user guide

win trijekt

for trijekt bee

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1. switch on supply voltage

1.1 switch on supply voltage

It is absolutely **imperative** to check the whole ***trijekt*** cable harness again before connecting the main plug to the control unit!

In particular make sure correct connection of the supply voltage as well as all ***trijekt*** output lines.

Applying the wrong voltage or overcharging the outputs can destroy the control unit.

Maximum current per output must not exceed 1 A!

In case that after exact inspection of installation you can exclude all possibility of doubt that wiring has been carried out correctly, the control unit can be plugged in at switched off ignition. Subsequently activating ignition, the fuel pump must start running for abt. 3 s.

For **trijekt** controlling you need a commercially available personal computer

- on which the provided software **win trijekt** is installed
- being connected to the control unit via serial interface.

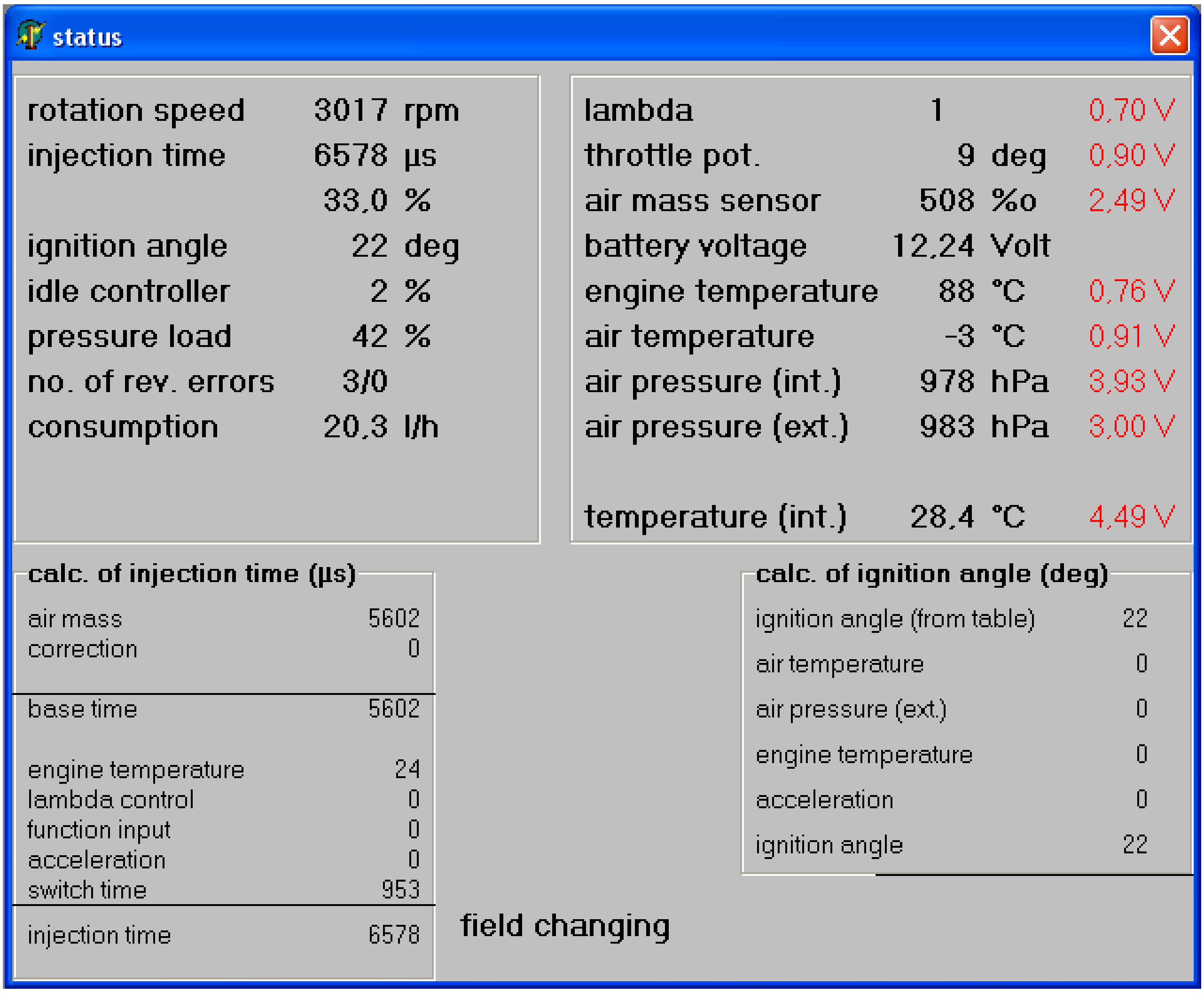
After having started the software you can call up a display of the updated engine data by pressing the function ”**Status**”. In case that the measuring values of engine temperature, air temperature and throttle position do not comply with the actual values, the sensors have to be adjusted.

Any modifications to the settings and maps must be saved in the flash memory of the controller with the F2 key before turning off the ignition. If this is not done, the data will be lost after turning off the ignition.
Also "learned" data will be lost!

After pressing the F2 key, the ECU performs a reset procedure.
The injection and ignition are switched-off during the reset.

1. switch on supply voltage

1.2 status panel



- Pressing key F8 the red marked voltage values of the sensors are shown.
- Pressing space-bar it is switched to „manual mode”.
- Pressing space-bar again you change from „manual mode“ to „normal mode“ again.

1. switch on supply voltage

status panel

rotation speed	Current engine speed
injection time	Current injection time **per crankshaft rotation** In case of fully-sequential injection(and thus every second rotation) the actual injection time is twice as high as the time indicated here. Injector Load is also indicated as percentage, related to the current rpm. (duty cycle) **The maximum duty cycle is 88% if each revolution,** **or 93% if every two revolutions is injected.**
ignition angle	Current ignition angle in „degrees before TDC“
idle controller	Current value of the idle controller in %
boost pressure	Current value of the boost pressure valve in %
no. of rev. errors	The data in front of the slash are „real“ rev. errors. At all events, this figure ought to be as low as possible (a few rev. errors at start and cutoff of engine are allowed) and should remain in single digit range. In case that this figure increases continuously, rpm measurement of the engine has to be revised again. The data behind the slash are rev. errors detected and filtered out by **trijekt** . Also this figure should be as low as possible by all means and must not count continuously high in the normal operation.
consumption	The „Instant Fuel Consumption per hour“ is calculated from injection time and flow rate being indicated in the settings.
target lambda	Target value of the lambda voltage
lambda	Current Lambda Value / Lambda Oxygen Sensor Voltage ---1 = --1 = } Lambda voltage below set value -1 = 1 = Lambda voltage actual value ≈ set value 1+ = 1++ = } Lambda voltage above set value 1+++ =
throttle pot.	Current throttle angle in degrees
air mass sensor	Current air mass value in per mill
battery voltage	Current vehicle voltage
engine temperature	Current engine temperature
air temperature	Current intake air temperature
air pressure int.	Absolute air pressure inside the **trijekt** control unit (=> ambient air pressure)
air pressure ext.	absolute air pressure from external air pressure sensor (e.g. manifold pressure resp. boost pressure)
exhaust gas temp.	Temperature at the exhaust gas temperature sensor
temperature int.	Temperature inside the **trijekt** control unit

1. switch on supply voltage

operating modes

start 1	Ignition switched on, no rpm recognized
start 2	rpm recognized, Starting quantity is injected
warming-up	Engine has started and is running in warming-up mode
normal mode	Idle Speed mode
normal mode (time)	During a period of 5 minutes after ending of warming-up mode the learning aptitude of the graphic maps is still switched off.
normal mode (lambda switched off)	Lambda Control is switched off. This can have the following reasons: - Lambda Control is switched off in the settings. - The engine temperature is below the temperature indicated in the settings for Lambda Control. - The time after starting the engine indicated in the settings for starting the Control has not elapsed, yet. - The engine is in a load range for which the value is 0.00 in the settings (below „Lambda”). - The voltage of the Lambda Oxygen Sensor is outside the min/max. ranges indicated in the settings. - The Lambda Oxygen Sensor Test is switched on in the settings and has detected a fault. - In the warmup map an enrichment for high engine temperatures has been adjusted being active now.
normal mode (temperature too low)	An enrichment from warmup map is active being over 1.5 %.
normal mode (fuel cut-off active)	While the engine is in throttle cutoff, the learning aptitude of the graohic maps is switched off.
normal mode (learning aptitude switched off)	The learning aptitude of the map is switched off in the settings under point “graphic map” (value = 0)
normal mode (function input active)	With active Function Input (formerly Race-Input) the learning aptitude of the graphic map is switched off.
field changing	The graphic map indicated in the settings as adaptive under point „graphic map“ now learns the corresponding injection time in the direction of the preset Lambda set value.
manual mode, step width: XXX	Manual Mode Switchover to manual mode is effected by pressing the space bar. Pressing the space bar again you get back to normal mode. The step width of the injection time can be changed with keys 1 to 9. With keys + and – the injection time can be changed by the amount of the step width (exclusively at recognized rpm). By means of this function e.g. the starting quantity and the correct injection time at idle speed can be calculated quite easily.

„normal mode“ means that the graphic map / characteristic curve - serving for air-mass measurement - is not changed by the learning aptitude.

2. settings

Introduction

Clicking the menu item „window“ you get to the window „settings“.
In these settings numerous details regarding the engine, the sensors and actuators being used and many other settings are carried out.

In the comment field an extensive manual appears for each setting alleviating the right adjustment of the corresponding value.
In order to scroll up and down in the comment field you either click your mouse in the comment field and scroll up and down by means of the arrow keys or hold the mouse button pressed and pull upwards or downwards.

2. settings

2.1 rpm measurement

Sensors for rpm measurement

Please consider **exactly** all comments given here for Sensor Checking and for rpm Measurement.

An absolutely error-free adjustment of these values and sensors is basic prerequisite to put the engine into operation!

- Call up the function **settings** in the menu **window**.
- Here call up **rpm measurement**.
- Depending on the rpm measurement applied, please enter the following data in array **Offset for Ignition Angle**:
  - with one **Hall Sensor and Single Ignition Coil:** Angle in degrees between Hall Signal and TDC of first cylinder.
  - with one **Gear Rim with Gap**: Crankshaft Angle in degrees between gap and TDC and TDC of first cylinder.
  - with one **Gear Rim with TDC Sensor:** gap between transmitting cam and TDC of first cylinder.

In case that the angle is not known exactly, please insert an estimated value.

- Carry out the function **Save to Flash** in menu „**Settings**“ in order to transmit the data to a non-volatile storage of the Control Unit.
- Subsequently, click function **Status**.
- Disconnect fuel pump and injection valves from voltage supply.
- Start the engine.
- Watch the value displayed in array **Motor Status**:
  - rpm must be indicated with abt.120 to 300 rotations.
  - During one constant start activity not more than 2 rev errors may occur.

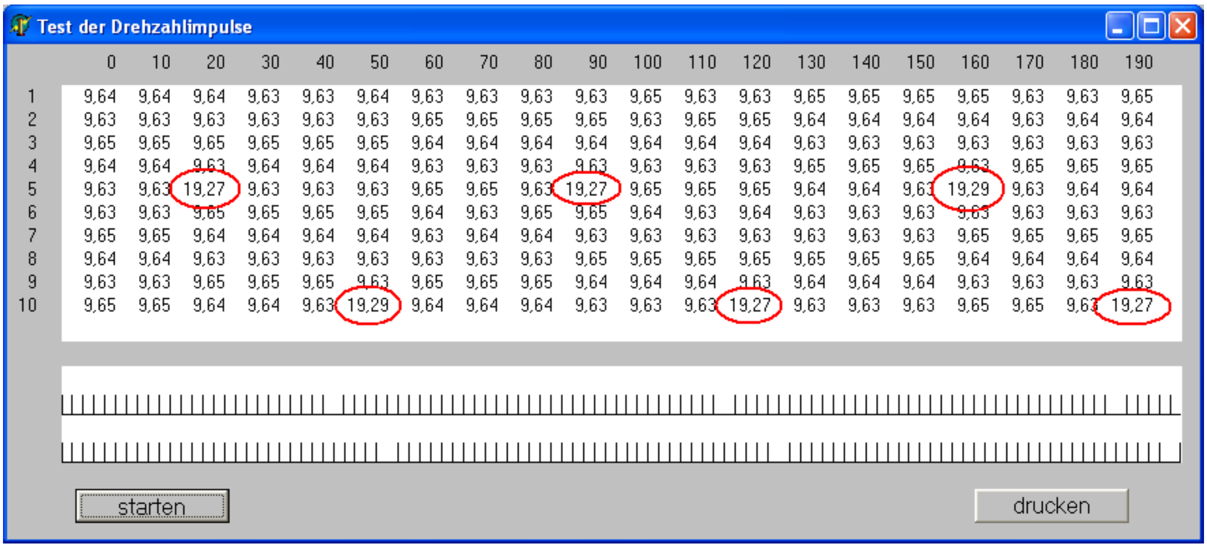
In case that rpm has been recognized properly, sensor polarity has to be tested when recording by means of an inductive sensor at a gear wheel with gap.

- Call up the function **rpm** in the menu **Test.**
- Click the button „start“.
- Operate the starter until numerical values are displayed.
- This will happen after **trijekt** has recognized 200 rpm sensors pulses.
- Please read these values column by column top down

These values – measured by **trijekt** - represent the times between the teeth recognized by the sensor and the tooth gaps. Provided that the Sensor is connected properly, the tooth gap is recognized by time doubled in relation to the preceding impulse (resp. triplication with a gap of 2 teeth). In case that the gap is displayed by two consecutive impulses of abt. 1.5 fold length, you have to change this value in array **falling edge of rpm sensor.**

2. settings

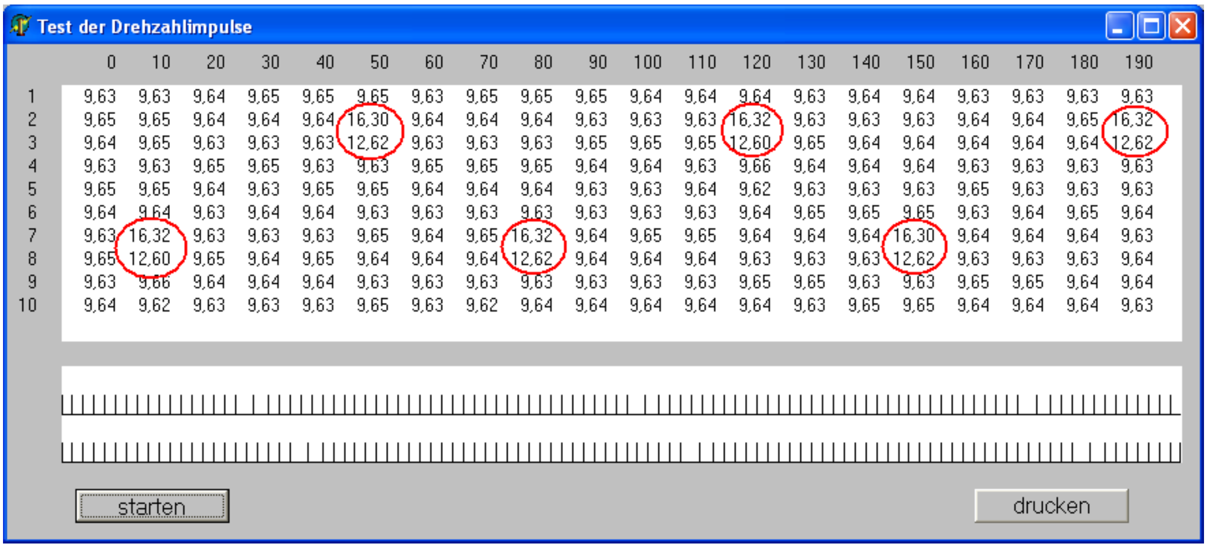
*Example for Measuring Results testing a **properly** operating rpm sensor.(Gear Rim with gap; 35 teeth): The gap in the gear rim is recognized due **to pulse durations being twice as long** – here 19,27ms.*



	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190
1	9,64	9,64	9,64	9,63	9,63	9,64	9,63	9,63	9,63	9,63	9,65	9,63	9,63	9,65	9,65	9,65	9,65	9,63	9,63	9,65
2	9,63	9,63	9,63	9,63	9,63	9,63	9,65	9,65	9,65	9,65	9,63	9,65	9,65	9,64	9,64	9,64	9,64	9,63	9,64	9,64
3	9,65	9,65	9,65	9,65	9,65	9,65	9,64	9,64	9,64	9,64	9,64	9,64	9,64	9,63	9,63	9,63	9,63	9,63	9,63	9,63
4	9,64	9,64	9,63	9,64	9,64	9,64	9,63	9,63	9,63	9,63	9,63	9,63	9,63	9,65	9,65	9,65	9,63	9,65	9,65	9,65
5	9,63	9,63	19,27	9,63	9,63	9,63	9,65	9,65	9,63	19,27	9,65	9,65	9,65	9,64	9,64	9,63	19,29	9,63	9,64	9,64
6	9,63	9,63	9,65	9,65	9,65	9,65	9,64	9,63	9,65	9,65	9,64	9,63	9,64	9,63	9,63	9,63	9,63	9,63	9,63	9,63
7	9,65	9,65	9,64	9,64	9,64	9,64	9,63	9,64	9,64	9,63	9,63	9,63	9,63	9,63	9,63	9,63	9,65	9,65	9,65	9,65
8	9,64	9,64	9,63	9,63	9,63	9,63	9,63	9,63	9,63	9,65	9,65	9,65	9,65	9,65	9,65	9,65	9,64	9,64	9,64	9,64
9	9,63	9,63	9,65	9,65	9,65	9,63	9,65	9,65	9,65	9,64	9,64	9,64	9,63	9,64	9,64	9,64	9,63	9,63	9,63	9,63
10	9,65	9,65	9,64	9,64	9,63	19,29	9,64	9,64	9,64	9,63	9,63	9,63	19,27	9,63	9,63	9,63	9,65	9,65	9,63	19,27

In case of connecting a reference mark sensor, the displayed value is written in red after the TDC reference mark sensor was connected.

