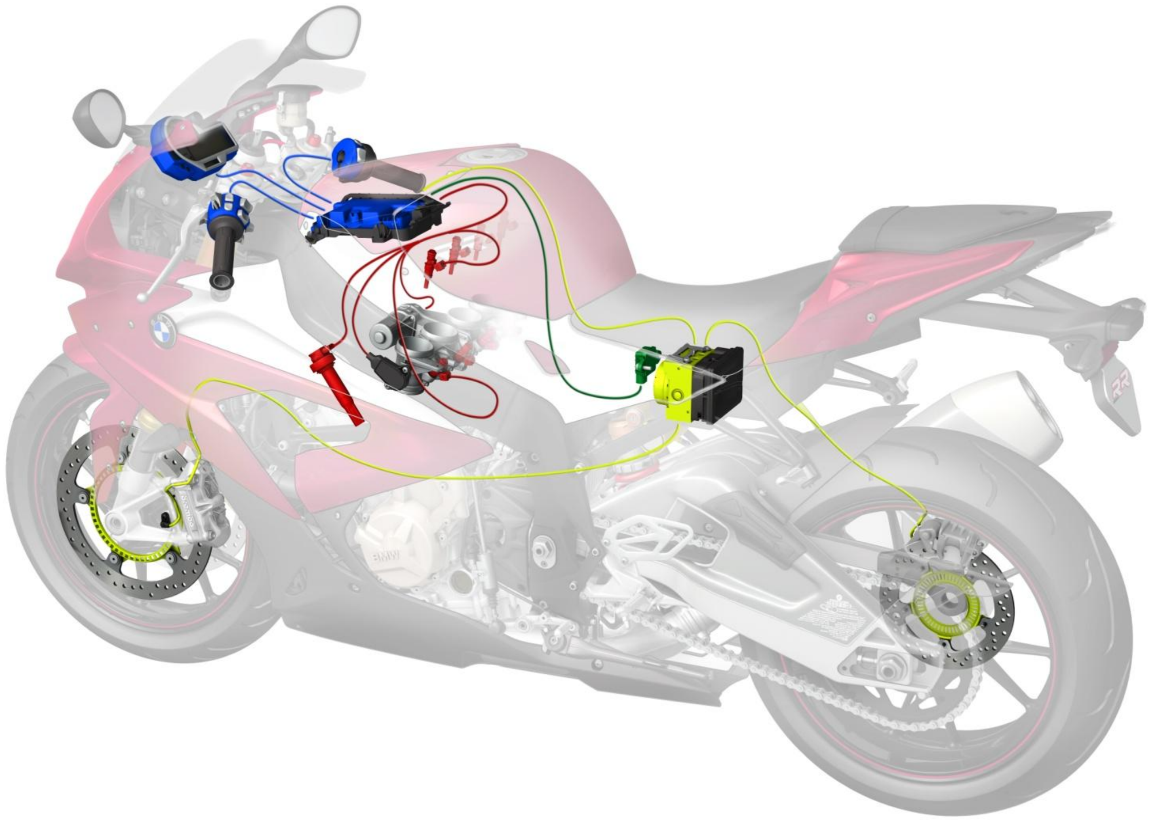
BMW Motorrad – HP Race Calibration Kit 3



Warnings

ATTENTION:

When you use this BMW product you significantly influence your motorcycle's electronic systems. Changing parameters to settings other than standard can lead to critical riding conditions for which BMW Motorrad cannot provide safeguards.

Warning:

Use of this product can change the handling of the motorcycle to such an extent that life and limb can be endangered and/or material damage can occur. Interventions in the engine control unit with this product can lead to serious consequences for rider and equipment. The durability of the engine can be significantly reduced. Engine damage might occur. Be sure to read and comply with the instructions in the rider's manual.

NOTES:

- Do not use this product if you do not have the necessary experience and training.
- The BMW Motorrad – HP Race Calibration Kit 3 software can be used only in combination with the appropriate engine control unit and BMW adapter cable. The software is not suitable for use with other parts.
- Use of a vehicle modified by the BMW Motorrad – HP Race Calibration Kit 3 is permitted only elsewhere than on public roads.

List of abbreviations

Abbreviation	Meaning
RCK1	BMW Motorrad – HP Race Calibration Kit 1
RCK2	BMW Motorrad – HP Race Calibration Kit 2
RCK3	BMW Motorrad – HP Race Calibration Kit 3
DTC	Dynamic Traction Control
DDC	Dynamic Damping Control
RPKIT	Race Power Kit
SASS	Shift assistant
ABS	Anti-lock Braking System
VCI	Virtual Communication Interface

Introduction

The BMW Motorrad – HP Race Calibration Kit 3 software allows you to adapt a variety of functions of the engine control and chassis control systems. This allows modifications to the vehicle (e.g. exhaust system, tyres) or rider preferences to be taken into account in the setup.
When the BMW Motorrad – HP Race Calibration Kit 3 software is activated, the "User" mode, which is configurable via the instrument panel, is tuned off. A modification via two different control levels could lead to settings that are hardly comprehensible and is prevented for this reason.

The following functionalities can be adapted:

- Injection
- Ignition
- DTC
- Launch control
- DDC
- ABS
- Shift assistant
- Pit Lane Limiter
- Fault memory
- Adaptation

Components

Installation

It is recommended that you download the latest version from www.bmw-motorrad.com website.

See installation instructions / insert in the delivery specification of the BMW Motorrad - HP Race Calibration Kit 3.
BMW part number: 7753 8 546 642

Notes:

- You can only work with the BMW Motorrad – HP Race Calibration Kit 3 software when the tool is connected to a motorcycle (online) or an available data record is loaded (offline).
- The BMW Motorrad – HP Race Calibration Kit 3 software replaces the BMW Motorrad – HP Race Calibration Kit 2 software and is the only communication tool applicable as of model S 1000 RR MÜ2 (model year 2015).

Working with BMW Motorrad – HP Race Calibration Kit 3

This software allows you to create and edit data records that include adaptations to the various functionalities.

User interface

The user interface of the BMW Motorrad – HP Race Calibration Kit 3 software is divided into different areas.

Menu bar

The menu bar provides access to all functions including the help and settings. The keyboard shortcuts, provided they are available, are also indicated here.

Toolbar

The toolbar provides access to frequently used functions. This bar can be switched off in the menu under options → symbol bars.

HP Race Calibration 3 bar

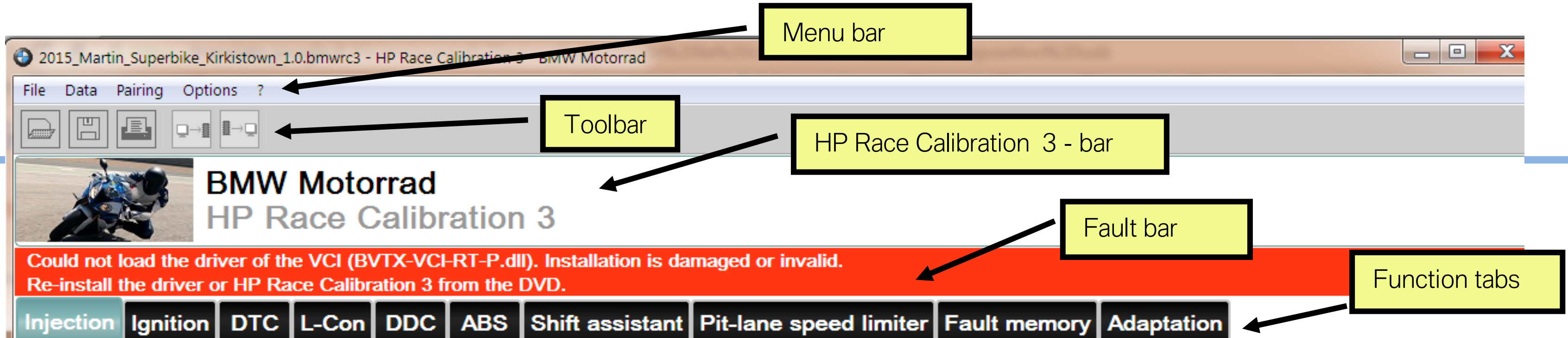
This bar can be switched off in the menu under options → symbol bars. This bar indicates which motorcycle you are connected with.

Working area

The working area changes depending on the selected subject area.

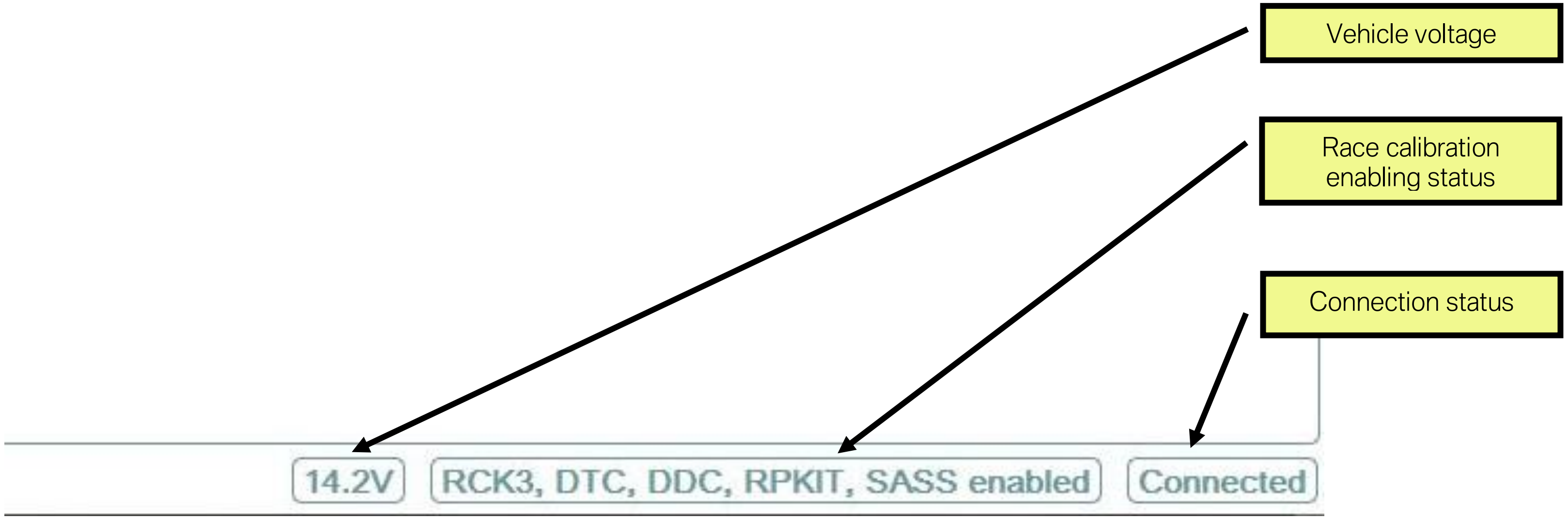
Status area

The connection status with the motorcycle is shown in the status area.

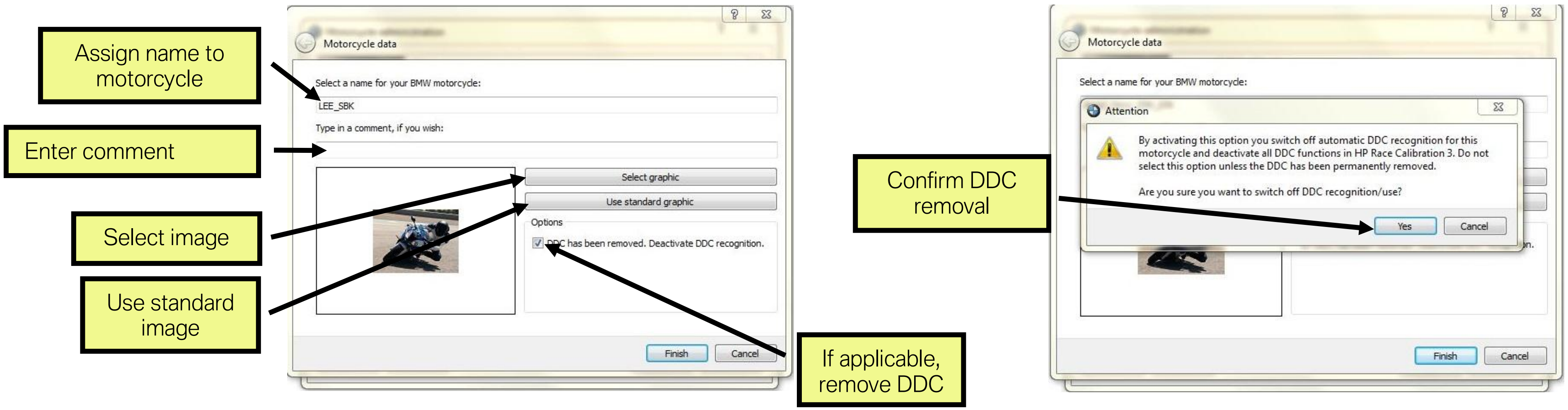


Connection to the motorcycle

The settings in the data records can be worked on without actually connecting to the motorcycle. The connection only needs to be established for transmitting the data to the control unit or for reading the data out of the control unit to the computer. The BMW RCK3 VCI adapter cable is used to connect the computer to the diagnosis port of the motorcycle. The communication is established after the ignition is switched on. The communication status, the enabling status for the BMW Motorrad – HP Race Calibration Kit 3 software, as well as the vehicle voltage of the motorcycle are shown in the status area.

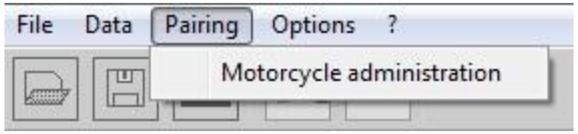


When a motorcycle is connected, it will be uniquely identified via the vehicle identification number and stored in the database of the software. You must give the motorcycle a name the first time you connect it. You can also add information such as descriptions and images to the motorcycle.



