be used to update the ETC. When there are new options available, a firmware update can be downloaded as a zip file from the [Van Kronenburg website](#). The zip file consists of 2 files, see figure below.



With the firmware downloader this update file can be sent to the ETC. Only 1 of the 2 files is visible with the firmware downloader, (see figure below).



The ETC update file starts with the characters 1E and also has extension *.FE1.

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 3.2.4.9 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 3.2.4.9 Communication port)

3 ETC software

When the ETC software is opened, a welcome screen will appear. Press 'Ok' to continue to the main screen.



The main screen is divided into 3 parts:

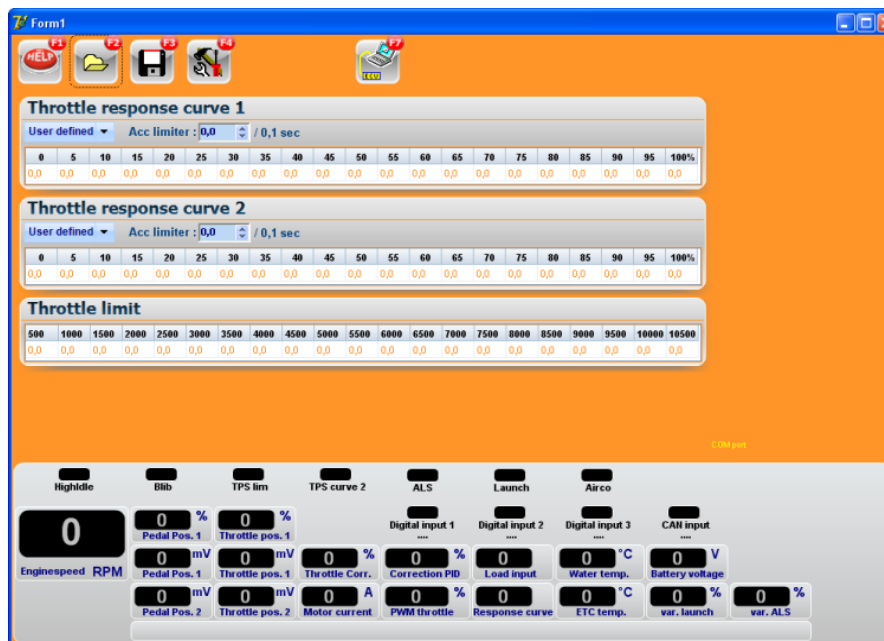
- The main screen
- The function bars
- The communication bars

The following chapters will describe the software possibilities and functions.

3.1 The main screen

The main screen is divided into 3 bars:

- Throttle response curve 1
- Throttle response curve 2
- Throttle limit

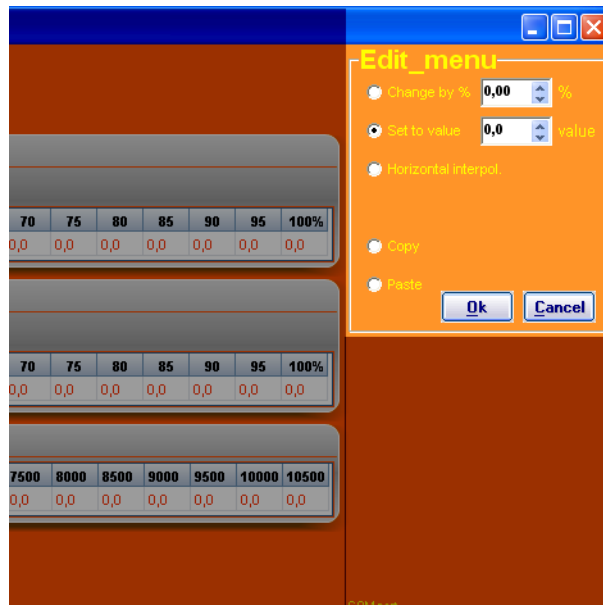


3.1.1 Throttle response curve

The 'throttle response curve' allows users to configure the relation between the pedal position and throttle valve position. The upper row displays the pedal position in percentage (%) and cannot be changed. In the second row, the desired throttle valve position can be set in (%) for each mating pedal position.

There are three options in setting the throttle response. First you can set the response curve to linear, meaning that throttle valve will do exactly the same as the throttle pedal operated by the driver. Another predefined possibility is an exponential relation which gives users a more precise control at lower throttle valve positions and somewhat less control at higher valve positions. Finally, users can also select 'User defined' to determine their own response curve.

Throttle response curve 1																				
User defined	Acc limiter : 100,0 / 0,1 sec																			
0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100%
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	0,0	0,0	0,0	0,0	0,0



Changing the values of User defined characteristic can be done in the 'Edit menu' which appears when a value in the response curve is selected. The value can be changed by setting another value, changing it with a certain percentage or through interpolation with other values. It's also possible to copy any values from other files.

It's also possible to restrict the speed at which the throttle valve must open. Setting the 'Acc limiter' at 100/0,1 sec means that the ETC will try to open the throttle valve as fast as possible, i.o. to 100% in 0,1 sec. This is often limited by the power of the throttle valve motor, meaning that from 0 to 100% in 0,1 sec is mostly not possible. But lowering this value does allow users to make the throttle valve feel softer rather than aggressive at fast pedal position changes.

Users can switch between throttle response curve 1 and 2 by activating a switch connected to one of the Digital inputs. This way you can, for example, make an aggressive and direct feeling throttle for dry conditions, and a more graduate responding throttle for wet conditions.

3.1.2 Throttle limit

The 'Throttle limit' determines the maximum allowed throttle valve opening for each mating RPM range. The first row displays the RPM range which can be configured in the 'RPM pickup' menu (see chapter 3.2.4.4 RPM pickup). Adjustment of the maximum throttle valve position in percentage (%) can be done in the second row.

Throttle limit																				
500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	10500
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	0,0	0,0	0,0	0,0	0,0

Adjustment of the values is again possible by selecting the desired value, which will open the 'Edit menu'. When the values are set at 100%, the 'Throttle limit' will not be used meaning that the throttle valve can be fully opened through the entire RPM range.



Warning:

It is important to set the throttle limit above 0%. When the throttle valve is limited to 0%, the ETC cannot open the valve. Furthermore, it is only possible to raise or increase the throttle limit for each RPM range. It is not possible to fluctuate or decrease the throttle limit characteristic.

3.1.3 Openloop idle

The 'Openloop idle' function makes it possible to maintain a constant idle speed based on an openloop controller. It uses the main throttle valve to regulate the idle RPM's. Depending on the input values, the throttle valve opening will increase when the engine speed decreases. The values should interpolate down to the desired engine speed so that the ETC always strives for the correct RPM's. The table below is an example of how the Openloop idle could be set.

Openloop idle																				
500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900
10,0	9,5	9,0	8,5	8,0	7,5	7,0	6,5	6,0	5,5	5,0	4,5	4,0	3,5	3,0	2,5	2,0	1,5	1,0	0,5	0,0

The Openloop idle can open the throttle valve up to 10%. Any value above will not have effect.

3.2 The function bar

The horizontal bar on top 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. The software can be found on the installation CD-ROM.

3.2.2 Function key F2



This function key enables a previously saved file to be opened from the hard disk, USB memory stick, etc. ETC files have the extension *.E00.

3.2.3 Function key F3

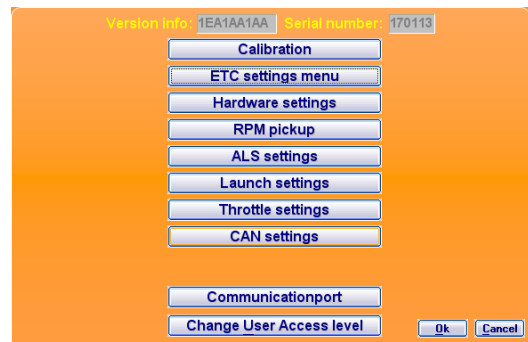


This function key is used to save modified files on to the hard disk, USB memory stick, etc.