*Example for Measuring Results testing a **falsely** operating rpm Sensor. (The same sensor was applied as above, only the setting of the value „**falling edge of rpm Sensor**“ was changed!)*



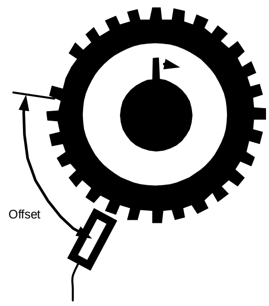
	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190
1	9,63	9,63	9,64	9,65	9,65	9,65	9,63	9,65	9,65	9,65	9,64	9,64	9,64	9,63	9,64	9,64	9,63	9,63	9,63	9,63
2	9,65	9,65	9,64	9,64	9,64	16,30	9,64	9,64	9,64	9,63	9,63	9,63	16,32	9,63	9,63	9,63	9,64	9,64	9,65	16,32
3	9,64	9,65	9,63	9,63	9,63	12,62	9,63	9,63	9,63	9,65	9,65	9,65	12,60	9,65	9,64	9,64	9,64	9,64	9,64	12,62
4	9,63	9,63	9,65	9,65	9,63	9,63	9,65	9,65	9,65	9,64	9,64	9,63	9,66	9,64	9,64	9,64	9,63	9,63	9,63	9,63
5	9,65	9,65	9,64	9,63	9,65	9,65	9,64	9,64	9,64	9,63	9,63	9,64	9,62	9,63	9,63	9,63	9,65	9,63	9,63	9,63
6	9,64	9,64	9,63	9,64	9,64	9,63	9,63	9,63	9,63	9,63	9,63	9,63	9,64	9,65	9,65	9,65	9,63	9,64	9,65	9,64
7	9,63	16,32	9,63	9,63	9,63	9,65	9,64	9,65	16,32	9,64	9,65	9,65	9,64	9,64	9,64	16,30	9,64	9,64	9,64	9,63
8	9,65	12,60	9,65	9,64	9,65	9,64	9,64	9,64	12,62	9,64	9,64	9,64	9,63	9,63	9,63	12,62	9,63	9,63	9,63	9,64
9	9,63	9,66	9,64	9,64	9,64	9,63	9,63	9,63	9,63	9,63	9,63	9,63	9,65	9,65	9,63	9,63	9,65	9,65	9,64	9,64
10	9,64	9,62	9,63	9,63	9,63	9,65	9,63	9,62	9,64	9,64	9,64	9,64	9,64	9,63	9,65	9,65	9,64	9,64	9,64	9,63

2. settings

Type of rpm measurement

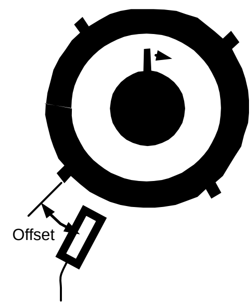
Range: (0..24)

0 = A Pick-up is installed at the crankshaft. There is a gap at the gear rim for TDC detection (one missing tooth). Here it is possible to use double ignition coils.

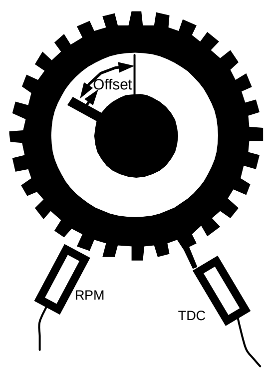


1 = A Pick-up is installed at the camshaft. At the gear rim there is a gap for TDC detection (one missing tooth). It is possible to use double and single ignition coils here.

2 = must not be used.



3 = An ignition distributor is applied. The pulses from the distributor get around a fixed angle in front of the respective cylinder TDC. An external ignition distribution is necessary.



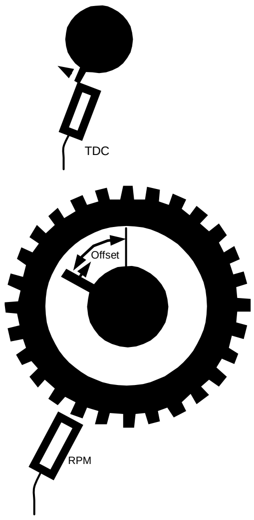
4 = A Pick-up is installed at a gear rim of the crankshaft. Another pick-up detects the TDC at the crankshaft. It is possible to use double ignition coils here.

6 = A Hall Sensor is applied. The pulses from the hall sensor get around a fixed angle in front of the respective cylinder TDC. A further pick-up or hall sensor supplies a TDC-signal from the crankshaft. It is possible to use double ignition coils here.

Import Information for Offset Regulation:

For specifying the degrees of the Offset the **last rpm Sensor Pulse** is evaluated being detected **before the TDC Pulse**. So you should see that the TDC Pulse is not identified exactly at the same time as the rpm Sensor Pulse, because otherwise the Offset might move by the angle between 2 crankshaft pulses during operation (e.g. due to minimum heat expansion of trigger disc).

2. settings

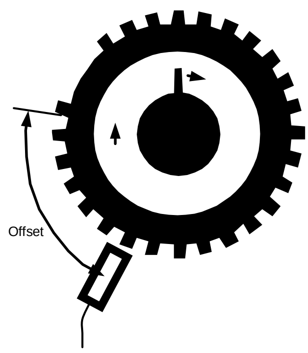


5 = A Pick-up is installed at a gear rim of the crankshaft. Another Pick-up detects the TDC at the camshaft. Here it is possible to use double and single ignition coils. You have to input the number of rpm pulses between two TDC pulses.

7 = A Hall Sensor is applied. The pulses of the hall sensor get around a fixed angle in front of the respective cylinder TDC. Another pick-up or hall sensor supplies a TDC-signal from the camshaft. Here it is possible to use double and single ignition coils.

Import Information for Offset Regulation:

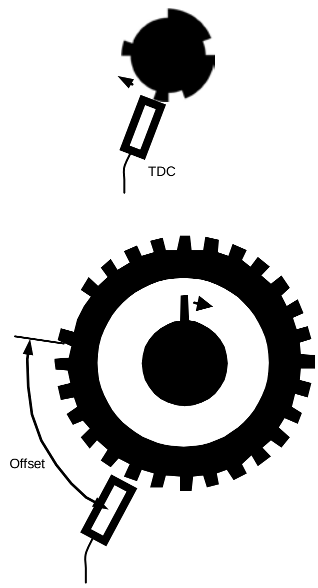
For specifying the degrees of the Offset the **last Crankshaft Pulse** is evaluated being detected **before the Camshaft Pulse**. So you should see that the Camshaft Pulse is not identified exactly at the same time as the Crankshaft Pulse, since otherwise the Offset might move by the angle between 2 Crankshaft Pulses during operation (e.g. because of minimum heat expansion of camshaft drive chain).



8 = A Pick-up is installed at the crankshaft. There is a gap at the gear rim for TDC detection (two missing teeth). Here it is possible to use double ignition coils.

9 = A Pick-up is installed at the camshaft. There is a gap at the gear rim for TDC detection (two missing teeth). It is possible to use double and single ignition coils here.

2. settings

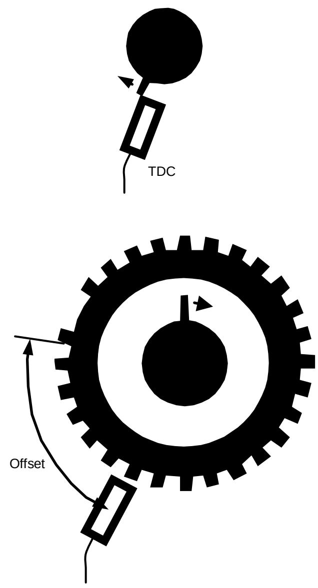


10 = ME7 rpm measurement

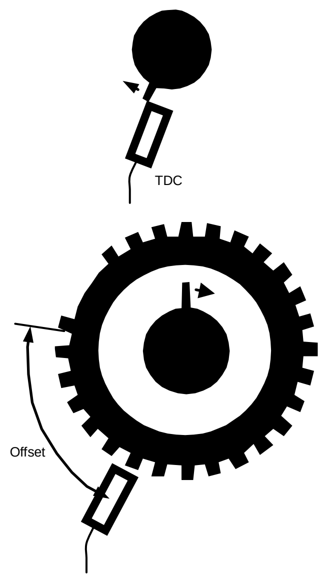
Just like under type 8 rpm measurement is carried out via a gear rim with gap (two missing teeth). An additional TDC sensor at the camshaft detects the position of the first cylinder.

In this case it is so that the current signal of the camshaft sensor is evaluated only at the moment while the gap is at the crankshaft sensor.
If the signal at the camshaft sensor is "low level" at this moment, then cylinder 1 has its next ignition TDC.

2. settings



16 Just as under 0 rpm measurement is carried out via a gear rim with gap (one missing tooth). An additional TDC sensor detects the position of the first cylinder. The next gap after the TDC signal refers to the TDC of the first cylinder.



24 Just like under 8 rpm measurement is carried out via a gear rim with gap (two missing teeth). An additional TDC sensor detects the position of the first cylinder. The next gap after the TDC signal is the TDC of the first cylinder.

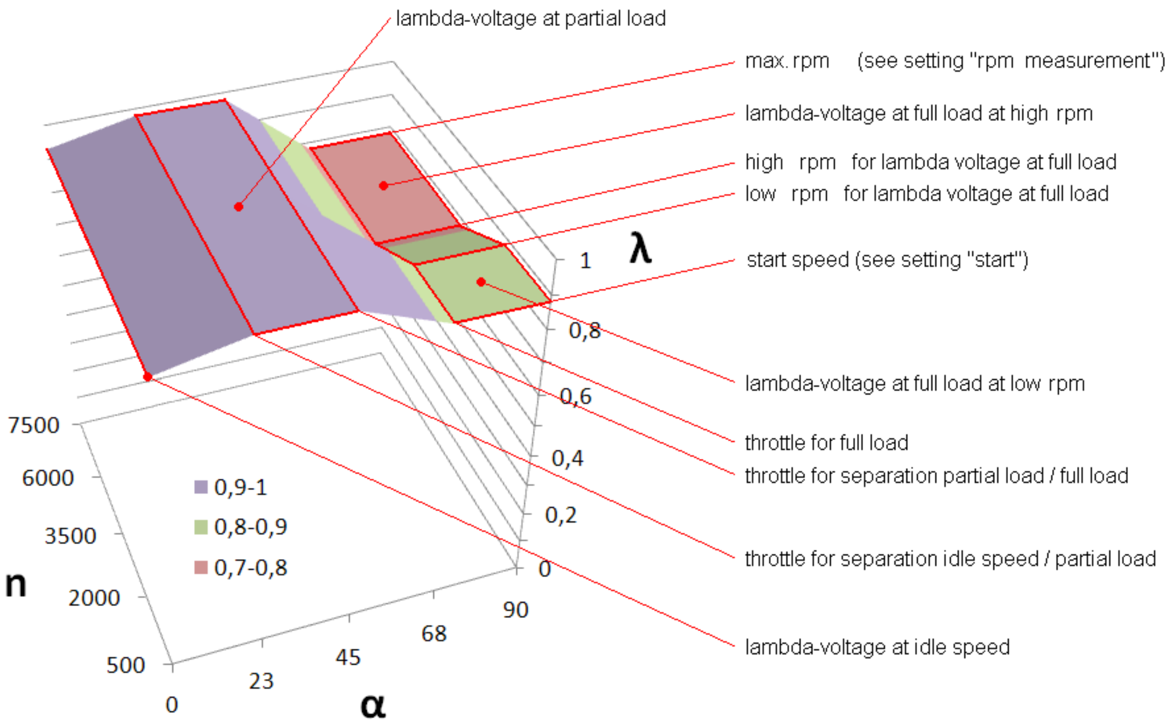
2. settings

2.2 lambda

Four different target lambda values are defined:
Lambda at idle speed
Lambda at partial load
Lambda at full load and low rpm
Lambda at full load and high rpm

The limits (rpm and throttle angle) can be set arbitrarily.
The lambda value at idle is a line (graphically interpretated) which is exactly at 0 ° throttle angle.
The lambda values in the partial and full load are flat platforms.
Between the specified limits, the target value is interpolated linearly.

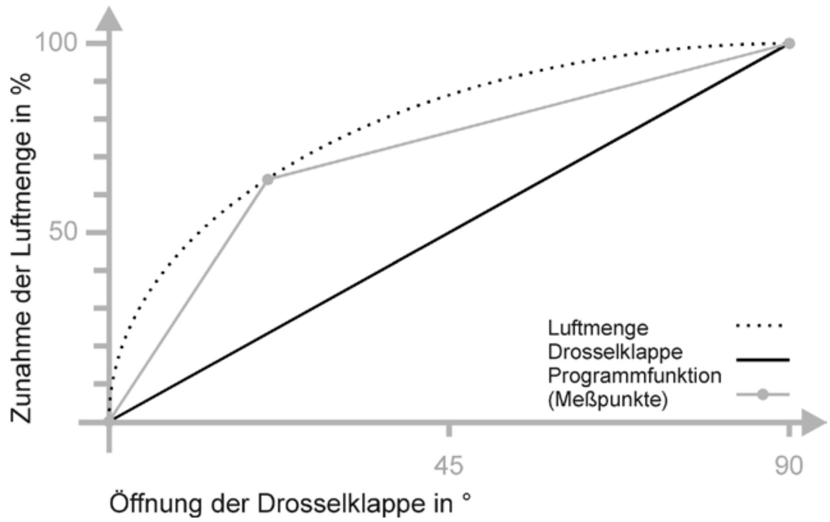
The following picture illustrates the values for the limits:



2. settings

2.3 throttle

throttle potentiometer



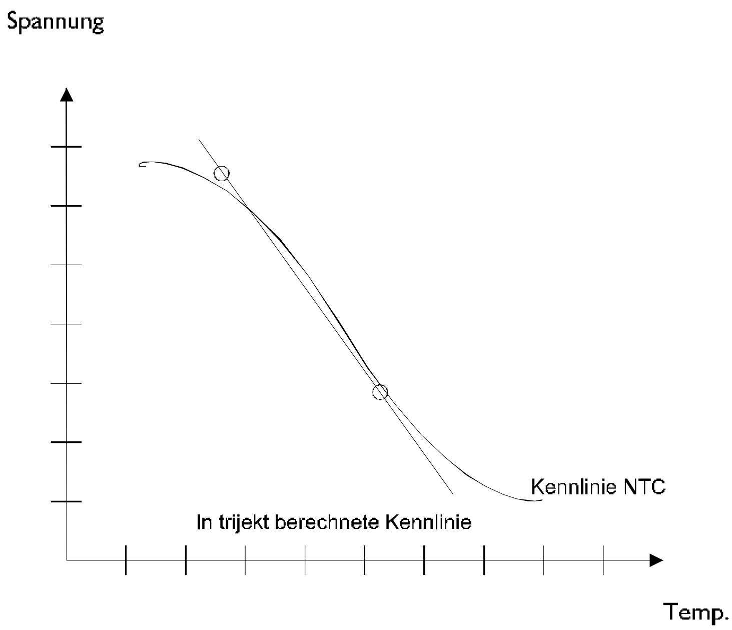
Since the air flow in the intake manifold does not increase linearly to the throttle opening, ***trijekt*** requires *three* voltage- and measured values for determining the throttle position. The input voltage values depend on the basic behaviour ot the throttle potentiometer.

- On **win trijekt** call up the function “**Status“**.
- There press the function key **F8** in order to have those voltage parameters displayed that are contacting all the sensors of all analogue inputs.
- In window “**Status**“ under “**Throttle**“ you can read off the voltage measured at present which corresponds to throttle position at idle speed and full throttle. At full throttle the voltage has to be higher than at idle speed, otherwise the potentiometer has to be changed.
- Record these values, since they cannot be used for input unchanged.
- In menu “**window**“ select the function “**settings**”.
- Now call up “**Throttle**“.
- In the array “**Throttle Potentiometer Voltage at Idle Speed**” feed the following voltage value:
  - measured voltage at idle speed + 0.01 V
- In the array “**Throttle Potentiometer Voltage at Full Throttle**” feed the following voltage value:
  - measured voltage at full throttle – 0.05 V
- As type of throttle select the one that comes closest to yours. By this input the nonlinear opening section of a throttle is “linearized“ for the program.

2. settings

2.4 engine temperature / air temperature

Sensor for engine temperature / air temperature



- First calculate the value for engine temperature at cold engine.
- Read In window **Status** under **Engine Temperature** the voltage value measured at the moment, corresponding to the temperature with cold ambient air.
- In menu **window** select the function **settings**.
- Select **engine temperature** here.
- In array **engine temperature cold: voltage** insert the voltage value read off in window **engine status.**
- In array **degrees engine temperature** insert the temperature value
- calculated for the cold engine.
- At first make a rough estimate of the values for the hot engine and insert them in the array **Engine Temperature hot: Voltage** resp**. Degrees Engine Temperature**.
- After the engine is warmed-up calculate the exact values and if necessary adjust your previous entries accordingly.

Please consider that the voltage and temperature values inserted for „warm“ and „cold“ should be as far as possible away from each other.

The voltage values produced by **trijekt** are

- 4,9 V at an open measuring input
- 0 V at a short-circuited Sensor.

The temperature values indicated by **trijekt** later, can deviate from the current temperature, since most sensors do not dispose of a linear characteristic curve. However, this is of no relevance for calculation of graphic maps.

Sensors with a highly non-linear curve should be adjusted with "engine temperature from characteristic curve". The characteristic curve is then displayed under "maps" and can be precisely adjusted with 17 points. For many commercially available sensors, we can offer you the perfect curve on request.

⇨ The same applies to the air temperature sensor

2. settings

2.5 injection

measure valve switch time of injectors

The current battery value has a strong influence on the opening period of the injectors.
E.g. battery voltage drops with a broken v-belt and due to the consequently more inertial opening period of injectors the mixture would lean.
These settings are required for compensation.

The injectors are charged with the subsequent system pressure.
At this test only the first injector is activated. For some time the injector is automatically „clocked“ out of the program. The fuel quantity is then weighed and recorded. This test exists of several cycles being preset by the program.
The knowledge acquired are entered in the settings.
During the test one can observe very well what effect the supply voltage is having on the opening period of the injectors and consequently on the quantity.

Basically, all injectors should be checked for equal quantity.
This means that you should carry out this test with every single injector in order to be sure that all of them have the same flow rate.
If e.g. three injectors deliver 100% each and one injector 80%, 3 cylinders run too rich and
1 cylinder runs too lean after adjustment.
(We use one Lambda Oxygen Sensor only for getting a result of combustion of all cylinders.)
The result is clear: the lean cylinder is broken first and the engine has not even delivered its full performance by then.

The following picture shows that even with brand-new injectors not always everything is okay:

This picture is only meant to illustrate how differently some „equal“ injectors can operate in practice!
For calculating the switch time you need to put only one pot below the injector of the first cylinder!

2. settings

measure valve switch time of injectors

- Remove the injection board together the injectors from your engine and put a pot below the injector of the first cylinder.
- First calculate the value for „low“ battery voltage and 2500µs opening period.
- Thereby you can manage with the use of a „weak“ battery or ideally an adjustable laboratory power supply for voltage feed being able to deliver a correspondingly high current.
- Preferably the voltage should be below 11Volt.
- Select the function **Extras** in Wintrijekt and chose **measure valve switch time**.
- During the test the fuel pump is switched on automatically by **trijekt.**
- Click the button „start“ in order to start the first cycle.
- After this cycle has finished, please enter the fuel weight in the corresponding array and empty the pot again.
- Please repeat this procedure now for „low“ battery voltage and 8000µs opening period.
- Now the turn on time of the injector for low battery voltage appears below.
- Note this value and the value of the corresponding battery voltage in order to insert them later in the settings.
- Now caluclate the value for „high“ battery voltage.
- Operate the battery with a charger additionally or adjust your laboratory power supply to a higher voltage.
- Voltage should be over 12,5Volt.
- Repeat the a/m procedure now for „high“ battery voltage.