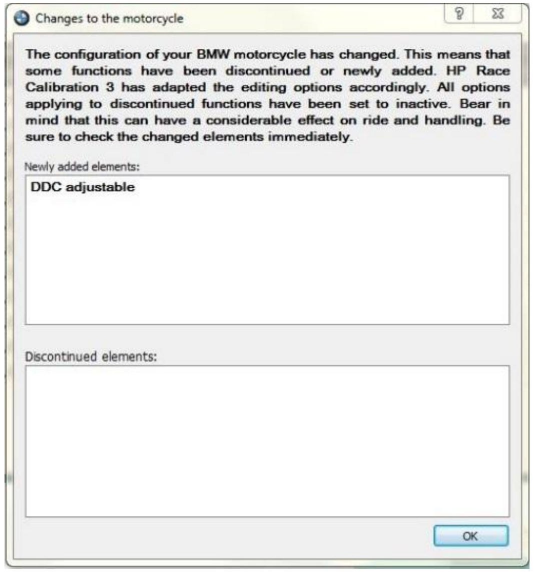
If you would like to remove the DDC and have placed a checkmark, a warning will appear (image on the right).
NOTE: If you remove the DDC, you will no longer be able to access the **DDC** tab in the BMW Motorrad – HP Race Calibration Kit 3 software.

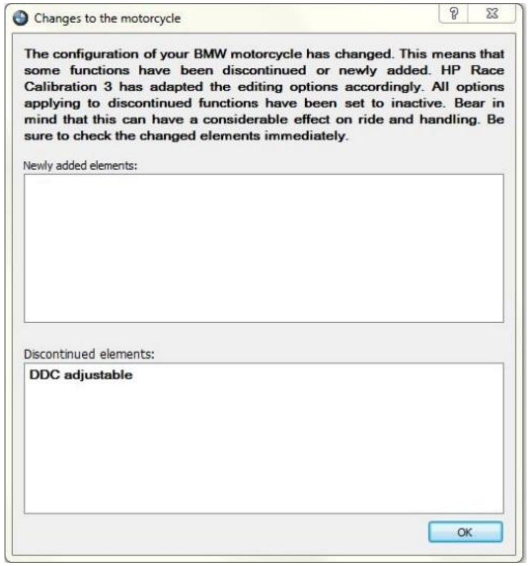
NOTE: To prevent an incorrect data record from being loaded to the motorcycle, which could lead to undesired behaviour of the motorcycle, the motorcycle is coupled with the data record. Under **Motorcycle administration**, all motorcycles are listed that have already been connected to your computer.



Use **Edit** to edit the motorcycle settings or **Delete** to delete motorcycles from the database.

If components are subsequently added, the modified configuration is automatically detected in the BMW Motorrad - HP Race Calibration Kit 3 and displayed. Added elements enable the corresponding tabs in the working area so that these can be edited.



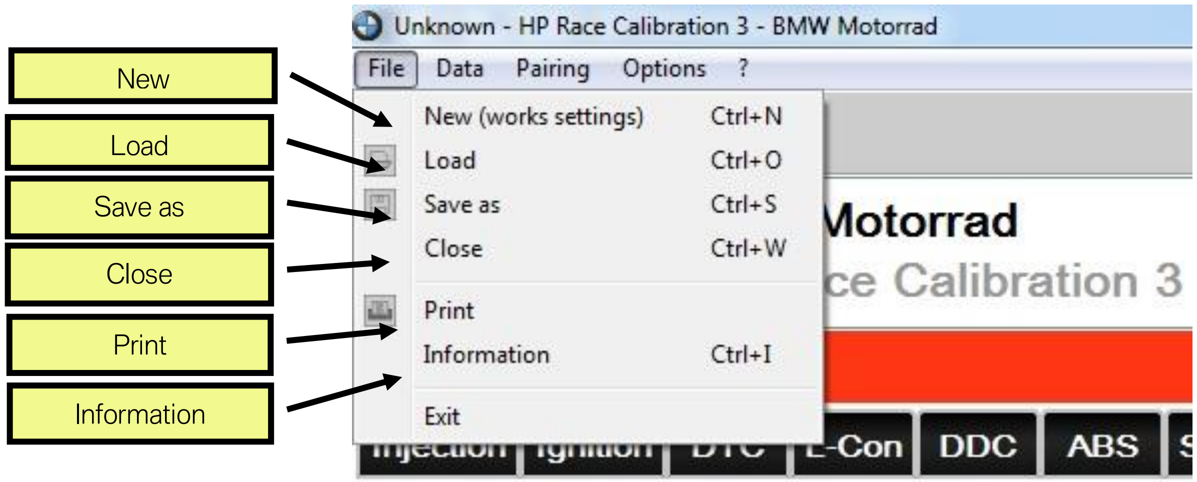


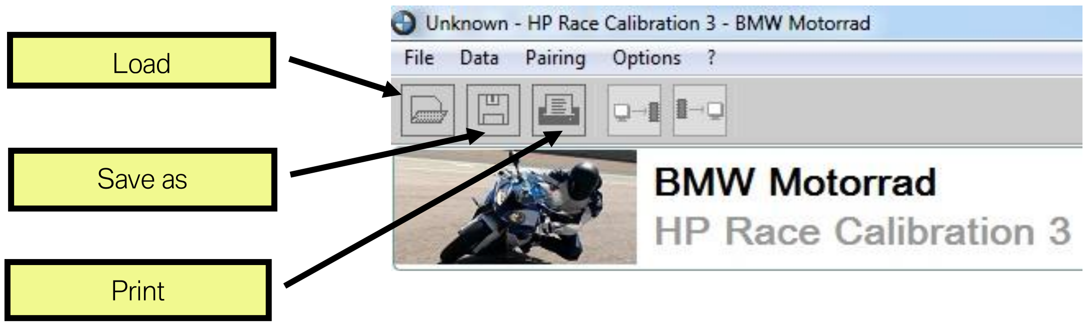
Omitted elements deactivate the corresponding tab in the working area. These can then no longer be edited.

NOTE: If you want to load an old data record after a new configuration, the modified elements will not be adopted and will be reset to the factory setting.

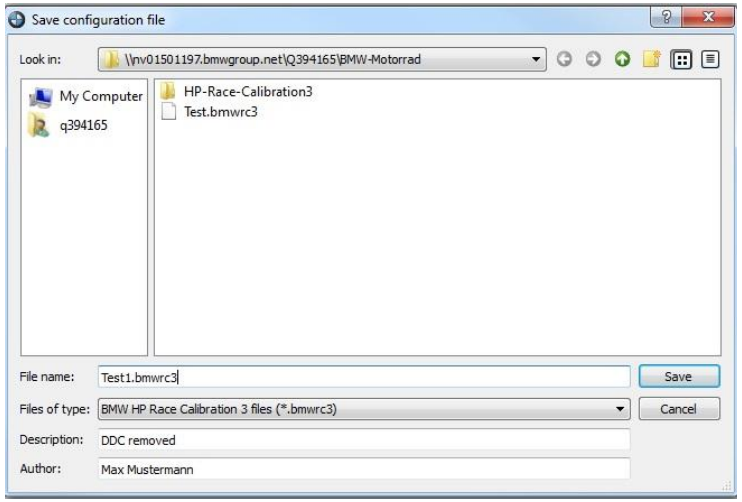
Loading/Saving/Printing data

A data record can be saved in a file or loaded from a file. This makes it possible to administrate a library of data records and exchange records with other users. Use the menu or the toolbar to access the data record. The complete data record is always loaded or saved in each case.

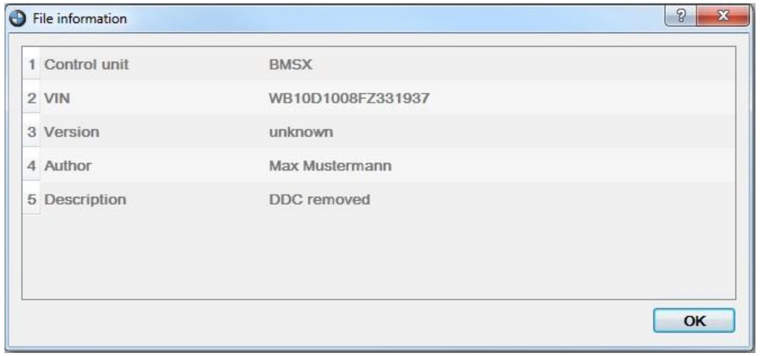




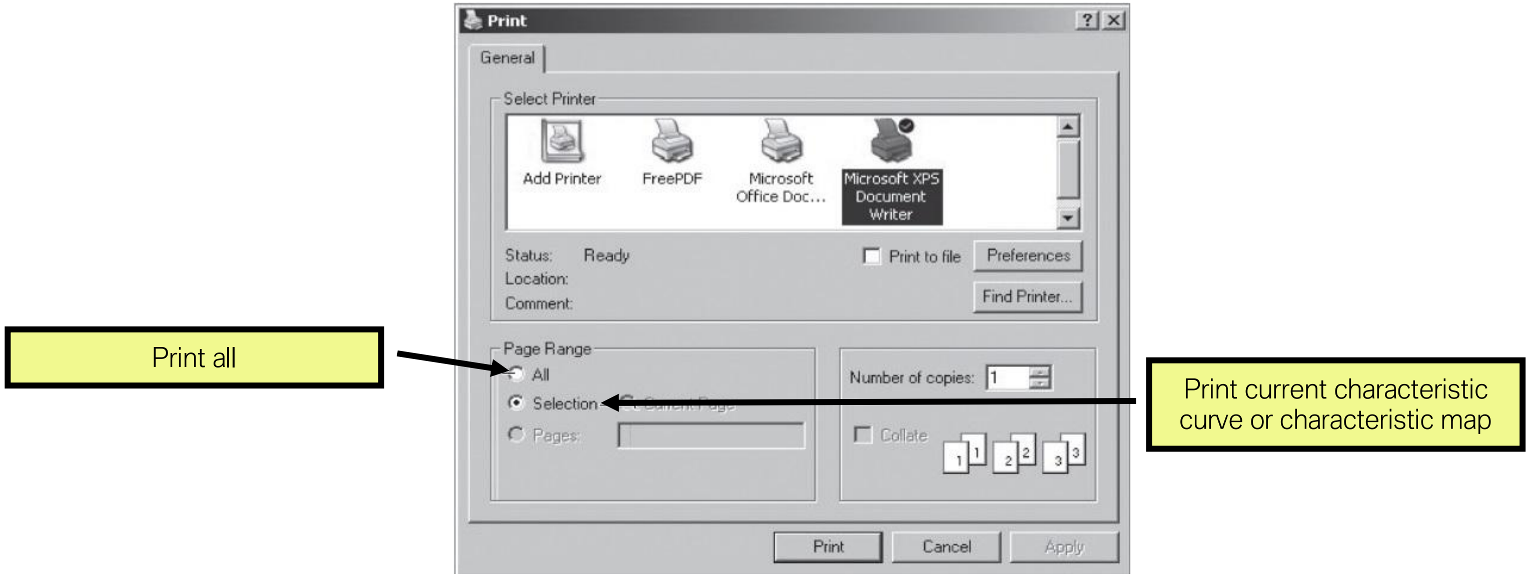
You can specify additional data when saving.



You can show this metadata from the current data record via the File information operating element.



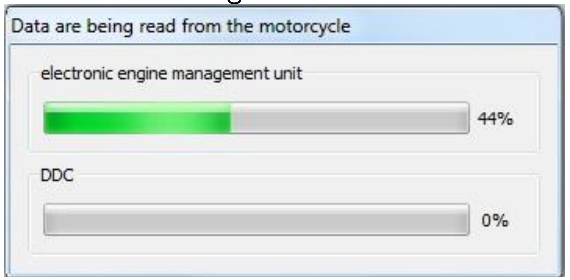
You can either print all the data or only a current characteristic map



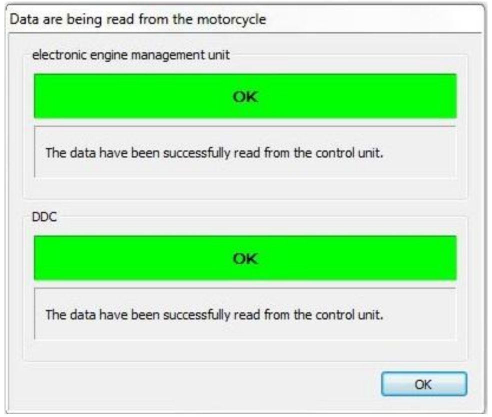
Writing/Reading data to/from the control unit

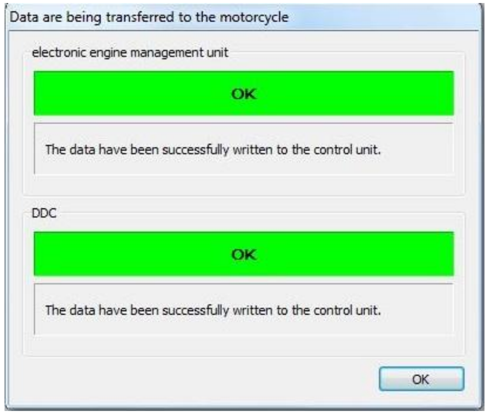
The current data record of the BMW Motorrad – HP Race Calibration Kit 3 software can be transmitted to the control unit. It will subsequently be active in the control unit and retained until it is overwritten. An existing data record in the control unit will be overwritten by this. To write data records to the control unit, it must be correspondingly enabled. Changes you make using the BMW Motorrad – HP Race Calibration Kit 3 software will only become active after they have been written to the control unit. The complete data record is always transmitted.

Conversely, the data record can also be read out of the motorcycle; in this case, the data record in the BMW Motorrad – HP Race Calibration Kit 3 software will be overwritten with the data record from the control unit. The complete data record is always transmitted. Use the menu or the toolbar to read and write data records. This is only possible when the vehicle is connected with the computer using a BMW RCK3 VCI adapter cable and the ignition is switched on and with the engine switched off. The corresponding buttons will not be active if the conditions are not fulfilled.
A progress bar indicates the current progress of the transmission. This can take several seconds. If a DDC has been installed, the data for the DDC is also transmitted in addition to the data for the engine control unit. You will then see two progress bars.



A dialogue window with a green OK will be displayed after the transmission or readout of the data has completed successfully.