3.2.4 Function key F4



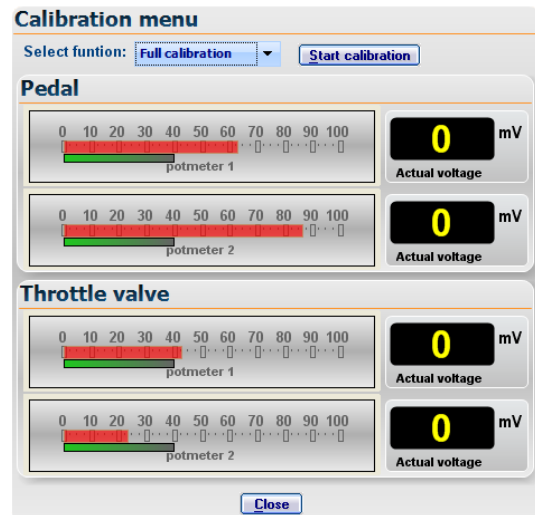
When this function key is activated, a menu will appear on the screen, which gives the option of several settings and tests. The options will be explained in the following sections.



3.2.4.1 Calibration

Calibration is carried out in the 'Calibration' menu. There are 2 different calibrations possible:

- Pedal calibration
- Throttle valve calibration



'Pedal calibration' is the calibration process for the electronic throttle pedal. When calibrating the throttle pedal, please carefully follow the instructions displayed in the software. During the calibration of the throttle pedal, users need to follow the green bar as closely as possible by operating the throttle pedal (red bar).

'Throttle valve calibration' is needed for calibrating the electronic throttle valve. This calibration is fully automatic. It's only necessary to indicate whether your throttle system features a 'single or dual spring'.

Most engines equipped with one or two throttle valves feature a valve which has two springs. This means that when the throttle valve is not powered/activated, it isn't fully closed or in zero position.

Engines with electronically controlled throttle bodies are often only equipped with one return spring in the throttle valve meaning that it will fully close.

To test whether your throttle valve has a single or double spring, try to push the throttle valve in two directions (**when it is not powered!**). As mentioned before, if you can push it in two directions it has a double spring, if you can only move it in one direction you will have only one return spring.

Warning:



If the engine is equipped with throttle bodies, make sure all the components that are restricting the throttle valve range, (like adjusting screws, etc.) will not do this when the ETC is active. It is important to do this before starting the calibration procedure. The throttle valve range, when it is calibrated to the desired minimum (idle) and maximum (full throttle) position, may not be restricted by any mechanical part. This is important because the system want to reach a certain position. If this position is blocked by a restricting part, it will power up the system until the position is reached. This can cause damage to the system or engine.

To start the calibration process, select the desired calibration and press 'Start'. When the calibration is finished, the message 'Calibration done' will automatically appear.



Warning:

When using the system for the first time, it is essential to execute the pedal and throttle valve calibration before using the KMS ETC. Do not switch off the power before the calibration is done.

The calibration screen displays the potentiometer signals from both the pedal and throttle valve. The bar graphs show the positions in percentage (%) and the numeric displays on the right show the positions in Voltage (mV).

Calibrating full throttle position

After the calibration process is done, a window will appear for setting up the full throttle position. Most electronic throttle valves can open more than 90 degrees, which means that if the throttle valve is controlled to the maximum, it is actually not fully open. To properly execute this calibration process, you must be able to view the throttle valve opening. Press the throttle pedal until the throttle valve is fully open or in your desired maximum throttle position. Then read the current throttle valve potentiometer 1 position in mV in the bottom of the main screen. Set this value for 'Maximum TPS1'.



Warning:

The electric throttle valve is very powerful and can cause serious injury. Stay away from the throttle valve when it is activated. It is important to read the throttle valve potentiometer 1 value for tuning the 'maximum TPS1' position.

Calibrating idle position

After the calibration process is done, the idle position must be set. The calibration process has set the lowest possible throttle valve position as 'minimum TPS1'. This means that the throttle valve is fully closed so the engine will not start. Increase this value gradually step by step to reach the desired engine idle rpm.

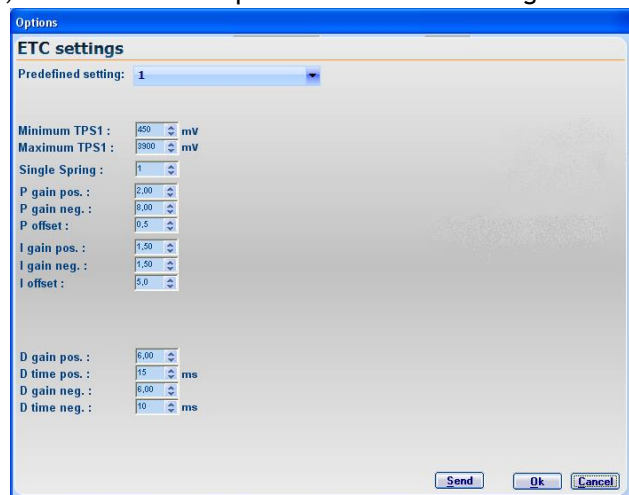


Warning:

Change the value 'minimum TPS1' with small steps of 20 mV at a time. A few mV can have a big effect on the idle RPM.

3.2.4.2 ETC – settings

All ETC parameters can be manually adjusted in the 'ETC settings' menu. Depending on the allowed safety access level, a different set of parameters can be changed.



The ETC system uses an extensive PID-algorithm. The main purpose is to transfer the throttle pedal signal into the desired throttle valve position in the safest and most reliable way. However, due to physical restrictions (inertia, resistance, etc.), there will always be a delay between throttle pedal position and throttle valve position. This is called 'the error'. Minimizing the error can be done by adjusting the parameters to a point where the error cannot be decreased anymore.



Warning:

Manually adjusting the parameters can cause serious damage to the engine, vehicle and possibly personal injury. These adjustments are therefore only allowed to be executed by specialists with knowledge of the ETC system.

Access to the parameters is therefore restricted by different security levels which are explained on this page.

3.2.4.2.1 Level 1

Level 1 allows users to only read data from the software. It is not possible to change any parameters in level 1.

3.2.4.2.2 Level 2

Level 2 is the base level where you can adjust the most important parameters.

Predefined settings

Users can choose between five predefined PID settings which are suitable for the majority of throttle valves. Setting 1 is the lightest setting designed for small throttle valves. Setting 5 is the most powerful setting for engines equipped with single throttle bodies.

Minimum TPS1

This is the lowest position of the throttle valve when it is active in mV and determines the engine idle RPM. More information about setting up 'Minimum TPS1' can be found in chapter 3.2.4.1 Calibration.

Maximum TPS1

This is the throttle valve position at full throttle displayed in mV. More information about setting up 'Maximum TPS1' can be found in chapter 3.2.4.1 Calibration.



Warning:

The value 'minimum TPS1' must be lower than 'maximum TPS1' at all times.

3.2.4.2.3 Level 3

Level 3 is only accessible for specialists with knowledge of the ETC system and PID algorithms. The predefined settings from level 2 are manually adjustable in level 3.

P gain pos.

This parameter gains the error of the system which results in a faster and stronger reaction to changes from the throttle pedal. 'P gain pos.' is only active when the throttle valve is opening. When the parameter 'P gain pos.' is set too high, this will lead to a very fast reaction causing the 'Throttle position' to become higher than 'Pedal position', resulting in a nervous throttle pedal response.

When the parameter 'P gain pos.' is set too low, this will lead to a slow reaction causing 'Throttle position' to be lower than 'Pedal position'. This will result in a delayed signal between pedal position and throttle valve position. Because the 'P gain pos.' is only active when the throttle valve is opening, the 'Throttle position' will become equal to the 'Pedal position' after a short time in both situations (P gain pos set to high or low). 'P gain pos.' can be set between 0 and 10.