3. starting operation

3.1 ignition table

If the distance to the tooth gap / to the TDC Signal is not known exactly, it should be tried now to calculate it at starting speed.
For this proceed as follows:

- In menu **maps** select function **ignition table.**
- In the upper left array (lowest rpm and lowest throttle position) enter 0.
- Click button „send to **trijekt“.**
- In menu **window** select function **settings -> ignition.**
- In the arrays
  „Ignition Engine Temperature Characteristic Curve ON“,
  „Ignition Air Temperature Characteristic Curve ON“ and
  „Ignition Air Pressure Characteristic Curve ON“
  enter „0“ each.
- Click button „send to **trijekt“.**.
- Carry out the function „**Save to Flash**“ (key F2) for transmitting the data to one of non-volatile storages of the Control Unit.
- Disconnect the fuel pump and the injection valves from voltage supply.
- Start the engine.
- Check the ignition angle by means of an ignition timing pistol.
- Correct the values if necessary under **rpm measurement** - **Offset for Ignition Angle**

Some Ignition Timing Pistols react very badly at Starting Speed!
In this case the engine must be started! Since most engines start quite badly at 0° advanced ignition and do not run steadily at Idle Speed, it is recommended to adjust a low advanced ignition (5-10°) for Idle Speed and enter in range of 2000 up to 2500 RPM 0°. Now, by means of the accelerator pedal the engine is kept at a speed value between 2000 and 2500 RPM in order to get an ignition angle of 0°. Now the ignition angle is read off and the offset is adjusted, if necessary.

The ignition table is configurated in the way that at starting speed with increasing opening of throttle more and more advanced ignition is picked up. The advanced ignition causes the engine - of which no injection- and ignition values are available so far - to start more easily.

3. starting operation

3.2 starting the engine

As the first start of an engine with a still incompletely adjusted fuel injection system can be tricky and is different from engine to engine, please receive some general hints below:

- In **Win trijekt** select the function **Status** from menu **Window**.
- In the program press the **Space Bar** in order to switch over to manual mode.
  In window **Status "manual mode"** is indicated below.
- Now pressing keys 1 - 9 you can select the step size being used for changing the injection rate.
- Pressing key 8 enter the step size on 500µs.
- Pressing keys + and – the injection rate can now adjusted in 500µs Steps **during start activity**.
- Start the engine and during start activity set the injection period more and more upwards until the engine starts up. In some cases it can be helpful „to soft-pedal the throttle control" when starting. In case that the value of abt.10000µs is exceeded and the engine has still not started, one should stop start activity and look for the cause of failure. According to experience in most cases there are problems with rpm measurement. So make sure that during start activity a rpm being higher than 60 is displayed in the Status Array!
- After starting up the engine reduce the injection period again to a range in which the engine is still running cleanly at idle speed.

4. maps

Since there doesn’t exist a formula calculating the exact injection time from the input parameters, the injection time is mainly calculated by means of graphic maps and characteristic curves. These can be set by the user correspondingly. A total of 25 graphic maps resp. characteristic curves are available:

- alpha/n
- air mass
- intake manifold vacuum
- intake manifold vacuum idle
- air mass correction
- injection correction air temperature
- start
- start load
- warmup
- lambda time
- fuel cut-off
- acceleration enrichment (load-dependent)
- acceleration enrichment (temp-dependent)
- idle controller
- idle control start value
- idle control rotation speed
- ignition table
- ignition engine temperature
- ignition air pressure
- ignition air temperature
- ignition displacement
- boost pressure
- boost pressure start
- voltage – engine temperature
- voltage – air temperature

The “step width” can be changed with the keys 1 to 9.
Use the + and - keys for increment or decrement the current value in the map.

<u>Function „change gradients“:</u>

By means of function „change gradients“ maximum change from one graphic map point to the next can be entered.(max. increase and max. decrease)
Thus the closest graphic map point would automatically be put upwards or downwards to the corresponding level.

This function can alleviate the engine adjustment considerably at correct setting, however make it nearly impossible at wrong setting.

These values should be changed by experienced users only!!!

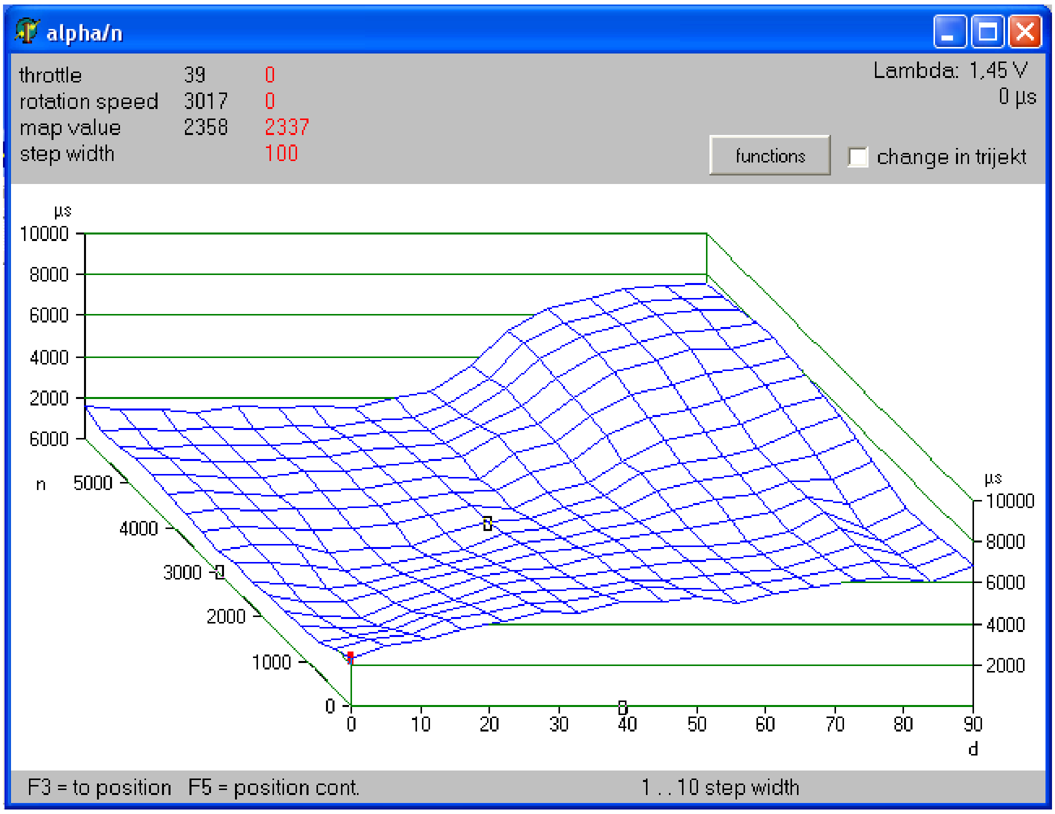
4. maps

4.1 alpha/n

The alpha/n map is the most important one for the injection in alpha/n control. In this graphic map the injection time per rotation at a certain combination of rpm / throttle position is specified. The x-axis shows the throttle position, the y-axis shows the rpm. The values in the graphic map indicate the injection periods in microseconds per rotation of crankshaft. This diagram is adaptive.

The basic injection rate is calculated by adjusting the value of the graphic map to the air pressure, air temperature and possibly also to the value of characteristic curve of the idle speed control.

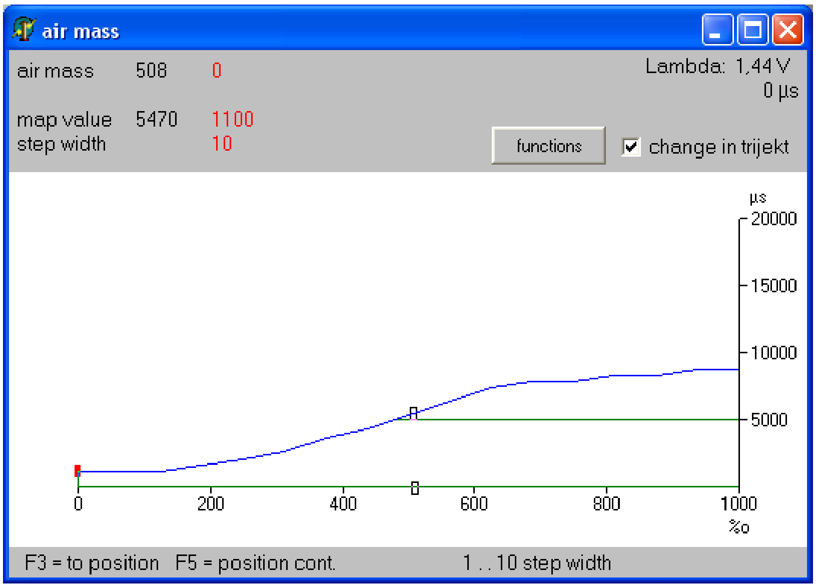
This graphic map should completely be run in first, before changing the other graphic maps resp. characteristic curves.



4. maps

4.2 air mass

The air mass characteristic curve is required only when using an air-mass flow sensor.
In this case control mode via air-mass measurement must be switched on.



The signal of the air-mass flow sensor is located on the x-axis. Here the value is indicated in “per mill”. Max. voltage of the air-mass flow sensor makes 1000 per mill.

Here the unit of the y-axis is not preset firmly. That’s not necessary, since this curve can be entered easily. Retracing only once all the 16 data points on the x-axis from idle speed to full throttle at max. rpm, you can change the curve until Lambda = 1. On an even roadway this is done within a few kilometres. After this the engine is already in running conditions in almost all operating ranges. Only a few fringes would have to be fine-tuned via air-mass correction map. But this can happen in the background, the learning aptitude being switched on.

After the engine is started in “manual mode” and has a good idle, note the values “injection time”, “switch time”, “rotation speed” and “air mass”.

The point on the curve for this air mass value can then be calculated as follows:

$$\frac{\text{(injection time – switch time) * number of cylinders * rotation speed}}{19200}$$

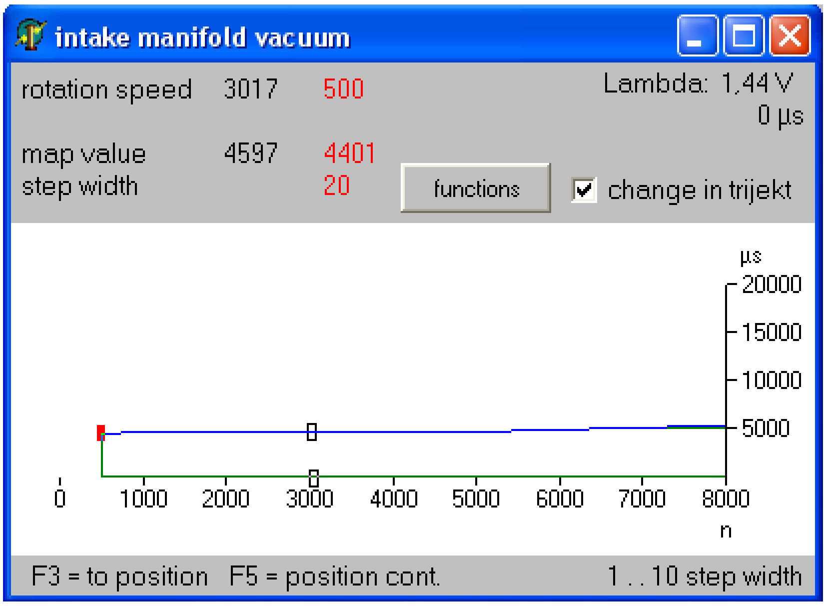
If necessary, it is possible to split the air mass in two curves (0-500 and 500-1000). By splitting the curve a more precise tuning is possible.

Applying this injection rate quantification it is very important that the valve switch time of the injectors is specified precisely.

4. maps

4.3 intake manifold vacuum

Running with intake manifold vacuum measurement, this characteristic curve is activated. Thereby an external air pressure sensor measures the air pressure between throttle and valves. This characteristic curve indicates the injection value at standard atmospheric pressure (= 1013 hPa) subject to rpm.



The value shown on this characteristic curve at a certain rpm is corrected by the current intake manifold vacuum and the air temperature, resulting in the basic injection rate.

After the engine is started in “manual mode” and has a good idle, note the values “injection time”, “switch time” and “air pressure (ext.)”.

The first point on the curve for the lowest rpm can be calculated as follows:

$$\frac{(\text{injection time} - \text{switch time}) * 1013}{\text{air pressure (ext.)}}$$

The other points of the curve are at a similar level.
For the first tuning, the line initially increases evenly, to a final value 1000µs above the first value.

4. maps

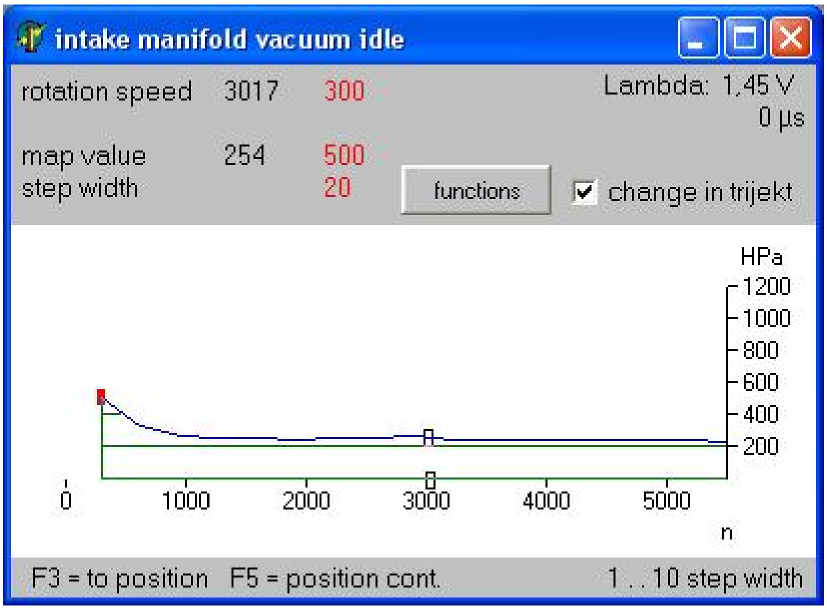
4.4 intake manifold vacuum idle

This characteristic curve is activated when air-mass measurement is carried out via „intake manifold vacuum (extended function)“.

Two characteristic curves have to be adjusted. The first curve (intake manifold vacuum) is the already known intake manifold vacuum characteristic curve. Here the injection period at standard air pressure of 1013 HPa is adjusted. In the second characteristic curve (intake manifold vacuum idle) the air pressure is also adjusted over the rpm at which the injection period is getting zero.

For tuning it is useful to proceed as follows:

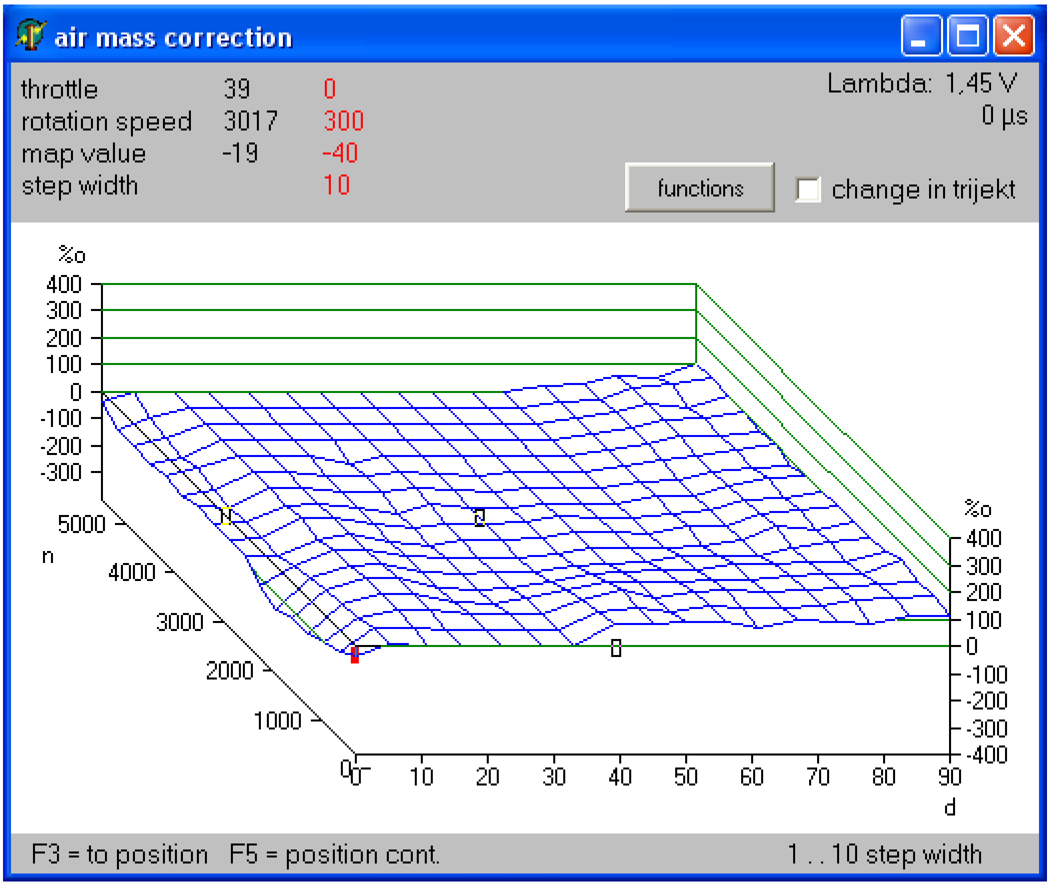
- At idle speed you have to push the gas pedal slightly until the engine revs up and then close throttle again directly. During this procedure read off the lowest Intake Manifold Vacuum displayed in the status. Now subtract abt. 20 per cent from this value and adjust the “Vacuum Idle Speed Characteristic Curve” to this value constantly.
- The Vacuum Characteristic Curve is now adjusted to the requested Lambda value at preferably high load (possibly full-load)
- The „Vacuum Idle Speed Characteristic Curve“ is now adjusted over the rpm to the requested Lambda value at idle speed (in declutched state).
  It has to be considered that the injection period is lower in case that the graphic map value “Manifold Pressure” is increased.



4. maps

4.5 air mass correction

This graphic map serves for both the fine tuning of the air-mass flow sensor and the intake manifold vacuum.



On the front axis you can find the throttle position, while rpm is shown on the axis directed backwards. The value of this graphic map indicates by how many
per mills the value of the air-mass resp. intake manifold vacuum characteristic curve is adjusted at the different operating points. Normally you needn't set this graphic map manually, but let it be self-adaptive in the background.