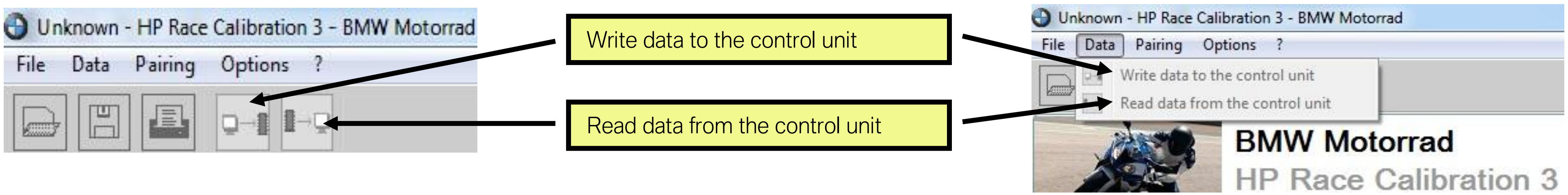




A red fault message indicates that a transmission did not complete correctly. The reasons for an unsuccessful transmission are usually due to the connection. Check whether the cable is connected to the motorcycle and the PC correctly and start the transmission again.

Transmitting a file

Use the menu to transmit parameters that you have changed in the BMW Motorrad – HP Race Calibration Kit 3 software to the motorcycle. All changes to the entire data record are replaced. You must write the data to the control unit as described to ensure that these settings also become active again in the motorcycle.



Editing data

A data record consists of a fixed number of adjustable parameters. These correspond to a selected range of the entire engine control and vehicle control functions in the vehicle. Functions from the following subject areas can be influenced.

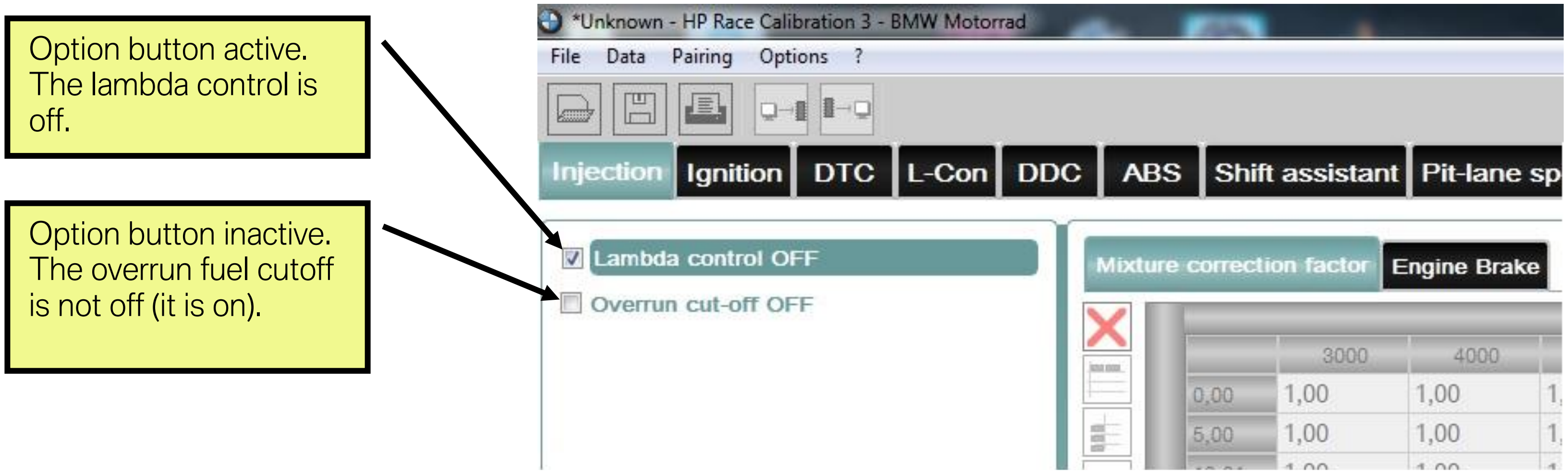
- Injection
- Ignition
- DTC
- Launch control
- DDC
- ABS
- Shift assistant
- Pit Lane Limiter
- Fault memory
- Adaptation

Each of these subjects is represented by a tab below the toolbar showing the corresponding parameters that can be modified. Click on the corresponding tab to open it.

There are four types of parameter that you can modify. You can see the changes immediately in the BMW Motorrad – HP Race Calibration Kit 3 software. The changes only become active in the motorcycle after the data has been written to the control unit.

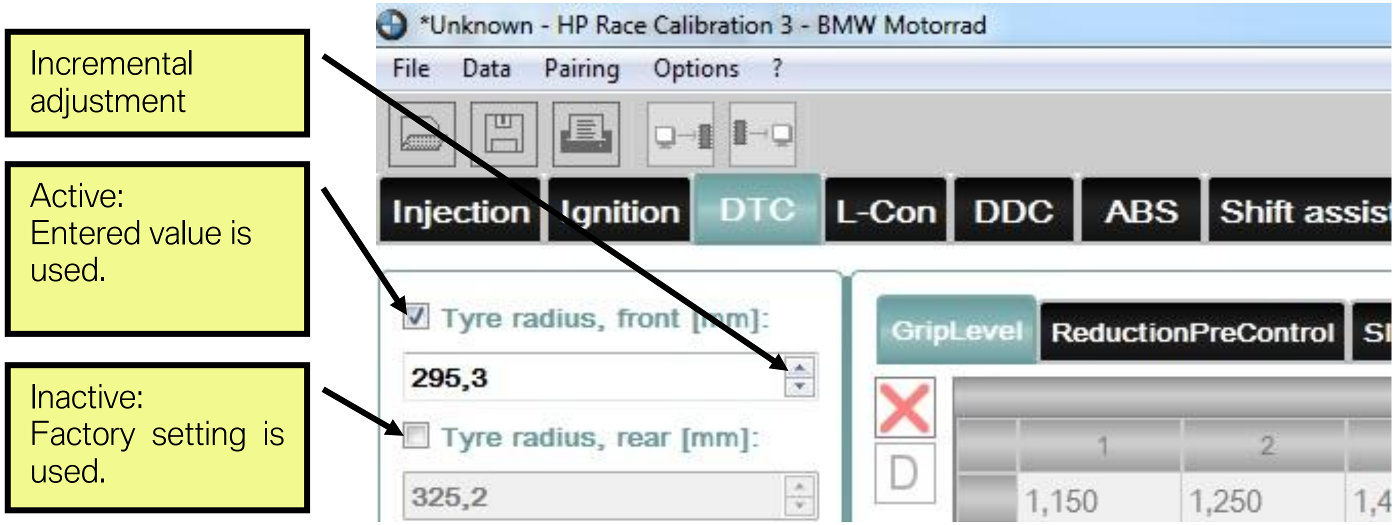
1. Option button

Option buttons have a selectable box with a text explanation to the right of it. They can only assume the active or inactive state. To activate the state, place a checkmark in the box by clicking it with the mouse. A text explanation describes the meaning of the option button in the active state.



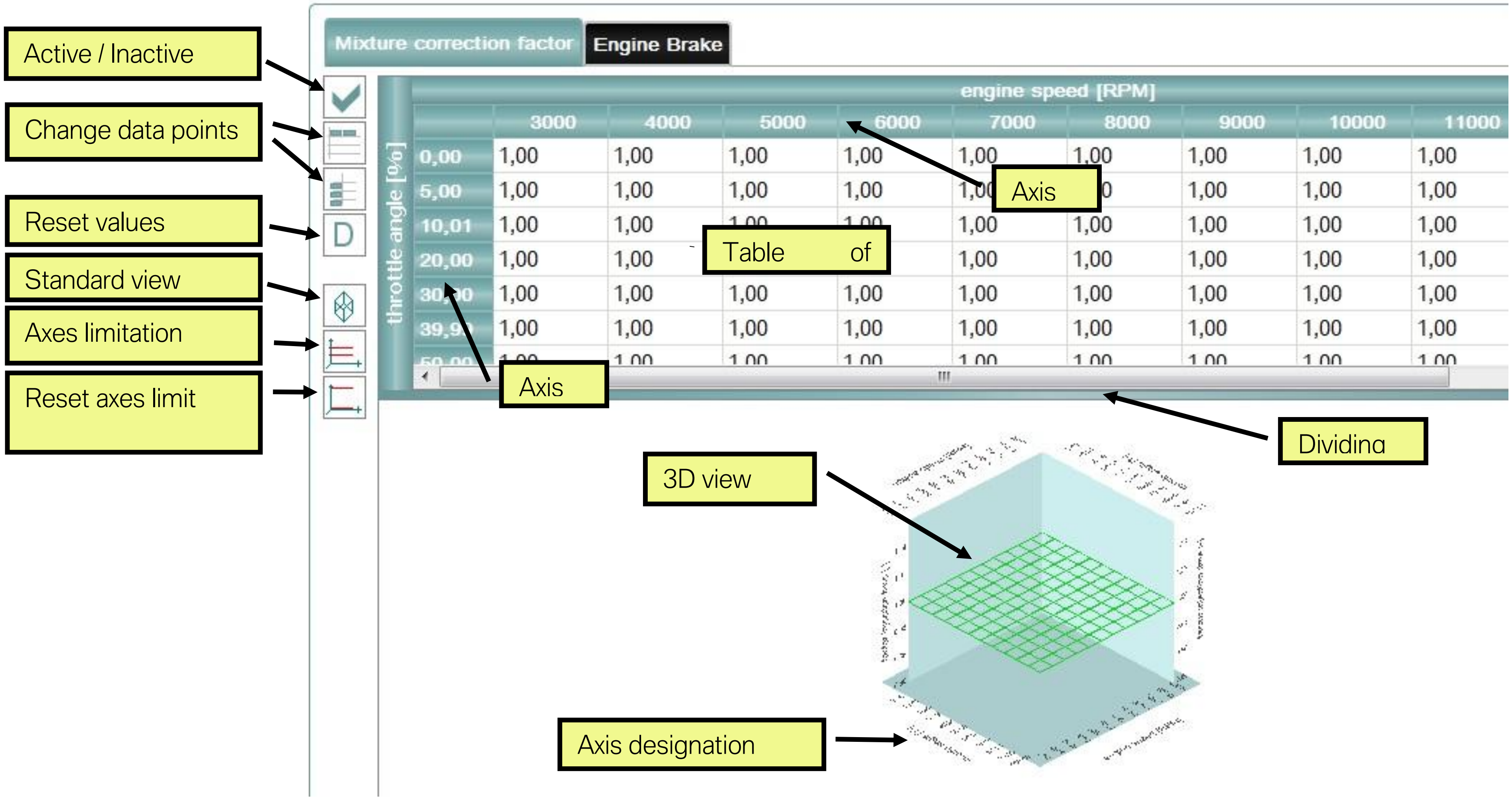
2. Characteristic values

Characteristic values consist of an activatable box, a text explanation to the right of it and a number input field below it with two value adjustment buttons.
Characteristic values must be activated. Activate the characteristic value by placing a checkmark in the box and then edit the value in the number input field. You can enter numbers using the keyboard; a comma will automatically replace the period to prevent confusion when entering the decimal separator. You can change the entered number using the arrow buttons (increment or decrement). You can also make changes by highlighting and using the clipboard to copy and paste. Some of the options are also available via the context menu. All input is restricted to a valid range and a valid increment.
When the characteristic value is not activated, the number field is greyed out and cannot be modified. In this case, the motorcycle works with the factory settings for this parameter and not with the greyed-out value.



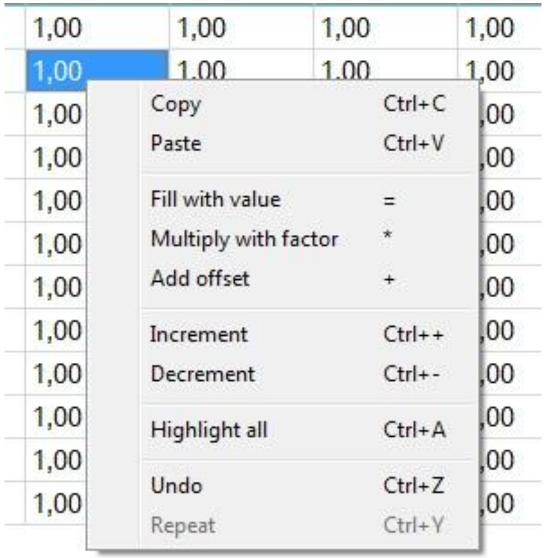
3. Characteristic maps

Characteristic maps consist of an activatable box, a table of values, a three-dimensional graph as well as various buttons. Characteristic maps must be activated. Changing the red "X" into a checkmark activates the characteristic map and you can edit the number fields. If the characteristic map is not activated, the number fields are greyed-out and are not able to be modified. In this case, the motorcycle works with the factory settings for this parameter and not with the greyed-out values.
A characteristic map consists of two axes and a table of values. Each axis has an input variable that corresponds to a modifiable variable in the motorcycle. The current value of both input variables can be used to determine where the operating point lies in the characteristic map; this determines the value to be used from the table of values. Linear interpolation is used when an input variable does not precisely fit to a value of the corresponding axis. The three-dimensional graph shows what the input variables of the axes are. These can be momentary values such as the engine speed, for example.



The axes and the table of values can be modified when the characteristic map is active. A data point editor can be opened in each case via a button on the left side of the table of values to modify the axes. The table of values can be modified directly.

Use the mouse or keyboard to highlight multiple cells and modify them. You can enter numbers directly using the keyboard; the decimal point is automatically replaced by a comma. There are also a range of adjustment options that are accessible via the context menu. The keyboard shortcuts for these are also listed there.



The entered number can be modified in steps using Increment/Decrement. You can also set the highlighted cells to be jointly filled with a value, multiplied with a factor, or an offset added.
You can also make changes by highlighting and using the clipboard to copy and paste. This allows the data to be used in other programmes.
A button to the left of the table of values allows you to reset the table and the axes to the stored standard values. This procedure does not have an effect on the rest of the data record.
All input is restricted to a valid range and a valid increment.

The characteristic map is depicted in the three-dimensional graph. The dividing line of the table can be moved to adapt the size. The view can be rotated using the left mouse button. Right-clicking or clicking on one of the buttons to the left will restore the standard view. The min/max values of the Z axis can be changed to optimise the three dimensional graph by clicking on the **axis limitation** button (to the left of the table of values). This only has an effect on the 3D graph and does not influence the data record. The axis limit can be removed again using the **remove axis limitation** button (to the left of the table of values).