P gain neg.

'P gain neg.' works in the same way as 'P gain pos.', with the important difference that it is only working when the throttle valve is closing. Most of the time 'P gain neg.' is lower than 'P gain pos.' because almost every throttle valve has a returning spring. This helps 'P gain neg.' to close the throttle valve. 'P gain neg.' can be set between 0 and 10.

P offset

'P offset' has the same purpose as the 'P gain' parameters. 'P offset' has the ability to create a logarithmic way of calculating. This means that the reaction on small errors will be more aggressive and the reaction on big errors less aggressive. The parameter 'P offset' can be set between 0 and 1.

I gain pos.

This parameter allows users to reduce the error to zero. When the parameter 'I gain pos.' is set too low, this will result in a slow reaction causing it to take a long time before the error is controlled to zero. When the 'I gain pos' is set high, this will result in a fast reaction. Too high will result in the error (and thus the throttle valve) fluctuating around the desired position. It also means that the throttle valve will be less stable. 'I gain pos.' can be set between 0 and 8.

I gain neg.

'I gain neg' functions in the same way as 'I gain pos.', with the difference that it is only working when the throttle valve is closing. 'I gain neg.' can be set between 0 and 8.

I offset

'I offset' has the same purpose as the 'I gain' parameters. 'I offset' has the ability to create a logarithmic way of calculating. This means that the reaction on small errors will be more aggressive and the reaction on big errors less aggressive. The parameter 'I offset' can be set between 0 and 1.

D gain pos.

This parameter influences the reaction to changes of the throttle pedal. When the parameter 'D gain pos.' is set too low, it cannot react fast on throttle pedal changes. This means that the throttle valve doesn't decelerate quickly when the throttle pedal is in the desired position. This will lead to overshooting of the throttle valve. On the other hand, the throttle valve cannot accelerate enough when the throttle pedal is suddenly applied, resulting in a slow reacting throttle valve.

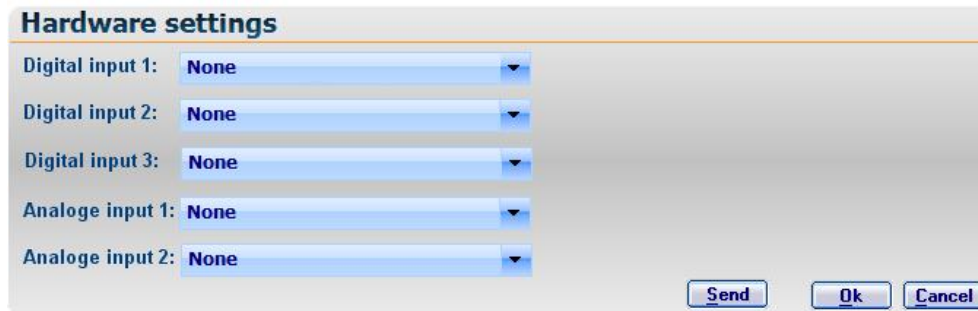
When the parameter 'D gain pos.' is set too high, it is reacting too much on changes from the throttle pedal resulting in a nervous throttle valve. Increasing the 'D gain pos.' results most of the time in decreasing of the 'P gain'. 'D gain pos.' can be set between 0 and 8.

D gain neg.

'D gain neg.' works in the same way as 'D gain pos.', with the difference that it is only working when the throttle valve is closing. 'D gain neg.' can be set between 0 and 8.

3.2.4.3 Hardware settings

In the 'Hardware settings' menu you can select the purpose of the digital and analog inputs. The KMS ETC has 3 digital and 2 analog inputs. 'Digital input 3' is the only digital input suitable for an RPM signal.



Hardware settings

Digital input 1: None

Digital input 2: None

Digital input 3: None

Analoge input 1: None

Analoge input 2: None

Send Ok Cancel



Warning:

The ETC can be connected in three ways: standalone, via CAN bus to an ECU or wired to an ECU without CAN bus. If the ETC is connect with the CAN bus, it is not necessary to connect the ALS, launch control, airco, RPM, water temperature and engine load to the digital and analog inputs, because the signals will be sent from the ECU over the CAN bus. When using the ETC without CAN bus connected or standalone, users have to connect all desired functions to the inputs. Most inputs which are already used for the ECU, can be shared with the ETC.

3.2.4.3.1 Digital inputs

All digital inputs can be activated by switching the input to ground (with the exception of the RPM signal). Digital input 3 is the only input suitable for an RPM signal. Other possible functions for the digital inputs are:

- Throttle response curve 2
- High idle
- A.L.S. activation
- Launch control activation
- Aircon/AC correction
- Throttle blip
- Throttle limit
- RPM input

Throttle response curve 2

The 'throttle response curve 2' function can be used for switching between 'Throttle response curve 1' and 'Throttle response curve 2'. When the chosen digital input is connected to the ground, 'Throttle response curve 2' will be selected, otherwise curve 1 will be active.

High idle

The high idle option sets the throttle valve in a constant position when the selected digital input is connected to ground. This position can be programmed in the 'Throttle settings' menu (chapter 3.2.4.7 Throttle settings).

A.L.S. activation

Anti Lag systems on turbo engines require extra air to create more energy in the exhaust and spool up the turbo. The extra airflow can be achieved by activating the A.L.S. on a digital input of the ETC. This will cause the throttle valve to open, allowing extra air to flow into the engine. The parameters for the A.L.S. can be programmed in the A.L.S. settings menu (chapter 3.2.4.5 A.L.S. settings).

Launch control activation



When the launch control input is switched to ground, the launch control will become active. This means that the ETC restricts the throttle valve from opening more than the desired position, regardless of the throttle pedal position being higher. The parameters for the launch control can be setup in the launch control settings menu (chapter 3.2.4.6 Launch settings).

Airco correction

Normally when an airco system is activated in a car, this will cause an extra load on the engine which can lead to a lower engine idle speed. With the ETC you can compensate for this extra load by opening the throttle valve when the airco input is activated. The compensation value can be programmed in the 'throttle settings' menu (chapter 3.2.4.7 Throttle settings). When the airco input is switched to ground, the set value will be added to the current throttle valve position.

Throttle blip

The throttle blip function gives users the possibility to shortly open the throttle valve when downshifting. When the throttle blip input is switched to ground, the throttle valve will open to the programmed throttle position for the selected time. These parameters can be adjusted in the 'throttle settings' menu (chapter 3.2.4.7 Throttle settings).

Throttle limit

Limiting the maximum throttle position can be done by setting up the throttle limit. When the input is switched to ground, the throttle limit function is activated. The throttle limit value can be adjusted in the 'throttle settings' menu (chapter 3.2.4.7 Throttle settings).

RPM input

An RPM signal can only be connected to digital input 3. The RPM signal has to be a pulsating signal, with each pulse representing one stroke of the engine, same as an analog tacho signal. The settings for this function can be found in the 'RPM pickup' menu (chapter 3.2.4.4 RPM pickup).



Comment:

If 'digital input 2' is set to 'None', this input is functioning as an error output. This means that 'digital input 2' will become active when the system detects an error.

3.2.4.3.2 Analogue inputs

There are two analogue inputs available on the ETC to connect different types of sensors or voltage inputs. The following predefined inputs can be connected:

- Variable A.L.S.
- Variable Launch control
- Water temperature
- Engine load

Variable A.L.S.

When a potentiometer is connected to the variable ALS input, the throttle valve opening can be adjusted with the potentiometer in a certain range. These settings can be changed in the 'A.L.S. settings' menu (see chapter 3.2.4.5 A.L.S. settings). The voltage output of the potentiometer has to be between 0 and 5V, where 0V will be the minimum opening and 5V the maximum opening of the throttle valve during ALS.