4. maps

4.6 injection correction - air temperature

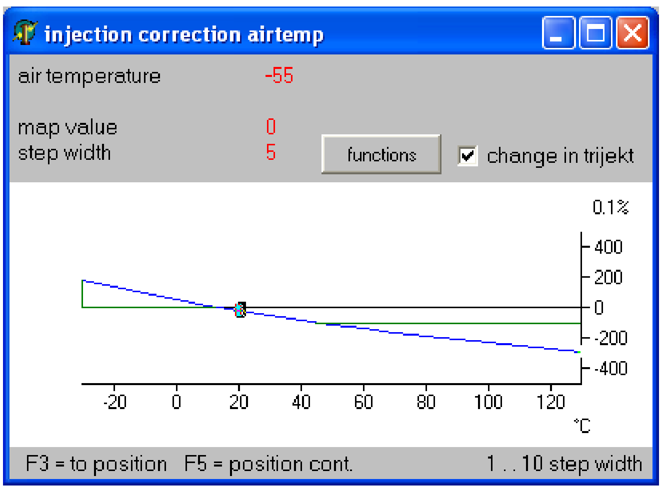
The correction of the injection time as a function of air temperature is usually internally calculated using a formula that represents the theoretically correct physical relationship between air temperature and the resulting change in air mass (gas equation).
The "normal temperature" is set here at 14°C:

$$\text{correction}[‰] = \frac{287K}{\text{air temp.}[°C] + 273K} * 1000 - 1000$$

In some cases it happens that this "theoretical factor" does not correspond with reality, and the air temperature-dependent interference with the injection time is too high.
One reason can be that the measured temperature does not match with the actual intake air temperature (e.g. if the sensor is influenced by the radiant heat of the intake manifold). For an accordant correction, the "injection correction - air temperature" characteristic curve can be activated in the settings.

In this characteristic curve you can define how much per mill the injection time should be corrected for each measured intake air temperature.
For example this could occur by the DIN-formula with 20°C normal temperature:

$$\text{correction}\ [‰] = \sqrt{\frac{293K}{\text{air temp.} + 273K}} * 1000 - 1000$$



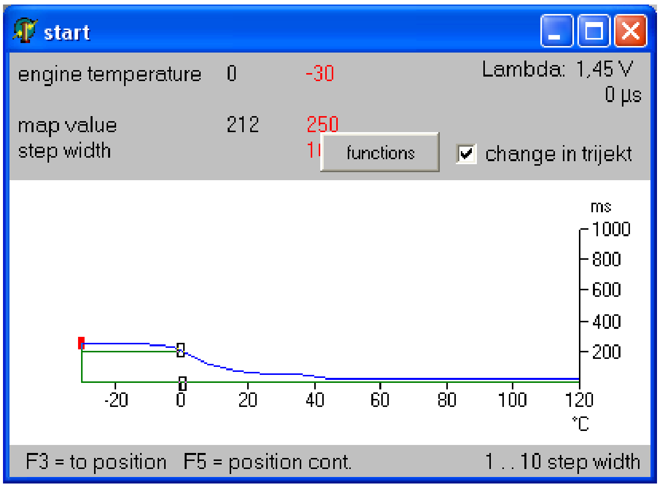
examples:

air-temp. °C	int. formula (14°C normal temperature)	DIN-correction (14°C normal temperature)	DIN-correction (20°C normal temperature)
-50	287	134	146
-40	232	110	121
-30	181	87	98
-20	134	65	76
-10	91	45	55
0	51	25	36
10	14	7	18
20	-20	-10	0
30	-53	-27	-17
40	-83	-42	-32
50	-111	-57	-48
60	-138	-72	-62
70	-163	-85	-76
80	-187	-98	-89
90	-209	-111	-102
100	-231	-123	-114
110	-250	-134	-125
120	-270	-145	-137
130	-288	-156	-147
140	-305	-166	-158
150	-322	-176	-168

4. maps

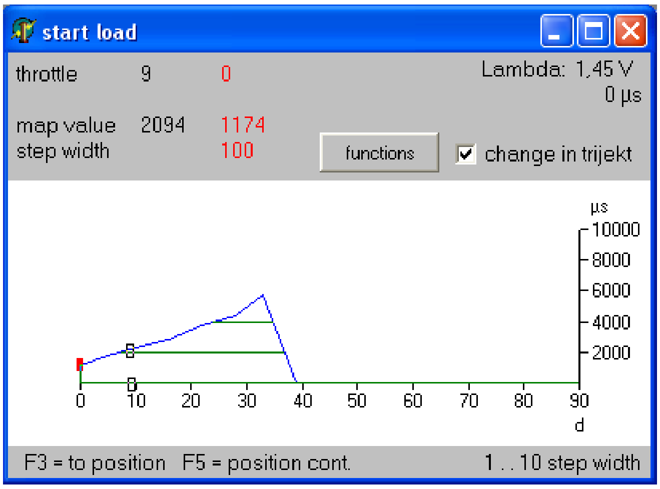
4.7 start

As the name implies, the start characteristic curve is only required for starting after switching on **trijekt.** After the first recognized engine rotation the injection rate (depending on the engine temperature) mapped on the curve is injected one-time. Thus the walls of the injection ducts are humidified first. This can be compared to stepping the gas pedal before starting an engine with carburettor.



4.8 start load

The start load characteristic curve indicates the injection time at start dependent upon throttle position. This characteristic curve is active only if point „injection time at start adjustable via characteristic curve“ has been selected in the settings.



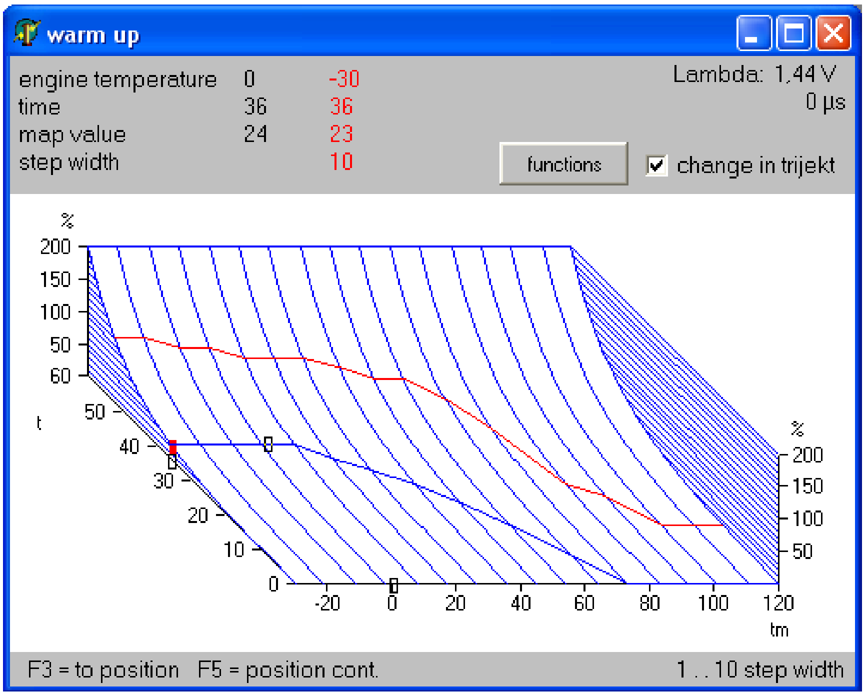
4. maps

4.9 warmup

In cold condition the engine must run a little richer than when being warm. The warmup graphic map serves to raise the injection rate by a certain percentage, subject to engine temperature and time. The warmup of an engine exists of two phases merging and also overlapping.

When a cold engine is started, the combustion chamber and the cylinder walls are heated up first. During this time enrichment is very high, because a lot of fuel condenses on the walls and can't be combusted. Since this is not noticed by the engine temperature sensor, being installed too far away from the combustion chamber, first this enrichment must be reduced time-dependent.

After a certain time the cylinder walls are heated up at such a rate that there is hardly any fuel condensation on them. However, the whole engine block and the engine oil are still rather cold, so you need some more performance to keep the engine running in the lower speed range. Therefore a mere engine temperature-dependent enrichment is sufficient for this second phase.



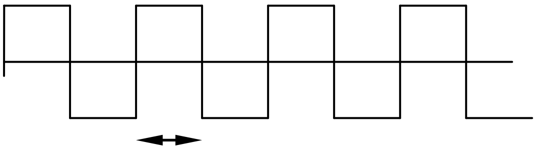
The front axis shows the current engine temperature and the axis directed backwards shows the time in seconds. In effect the graphic map exists of two characteristic curves lying on a level falling forwards. The upper curve shows the enrichment directly after starting the engine. By and by the current operating point is moving forwards on the falling level, thus reducing the enrichment. When reaching the lower (resp. front) characteristic curve, only the enrichment on this curve is used. This one keeps on falling at increasing engine temperature.

So the operating point is always located on resp. between the two characteristic curves.

4. maps

4.10 lambda time

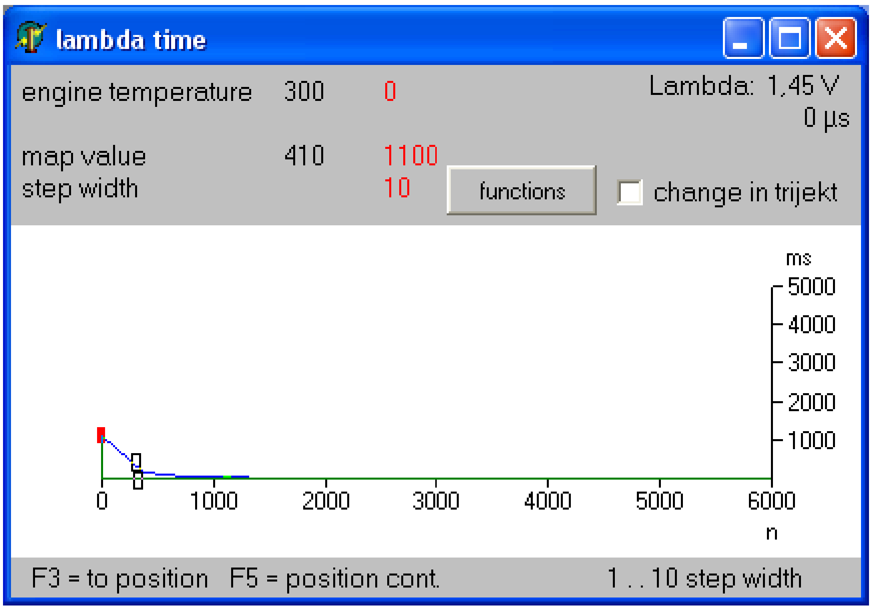
This characteristic curve is used only when the control mode is set on ‚exhaust gas'.
At this mode injection time is oscillating around the average value resulting from the graphic maps resp. curves.



Time from Characteristic Curve

This control mode serves for achieving a better definition of Lambda and for keeping the exhaust gas in slightly lean state so that the catalytic converter gets some residual oxygen.

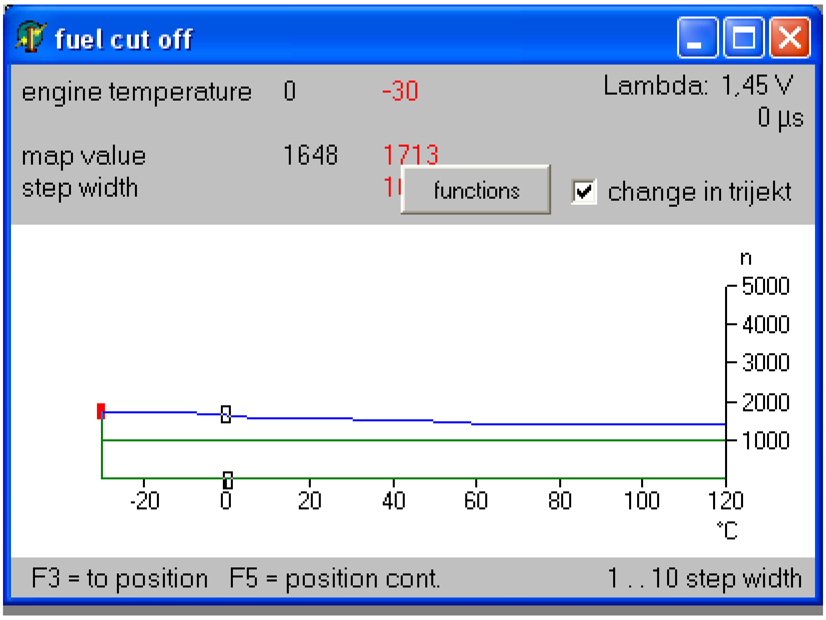
At low rpm this switching time has to be somewhat longer (abt. 1.5 s) than at high rpm.



4. maps

4.11 fuel cut-off

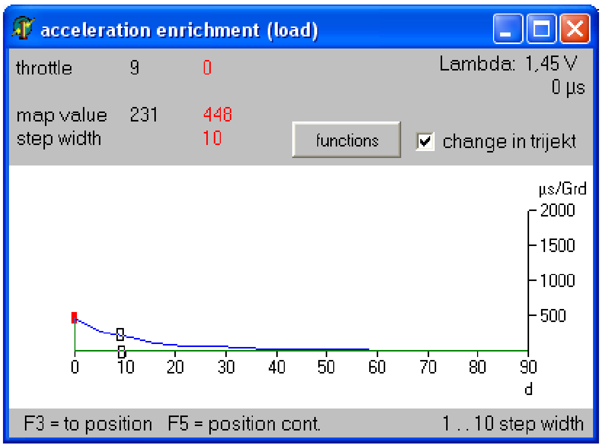
In case that fuel cut-off is activated, injection is switched off with closed throttle (angle = 0 degrees) and above the rpm indicated on this characteristic curve. In this case rpm depends on the engine temperature. The rpm is not of high importance at transition to fuel cut-off, but when throttling in declutched state, the engine moving shortly from a high rpm to fuel cut-off and starting again. Thereby rpm drops down just like a stone. In case that the regulated rpm here is too low, the engine stops before injection can work again properly.
This effect is higher, the colder the engine is. Therefore at cold temperatures the turn- on-speed must be set marginally higher.



4. maps

4.12 acceleration enrichment (load dependent)

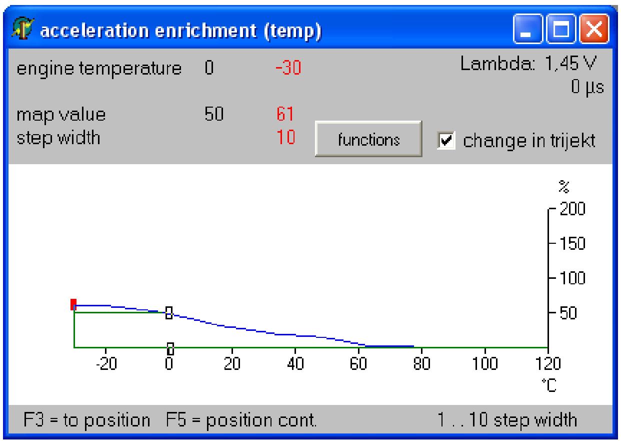
In order that the engine is close to the fuel, the mixture has to be enriched at the moment of acceleration. This happens by means of this characteristic curve.



The x-axis represents the throttle position, while the area below the characteristic curve shows the acceleration enrichment. If e.g. the throttle is suddenly opened from 0 degrees to 20 degrees, the surface in this area below the characteristic curve is evaluated and taken as measure for the additional fuel quantity. Only in the lower throttle positions an acceleration enrichment is necessary. For this reason the characteristic curve falls rightwards quite fast.

4.13 acceleration enrichment (temperature-dependent)

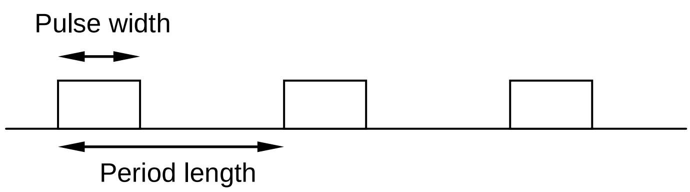
In cold condition the engine requires a higher acceleration enrichment than when being warm. By means of this characteristic curve the load-dependent acceleration enrichment is adjusted correspondingly. So the x-axis represents the engine temperature and the y-axis shows the adjustment as percentage.



4. maps

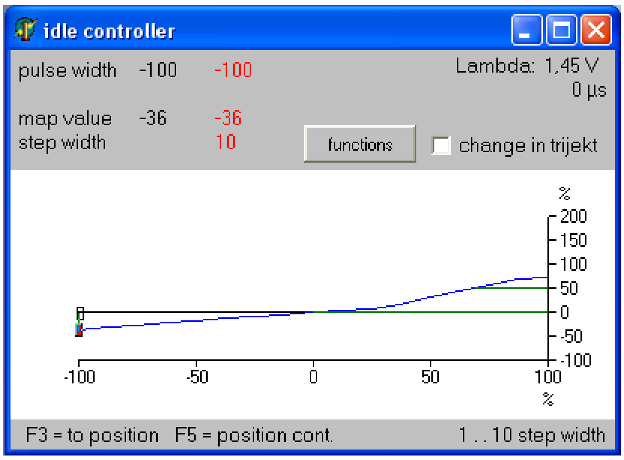
4.14 idle controller

The idle speed control is activated by means of clock frequency. Thereby the frequency ratio defines how much the valve opens. The frequency ratio is the ratio between pulse width and period length.



$$\textbf{frequency ratio} = \frac{\textbf{Pulse width}}{\textbf{Period length}} * \textbf{100\%}$$

Unfortunately, this takes place nonlinearly, i. e. a frequency ratio of 10 % doesn’t mean that 10% more air flows through the valve. First the basic spring force has to be overcome before the valve opens. This nonlinear ratio is shown on the idle speed characteristic curve. **It is only needed in alpha/n mode.**



The right half is responsible for the valve for air-mass increase and the left half for the one for air-mass reduction.

Adjustment of the characteristic curve of idle speed control is done in the following steps:

- adjust alpha/n map in idle speed range.
- drive the car on a slightly sloping road and keep brakes on idle speed (without acceleration.
- Display the characteristic curve of idle speed control on the computer and press key F3 (alter).
- Put the cursor with the arrow keys (left, right) on the individual items and adjust the characteristic curve by means of the keys +/- in the way that Lambda is 1.

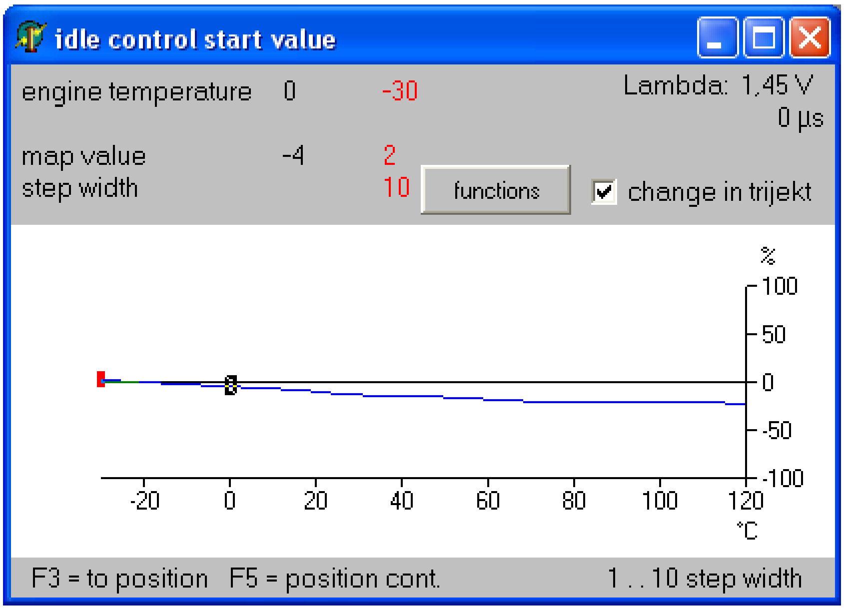
While changing the characteristic curve of idle speed, the idle speed control with the selected frequency ratio is automatically activated.