4. Characteristic curves

Characteristic curves behave similarly to characteristic maps. However, they have only one input variable and thus one axis. The graphic is correspondingly two-dimensional.
The axis on some characteristic curves cannot be changed since the input variable only assumes fixed values, which are included in the standard axis (e.g. DTC mode).

Application information

The following provides information about making settings in the individual subject areas. Regardless of the subject area, please note the following instructions which serve your safety and facilitate the work.

NOTES:

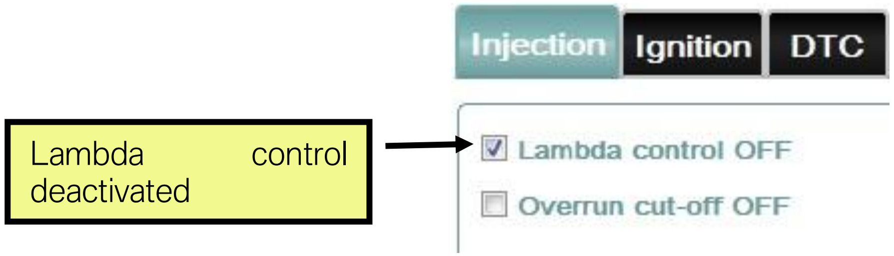
- ***Continuous parameters***
  With characteristic maps and characteristic curves, you should make sure that you always use harmonic progressions. "Jumps" or "corners" in the data input can lead to unexpected and possibly even dangerous behaviour of your motorcycle. Make sure that the parameters are continuous in the 3D or 2D view.
- ***Gradual approach***
  Approach the optimal values of the parameters gradually if you are not able to immediately determine the optimal value. The tyre circumference, for example, can be measured and entered, whereas the optimal values of a correction characteristic map of the DTC must be found by means of a loop of small modifications and by an evaluation by driving each time. Do not make large changes. Instead, use small steps to get close to the best value.
- ***Saving and documenting intermediate states***
  Save your data records regularly in a file and note as much as possible about what you have achieved with the data record and what is still not optimal. This will allow you to revert to a known state and use it for comparison.

Injection

In the Injection tab, you can make a variety of interventions that affect the fuel injection.

Lambda control off

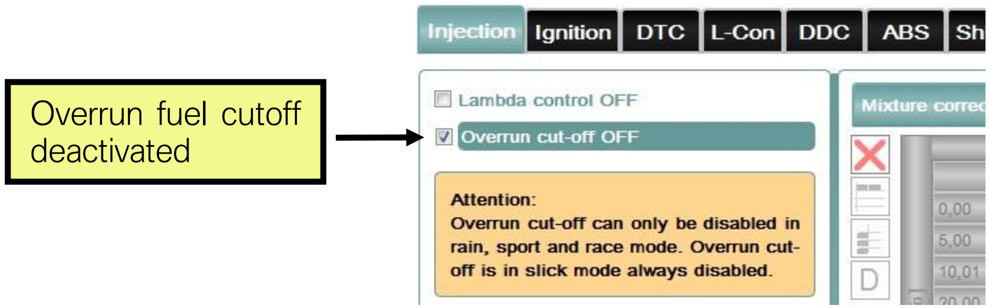
The lambda control evaluates the signals of the standard oxygen sensors in the exhaust system and corrects the fuel injection times in order to achieve a stochiometric fuel-air ratio for combustion.
The lambda control is always active for a standard programme state – in all riding modes.
When using the HP Race Power Kit programme status (activatable with enabling code at your BMW retailer), the lambda control is always deactivated. Since this programme status assumes a racing exhaust system and the vehicle no longer has a road approval (vehicle type approval).
You can deactivate the lambda control with series programme states.
A deactivation of the lambda control is then necessary when it deviates from the stochiometric fuel-air ratio. You can then modify the injection periods without the lambda control correcting the change again.
Deactivate the lambda control by placing a checkmark in front of the **Lambda control OFF** .

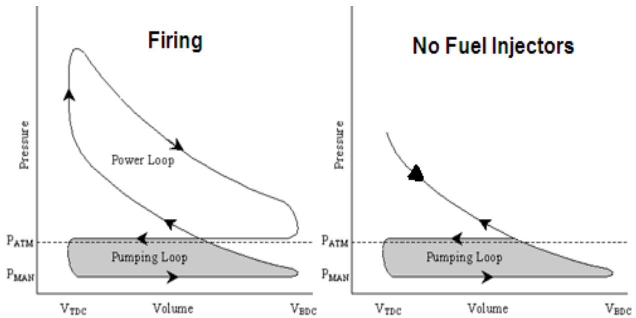


Overrun fuel cutoff off

The overrun fuel cutoff ensures that with the throttle grip closed and simultaneous increased engine speed, the fuel supply to the engine is completely switched off in order to save fuel and reduce the exhaust emission.
In this state, the motorcycle decelerates due to the friction power of the drivetrain, since combustion no longer occurs.
A deactivation of the overrun fuel cutoff then makes sense if you would like to reduce the deceleration of the motorcycle with closed throttle grip. If the overrun fuel cutoff is switched off, fuel will continue to be injected as a function of the amount of air drawn in. You then have the option of influencing the mixture and ignition timing interventions of the combustion and thus the deceleration of the motorcycle.
You can deactivate the overrun fuel cutoff by placing a checkmark in front of **Overrun cut-off OFF**.

NOTE: On several models, the overrun fuel cutoff is generally deactivated in SLICK mode independently of the setting in the software.





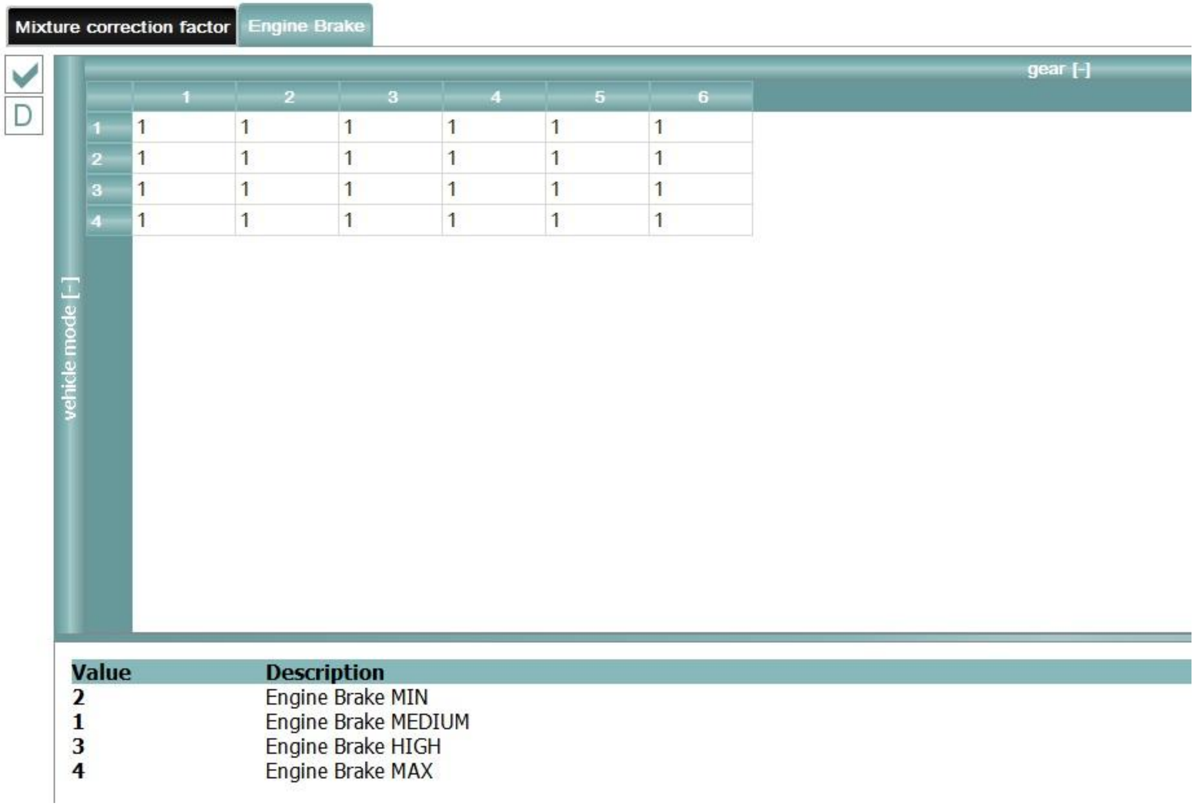
Mixture correction factor

Using the characteristic map **Mixture correction factor**, you can correct the injection period calculated by the engine control. The engine control calculates the injection period that leads to an optimal combustion in the motorcycle's factory state. Depending on the operating point, different air/fuel ratios (Lambda) of the combustion are arrived at
If you have made modifications to the motorcycle that change the amount of air drawn in (e.g. exhaust system) or you would like to deviate from the optimal air/fuel ratio, you can multiply the calculated injection period by a factor using this characteristic map. Values greater than one lengthen the injection period, increase the injected fuel quantity and thus provide for a "richer" air/fuel ratio. The behaviour is the opposite for values less than one. When equal to one, the injection period calculated by the engine control is not changed. The correction factor can be stored in the characteristic map depending on the engine speed and the throttle valve opening angle and is limited to maximum and minimum values to protect components.

Note: The air/fuel ratio has a very strong influence on the engine running (misfiring) and various component temperatures (e.g. piston, exhaust valves). Particularly with high engine speeds and throttle valve opening angles, it is recommended that you only make changes to compensate the amount of air drawn in. You should use a suitable oxygen sensor measuring technique here to input data into the characteristic map so that the optimal air/fuel ration is achieved.
The correction factor will likewise be included in the calculation for all fuel injectors.

Engine brake

In **Engine Brake**, the deceleration of the motorcycle can be influenced in coasting overrun mode (throttle grip closed). You can ride using four coasting overrun characteristic curves, which are riding mode and gear dependent. The table shows the coasting effect or deceleration of the versions. MIN means the least amount of deceleration and MAX is the most deceleration. **Engine Brake** is only active if **Overrun cut-off OFF** is activated.



Ignition

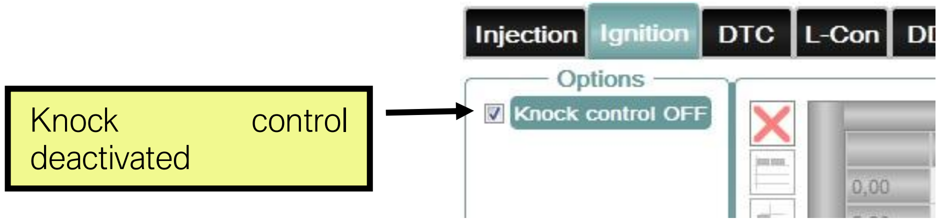
A variety of interventions that affect the ignition signal can be made in the Ignition tab.

Knock control off

The knock control evaluates the signals of the knock sensor and corrects the ignition timing so that engine knock is prevented (see below).
You can deactivate the knock control if you would like to suppress these interventions in the ignition timing signal.

NOTE: Since the knock control only intervenes when knocking combustion occurs, we therefore recommend that you not switch it off. A deactivation of the knock control is not necessary in order to make interventions in the ignition signal. However, the knock control can work against changes to the ignition signal.

Deactivate the knock control by placing a checkmark in front of the **Knock control OFF**.



Ignition timing adjustment offset

You can correct the ignition point calculated by the engine control using the characteristic map **Ignition correction offset**.
The drawn-in fuel-air mixture is ignited by the spark plugs to trigger the combustion. The timing point of the ignition is selected so that the conversion of the fuel energy into torque can occur in the most optimal way possible. The ignition timing is specified in degrees of crank angle before compression dead centre.

NOTE: A deviation from the optimum will lead to a combustion that is not optimal and thus to a decrease in torque. This can lead to major engine damage and reduce the useful life of the engine.

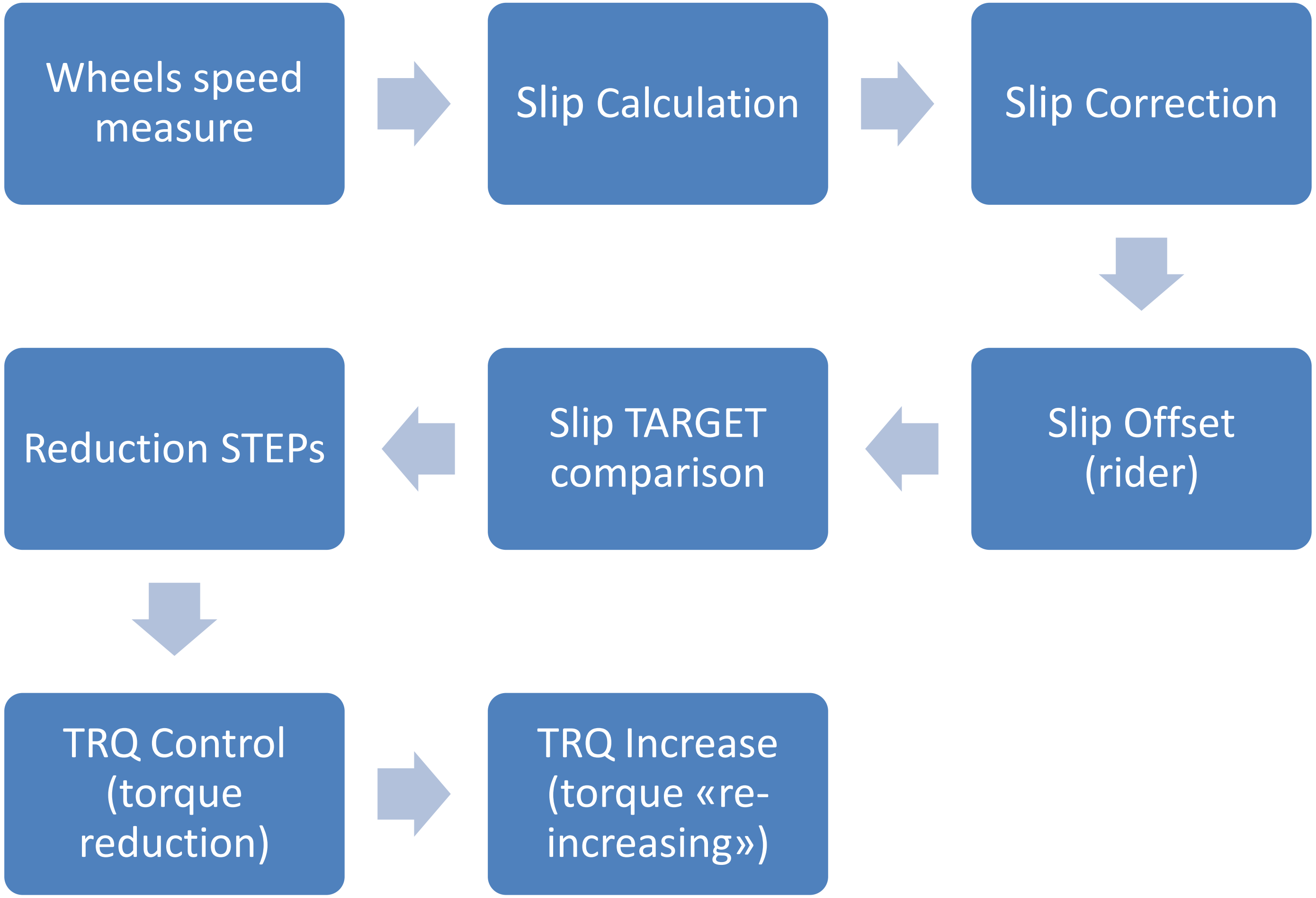
If you have made modifications to the motorcycle that change the optimal ignition point (e.g. exhaust system) or you would like to reduce the optimal torque, you can correct the calculated ignition point using an offset via this characteristic map in dependence on the engine speed and throttle valve opening angle. Like the ignition timing itself, it is specified in degrees of crank angle. The correction offset will likewise be included in the ignition timing calculation for all cylinders. Values greater than zero advance the ignition point and thus increase the risk of knocking during engine operation (engine damage). Values smaller than zero retard the ignition point and have a reducing effect on the optimal torque. At precisely zero, the ignition timing calculated by the engine control is not changed.