Variable Launch control

This input can be used to make the launch control variable in the same way as the variable ALS. The settings can be changed in the 'Launch control settings' menu (see chapter 3.2.4.6 Launch settings).

Water temperature

If the water temperature is wired to an analogue input, users will have the ability to set up an automatic idle warm up procedure. This means that during warm up, the engine idle rpm can be raised by opening the throttle valve. Adjustments can be made in the throttle settings menu (chapter 3.2.4.7 Throttle settings). More information about connecting the water temperature to the KMS ETC can be found in chapter 6.3.2 'Analogue inputs'.

Engine load

An engine load sensor (MAP, MAF or TPS) can be connected to one of the analogue inputs for displaying the engine load in the ETC software.

3.2.4.4 RPM pickup

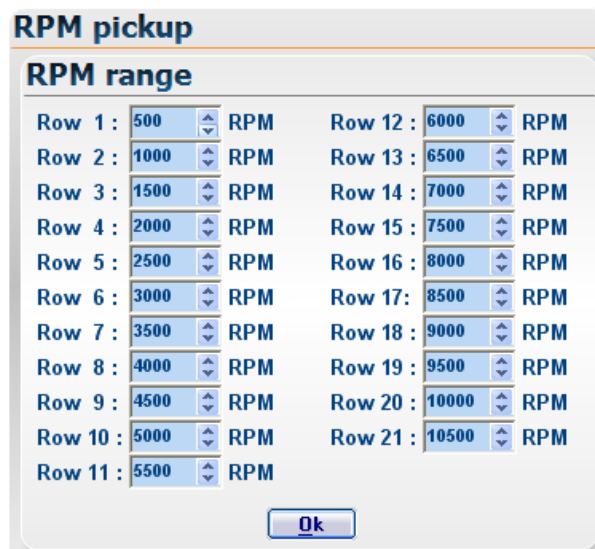
When an RPM signal is connected to the ETC digital input 3, a few settings for the RPM signal have to be configured. If the ETC is connected to an ECU via CAN bus, it's not necessary to setup the RPM pickup, because the RPM signal is then automatically recognized.



'RPM pickup connected to' displays to which input the rpm signal is connected. This can be adjusted in the 'hardware settings' menu (see chapter 3.2.4.3 Hardware settings). The RPM signal is a low voltage input. The pulses per revolution is the number of pulses from the RPM input (hall sensor, tacho output, etc.) to determine the engine speed.

RPM Range

By clicking on the 'RPM range' button you can set the rpm range for the 'Throttle limit' bar in the main screen (minimum rpm is 500 and maximum is 20.000). Standard the 21 columns are divided over an rpm range to 10.500 rpm. If your engine doesn't make more than 8.000 rpm for example, you can divide the 21 rows over this 8.000 rpm so the throttle limit can be setup more precise.



3.2.4.5 A.L.S. settings

Anti Lag systems on turbo engines require extra air to create more energy in the exhaust and spool up the turbo, reducing turbo lag. The extra airflow can be achieved by activating the A.L.S. on a digital input of the ETC (see chapter 3.2.4.3 Hardware settings) or via the CAN bus. This will cause the throttle valve to open, allowing extra air to flow into the engine.

To make full use of the ALS function, the ETC needs to cooperate with an engine management system. When the ETC is connected to a (KMS) ECU via CAN bus, it is not necessary to connect the ALS to any digital input. The ECU will activate the ALS over the CAN bus. However, when variable ALS is used, the potentiometer needs to be connected to both the analogue inputs of ECU and ETC. If there is no CAN bus available or connected on the ECU or ETC, the (variable) ALS still needs to be connected to the ETC inputs.

To activate the ALS function in the ETC software, tick the box in front of 'ALS active'. 'ALS function connected to' displays the selected input for the ALS input in the hardware settings.

A.L.S. min

The 'A.L.S. min' will only be used when the variable ALS input is connected and selected in the hardware settings. ALS min. represents the minimum possible throttle valve position when ALS is activated. When the potentiometer connected to the variable ALS input is turned to 0V, the ETC will control the throttle valve to the minimum programmed (A.L.S. min) position.

A.L.S. max

'A.L.S. max' is the (maximum) throttle valve position when the ALS function is activated. If the variable ALS is not connected, 'ALS max' will be the controlled position of the throttle valve when the A.L.S. function is active. When the potentiometer connected to the variable ALS input is turned to 5V, the ETC will control the throttle valve to the maximum programmed (A.L.S. max) position.

A.L.S. settings

ALS active

A.L.S. activation function connected to : **Not connected**

A.L.S. variable function connected to : **Not connected**

ALS min: 5,0 %

ALS max: 0,0 %

Send Ok Cancel

3.2.4.6 Launch settings

The launch control function on the ETC works in the same way as the ALS function described above, with the only difference being that the throttle valve is not opened by the ETC, but it is restricted. This means that the ETC restricts the throttle valve to the set parameters in the software, regardless if the pedal position is higher. To get the full potential from the launch control function, it is advised to also use this function in cooperation with an engine management system.

Launch settings

Launch active

Launch activation function connected to : **Not connected**

Launch variable function connected to : **Not connected**

Launch min: 0,0 %

Launch max: 1,5 %

Send Ok Cancel



Warning:

A.L.S. and Launch control can cause extreme wear and shorten the lifespan of the engine, turbo, exhaust-valves, exhaust manifold etc.

3.2.4.7 Throttle settings

The KMS ETC features a wide range of functions which can be programmed in the 'Throttle settings' window. This window is divided into four sections with different functions.

The screenshot shows the 'Options' window with the following settings:

- Version info:** 1EA1AA1AA
- Serial number:** 170113
- Throttle settings**
 - Start opening (without RPM signal)**
 - Start opening: 8,0 %
 - Start conditions**
 - Water temperature up to: 0, 25, 40, 60, 100 °C
 - Start valve opening < 400 RPM: 5,0, 6,0, 4,0, 4,0, 3,0 %
 - Valve opening: 3,5, 3,0, 2,0, 2,0, 1,0 %
 - High idle valve opening: 3,0, 5,5, 8,0, 2,0, 2,5 %
 - High idle valve opening: 208, 10, 30, 30, 20 sec.
 - Throttle corrections**
 - Airco correction function connected: Not connected, Airco: 5,0 %
 - High idle function connected to: Not connected, High idle: 5,0 %
 - Throttle blip function connected to: Not connected, Max opening: 50,0 % Opening time: 1000 ms
 - Throttle limit function connected to: Not connected, Limit: 80,0 %
 - Anti-stall**
 - Anti-stall point: 2 %
 - Anti-stall RPM: 1900 RPM
 - Anti-stall time: 300 ms
 - Anti-stall trigger: 2000 RPM

3.2.4.7.1 Start opening (without RPM signal)

If there is no RPM signal (neither via CAN nor via a digital input) connected to the ETC, this value determines the position of the throttle valve when the engine is started. The throttle valve will stay in this position until the throttle pedal is pressed. After the throttle pedal has been moved, the control valve will return to the minimum throttle position.

3.2.4.7.2 Start conditions

The start conditions can only be used if both water temperature and RPM signal are connected to the ETC, or the ETC is connected to an ECU via CAN bus. In the 'Start conditions' menu different settings can be made for an automatic warm up procedure of the engine.

Water temperature up to

In the upper row, 5 different water temperatures can be set to determine the control range of the warm-up. Be careful not to set the highest water temperature above the normal operating temperature of the engine. If the operating temperature of the engine does not reach the maximum set water temperature, the throttle valve will always be controlled to the set parameters in this menu, and never go back to the actual throttle minimum calibrated in the ETC software.

Start valve opening < 400 RPM

During cranking of the engine, engine RPM under 400 RPM, the values set for the 'start valve opening < 400 rpm' will be added to the minimum throttle position by the ETC.