4. maps

4.15 idle control start value

When the engine is getting to idle speed range, the idle speed control should preferably open already so far that the required idle speed is reached. Normally, the idle speed control is too inactive so that speed may decrease too much at the first moment and the engine possibly stops. On this characteristic curve it is determined how much the idle speed control opens if e. g. the engine gets from a high speed to the idle speed range. This depends also on the engine temperature, though, as in cold state the idle speed is also a little higher and the engine still runs rather hard. It is recommended to use always a slightly higher value for switching on than being necessary for the idle speed. When the engine gets to the idle speed range, **trijekt** always manages speed control from a somewhat increased rpm to the adjusted speed.

This characteristic curve is only active at turned-on idle speed control.

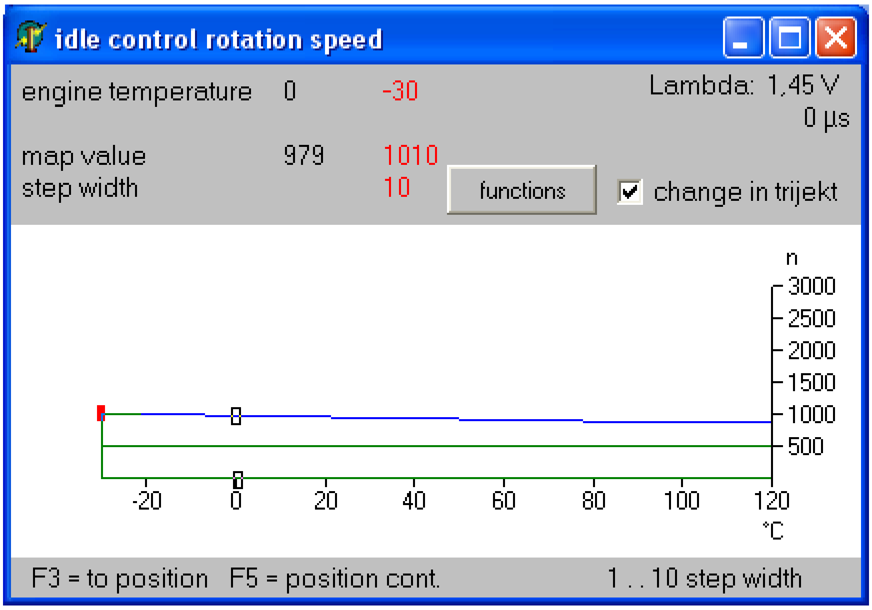


The y-axis indicates the value of idle speed control for each engine temperature, the engine reaching the idle speed range.

4. maps

4.16 idle control rotation speed

This characteristic curve indicates the idle speed. However, it is only active in case that the idle speed control is switched on, too. At a cold engine idle speed should be a little higher in order to ensure a clean rotation of the engine.

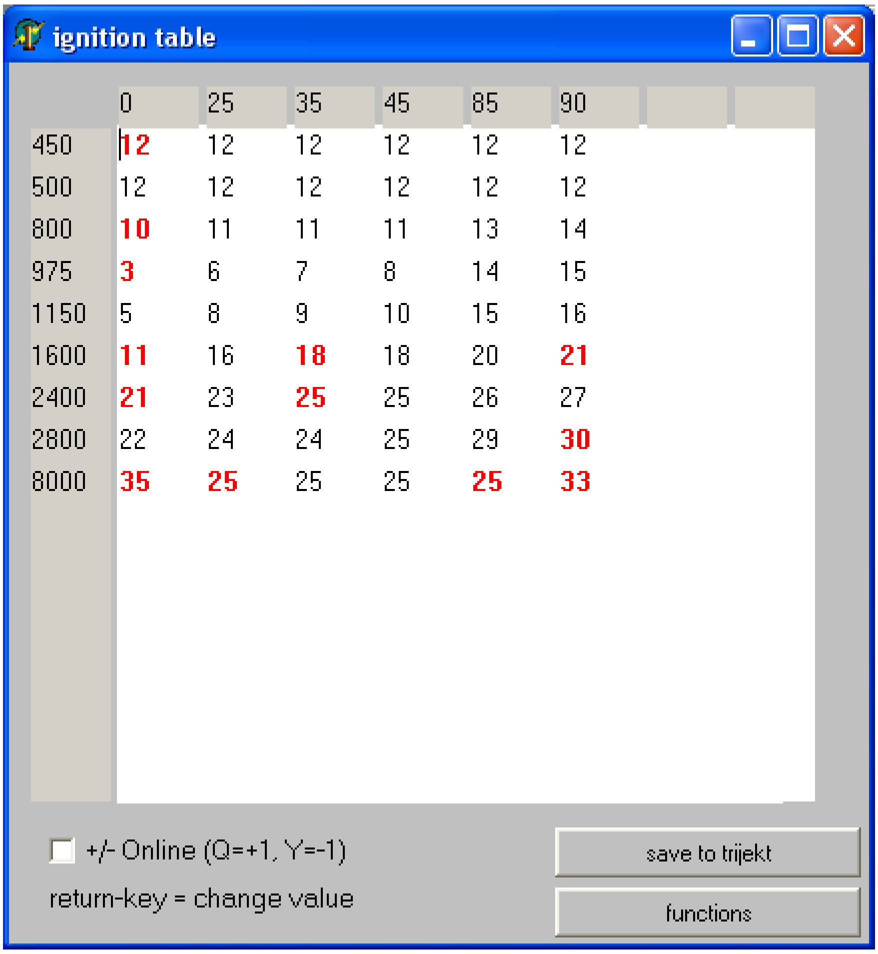


4. maps

4.17 ignition table

In the ignition table the ignition angles are recorded at different rpm/throttle combinations. There are max. 16 freely selectable rpm and 8 freely selectable throttle positions available. It is the only graphic map that can't be modified resp. shown graphically.

Values above 100 are assumed to be hPa, which is an air-pressure-dependent ignition angle.



	0	25	35	45	85	90		
450	12	12	12	12	12	12		
500	12	12	12	12	12	12		
800	10	11	11	11	13	14		
975	3	6	7	8	14	15		
1150	5	8	9	10	15	16		
1600	11	16	18	18	20	21		
2400	21	23	25	25	26	27		
2800	22	24	24	25	29	30		
8000	35	25	25	25	25	33		

As you can see, not all lines and columns have to be filled in.   E. g. you can reduce the graphic map to one single column. So this would correspond to a rpm dependent centrifugal force adjustment at the distributor.

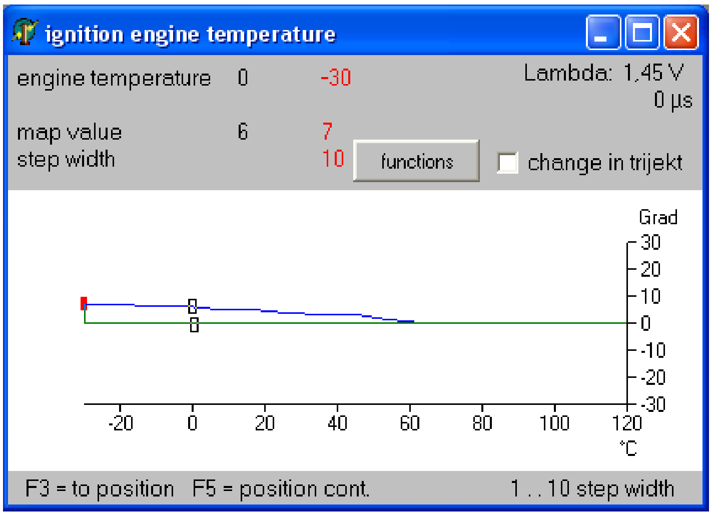
Moreover, not all points of the used columns and lines must be entered in the graphic map, but you can concentrate on the essential support points.
The remaining points are interpolated automatically at input. Thus a complete graphic map can be realized with a few inputs only.

trijekt interpolates once again between all points in the graphic map.

4. maps

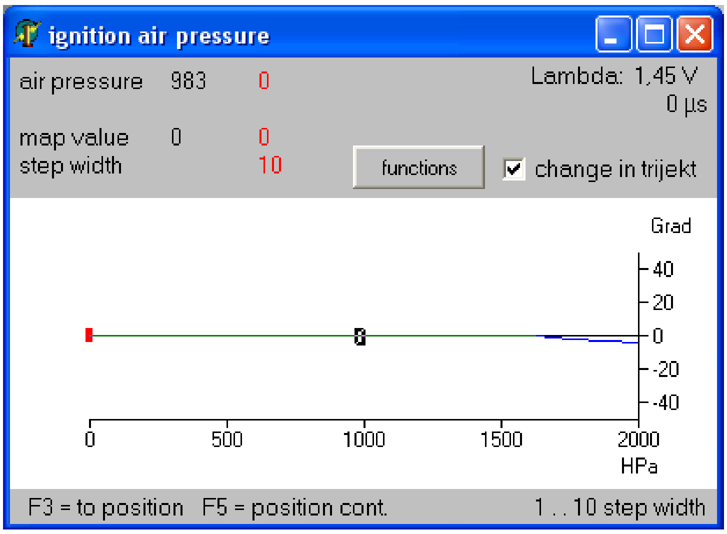
4.18 ignition – engine temperature

In cold state you often want to run the engine by slightly raising the advanced ignition, so that the idle speed is getting steadier. Others prefer late firing in order to heat up the Lambda oxygen sensor faster. These possibilities can be set in this characteristic curve.
The value resulting from this characteristic curve is added up to the value of the ignition table.
This characteristic curve is running only at idle!



4.19 ignition – air pressure

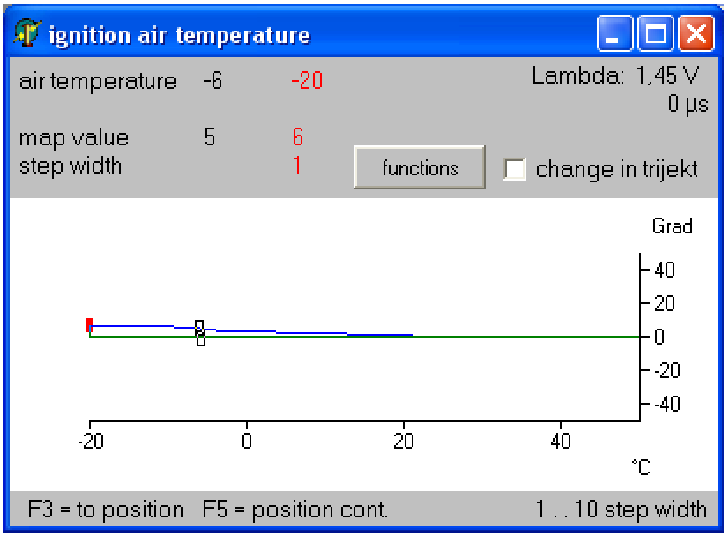
Also at higher boost pressures the knocking tendency of the engine is very high. For this reason in this characteristic curve ignition should be somewhat reduced at higher air pressures. The value resulting from this characteristic curve is added up to the value of the ignition table.



4. maps

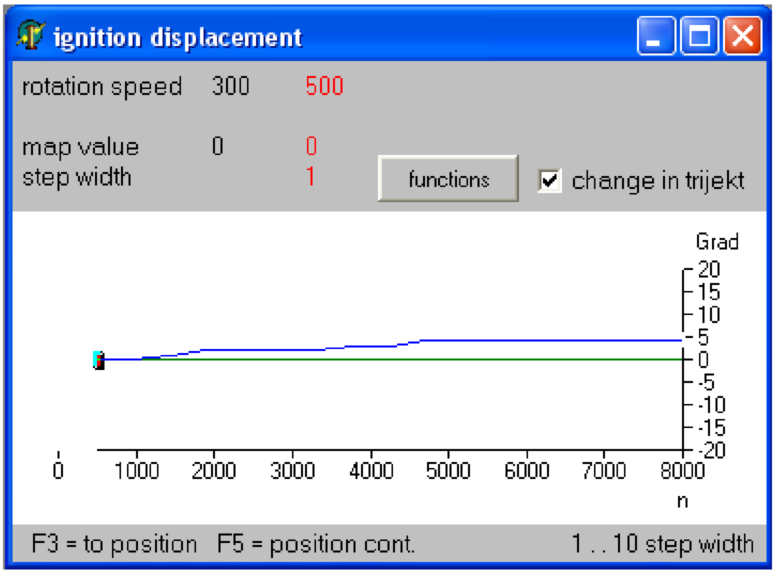
4.20 ignition – air temperature

If the induction air gets too hot (e.g. with turbo engines) the engine tends to advanced ignitions. This can be avoided by reducing ignition angle at high induction air temperatures. The value resulting from this characteristic curve is added up to the value of the ignition table.



4.21 ignition displacement

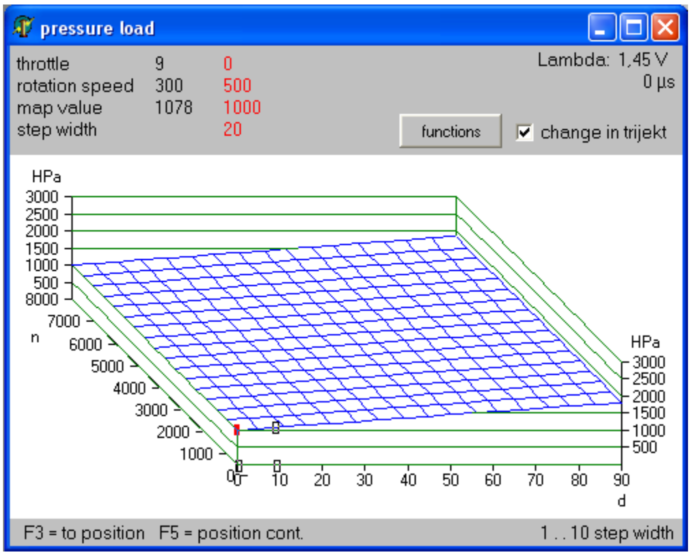
The Ignition Displacement Characteristic Curve is active only in case that type of ignition has been adjusted to 2 spark plugs per cylinder (Type of ignition = 4,5,6). Over this characteristic curve an ignition displacement in degrees is adjustable between first and second spark plug of a cylinder.



4. maps

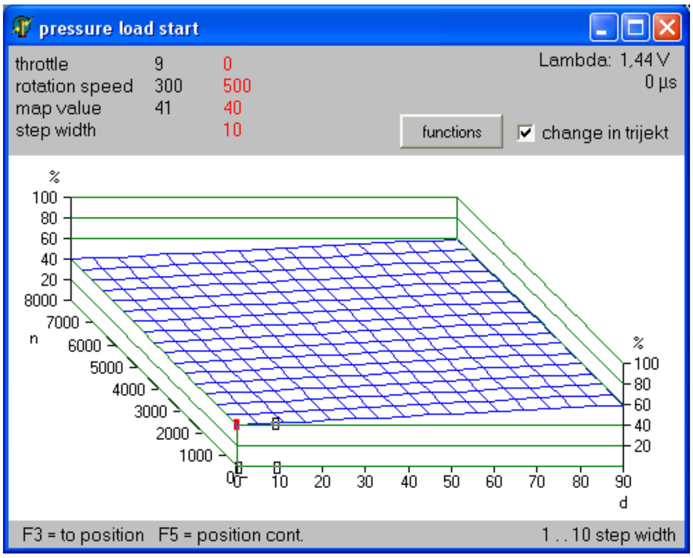
4.22 boost pressure

At a turbo engine charge pressure can be controlled by means of a so-called boost pressure valve. In this graphic map the required boost pressure can be indicated for each operating point (throttle/rpm).



4.23 boost pressure start

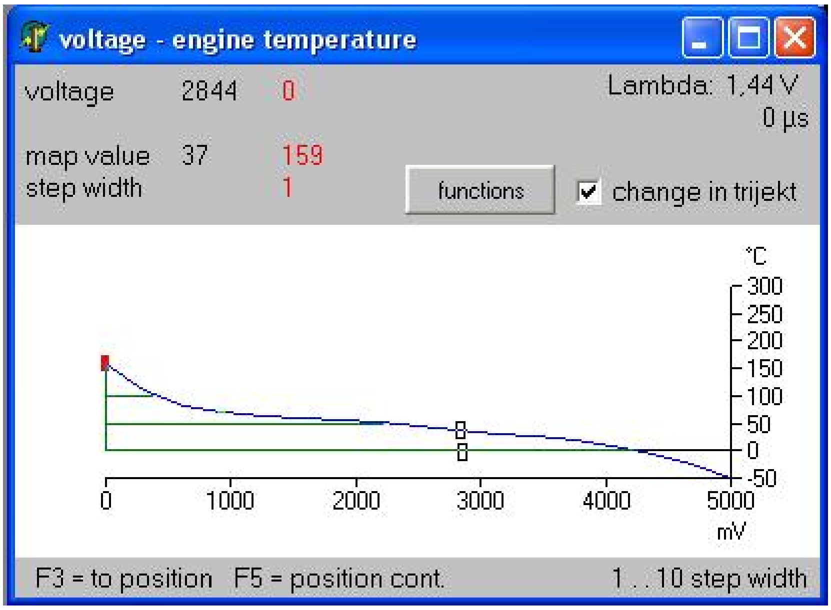
Since due to the system the boost pressure control is relatively slow, the boost pressure valve has to be preset via this graphic map, in case that the operating point is displaced by operating the boost pressure valve or by changing rpm. The proper boost pressure control effects only the exact readjustment **downwards** to the desired set-point.



4. maps

4.24 voltage – engine temperature

The current engine temperature is calculated via this characteristic curve. For this purpose the sensor has to be calibrated preferably at each voltage point of the characteristic curve.



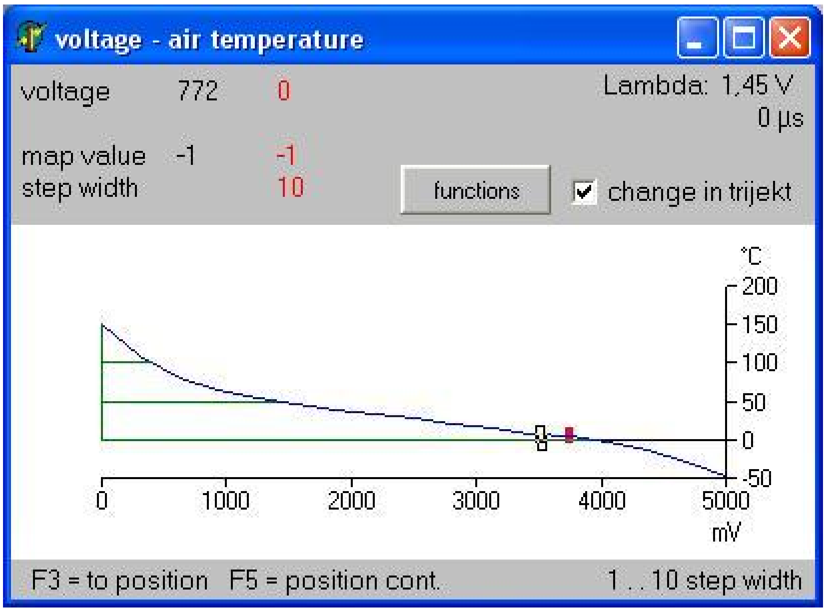
This characteristic curve is active only in case that in the setting under “engine temperature” the value for „engine temperature from characteristic curve” has been input.