WARNING: An ignition timing that is too early can cause a spontaneous ignition of mixture areas that were not yet included in the regular combustion. Extremely high pressures occur in this case and can very quickly lead to the destruction of engine components due to excess temperature and excess pressure. An ignition timing that is too retarded increases the risk that the exhaust valves and other exhaust system components will overheat which can also lead to severe engine damage. Particularly at high engine speeds and throttle valve opening angles, we recommended that you make changes very carefully. We recommend that you not deactivate the knock control as it only intervenes during knocking combustion that absolutely must be prevented.

Preferably use the ignition correction to influence the response characteristics and the engine running with small throttle valve opening angles.

DTC

Summary of DTC control



DTC sensors

The wheel circumferential velocity signals from the DSC control unit and the angular rate sensor signals for the calculation of the inclination angle are used for the DTC function. It is important for the function that the angular rate sensor is installed in the correct position and the wheel sensors are installed at the correct distance and that both are undamaged. Damage to the sensor ring or out-of-round running in the radial or axial direction can generate signal interference. On the front and rear sensor ring there must be 48 evenly distributed flanks/teeth made of magnetic material and an equal number of recesses. The angular rate sensor is mounted vertically downwards and the black base plate faces to the rear opposite to the direction of travel.

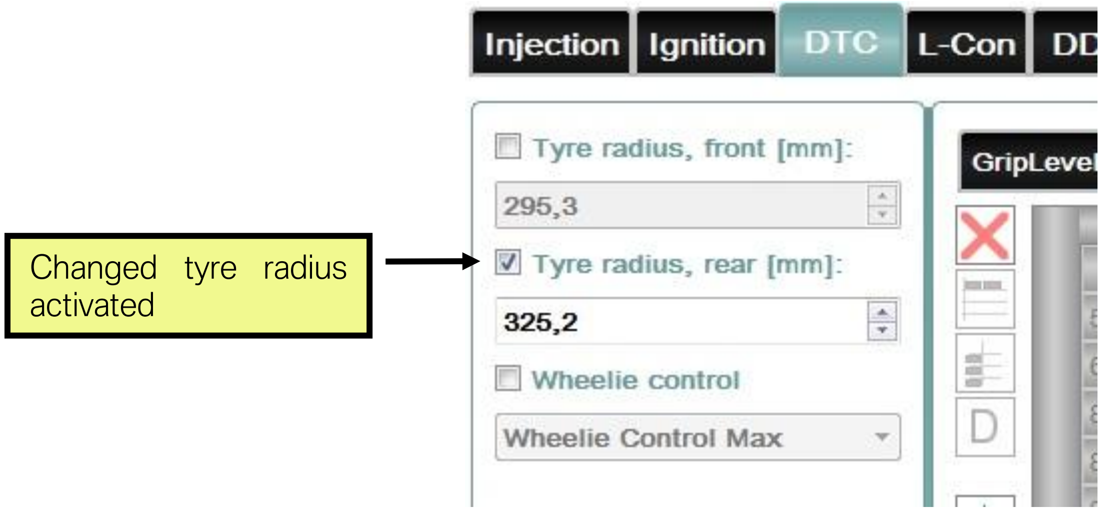
⚠ **WARNING:** Deviations when installing the angular rate sensor or the wheel circumferential velocity sensors can lead to measuring errors or even to an implausibly detected angle of inclination (banking angle). This can lead to a deactivation of the DTC.

Application approach

The correct tyre radii must first be determined (**tyre radius, front [mm]** resp. **tyre radius, rear [mm]**). After this, the tyre grip can be determined (**GripLevel**). At a later stage, you can differentiate how the DTC works and how it can be made more aggressive. Later, based on the wheel speed curves, you can decide whether the control intervention is based on a wheelie or slipping wheel. In contrast to the RCK2 (the traction control was deactivated here at certain angles of inclination due to the wheelie inclination), the RCK3 allows you to select between different motor interventions during a wheelie. This allows vehicle trim, route profile, rider position and preferences to be taken into account. In the **SlipCor** characteristic maps , a fine tuning can be made to the local differences of the racetracks using the information about the angle of inclination and the speed present in the track segment.

Tyre radii

For the correct wheel speed calculation, the tyre radius of the front and rear wheel for the straight-ahead driving must be entered (**Tyre radius, front [mm]** resp.**tyre radius, rear [mm]**).



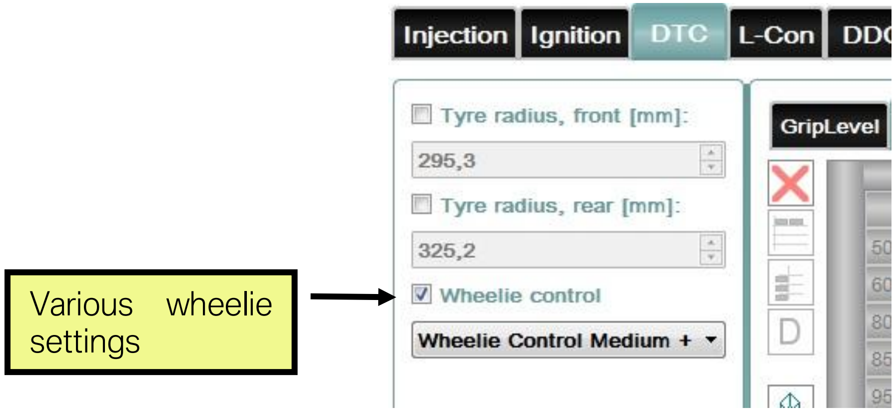
The current tyre pressure is to be taken into account for the application or slip evaluation. This influences the tyre stiffness and thus the current rolling radius. The tyre radii can be metrologicaly determined or corrected with the clutch pulled during straight-ahead rolling without braking and without an inclined angle. If the radii are correct, it results in the same speed for the front and rear wheel (measured variable **V_Front** and **V_Rear**). Speed-dependent differences must be taken into account or adapted in the characteristic maps **SlipCor Mod 1-4**. A 1 % smaller entered rear-wheel radius will generate a 1% greater slip over all riding modes.

Anti-Wheelie Control

As of the RCK3, the Anti-Wheelie Control reacts independently of the angle of inclination. When a wheelie is detected, the engine torque is initially limited and subsequently reduced. Four support models are provided:

Wheelie Control Max
Wheelie Control Medium +
Wheelie Control Medium –
Wheelie Control Min

In addition, the Anti-Wheelie Control can also be deactivated by selecting **Wheelie Control off**.
To select the individual settings, use the drop-down menu at the end of the selection window after setting the checkmark for Wheelie Control.



The selected setting is mode-independent. It is thus the same for all riding modes. If the rear-wheel slip exceeds the applied value while the anti-wheelie control is working, interfering control interventions will occur.

Grip limits

The coefficient of friction for each mode can be entered separately in the characteristic curve **GripLevel**. At the moment, only the first four modes can be activated. These four values only apply to the subsequent **ReductionPreControl** characteristic map.

NOTE: In order to find out the grip limit, we recommend starting with a larger rear-wheel radius (control starts earlier since a larger wheel slip is calculated) and then approaching the grip limit from the safe side. For this purpose, the value in the **GripLevel** characteristic map is reduced step-by-step for the current mode until the motorcycle breaks traction.

Torque precontrol

Torque precontrol calculates how close the motorcycle is to the limit of the circle of forces. As of model year 2015 (BMW S 1000 RR), you can look up in the data logger where the motorcycle is located in the circle of forces using the measured variable **Camm arbitrage [%]** .
In the characteristic map **ReductionPreControl**, the torque reduction can be input in dependence on the engine speed and the utilisation of the applied coefficient of friction.
The factory settings are applied so that the acceleration behaviour of the full throttle line has a constant progression in first gear as of approx. 4000 rpm and maximum coefficient of friction with the BMW Akrapovič exhaust system from the HP Race Power Kit. The precontrol has the advantage that no chassis unrest arises from the slip control.

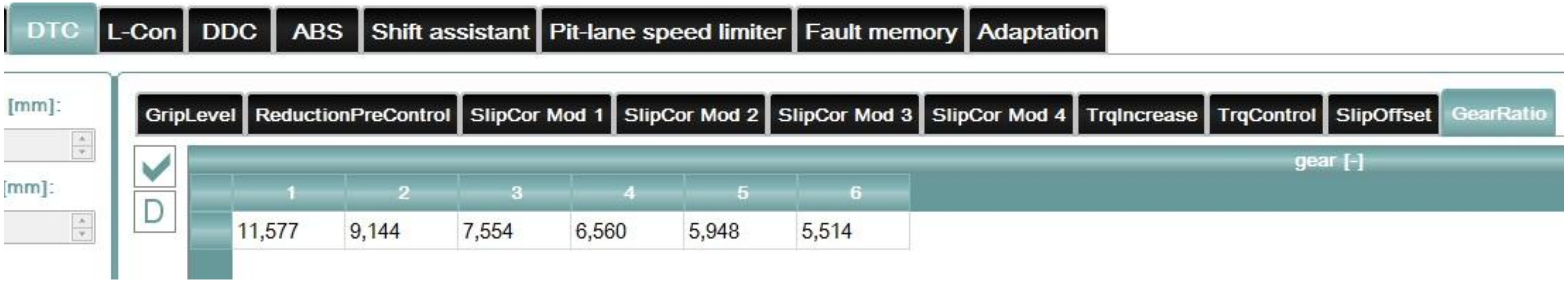
	50,00	60,00	70,00	80,00	85,00	90,00	95,00	100,00
5000	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
6000	100,0	96,9	97,0	97,0	97,3	97,5	98,0	98,5
8000	100,0	96,9	95,4	95,0	95,5	96,0	96,0	96,0
8500	100,0	97,9	96,4	95,0	95,5	96,0	96,0	96,0
9500	100,0	100,0	99,0	97,5	96,8	96,0	96,0	96,0
10000	100,0	100,0	100,0	99,5	98,3	97,0	96,5	96,0
11000	100,0	100,0	100,0	100,0	99,0	98,0	97,5	97,0
12000	100,0	100,0	100,0	100,0	100,0	99,4	99,4	99,4
13000	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
13500	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

NOTE: The precontrol can be deactivated with the following data input: in the characteristic curve **GripLevel** , fill in all values with 1.95 (maximum value) and fill in the entire characteristic map **ReductionPreControl** with 100.

Gear ratio adaptation

The parametrised reduction is only fully effective in the first gear. In the higher gears, the characteristic map value is multiplied or reduced with the ratio of the gear ratio change. If the gear ratios were changed or the effect of the precontrol is to be modified depending on the gear, it can be adapted in the characteristic map **GearRatio** in the same way as the other characteristic maps and curves.
The gear ratio adaptation has only one effect on the Launch Control since the Launch Control is torque-controlled.

Note: changing the ratio changes the torque at the rear wheel and thus these values must be adapted.