Valve opening

After the engine has been started and the engine RPM goes above 400 RPM, the throttle valve can be opened extra by setting the 'valve opening' in percentage. The set values will be added to the minimum throttle position for warming up the engine. This means that users can make the engine run a higher idle RPM for different engine temperatures.

High idle valve opening

There are two 'high idle valve opening' menu's where an extra opening of the throttle valve can be set for the high idle function. The high idle function can be activated by switching the selected digital input to ground. When the high idle function is activated, the throttle valve will be opened extra by the set percentage in addition to the minimum throttle position and 'valve opening'. It's also possible to set a timer in seconds for the 'high idle valve opening' which allows users to automatically end the 'high idle valve opening'. If the timer expires before the next water temperature range is reached by the engine, the 'high idle valve opening' will end.

3.2.4.7.3 Throttle corrections

The ETC has several functions which are connected to the analog and digital inputs. In this section the selected inputs (see chapter 3.2.4.3 Hardware settings) can be configured.

Aircon/AC correction function

'Airco correction connected to' display to which input the Airco correction is connected and selected in the hardware settings. As described before, when an airco system is activated in a car, this will cause an extra load on the engine which can lead to a lower engine idle speed. With the ETC you can compensate for this extra load by opening the throttle valve when the airco input is activated. When the airco input is switched to ground, the set value will be added to the current throttle valve position.

High idle function

Again 'High idle connected to' displays which input is selected in the hardware configuration. The high idle option corrects the throttle valve to the programmed minimum position when the selected digital input is connected to ground. The set value will be the minimum throttle valve position as long as the function is activated.

Throttle blip function

The colored box in this function displays to the input to which this function is connected. The throttle blip function gives users the possibility to shortly open the throttle valve when downshifting. When the throttle blip input is switched to ground, the throttle valve will open to the 'Max opening' position in percentage. Furthermore, users can also configure the 'Opening time' in ms to define the maximum time the throttle valve is open in this position. In case that the input is deactivated before the time expires, the throttle valve will go back to its normal position.

Throttle limit function

Limiting the maximum throttle position can be done by setting up the throttle limit. When the input is switched to ground, the throttle limit function is activated. The 'Limit' value represents the maximum throttle position in percentage.

3.2.4.7.4 Anti-stall

Another function from the ETC can be programmed to prevent the engine from stalling when the throttle is (suddenly) lifted. There are four parameters that need to be configured.

Anti-stall point



Preventing the engine from stalling can be done by opening the throttle valve when the engine is returning to its idle RPM. The 'Anti-stall point' is the throttle valve position in percentage when the anti-stall function is active.

Anti-stall time

The duration of the anti-stall function can be determined by setting up the 'Anti-stall time'. This means that the throttle valve is opened to the 'Anti-stall point' for the set 'Anti-stall time'.

Anti-stall RPM

When the engine is decelerating and RPM is dropping, the 'Anti-stall RPM' defines the point where the Anti-stall function becomes active. This means that the engine RPM first has to become higher than the 'Anti-stall trigger', before the anti-stall function can become active when engine RPM drops below the 'Anti-stall RPM'.

Anti-stall trigger

This is the minimum RPM for activating the anti-stall function. The engine first has to rise above the 'Anti-stall trigger' RPM after which the Anti-stall function becomes active when engine RPM drops below the 'Anti-stall RPM'.



Warning:

'Anti-stall RPM' always has to be lower or equal to the 'Anti-stall trigger'. If this is not the case, the engine RPM can start to fluctuate around the 'Anti-stall RPM' because the anti-stall function is constantly activated and deactivated.

When the 'anti-stall point' is set (too high) so that the engine RPM will exceed the programmed 'anti-stall trigger', the function goes into a closed loop and the anti-stall function can't stop anymore. It is therefore needed to tune the 'anti-stall point' so the engine RPM won't reach the anti-stall trigger.

3.2.4.8 CAN settings

The ETC can be connected to a CAN bus network from an ECU. All settings for the CAN bus can be configured in the 'CAN settings' menu.



Warning:

The 'CAN settings' only have to be used when the KMS ETC is connected to a CAN bus network.

If the ETC is connected to the CAN bus, it is not necessary to connect the ALS, launch control, airco, RPM, water temperature and engine load to the digital and analog inputs, because the signals will be sent from the ECU over the CAN bus.

3.2.4.8.1 CAN messages

All incoming CAN messages are displayed in the 'CAN messages' menu, divided into 8 different possible CAN messages. Below CAN message 1 is described as an example.

CAN msg1 msg valid ID 11Bit Tx Mode On ID 29Bit Rx

DLC: 8 CAN ID: 40 TimeOut ms: 5 start bit Mode: 0

MSG valid

'MSG valid' needs to be selected/ticked if the CAN message has to be used. The ETC will wait for a certain period of time if it receives a message.

Mode On

If CAN messages are implemented with a mode byte, the box 'Mode on' needs to be ticked. It is also necessary to set the value 'start bit mode' if the box 'Mode on' is activated. This is the start position of the mode signal.

ID 11bit - ID 29bit

CAN-messages can have a length of 11 or 29 bits. One of these two has to be selected and the box ticked at all times.

DLC

Data length of the CAN message in bytes.

CAN ID

CAN message identification number.

Timeout ms

The time (in ms) that the system waits for the CAN message to receive the data.

3.2.4.8.2 CAN receive

Each separate CAN message contains several channels which can be configured in the 'CAN receive' menu.

msg nr	Channel Name	Unit	data type	Start bit	Factor	offset	digits	Mode nr
Off	Noname	Blanc	1 bit	0	-999,999	-999,999	0	Off

MSG nr

The message number is the number of the message which contains the desired channel. This number corresponds to the message number in the 'CAN messages' menu.

Channel Name

Users can set the name of the selected channel to a predefined name for the most common signals or define their own name.

Unit

The unit that will be displayed for the relating channel.

Data type

Select the type of data that is related to the CAN-message:

- 1 bit: used for switches (0 is off and 1 is an active signal)
- 8 bit:
- 8 bit signed:
- 16 bit Intel:
- 16 bit Motorola:
- 16 bit signed Intel:
- 16 bit signed Motorola:

Start bit

The bit number where the related channel starts. Usually there will be more than one data channel inside one CAN message.



Factor

Data from the CAN message can be multiplied with this value to reach the desired order of magnitude.

Offset

An offset can be added to the CAN message data to reach the desired order of magnitude.

Digits

The amount of digits the received channel contains.

3.2.4.8.3 Settings

All other settings for the CAN communication can be programmed in the 'Settings' menu.

Baud rate

The communication speed of the CAN bus can be adjusted by changing the baud rate. If the baud rate is unknown, the auto detect function can be used meaning that the system will automatically search for the correct baud rate.



Warning:

The auto detect function does not work when there are no messages send over the CAN bus network. In this case it is necessary to tune the baud rate manually.