4. maps

4.25 voltage – air temperature

The current air temperature is calculated via this characteristic curve.

For this purpose the sensor has to be calibrated preferably at each voltage point of the characteristic curve.



This characteristic curve is active only, in case that in the settings under “air temperature” the value for „air temperature from characteristic curve” has been input.

5. appendix

5.1 Introduction to the terms „Program“ and „Data“

The terms „Program“ and „Data“ are often misunderstood. For this reason we give you a short explanation below:

In „Program“ is determined how the Engine Control Unit processes the data that were fed into **trijekt** Engine Control Unit.
The program has been created by **trijekt GmbH** and is continuously improved and extended. You can download our current program on www.trijekt.de.

In Win trijekt it is indicated, embraced by the term „Software“, which Programm Version is available in your Control Unit.
The „Data“ are the settings of your engine that you have indicated in the **trijekt** Engine Control Unit specifically for your engine, including all settings, maps, switching outputs etc.

5. appendix

5.2 Password in trijekt

Setting up a Password in the **trijekt** Engine Control Unit you avoid that end customers or other users can change individual data, settings or maps.

The purpose of the Password Number is that your Company as vehicle-/engine producer can enter different Passwords in each individual Control Unit and with a simple list containing the Password Number and the belonging Password the correct Password is always quickly within reach.

The Password Number is always indicated in the menu window. It must be >0!
0 = no Password

5. appendix

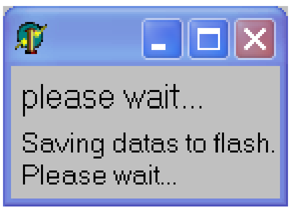
5.2.1 Setup Password in **trijekt** Engine Control Unit

- Start **trijekt** Software
- Menu Function 'Extras / Click „Change Passwort“
- Array „Change Password“ appears.

- enter Password and the belonging Password Number (freely selectable)

NOTICE: In case that the Password shall completely be deleted in the **trijekt** Engine Control Unit, all boxes in array „Change Password“ must be empty!

- Click button „OK“
- save to Flash (with key F2)



- Ignition to be switched off and then on again.
- The **trijekt** Engine Control Unit is now provided with a Password.

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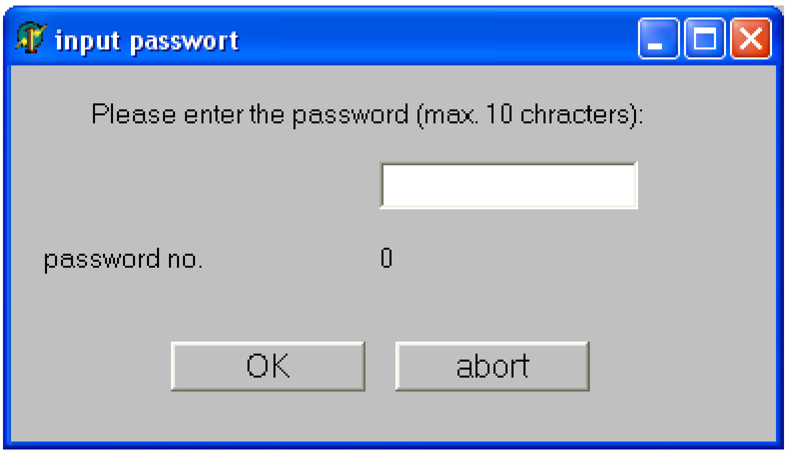
5.2.2 Enter Password

This function is necessary if:

- you want to change data, settings or maps in a **trijekt** Engine Control Unit in which a Password was set up.
- you want to change the Password in the **trijekt** Engine Control Unit.
- you want to delete the Password completely in the **trijekt** Engine Control Unit.
- you want to start an Export File in the **trijekt** Engine Control Unit disposing of a Password changing the existing Password when importing data later.

- this Function is only necessary in case that a Password has been set up in the **trijekt** Engine Control Unit.
- start **trijekt** Software
- Menu Function 'Extras“ / Click „Enter Password
- Array „Enter Password “ appears



- Enter Password (the belonging Password Number is displayed)
- Click Button „OK“

5. appendix

5.3 Data Export

Data Export means that data are exported from the **trijekt** Engine Control Unit!

Using the Function „Export“ you start a File on your PC containing all data, settings, maps, error memory-definitions etc of the **trijekt** Engine Control Unit.

Using the Function “Import” this File can afterwards be sent to only those Control Units having the same Control Type, Manufacturer and Type Number.
The Password must be identical, too!

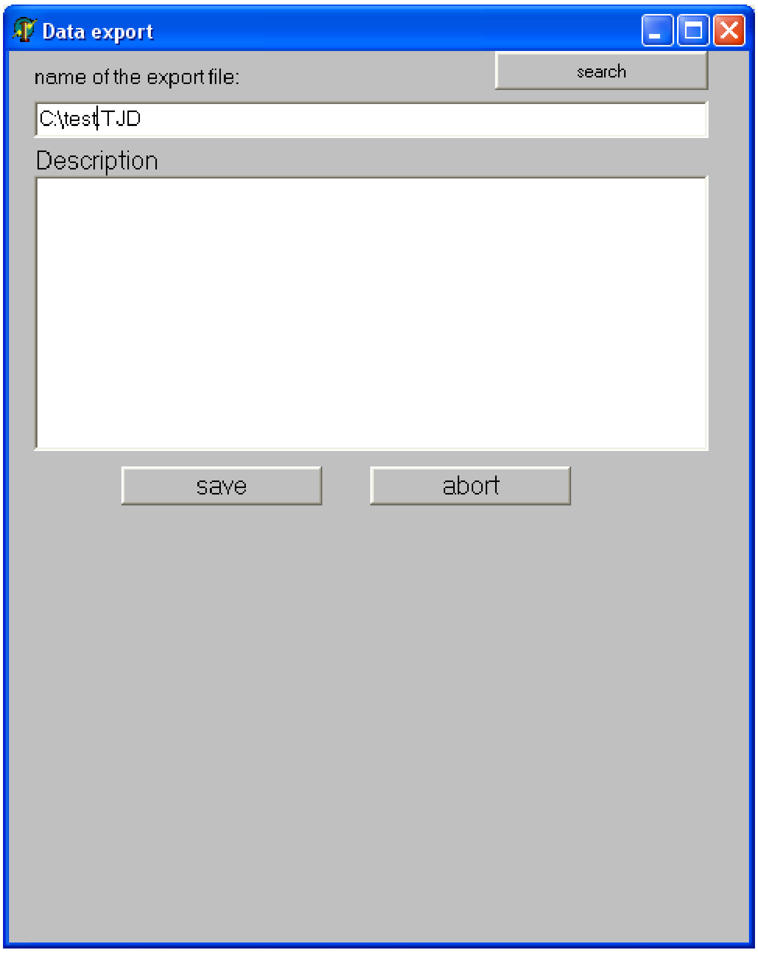
The File has the ending .TJD

5. appendix

5.3.1 Create Export File

In case that a Password exists in the source control but is not „entered“, this Function is applied automatically (see Point 1.2)
The same Password must already be available in the client’s Control Unit.
The client doesn’t have to enter the Password.

- start **trijekt** Software
- click Menu function 'File / Data Export'
- Array „Data Export“ appears



- enter requested File Name
- If required, any additional description can be input
- click button „save“
- wait until File has been completed

5. appendix

5.3.2 Create Export File (extended Functions)

By means of this Function you are able to change the Password in your client's **trijekt** Engine Control Unit additionally, as soon as he imports the File. Thus you prevent your client from detecting the Password for his **trijekt** Engine Control Unit due to any circumstances in the course of time and consequently from changing data without authorization.

You can enter 3 further Passwords. Thus the file can be imported in all Control Units containing one of the following 5 Passwords!

1. Password of source ECU
2. Password behind 'new password'
3. one of the three Passwords under: 'replaces old passwords'

In case that an Export File is to be created for a Control Unit without Password, you must not create a Password in the source ECU either and not enter a further Password when creating an Export File.

Using this Function it is **not** possible to create a Password in a **trijekt** Engine Control Unit in which no Password is available!

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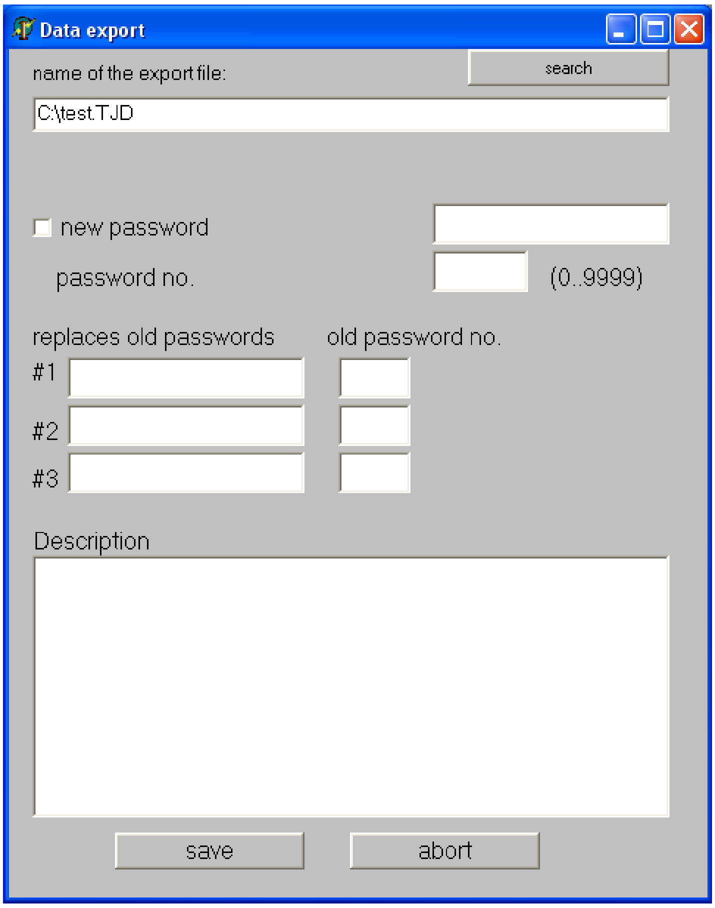
- Start **trijekt** Software
- Enter Password, if created (see Point 1.2)
- Click Menu Function 'File / Data Export'
- Array „Data Export“ appears



- enter requested File Name
- enter requested Passwords under 'new Password' and 'replaces old Passwords' with the belonging Password Number.
- click button „save“
- wait until File has been completed

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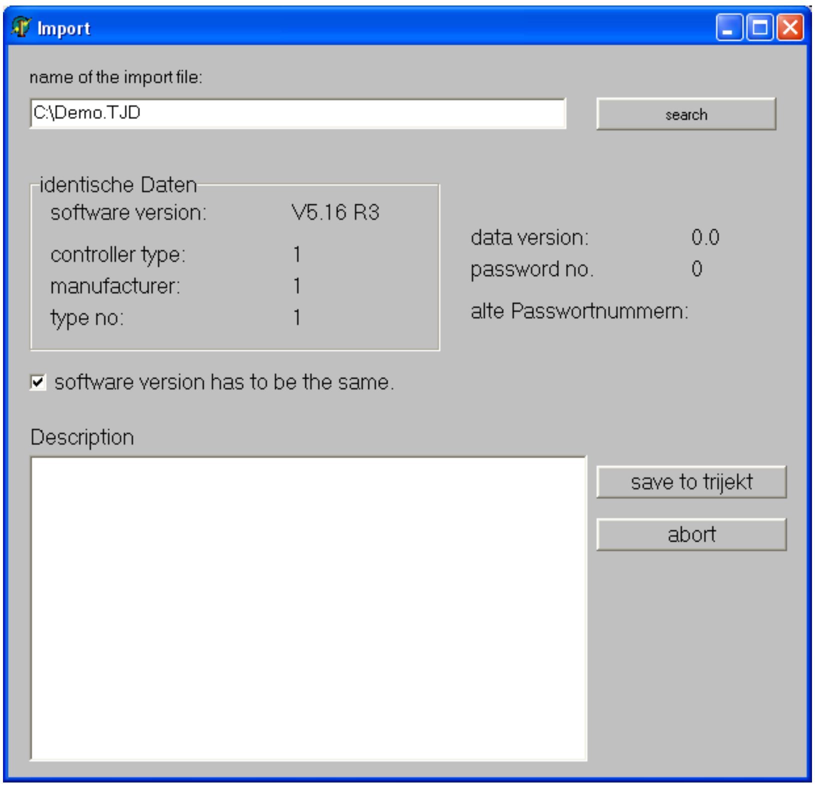
5.4 Data Import

5.4.1 Read in Import File in trijekt

- Start **trijekt** Software
- Click Menu Function 'File / Data Import'
- Array „Import“ appears.



- Enter File Name (Password, Type of Control Unit, Manufacturer and Type Number of Control Unit must correspond exactly to the data of Import File, otherwise the File is not transmitted!)

- Click button „send to **trijekt** “

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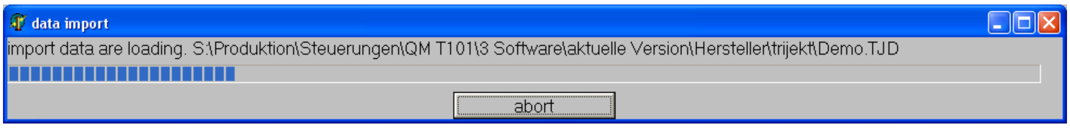
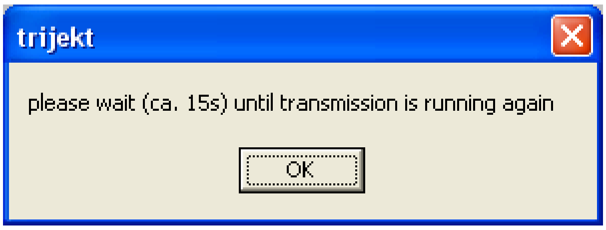


- the file is transmitted to **trijekt.**



- wait 15 seconds.
- click button „OK".
- The data have now been transmitted from your hard disk to your **trijekt** Engine Control Unit.

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5.5 Backup

The function „backup“ is similar to Data Export/Import.
The difference is that the settings and maps are not stored in one ‚summing up’ File but in several individual Files. So e.g. each File relates to a map.

The advantage of backup over the Data Export/Import Function is that after backup the maps and settings can also be processed “offline”, i.e. connected **trijekt** Control Unit.

So in principle backup is a batch processing of the functions „Load“ and „Save“ that can also be carried out in the individual maps and settings.

Backup enables you to save several data sets. These are stored in the PC with the corresponding date. In case that data are transmitted to the **trijekt** Control Unit via backup, always the latest version is selected automatically.

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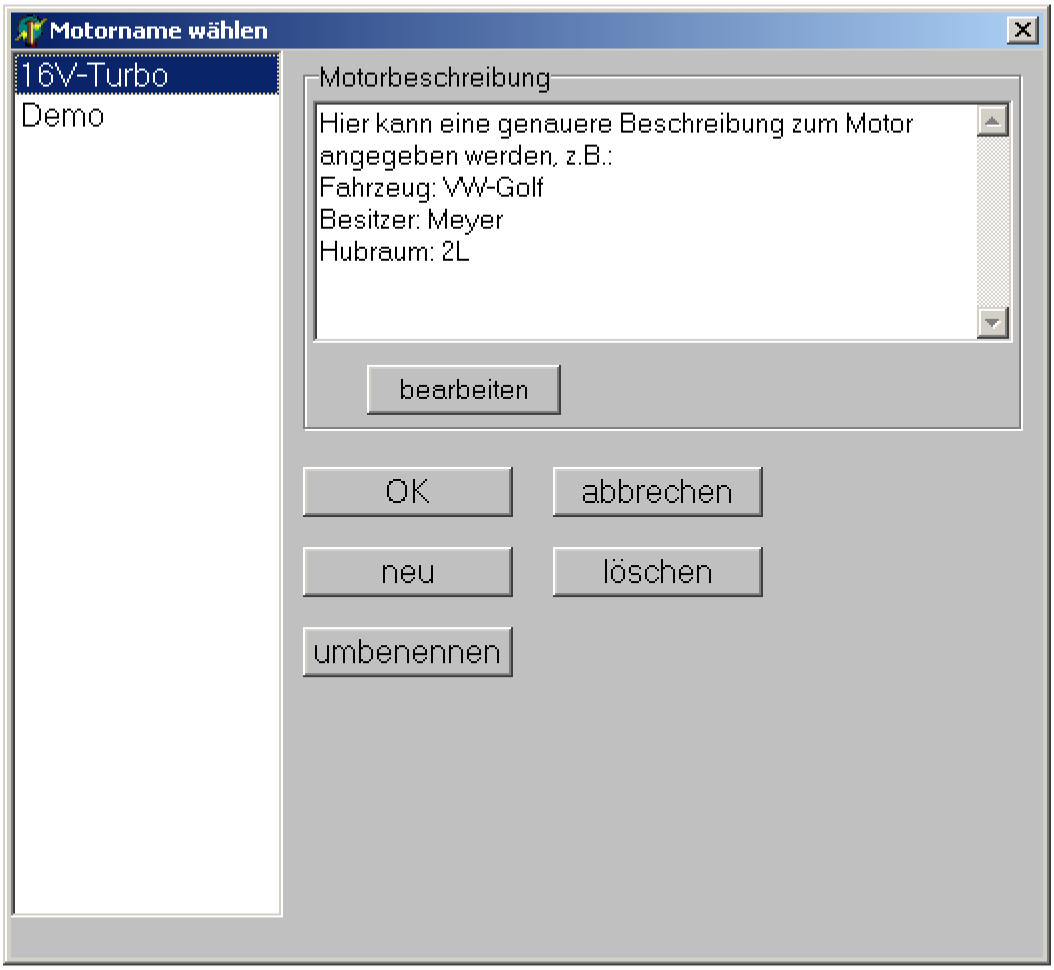
Before being able to use the backup the “engine name” has to be entered on the PC.

Select Menu Window „File“ -> „Engine Name“ and window „Select Engine Name“ is open.
The Engine Name „Demo“ and its corresponding maps and settings are already included in the PC-Software. Clicking „new“ you can enter a new engine name (example below: 16V-Turbo). In array „Engine Description“ you can – after clicking button „Edit“ enter detailed engine information.



Having confirmed the selected engine name by pressing button „OK“ this name is also displayed in the **trijekt** window with the term “„Engine Name“ .