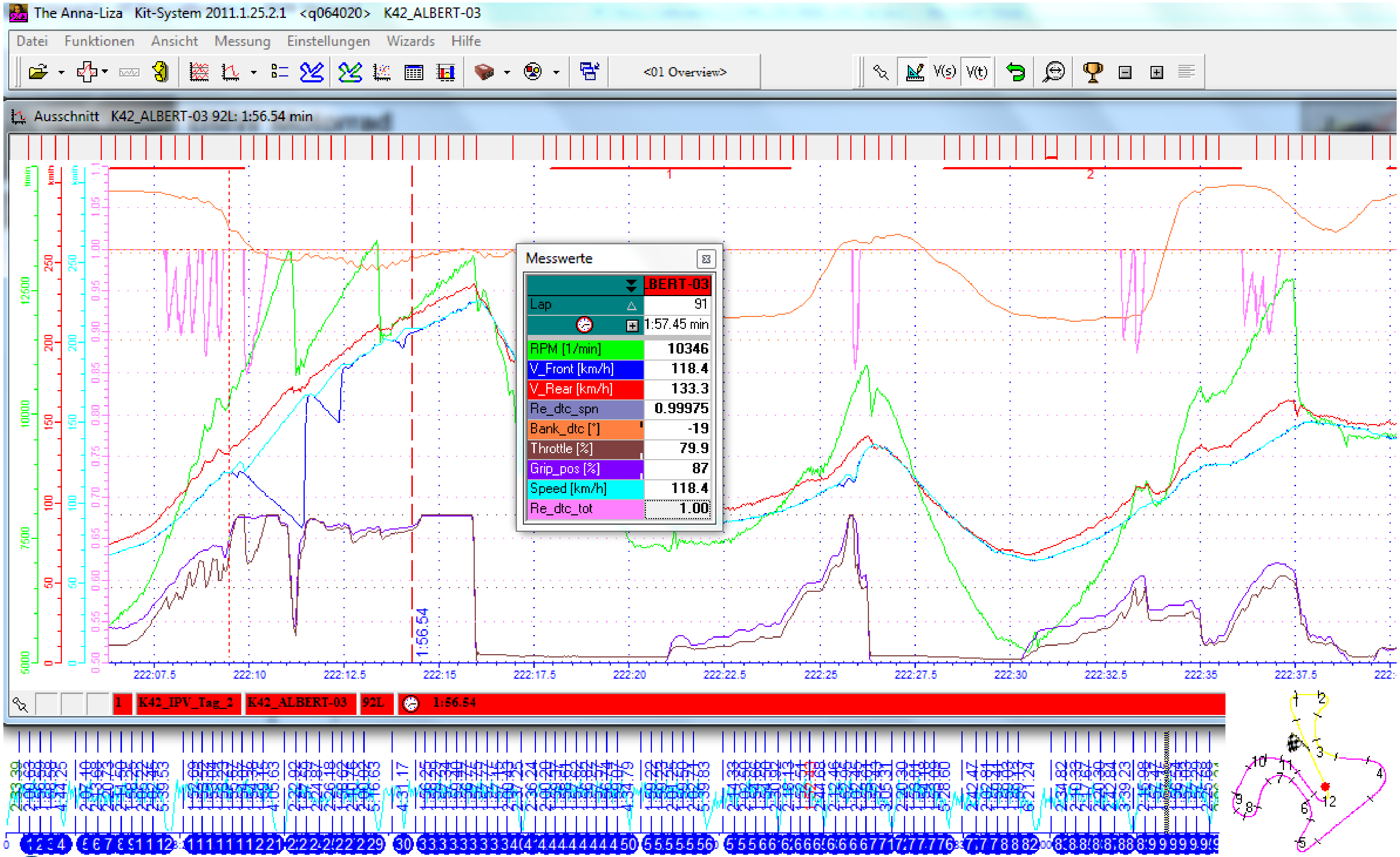
Data logger as application help

The use of a data logger is recommended for the application of a slip control. The following shows a measurement using the BMW HP Race Datalogger with an explanation of the measured variables:

Measured variables:

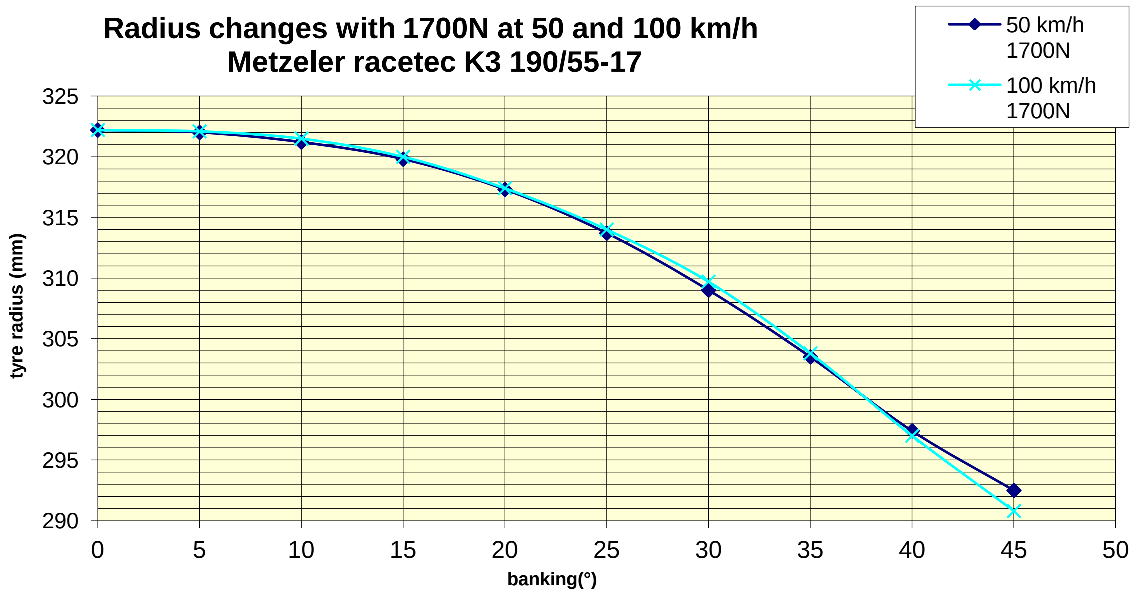
Front wheel speed	dark blue	**V_Front**
Rear wheel speed	red	**V_Rear**
Reference speed for the front wheel	light blue	**speed**
Angle of inclination	yellow	**Bank_dtc**
Throttle grip angle	violet	**grip_pos**
Throttle valve opening angle	brown	**Throttle**
Engine speed	green	**RPM**
Reduction from slip	grey	**Re_dtc_spn**
Reduction from slip and precontrol	pink	**Re_dtc_tot**

At the beginning of the measurement, the slip control and the precontrol are active together at the curve vertex. After the curve vertex, the rider throttles up and accelerates more (222:07.5). In this measurement, the Anti-Wheelie Control is deactivated so that the raised front wheel (222:10) only comes back down onto the asphalt (222:12.3) by closing the (throttle grip).

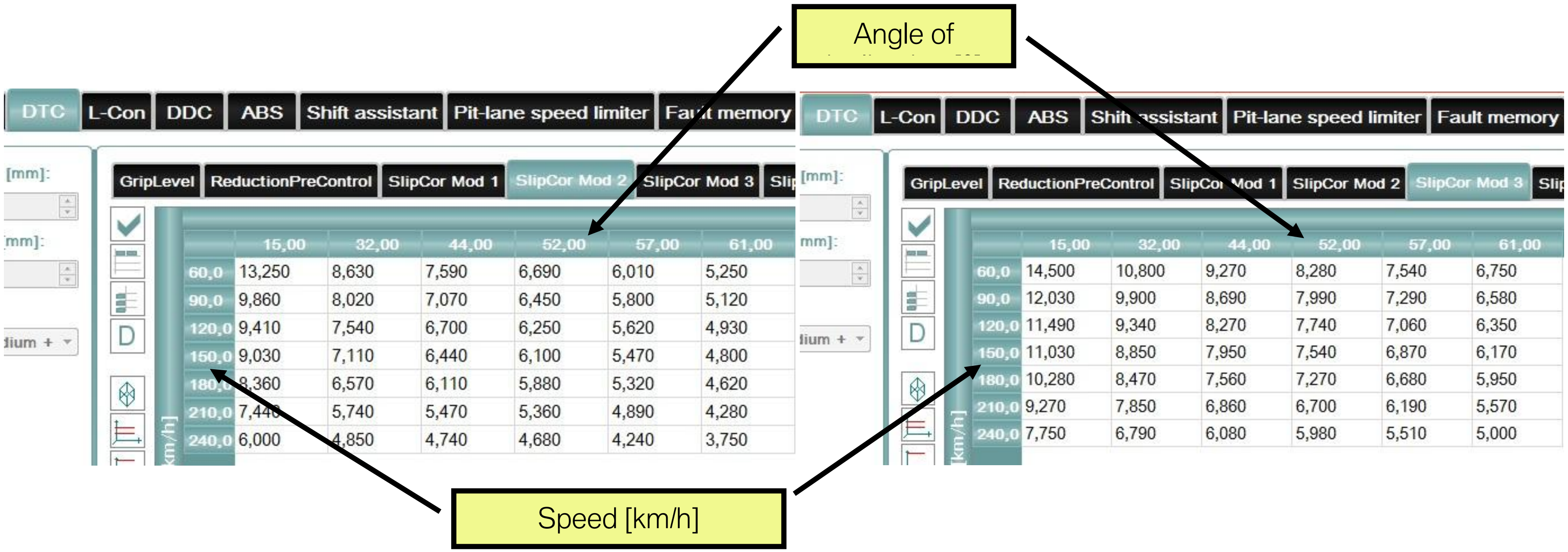

The Anna-Liza Kit-System 2011.1.25.2.1 <q064020> K42_ALBERT-03
Datei Funktionen Ansicht Messung Einstellungen Wizards Hilfe
<01 Overview>
Ausschnitt K42_ALBERT-03 92L: 1:56.54 min
Messwerte
BERT-03
Lap 91
1:57.45 min
RPM [1/min] 10346
V_Front [km/h] 118.4
V_Rear [km/h] 133.3
Re_dtc_spn 0.99975
Bank_dtc [°] -19
Throttle [%] 79.9
Grip_pos [%] 87
Speed [km/h] 118.4
Re_dtc_tot 1.00
1:56.54
222:07.5
222:10
222:12.5
222:15
222:17.5
222:20
222:22.5
222:25
222:27.5
222:30
222:32.5
222:35
222:37.5
1 K42_IPV_Tag_2 K42_ALBERT-03 92L 1:56.54

Slip correction - SlipCor Mod 1-4

The wheel slip is calculated according to the following procedure: first, the difference between vehicle speed (measured variable **speed**) and rear wheel speed (measured variable **V_Rear**) is calculated. The wheel slip is calculated as of 30 km/h from the difference of the rear wheel speed and the driving speed in relation to the driving speed. A correction then occurs, which accounts for the deviation in the tyre rolling radius over an inclined position (measured variable **Bank_dtc**). Every mode (rain=1, sport=2, race=3 and slick=4) has its own separate characteristic map (**SlipCor Mod 1-4**). The slip calculated from the wheel speed signals can be reduced in these mode-dependent characteristic maps. Effects of the tyre contour and the increase in the lateral guide can be taken into account there by means of inclination-dependent slip reduction. The system starts an engine intervention when approx. 10% of the wheel slip calculated is reached. The basic application of the series motorcycle is based on the Metzler Racetec Interact K3 in the dimension 120/70-17 and 190/55-17 or Pirelli Supercorsa SC2 in the dimension 120/70-17 and 200/55-17.
The following diagram shows that the tyre radius of the front and rear wheel becomes smaller with increasing angle of inclination. As reference value, the tyre radius on the front wheel declines by approx. 5% and the rear wheel by approx. 10% at a 45° angle of inclination. This results in a speed difference of approx. 5% between the front and rear wheel.



This difference between the front and rear tyre radius due to the angle of inclination must be subtracted from the target slip. This is achieved with the characteristic maps **SlipCor Mod 1-4**. These are in % and can be applied in dependence on driving speed and angle of inclination. A DTC intervention occurs beyond a calculated wheel slip of approx. 10%.
For example, if 1% more slip is to be generated with a **SlipCor** characteristic map than with the previous one, then the entire characteristic map is raised by the value 1%. As a rule, however, this reduction is only needed in areas where the angle of inclination is large.
The following diagram shows an example for a Metzeler racetec K3 tyre resp. the change of the tyre radius for different modes or SlipCor characteristic maps.. At 150 km/h and a 52° angle of inclination, the right characteristic map generates 1.44 % more slip than the left characteristic map.



	15,00	32,00	44,00	52,00	57,00	61,00
60,0	13,250	8,630	7,590	6,690	6,010	5,250
90,0	9,860	8,020	7,070	6,450	5,800	5,120
120,0	9,410	7,540	6,700	6,250	5,620	4,930
150,0	9,030	7,110	6,440	6,100	5,470	4,800
180,0	8,360	6,570	6,110	5,880	5,320	4,620
210,0	7,440	5,740	5,470	5,360	4,890	4,280
240,0	6,000	4,850	4,740	4,680	4,240	3,750

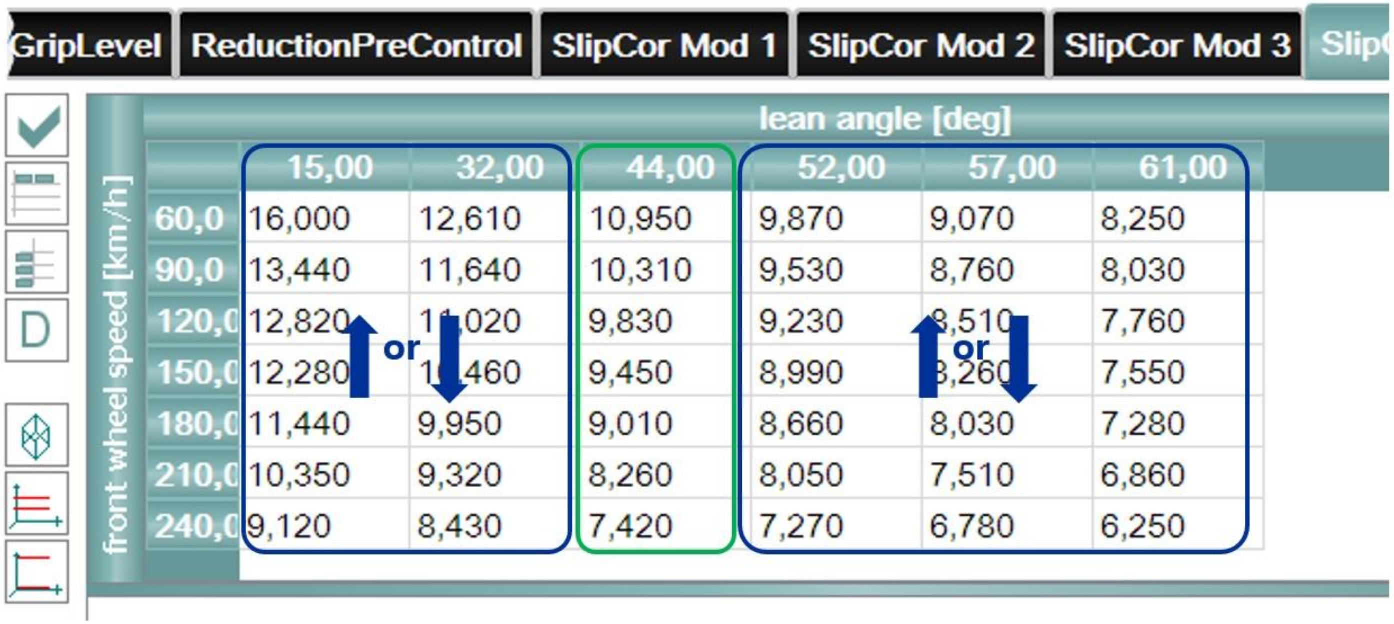
	15,00	32,00	44,00	52,00	57,00	61,00
60,0	14,500	10,800	9,270	8,280	7,540	6,750
90,0	12,030	9,900	8,690	7,990	7,290	6,580
120,0	11,490	9,340	8,270	7,740	7,060	6,350
150,0	11,030	8,850	7,950	7,540	6,870	6,170
180,0	10,280	8,470	7,560	7,270	6,680	5,950
210,0	9,270	7,850	6,860	6,700	6,190	5,570
240,0	7,750	6,790	6,080	5,980	5,510	5,000

Adaptation by means of angle of inclination

If the DTC has good control on a stretch of road with the existing weather conditions in a certain angle of inclination, but it does not work in other inclination angles because it regulates too much or too little, then you can adapt the DTC via the angle of inclination. Fix the value at which the control is good and increase or decrease the control in other areas.