CAN protocol

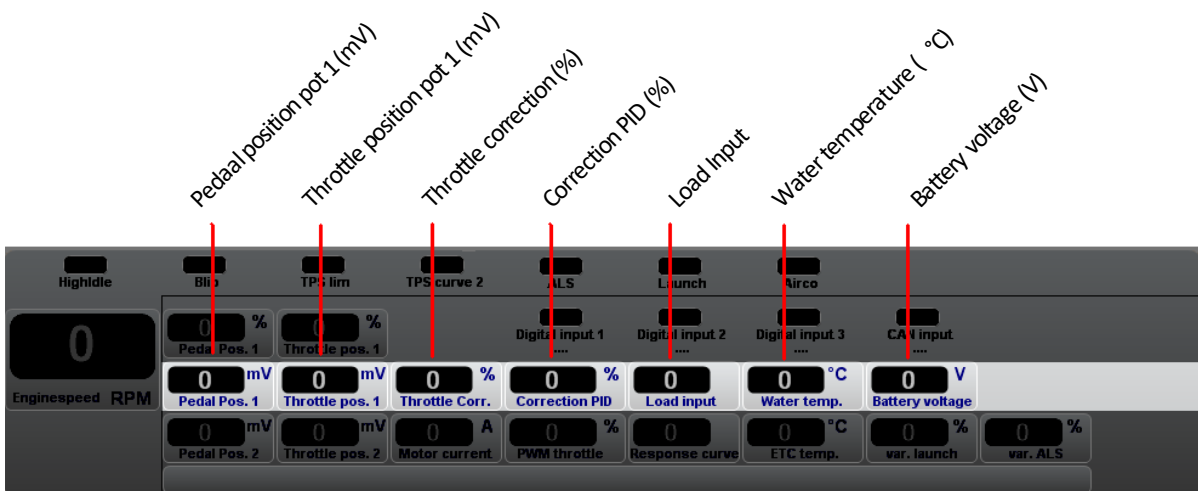
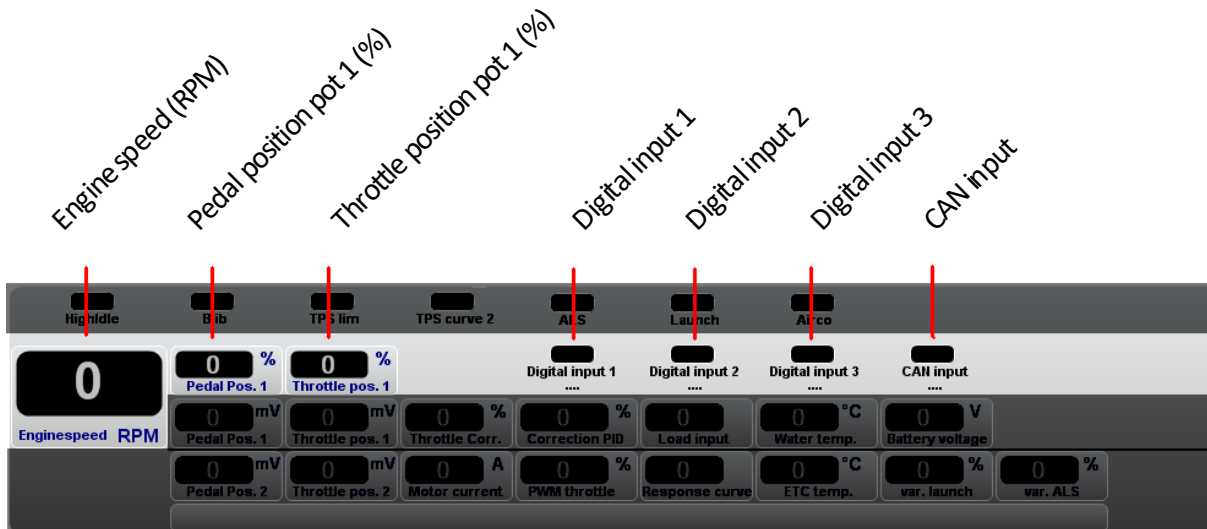
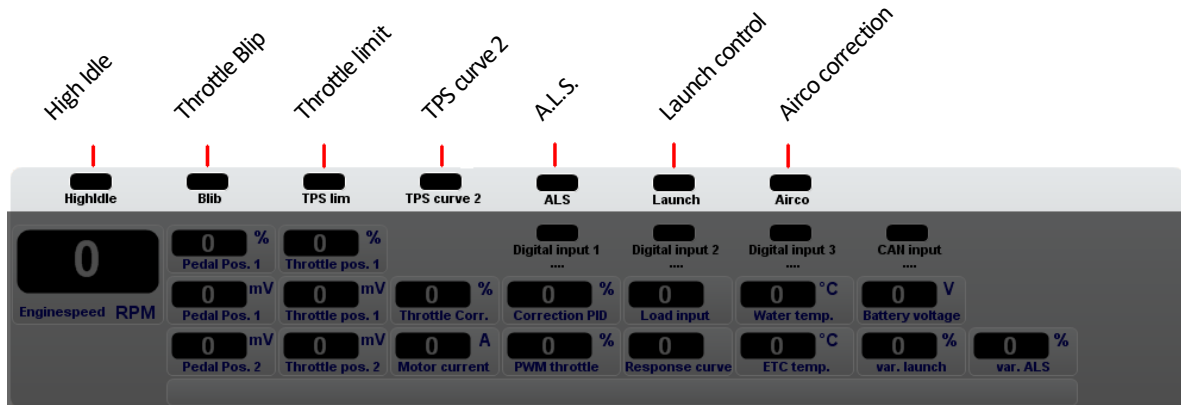
The software contains a preset CAN protocol for the KMS MD35. All the data from the KMS MD35 will be received by the KMS ETC. The CAN messages can be manually adjusted in the 'CAN messages' (see chapter 3.2.4.8.1 CAN messages) and 'CAN receive' (see chapter 3.2.4.8.2 CAN receive) menu, if the setting 'User defined' is selected as the used CAN protocol.

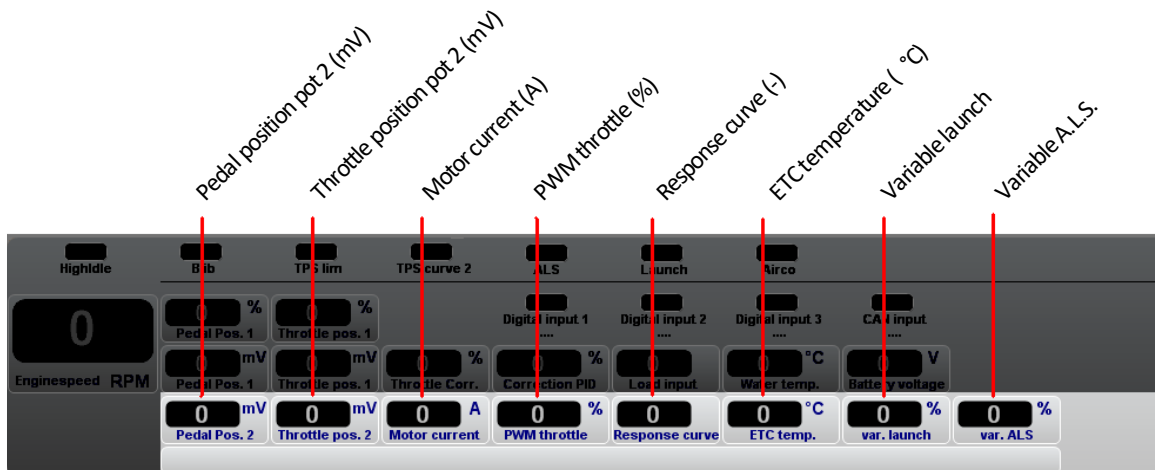
3.3 The communication bar

The horizontal bar at the bottom of the screen is the communication bar. If the system is connected to the 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 11 check lights in the communication bar, which indicate the status of the relevant outputs and inputs.

The following readings will show:





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

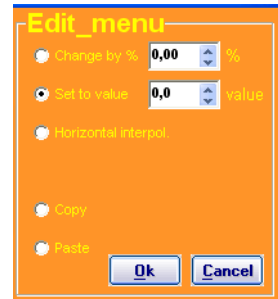
4 Programming

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

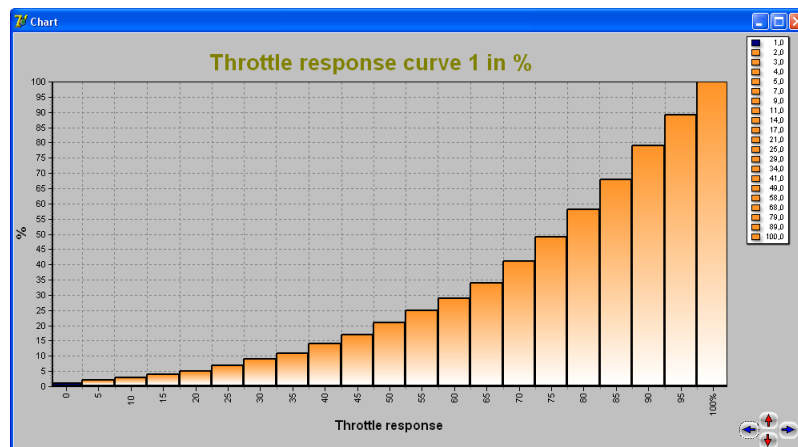
4.1 Manual adjustment

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 a throttle pedal position is clicked. If a throttle pedal position is clicked, a bar chart will appear showing all the throttle valve values related to that throttle pedal position.