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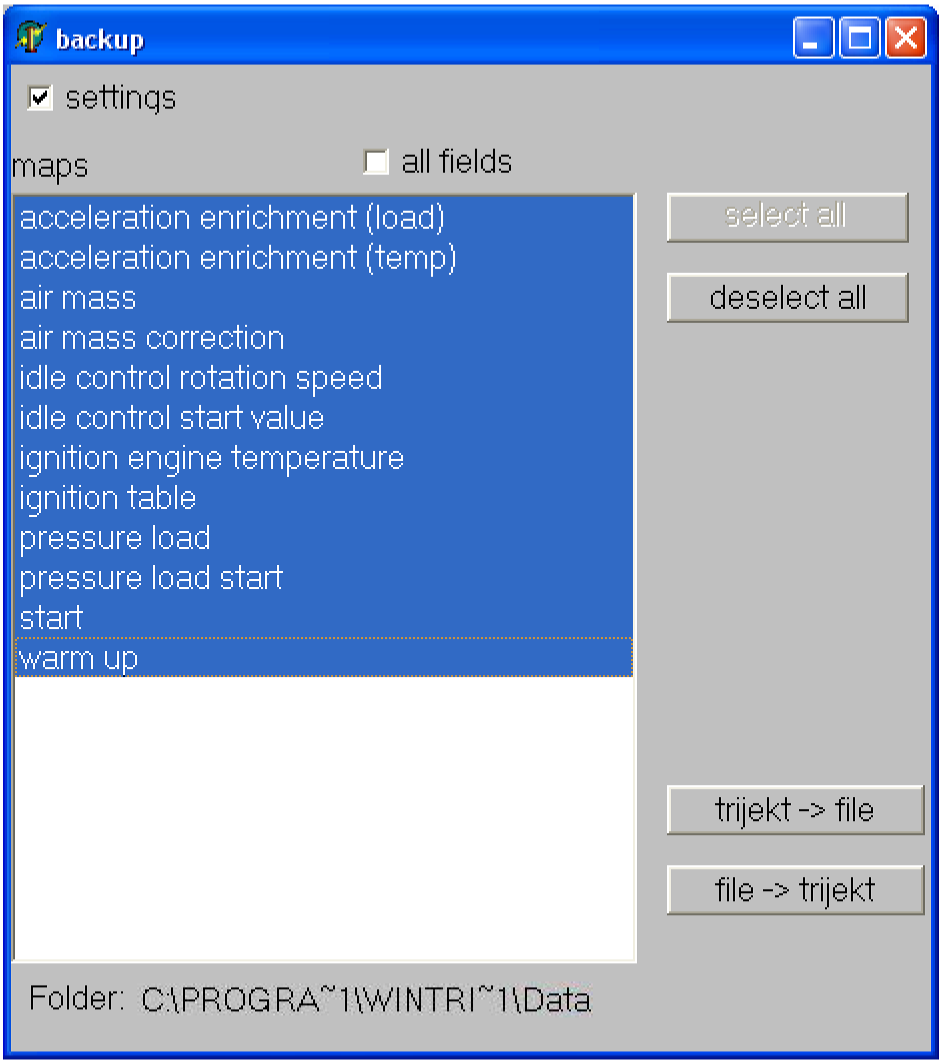
Now the backup can be carried out.

Via menu window „**File**“ => „**backup“** you reach pop-up window „backup” .At first only the “active” maps are displayed (i. e. having selected e.g. air-mass measurement „alpha/n“, the characteristic curve „air-mass“ won’t appear here because it is not being required.) If, however, you want the unused maps to be displayed / transmitted just tick the box „**all fields”.**



The place of the backup cannot be changed.
Basically, the data are stored in the subdirectory “Data” of „win trijekt“ Installation Directory. As a rule this is directory: „C:\Programs\win trijekt\Data“
Afterwards there will be an individual file for each map.

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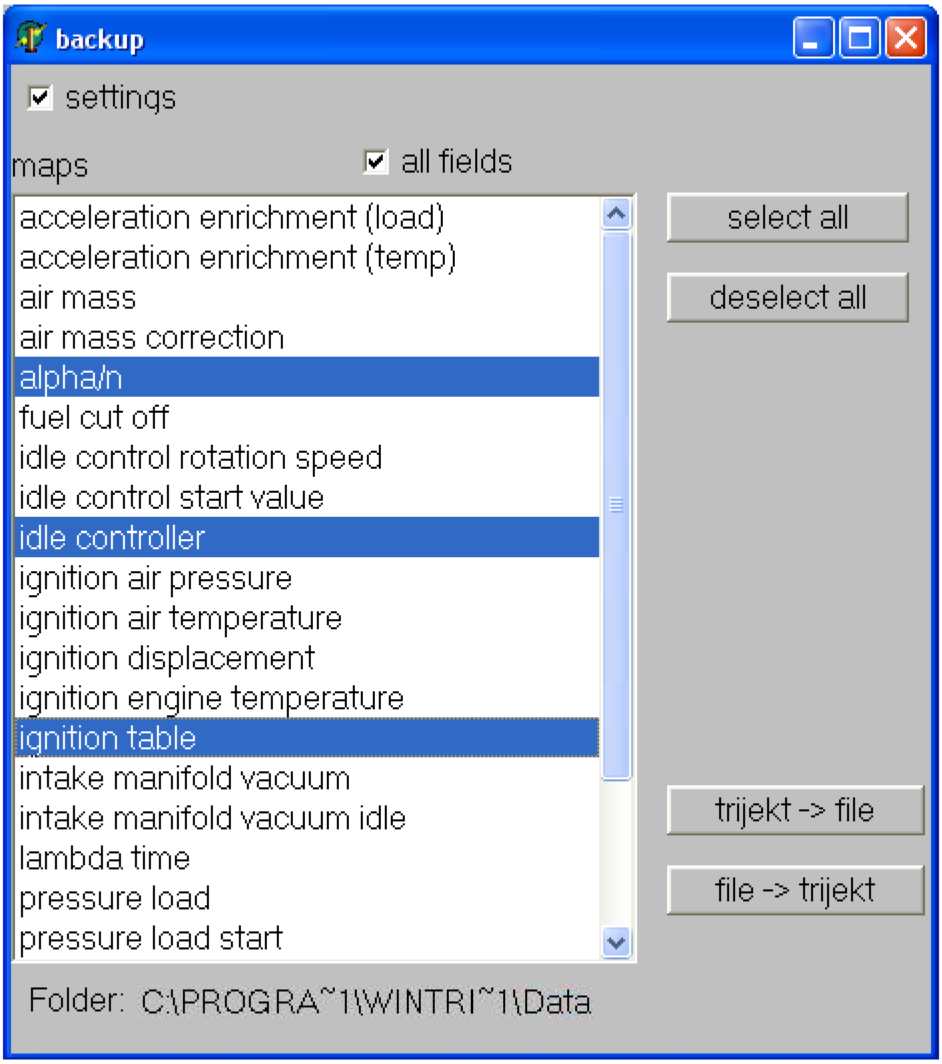
You have got the possibility to choose whether the settings and which maps shall be transmitted and in which direction transmission will be carried out. You can select resp. deselect several individual maps specifically by keeping the „Ctrl“ button pressed while choosing.



Now you can select in which direction the data shall be transmitted.

„**trijekt -> File**“
means that the maps of the Control Unit are saved on the computer.

„**File -> trijekt**“
means that the most current maps, saved before, are transmitted from the computer to the „**trijekt**“ Control Unit.

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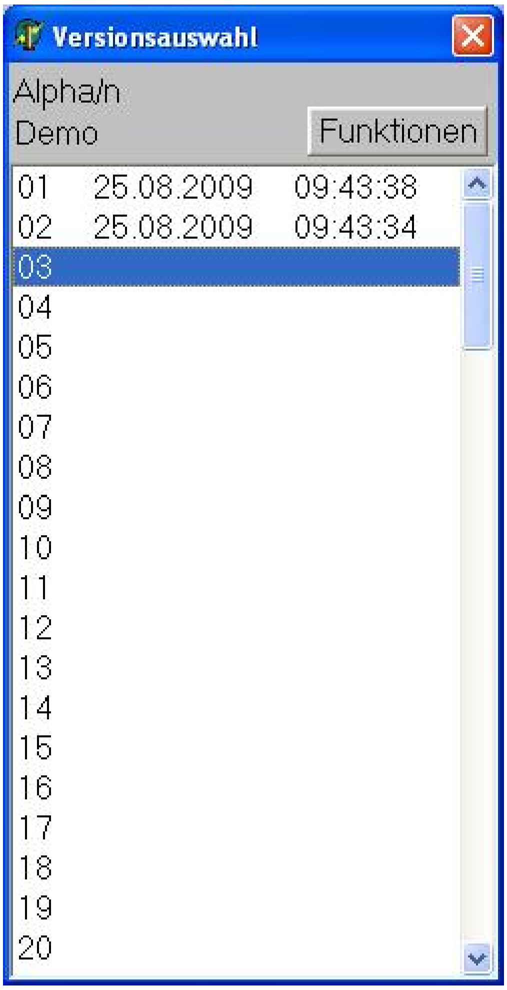
Now the individual maps can also be loaded in „Offline mode“, without associated control unit. For this purpose the engine name has to be chosen (see above) and the desired map has to be opened. Clicking the button „**Functions**“ => „**Load**“ the window with the different software versions is opened. The required version is chosen by double clicking. After processing the map you click „**Functions**“ => „**Save**“ to store the data on the computer or click „**send to trijekt** “ to transmit the data to the control unit.



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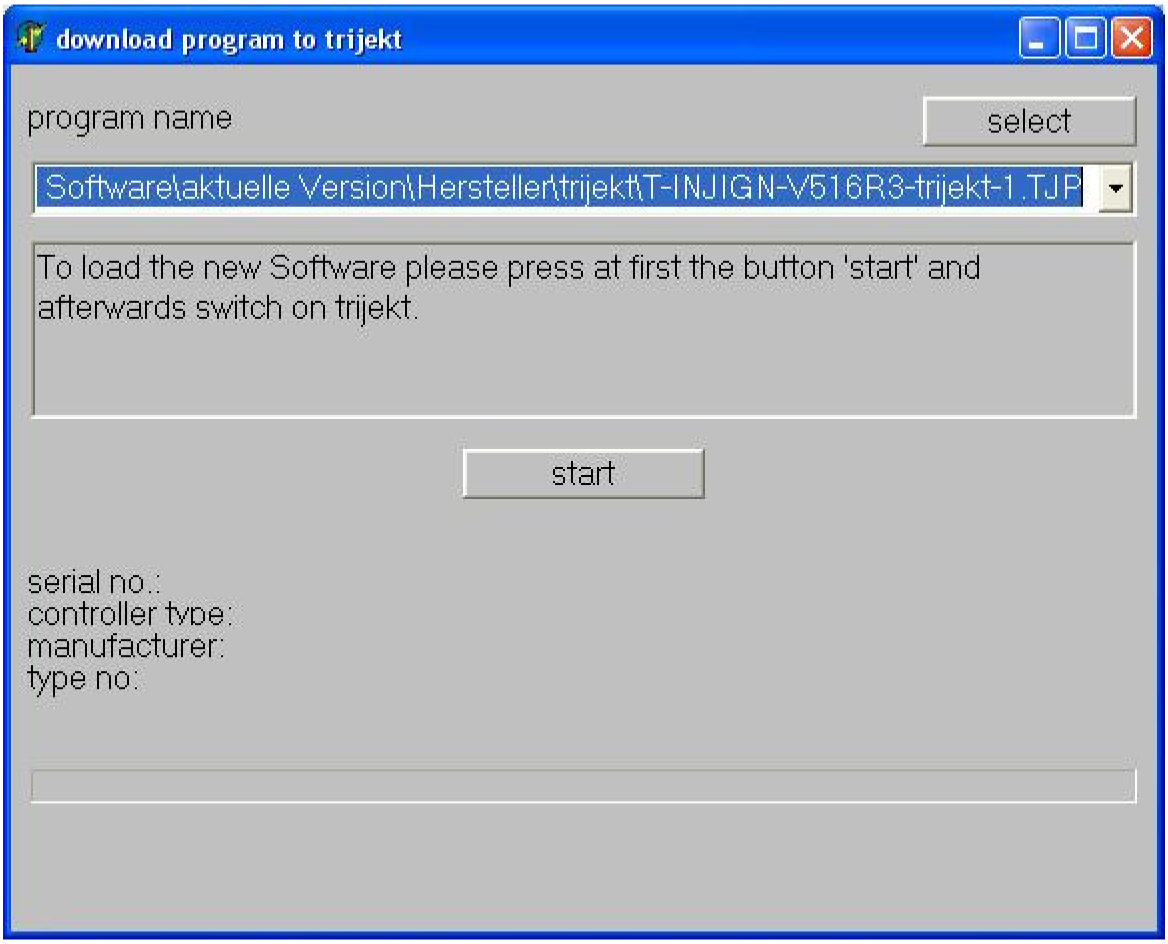
5.6 Program Update

Before carrying out the Program update it is imperative to create an Export File being imported in the trijekt Control Unit via Function Data Import after completed Program Update!

In order to carry out a Program Update please select in Wintrijekt in Menu window „Extras“ item „Program update“.
Window „Program load to **trijekt**“ appears.

Select Program File (recognizable by the ending „.TJP“)
Click Button „Start“



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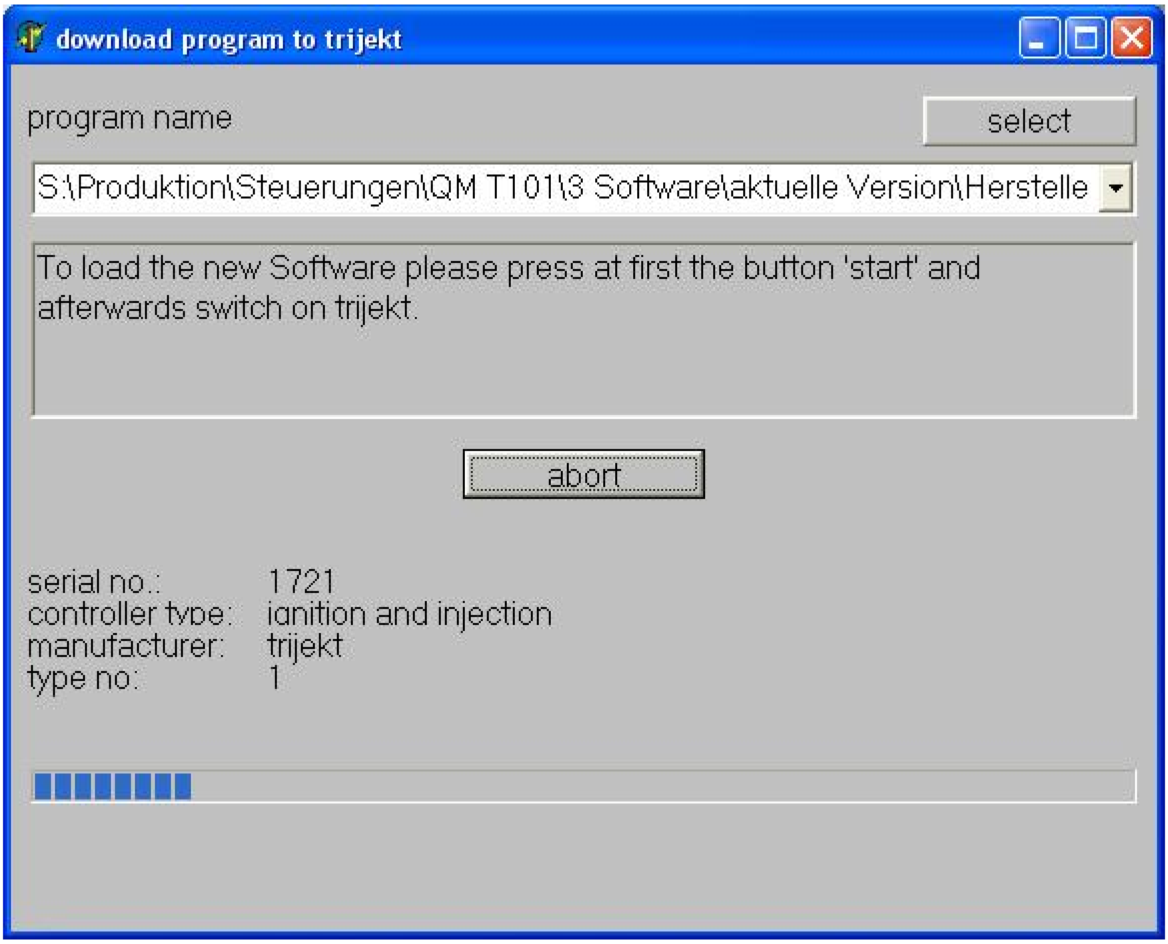
Now switch the ignition off, disconnect the ignition coils from the supply voltage and press „OK“.

Then switch the ignition on again.
Now the Program is automatically transmitted to **trijekt.**



5. appendix

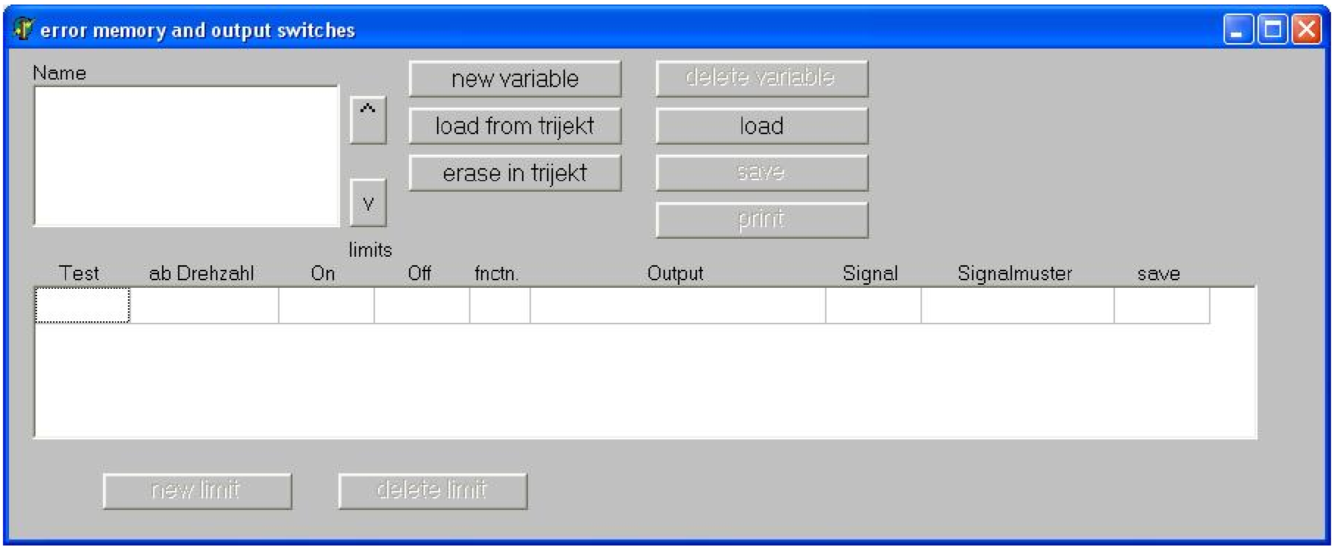
5.7 Define Switching Outputs and Error Memory

Every output not being required for engine operation can be used as freely programmable switching output.