NOTE:

- With larger values, the DTC intervention is reduced since more slip is permitted
- With smaller values, the DTC intervention is increased since less slip is permitted



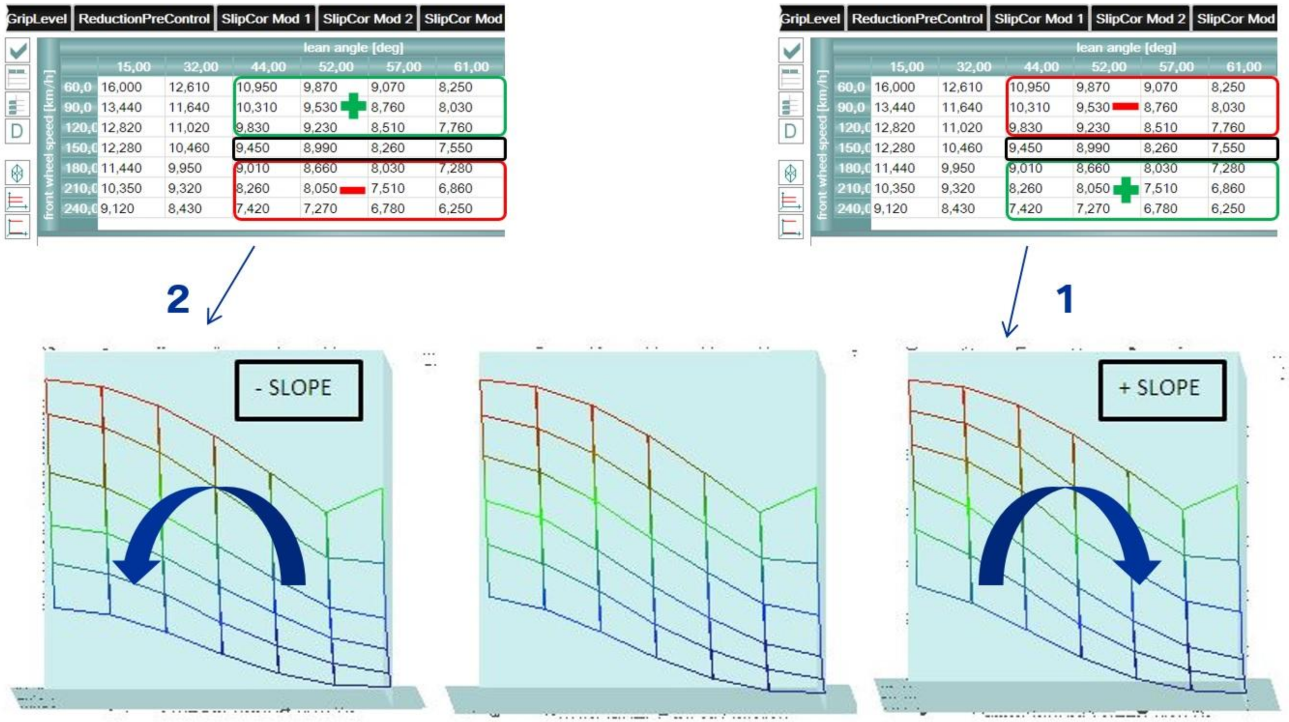
	15,00	32,00	44,00	52,00	57,00	61,00
60,0	16,000	12,610	10,950	9,870	9,070	8,250
90,0	13,440	11,640	10,310	9,530	8,760	8,030
120,(	12,820	1[illegible],020	9,830	9,230	[illegible],510	7,760
150,(	12,280	1[illegible],460	9,450	8,990	[illegible],260	7,550
180,(	11,440	9,950	9,010	8,660	8,030	7,280
210,(	10,350	9,320	8,260	8,050	7,510	6,860
240,(	9,120	8,430	7,420	7,270	6,780	6,250

Adaptation by means of speed

If the DTC has good control on a stretch of road with the existing weather conditions at a certain speed, but it does not work in other speed ranges because it regulates too much or too little, then you can adapt the traction control via the speed. Fix the value at which the control is good and increase or decrease the control in other areas.

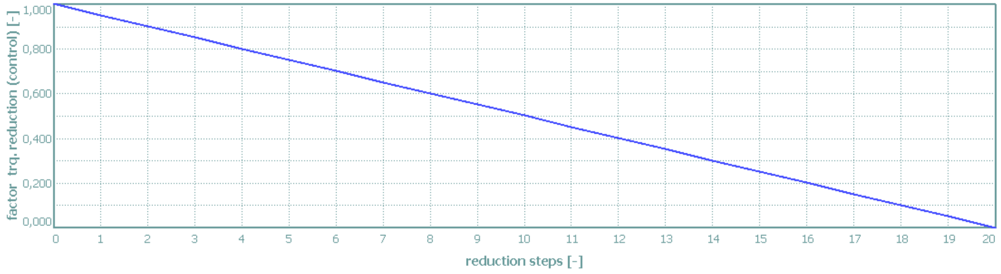
NOTE:

- With larger values, the DTC intervention is reduced since more slip is permitted
- With smaller values, the DTC intervention is increased since less slip is permitted

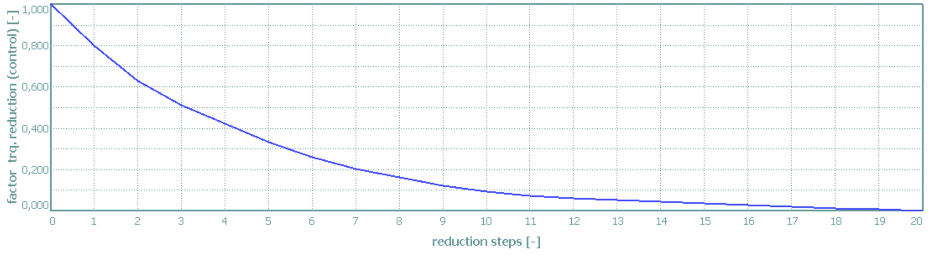


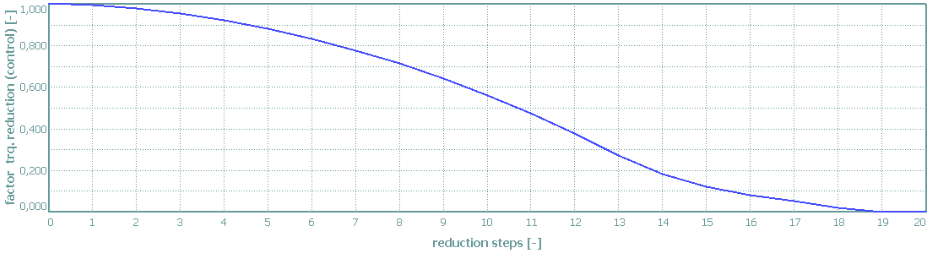
Engine torque reduction

The measured variable **Re_dtc_spn** shows the engine torque reduction in percent and comes from the reduction characteristic curve **TrqControl**. The value 1.0 corresponds to no reduction and the value 0.0 corresponds to 100% reduction (engine off). The reduction characteristic curve allows you to influence the engine torque reduction in dependence on the racetrack and tyres. The basic parametrisation of **TrqControl** linear (see diagram).



NOTE: the decrease in the characteristic curve must be extremely monotonic. A hard-breaking tyre already requires a larger engine torque reduction at small reduction levels (decreasing degressively, see diagram on the left). In contrast, a tyre with a soft/wide limit range requires less engine torque reduction for small reduction levels (decreasing progressively, see diagram on the right).





Engine torque reversal

If the rear wheel slip reduces by the values applied in the **SlipCor** characteristic map, the torque is reduced again. The preset values can be modified by the characteristic curve **TrqIncrease** in dependence on speed. A value above 1.0 speeds up the torque reduction and a value below 1.0 slows down the engine torque reduction.
Depending on the spring/judder damper settings, the engine speed reduction can cause the motorcycle to oscillate more or less. To allow the oscillating frequencies from the slip control and the spring/judder damper/tyre system to be separated from each other, it is advisable to reduce the engine torque reduction (values smaller than 1.0), for example. If an extremely small engine torque reduction value is input, the motorcycle will become too sluggish or lose accelerating ability.

ATTENTION: If you are not using a BMW HP Race Power Kit, but rather the standard exhaust system with standard data state, you must take into account that the engine torque restriction is already greatly moderated at engine speeds above approx. 8000 rpm. Thus, the value 1.0 is not a neutral data input.

GripLevel | ReductionPreControl | SlipCor Mod 1 | SlipCor Mod 2 | SlipCor Mod 3 | SlipCor Mod 4 | TrqIncrease | TrqControl | SlipOffset | GearRatio

engine speed [RPM]

4000	6000	8000	9000	10000	11000	12000	13500
1,30	1,30	1,22	1,15	1,11	1,08	1,06	1,06

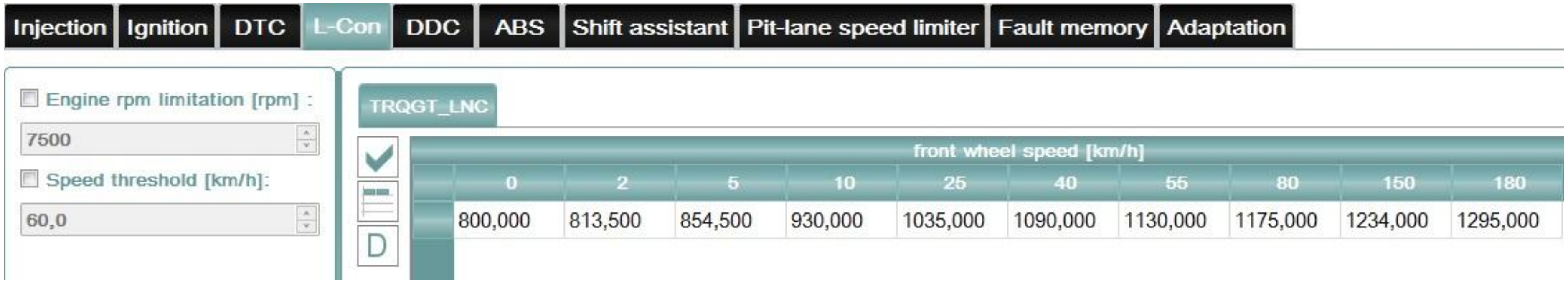
DTC shift characteristic curve

On the S 1000 RR (HP4 or as of model year 2015) there is a DTC +/- rocker button located on the left switch unit which can be used to correct the target slip of the rear wheel in the riding modes that are enabled for this. There are 7 steps in the + direction and 7 steps in the – direction. The individual steps of the slip correction values can be stored in the **SlipOffset** characteristic curve. The steps -7 to +7 correspond to the display in the instrument panel and are hard programmed into the system. If **smaller values** are input, the DTC allows more slip and thus there are less control interventions. The drive is increased and the lateral guide of the tyre is reduced. **Larger values** allow less slip, increase the lateral guide for larger control interventions and less drive. The slip of the basic application of the respective riding mode is increased or decreased overall.
In the Race Power Kit, data is available to the function in all four riding modes and in the series file only in slick mode.

Launch control

The objective of the Launch Control is to hold the engine speed stable for the driver and to hold the rear wheel torque (acceleration) at the highest possible level independently of the engine characteristic. The application variables **Engine rpm limitation [rpm]** and the associated **Speed threshold [km/h]** up to which the engine speed limitation is effective are available for this. The maximum speed-dependent, rear-wheel torque is entered in the torque characteristic curve **TRQGT_LNC** (Nm). This should lie at the level where the front wheel loses contact with the ground (rider's weight, position, slope, wind, …). The rear-wheel torque is calculated and adapted from the engine torque in accordance with the gear-dependent overall ratio (see DTC - ratio adaptation - GearRatio). The Launch Control is deactivated automatically when the engine is turned off, third gear is reached or if the angle of inclination exceeds 30°.

The adjusted Anti-Wheelie Control and the DTC remain active in the background with Launch Control active.



DDC

General information

- The finally acting damping action is set in the DDC control unit in percent (0% … 100%).
- Every data input in the RCK3 affects the factory setting relatively. A factor of 0% to 200% can be set. With it, a maximum of double the damping factor of the factory setting can be achieved.
- When using the RCK3, the damping adjustment is no longer available in the instrument panel. As soon as one of the following RCK3 functions is used, this menu item can no longer be selected in the instrument panel. Instead, the individualisation that was set in the RCK3 is valid:
    - **Tuning Mode Front**
    - **Tuning Mode Rear**
    - **Mode:** individual mode assignment
    - **Components: DDC fork active**
    - **Components: DDC shock active**
    - The **RCK-ddc active** appears here in the DDC adjustment window
- In general, rebound- and compression-stage damping can be differentiated on the spring strut. On the fork, this is only possible with a deflection sensor, which is not factory-installed. From the factory, the damping action in the front can be globally adjusted (no differentiation between rebound- and compression-stage damping, see also the operating instructions).
- A differentiation is made between the riding mode and the DDC setting. Factory setting:

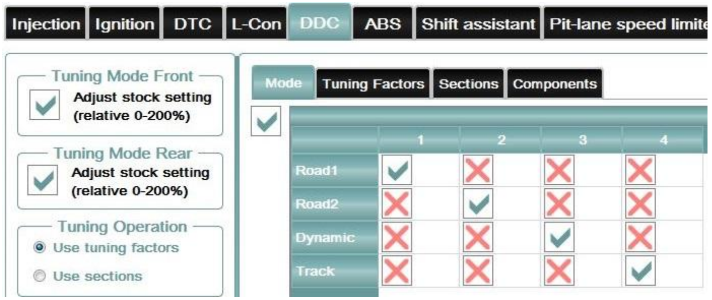
Riding mode	Rain	Sport	Race	Slick
DDC setting	Road1	Road2	Dynamic	Track

Deflection sensor on the fork

- This accessory is not offered by BMW Motorrad.
- A connector on the wiring harness (see the motorcycle operating instructions) is available for connecting a suitable sensor. Please contact the BMW HP Race Support (e-mail: hp-race-support@bmw-motorrad.de) to receive more information.
- **ATTENTION:** installing a different sensor or even a differing connection of the sensor can lead to a faulty spring deflection measurement. This can also affect the functioning of the system.
- ⚠ **WARNING:** when installing the sensor, you must ensure that this does not restrict the spring travel of the fork and that it does not affect or block the steering movements (ensure that the fork can move freely)
- The measured spring travel (at the spring strut and also on the fork with installed sensor) are output via the CAN bus and can be recorded using the BMW HP Race Datalogger (optional accessory).
  NOTE: bear in mind that a zero balancing can possibly be necessary.