It is 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 1 with each touch of the key. If the Alt key is pressed simultaneously, the value will change 10 per touch and if instead of the Alt key the Ctrl key is pressed, the value will change 0.5 per touch.

5 Specifications

Minimum system requirements

Windows XP, Vista, 7, 8, 8.1, 10 or 11

Internal memory 32Mb

Screen resolution 1024x768

Standard USB port

Acrobat reader 3.0 or higher

Dimensions

LxWxH: 77 x 64 x 15 mm

Weight: 126 g

6 Wiring

This chapter contains more information about the wiring and connection of the KMS ETC.

6.1 Connection Pins

The KMS ETC main connector has 24 pins/positions with each pin having its own function. The pin numbers can be seen on the inside of the male connector (on the KMS ETC) or at the back of the female connector (wiring loom).

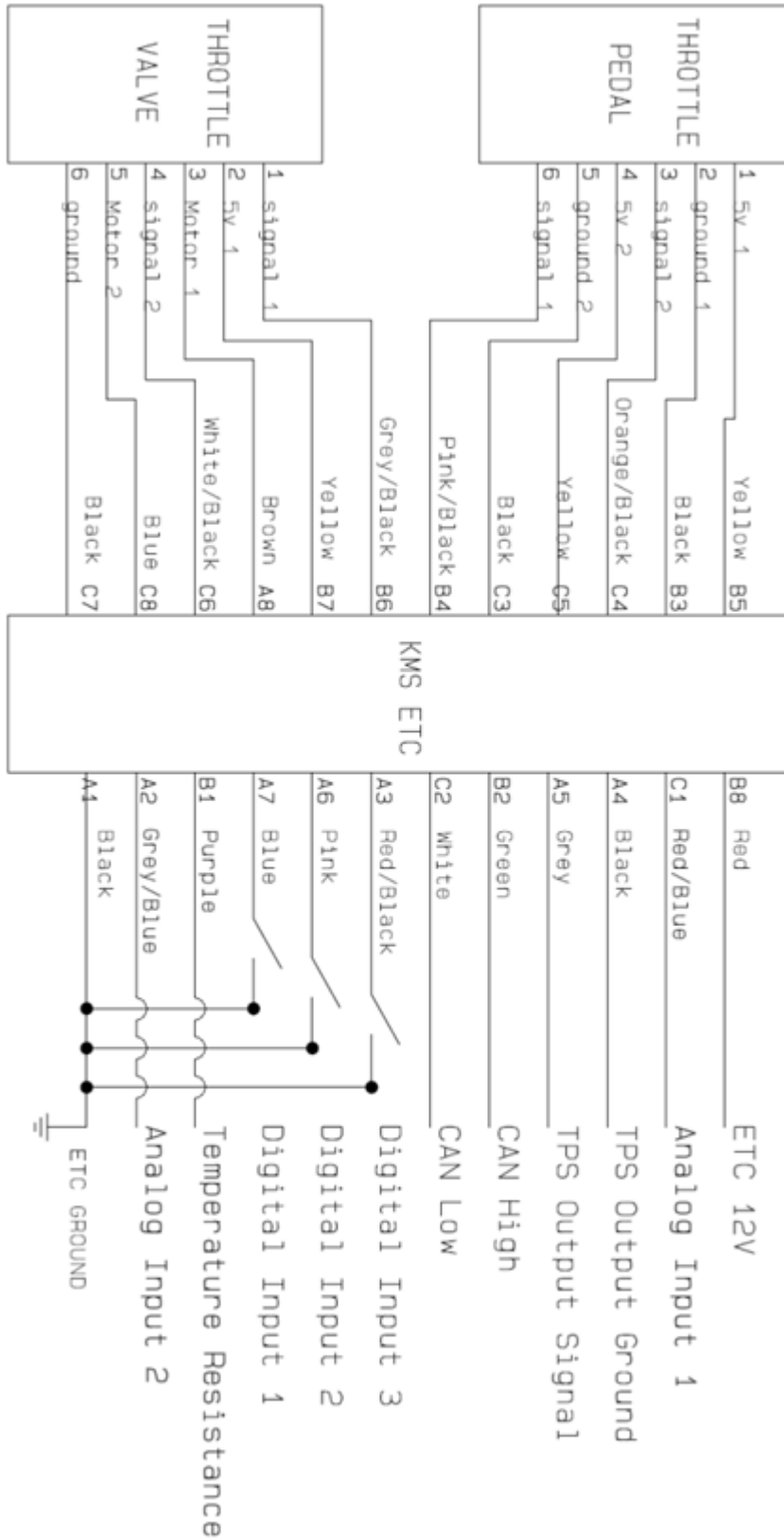
Pin nr.	Color	Wire diameter	Function	Remarks
A1	Black	1	ETC Ground	
A2	Grey/Blue	0,5	Analog Input 2	
A3	Red/Black	0,5	Digital input 3	
A4	Black	0,5	TPS output ground	Not for Stand-alone use ⁽¹⁾
A5	Grey	0,5	TPS output signal	Not for Stand-alone use ⁽¹⁾
A6	Pink	0,5	Digital input 2	
A7	Blue	0,5	Digital input 1	
A8	Brown	1	Motor 1	
B1	Purple	0,5	Temperature resistance	Not used for the MD35 ⁽²⁾
B2	Green	0,5	CAN Low	Not for Stand-alone use ⁽¹⁾
B3	Black	0,5	PPS ground 1	
B4	Pink/Black	0,5	PPS signal 1	
B5	Yellow	0,5	PPS 5v 1	
B6	Grey/Black	0,5	TPS signal 1	
B7	Yellow	0,5	TPS 5v	
B8	Red	1	12V ETC	
C1	Red/Blue	0,5	Analog Input 1	
C2	White	0,5	CAN High	Not for Stand-alone use ⁽¹⁾
C3	Black	0,5	PPS ground 2	
C4	Orange/Black	0,5	PPS signal 2	
C5	Yellow	0,5	PPS 5v 2	
C6	White/Black	0,5	TPS signal 2	
C7	Black	0,5	TPS ground	
C8	Blue	1	Motor 2	

The KMS ETC has 3 digital inputs and two analog inputs. The function of these inputs has to be programmed in the ETC software.

- ⁽¹⁾ This function does not work in stand-alone mode.
- ⁽²⁾ This pin does not need to be connected when the KMS ETC is used in combination with a KMS MD35. For more information see chapter 6.3.2.

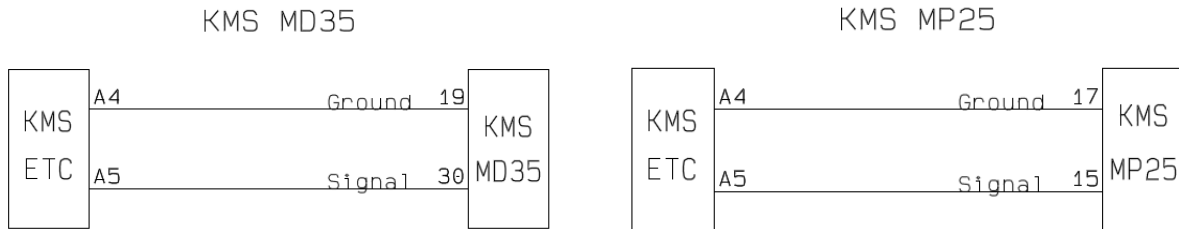
6.2 Basic wiring diagram

The picture below shows the wiring diagram for the KMS ETC. The connection/pin numbers of the throttle valve pedal are examples and can differ for the different types of throttle valves and pedals that can be used.