(If e.g. a 4-cylinder engine is operated with semi-sequential ignition, the ignition outputs 3+4 are not required for engine operation.)

Both Ohmic and inductive loads are possible! (e.g. lamps, relays…)

In order to determine switching outputs and Error Definitions, please select in Wintrijekt in Menu Window “Error” the item “Define Errors and Switching Outputs”.
The window „Error Memory and Switching Outputs“ appears.



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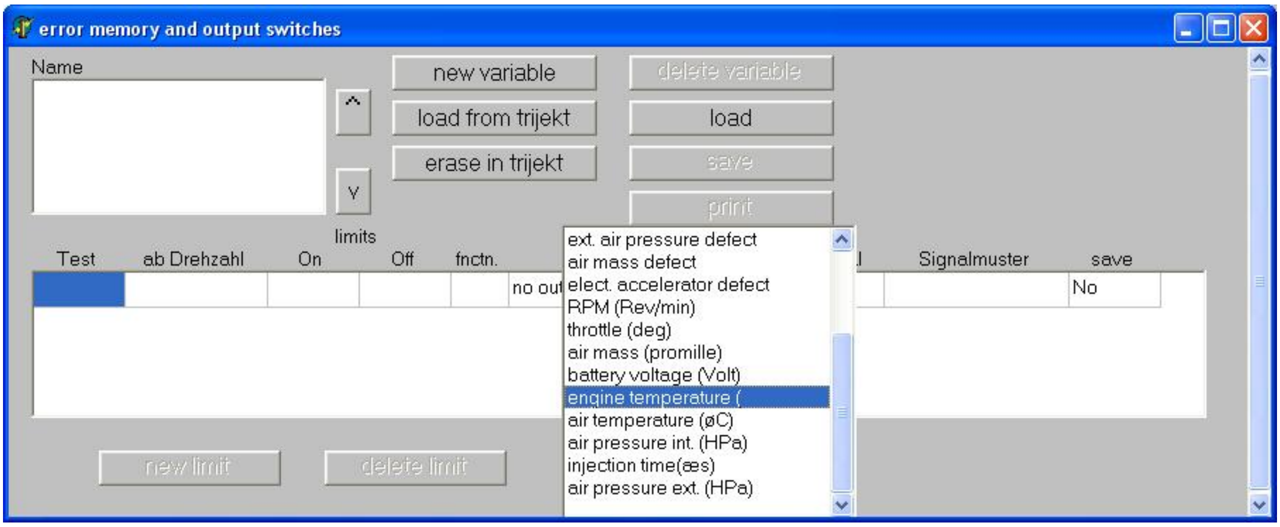
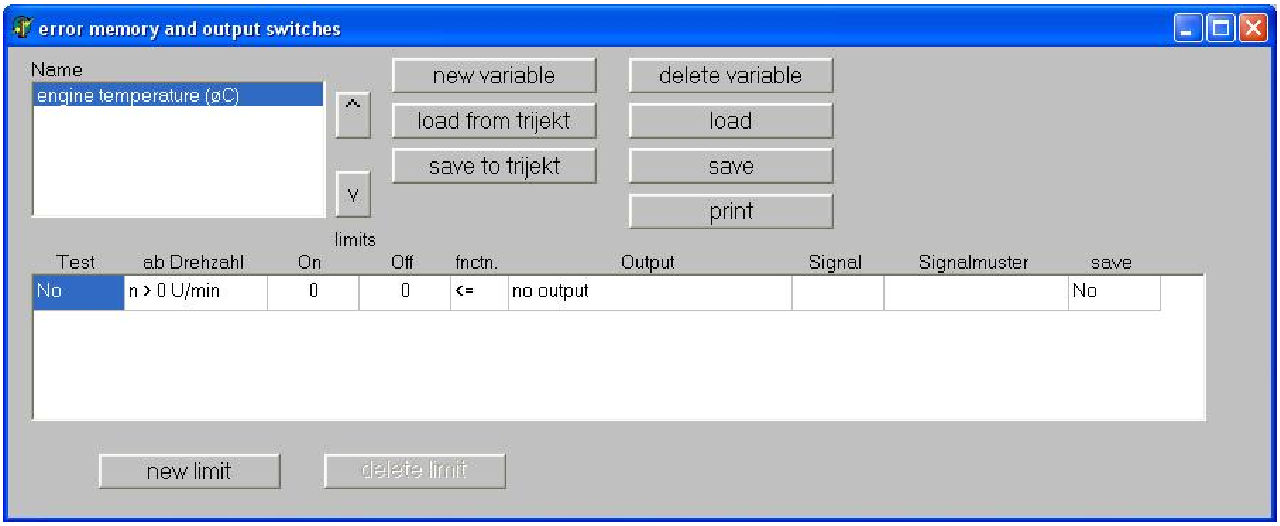
In order to define an output or an error Wintrijekt has to be connected to the **trijekt** Control Unit (Online On).
E. g. you want **trijekt** to switch an output in case that the water temperature reaches a value of over 110°C and to switch this output off again if the value goes below 105°C.:

- click the Button „new variable“
- Select the required variable by doubleclick.
  (here: „engine temperature")





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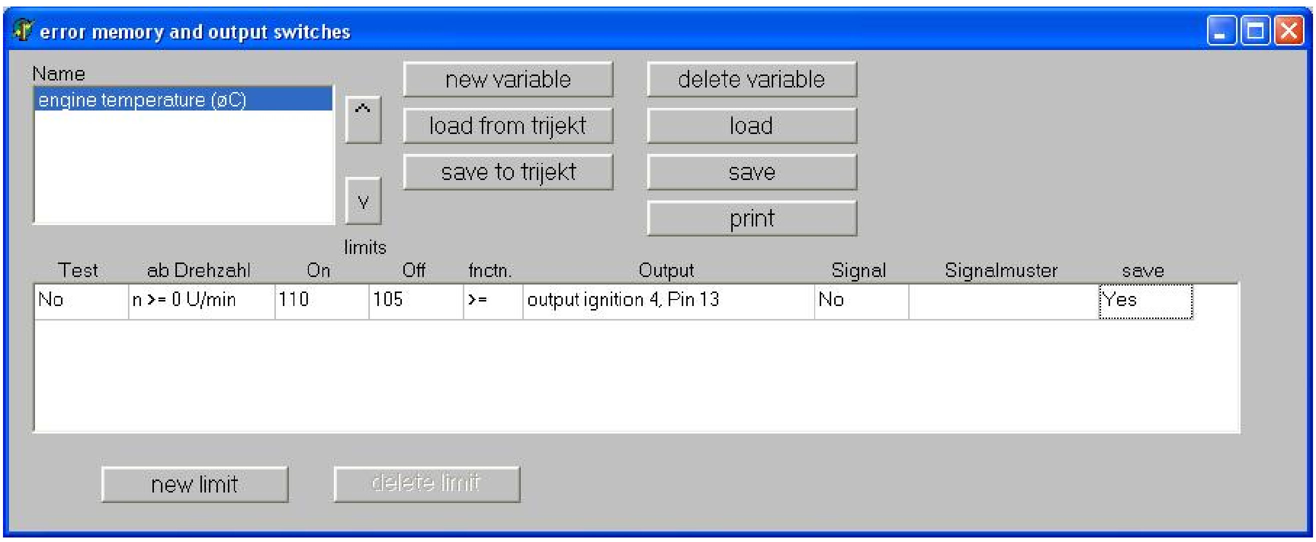
- In Array „Test“ you determine whether the required output shall be switched on for 2 seconds when switching on ignition (Function Check).
- In Array „from rpm“ you determine whether the output shall be switched at running engine only (n > 0) or also at switched off engine (n >= 0).
- In Array „On“ you determine the limit at which the output shall be switched on (here: 110°C).
- In Array „Off“ you determine the limit at which the output shall be switched off (here: 105°C).
- In Array „Fnktn“ you determine the Function by which the output shall be switched on (here: at temperatures **over** 110°C, so Function **“>=“** is selected).
- In Array „Output“ you determine which free output shall be switched. (in our example a 6-cylinder engine with semi-sequential ignition is tuned, which means that Ignition Outputs 4,5 and 6 are not required for engine operation. (For this reason “Ignition Output 4, Pin 13“ was chosen.)
- In Array „Signal“ you determine whether a certain Bit Pattern shall be displayed at the output (flashing code).
  - Selecting „no“ the next array „Signal Pattern“ is irrelevant. and the output is switched on pemanently.
  - Selecting „yes“ you have to insert a 16-Bit signal sequence (e.g.1010101010101010 in the array “Signal Pattern”.) Each Bit has a duration of 200ms, whereby the whole Signal Pattern has a duration of 3,2s.
- In case that several variables „**without Signal Pattern**“ are defined for the same output these are linked with the Function „**and“** by **trijekt**, i.e. all conditions must be fulfilled in order that the output will be switched.
- In case that several variables „**with Signal Pattern**“ are defined for the same output, basically the Signal Pattern with the highest priority is displayed.
  - The sequence in array „Name“ indicates the priority. (the higher the variable is positioned in array „Name“ the higher is its priority.) With buttons **^** and **v** you can change priority of the variables.
  - In array „Save“ you determine whether an entry should be carried out in the error memory.
- With button „New Limit“ you can determine further conditions being fulfilled by the selected variable (here: engine temperature).



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- Clicking the button „save to **trijekt** "
  (window „save to trijekt" appears and has to be confirmed by OK)
  all settings are saved in **trijekt**.

- Afterwards switch ignition off and then on again in order to finish programming the output.

Notice:

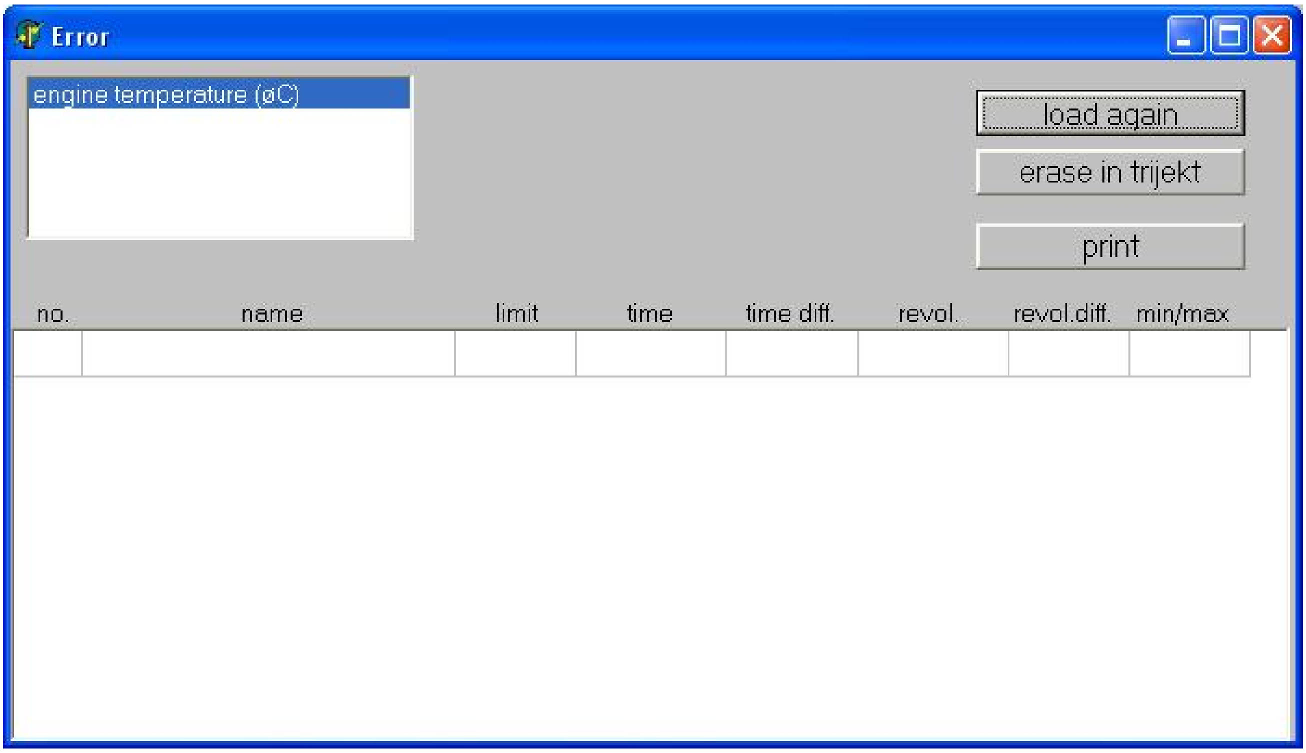
In case that on one and the same occasion one switching output with bit string (display flashing code) **and** one entry into error memory shall be carried out at the same time, this cannot be entered in only one row. Over button „new limit" a second row can be created so that you insert in one row that the output has to flash and in the second row without output you insert only the entry into error memory.

5. appendix

5.8 Readout Error Memory

In case of errors according to the definitions adjusted by you, you can view them in the error memory at any time.

In order to open error memory, please select in Wintrijekt in Menu Window „error“ point „show errors“ . Window „Error“ appears.



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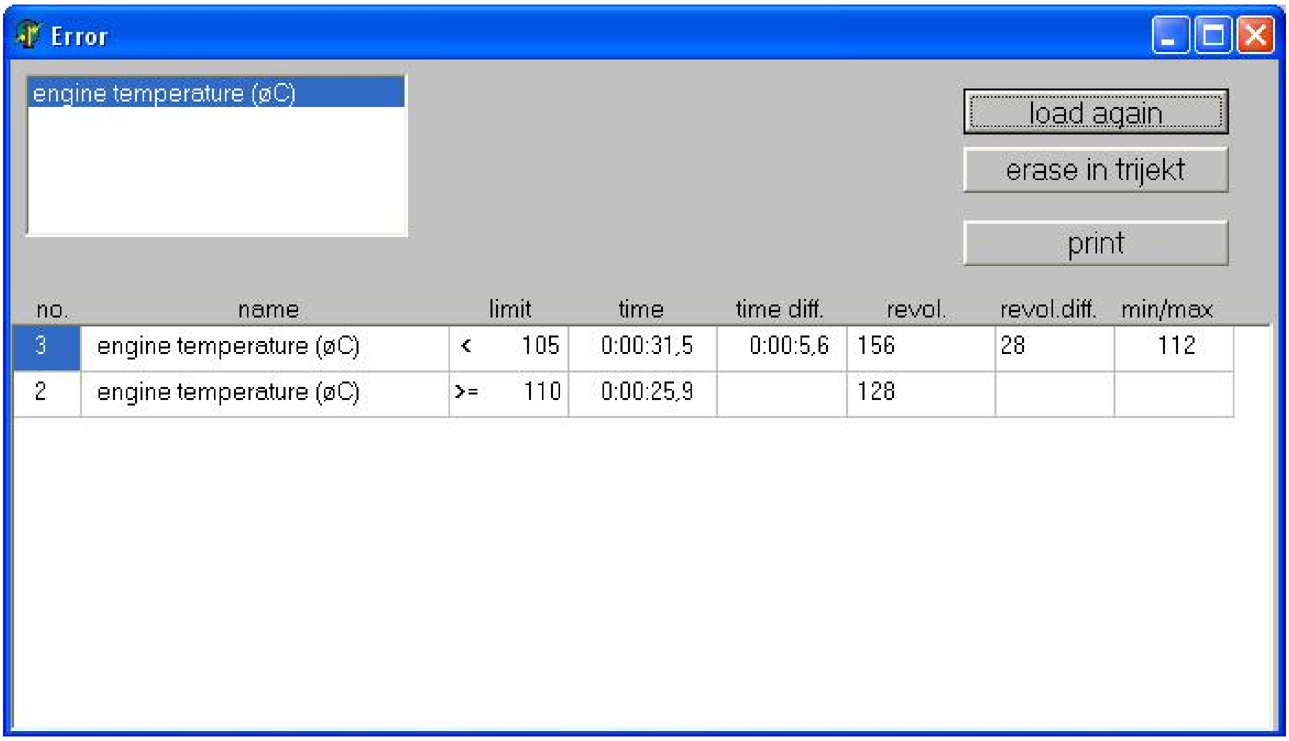
- click the button „load again“ in oder to load the Error Memory entries from the **trijekt** Control Unit.



In the Error Memory the „errors“ that occured (exceeding adjusted upper and lower limits) are listed in their order bottom-up.

In our example the fixed temperature of 110°C was exceeded after 25,9s (since “Ignition On”. Number of engine rotations was 128 at that time.

After a time of 31,5s the adjusted temperature of 105°C fell below the limit. The time difference to „Exceeding the limit“ (and thus error duration) is 5,6s (resp. 28 rotations). The counter reading of rotations was 156 at that time.
The maximum value reached was 112°C.

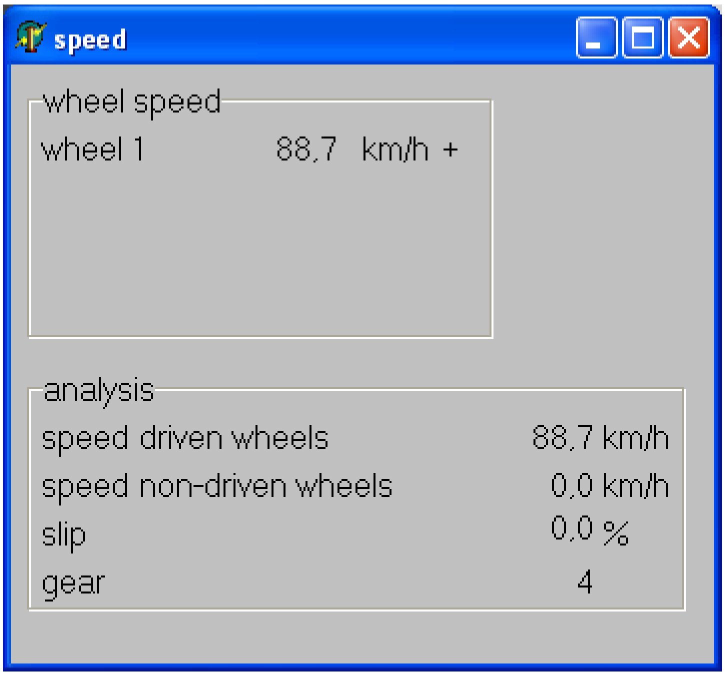
Clicking the button „erase in **trijekt**“ the error memory is deleted.

5. appendix

5.9 speed- and gear-detection

With **trijekt** bee it is possible to detect the driving speed and the currently selected gear.
For this you need a pickup, attached at the gearbox, at the cardan shaft or (for motorcycle) at the driven wheel and connected to the AUX-Input (Pin 26).
The pickup must give 1000-30000 pulses per kilometer.
This corresponds between 3 and 50 pulses per wheel revolution (depending on the rolling circumference).
Enter the values in the “settings” under the point “speed”.

The driving speed and the currently selected gear are displayed in the window "speeds" under the menu item "Window":



The speeds of the "non-driven wheels" and the slip are not displayed, because **trijekt** bee has only one input for the speed detection.