6.2.1 TPS Output

Pin number A4 and A5, 'TPS output ground' and 'TPS output signal', send out the throttle valve position to the ECU. The pictures below show the connection to the various KMS ECU's.



6.3 KMS ETC Input signals

The KMS ETC is equipped with 3 digital inputs and two analog inputs. This chapter describes the different functions and the connection possibilities.

6.3.1 Digital inputs

The following digital inputs are available:

- Map selector
- High idle
- A.L.S. activation
- Launch control activation
- Airco/AC correction
- Throttle Blip
- Throttle Limit
- RPM Input (only digital input 3)

Each function (except the 'RPM input' function) will be activated when the selected pin is switched to ground. The 'RPM input' function can only be used at digital input 3, see 'Hardware settings' for more information.

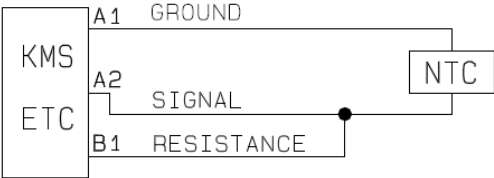
6.3.2 Analog inputs

The following analog inputs can be connected:

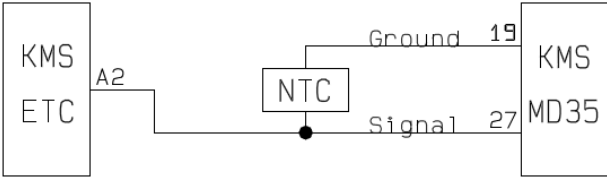
- Variable A.L.S.
- Variable Launch control
- Water temperature
- Engine load

The wiring of a temperature sensor to the KMS ETC depends on the way the KMS ETC is used. The pictures below show how to connect a water temperature sensor to the ETC when it is used standalone or in combination with a KMS MD35. For more information see also 'Hardware settings'.

Stand alone



KMS MD35



7 Diagnose

There are several error messages build into the software to display which component is not functioning correctly. Each error message has its own reason and possibilities to solve the problem. In this chapter, each error message will be clarified and all the possible solutions will be described.

7.1 Calibration errors

Fault	Possible causes	Solution
Range pedal potentiometer 1 is smaller than 2000mV.	<ul style="list-style-type: none"> - Pedal is incorrect connected to the ETC system. - Pedal potentiometer 1 is damaged or is not working correctly. 	<ul style="list-style-type: none"> - Take a look at the ETC communication bar (into the ETC software) and check the 'Pedal pos. 1 value' while controlling the pedal: <ul style="list-style-type: none"> - Is this value is very low (0-100mV), and not changing while controlling the pedal, it probably means the pedal is connected wrong or is damaged. - Is this value is very high (4900-5000mV) and not changing while controlling the pedal, it probably means the pedal is connected wrong or is damaged. - Is this value changing while controlling the pedal, but the range is smaller than 2000mV, than try to switch 'PPS signal 1' with 'PPS signal 2' at the ETC main connector.
Range pedal potentiometer 2 is smaller than 1000mV.	<ul style="list-style-type: none"> - Pedal is incorrect connected to the ETC system. - Pedal potentiometer 2 is damaged or is not working correctly. 	<ul style="list-style-type: none"> - Take a look at the ETC communication bar (into the ETC software) and check the 'Pedal pos. 1 value' while controlling the pedal: <ul style="list-style-type: none"> - Is this value very low (0-100mV), and not changing while controlling the pedal, it probably means the pedal is connected wrong or is damaged. - Is this value very high (4900-5000mV) and not changing while controlling the pedal, it probably means the pedal is connected wrong or is damaged.
Pedal correction table can't be made due to missing positions.	Pedal potentiometer 1 is damaged.	Retry the calibration procedure. Try a different pedal if this resulting in the same error.
Interpolation error between missing pedal positions.	Pedal potentiometer 1 is damaged.	Retry the calibration procedure. Try a different pedal if this resulting in the same error.
Pedal correction table is decreasing.	Pedal potentiometer 1 is damaged.	Retry the calibration procedure. Try a different pedal if this resulting in the same error.

<p>Range throttle valve potentiometer 1 is smaller than 2000mV.</p>	<p>-Throttle valve is incorrect connected to the ETC system. - Throttle valve potentiometer 1 is damaged or is not working correctly.</p>	<p>- Take a look at the ETC communication bar (into the ETC software) and check the 'Throttle pos. 1 value' while running the calibration procedure: - Is this value is very low (0-100mV), and not changing while running the calibration procedure, it probably means the throttle valve is connected wrong or is damaged. - Is this value is very high (4900-5000mV) and not changing while running the calibration procedure, it probably means the throttle valve is connected wrong or is damaged. - Is this value changing while running the calibration procedure, but the range is smaller than 2000mV, than try to switch 'TPS signal 1' with 'TPS signal 2' at the ETC main connector.</p>
<p>Range throttle valve potentiometer 2 is smaller than 1000mV. Direction error throttle valve. Change Motor1 with Motor2.</p>	<p>-Throttle valve is incorrect connected to the ETC system. - Throttle valve potentiometer 2 is damaged or is not working correctly.</p>	<p>- Take a look at the ETC communication bar (into the ETC software) and check the 'Throttle pos. 1 value' while running the calibration procedure: - Is this value very low (0-100mV), and not changing while running the throttle valve, it probably means the throttle valve is connected wrong or is damaged. - Is this value very high (4900-5000mV) and not changing while running the calibration procedure, it probably means the throttle valve is connected wrong or is damaged.</p>
<p>Unstable throttle valve signal when fully closed.</p>	<p>-The wiring is not working properly. -Throttle valve potentiometer 1 is damaged.</p>	<p>-Check the wiring and its connection pins. Keep the wiring away from disturbances (ignition wiring, etc.) -If it is an engine with throttle bodies, change the relevant potentiometer. If it is an engine with a throttle valve, change the whole throttle valve.</p>
<p>Unstable throttle valve signal when fully opened.</p>	<p>-The wiring is not working properly. -Throttle valve potentiometer 1 is damaged.</p>	<p>-Check the wiring and its connection pins. Keep the wiring away from disturbances (ignition wiring, etc.) -If it is an engine with throttle bodies, change the relevant potentiometer. If it is an engine</p>

		with a throttle valve, change the whole throttle valve.
Throttle valve correction table can't be made due to missing positions.	Throttle valve potentiometer 1 is damaged.	Retry the calibration procedure. Try a different throttle valve or potentiometer if this resulting in the same error.
Interpolation error between missing throttle valve positions.	Throttle valve potentiometer 1 is damaged.	Retry the calibration procedure. Try a different throttle valve or potentiometer if this resulting in the same error.
Throttle valve correction table is decreasing.	Throttle valve potentiometer 1 is damaged.	Retry the calibration procedure. Try a different throttle valve or potentiometer if this resulting in the same error.
The ETC voltage is too low to finish the calibration procedure. Check the power supply.	-The power supply is not sufficient for this application. -The power supply is not functioning properly.	Check the ETC voltage at the dashboard (ETC software) while running the calibration procedure: -If it is constantly too low, charge the battery or try a different power supply. -If it is dropping heavily while running the calibration procedure, try a different power supply.
The system power consumption is beyond the system limits.	-The throttle valve or throttle body is damaged and/or not working correctly. -The throttle valve or throttle body power consumption is too high for the ETC system.	- Check the throttle valve or throttle body for damage. - Try a different throttle valve or throttle body.