Mode tab: individual mode assignment

- A DDC setting , which is valid as basis for additional settings, can be assigned to each riding mode (assignable via the mode button).
- Application example: for use on a racetrack, it is useful to assign the Track DDC setting to every riding mode.



Tuning Factors tab: four individual tunings, switchable via the riding mode

- An individual adjustment of the basic settings (selected in the Mode tab, if necessary) can be made for each riding mode.
- **ATTENTION:** the basis of the adjustment changes for individualised mode assignment (Mode tab). With factory settings, the basis of the riding mode 4 (Slick) is the DDC setting Track. However, if a different DDC setting is selected for the riding mode 4 in the mode assignment, the tuning factors set here affect this deviating setting.
- A differentiation can be made on the spring strut between rebound and compression stage. On the fork, this differentiation is only possible when the deflection sensor is installed and connected (see the Components tab).
- Values from 0% to 200% can be entered.
- If **Tuning Factors** is activated, **Sections** (selection-dependent damping action) is automatically deactivated.
- Application example: during a race with a change of rider, each rider can define two tunings in advance, whereby one of these is possibly a tuning for rain. With this example – under dry conditions – the second rider would have to switch from the Rain mode to the Race mode in order to ride with his/her desired tuning.

Riding mode	Rain (1)	Sport (2)	Race (3)	Slick (4)
DDC setting (assigned under Mode)	Track	Dynamic	Track	Dynamic
tuning (Tuning Factors)	Rider 1 - dry	Rider 1 - rain	Rider 2 - dry	Rider 2 - rain

Mode | Tuning Factors | Sections | Components

Tuning Factors Front

vehicle mode [-]	1	2	3	4
Damping Front	100	100	100	100
-	0	0	0	0

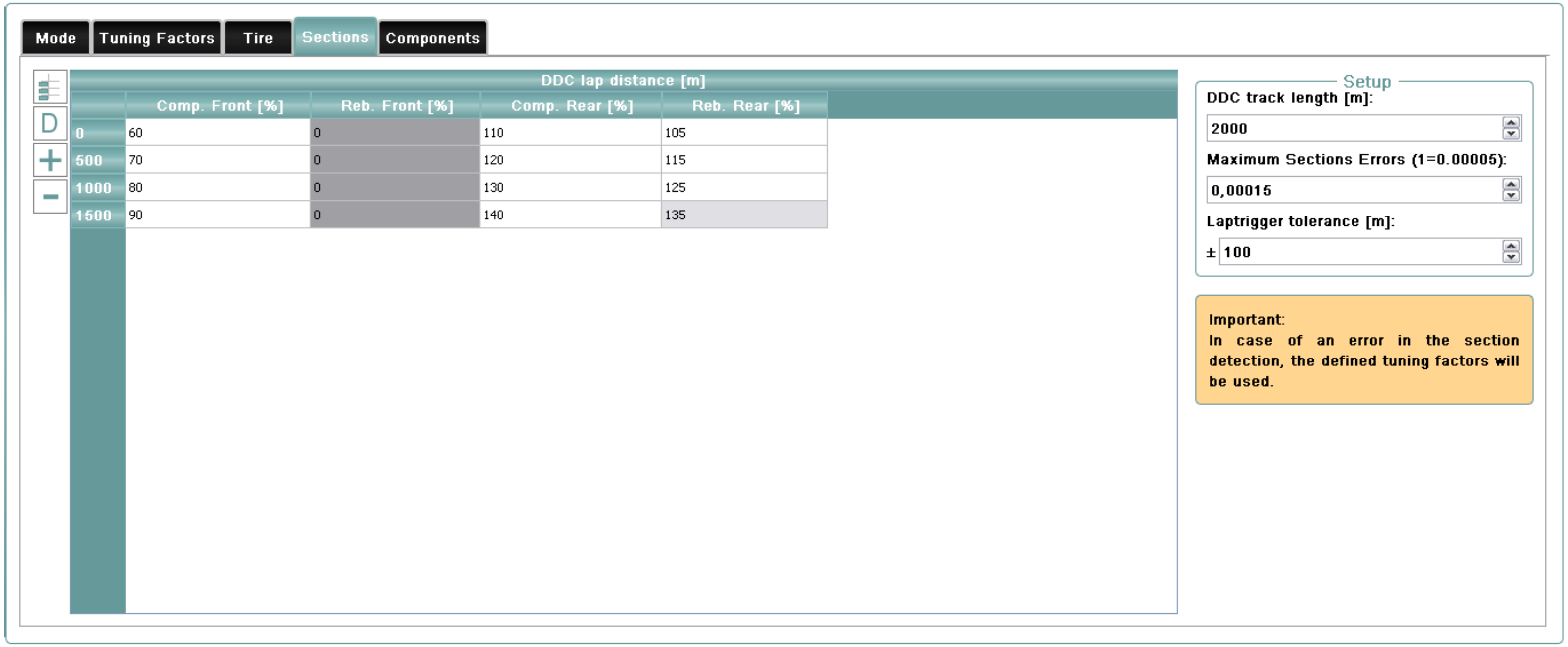
Tuning Factors Rear

vehicle mode [-]	1	2	3	4
Compression	100	100	100	100
Rebound	100	100	100	100

Sections tab: section-dependent data input

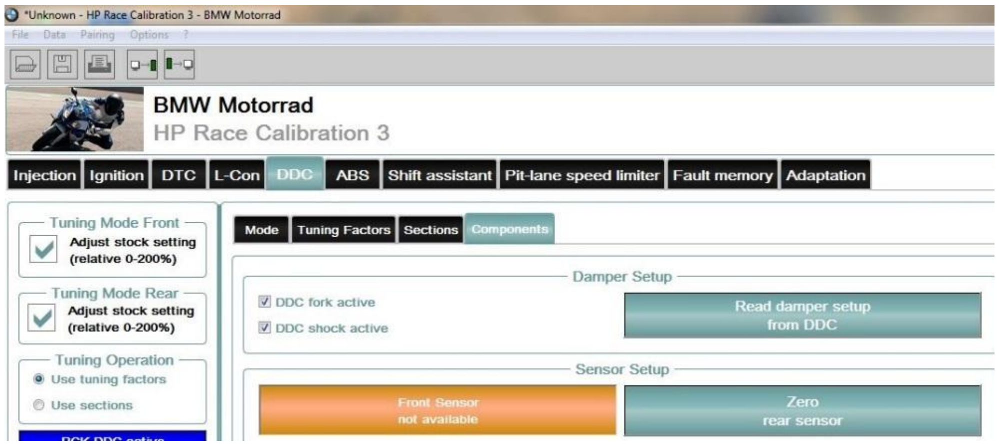
- There are up to 30 data points available that can be distributed over the distance of a round course. The data input of the data points occurs absolutely, i.e. every new data point must have a larger value (in metres) than the previous one.
- A deviation of the measured course distance to the nominal distance, which can, for example, be read out of the course specification, is probable. For this reason, the data input should only occur after initial operation of this function:
  - Drive several laps on the course with your personal line, after you have activated the **Use sections** tuning operation and intentionally selected the **DDC track length [m]** parameter to be clearly too high. This is necessary, since the distance recording function stops if the stored track length was exceeded.
  - Evaluate the measurement with the BMW HP Race Logger. The **DDC_lap_distance** signal includes the lap distance recorded by the DDC control unit. Check this signal for plausibility.
  - The signal **Laptrigger** can additionally be helpful. For every change of this signal, a laptrigger was received by the BMW HP Laptimer. However, the DDC function Sections will only consider a laptrigger as valid if this occurs in the defined tolerance window **Laptrigger Tolerance [m]**.
  - Divide the course into the desired sections and extract the associated lap distance data points from the recording of the BMW HP Race Datalogger.
  - Input the data into the sections according to your expectations with factors of 0% to 200% These have a relative effect on the respectively valid basic setting. If you are using the individual mode assignment, please observe that the setting you select serves as basis for the adjustment in the respective riding mode.
- With the BMW HP Laptimer, the system detects the start of a new lap. The lap distance is reset by this. The function of the instrument panel, with which lap time can be taken by pressing the button, does not lead to the resetting of the DDC lap distance.
- The **Laptrigger tolerance** parameter includes the tolerance window for the signal of the laptrigger. If you enter 100 metres here, a signal will be accepted after a lap distance of 100 metres before the entered **DDC track length** and up to 100 metres after a laptrigger signal.

- If there is a fault in the detection of the lap, the setting of the **Tuning Factors** will be switched. Since this type of error cannot be excluded, you should have defined a suitable data input of the **Tuning Factors** in the background. The error mode is indicated to you by the DDC warning light in the instrument panel. You can find more information on this under the **Sections error mode**.
- Using the **Maximum Sections Errors** parameter, you can set how many times the system will attempt to set up again after an error.



Components tab: overview of the DDC components

- Under **Damper Setup**, fork and/or spring strut can be deactivated. In the series configuration (no RCK3 active), it is not possible to ride with only one of the two DDC components, since in this case components, which are still installed, are no longer activated for safety reasons. For example, if you have to replace the fork with a conventional part after a fall, you can deactivate this as a DDC component and continue to individualise the activation of the spring strut in the RCK3.
- **NOTE:** observe that the rear deflection sensor must continue to be connected correctly and installed even after a possible removal of the spring strut, even if the spring strut was deactivated.
- ⚠ **WARNING:** the fault diagnosis is also switched off by deactivating a component. Thus, if you deactivate a component, although it is still installed, a correct activation is no longer ensured.
- On the one hand, **Sensor Setup** shows whether a deflection sensor is installed on the fork (Front Sensor available) and on the other hand, it is possible to adjust the rear sensor. This is useful, e.g. if the connection was changed via the sliding block. In order to calibrate correctly, the rear wheel must be pulled into the tensioning stop of the spring strut and the **Zero rear sensor** button must be pressed
- **ATTENTION:** an incorrect calibration can have a negative influence on the drivability. If the calibration with the RCK3 fails, the measured spring travel should be checked in a suitable recording with a BMW Race Datalogger.



Sound practice

1. Find out which DDC setting you prefer on the given course and select it as basic setting (e.g. Track).
2. Use the **Tuning Factors** to individualise the basic settings. You can try out four different tunings by toggling the riding mode.
3. Position your laptrigger transmitter right at the beginning of the pit wall, since the system gradually reacts to the first transmitter through the permissible window distance for the trigger. Develop data points that make sense for the section-dependent damping and make sure that the recording of the lap distance functions reliably. Observe the information about setting up the laptrigger transmitter under **Sections error mode**.
4. Input the data for your individual tuning for the various sectors based on the selected basic setting.

Relevant signals of the BMW HP Race Logger

Laptrigger
Laptrigger Signal [-] – every change of the signal value means that the instrument panel has detected a laptrigger. The Sections function only takes a laptrigger into account in the tolerance range.
DDC_lap_distance
DDC lap distance [m] - basis for the data input of the Sections function
DDC_sensor_fr_status
Front deflection sensor available [-] – 0: sensor not detected, 1: sensor detected
DDC_error_status
Error display DDC [-] – 0: no error, 1: error mode (warning light on)
DDC_rck_status
Display RCK3-DDC active [-] – 0: not active, 1: active (instrument panel not available)
Susp_fr_ddc
Front spring travel [mm] – only available if a sensor was subsequently installed. A zero point calibration can be necessary.
Susp_rr_ddc
Spring travel rear [mm]

Sections error mode

Should the ridden lap distance be greater than or less than the stored lap distance, due to a different line or shortcut, minus or plus the **Laptrigger tolerance**, the laptrigger signal will arrive too soon or too late.
In this case, the system will ignore the laptrigger and switch to the error mode after using up the lap distance plus laptrigger tolerance.
In the error mode, a DDC warning is displayed in the instrument panel and the function switches to the data input of the **Tuning Factors**. Thus, you can use your stored, mode-dependent settings as of this point in time.
However, note that the system is not able to differentiate whether a laptrigger signal originates from the desired laptrigger or, for example, from a foreign device.
If the **Sections** function is in error mode, this can be ended by manually switching the ignition off and on. In doing so, the **Maximum Sections Errors** counter is also set to zero.

Example 1:

- The nominal lap distance is 3500 metres
- The recording with the BMW HP Race Logger shows a DDC lap distance with your line of 3700 metres.
- Your data input provides for a laptrigger tolerance of 20 metres and your laptrigger transmitter is at the exit of the pit lane.
- You take several laps with section-dependent damping without any problems until you are forced to take a shortcut that accounts for a 50 metre distance.
- As of this point in time, the system will switch over to the damping of the next section 50 metres too early. Several metres behind the laptrigger transmitter you have set up (DDC distance 3720 Meter), the system switches to error mode and uses the damping defined in the **Tuning Factors**. This will be indicated to you in the instrument panel with the DDC warning light.
- One lap later, the system sets up again after the laptrigger sensor and the warning light disappears if you have set the **Maximum Sections Errors** parameter to a value greater than 0. The section-dependent damping now functions again.
- Result: the tolerance window for the laptrigger signal should not be set too small. Moreover, it can be useful to set the **Maximum Sections Errors** parameter to a value greater than 0.

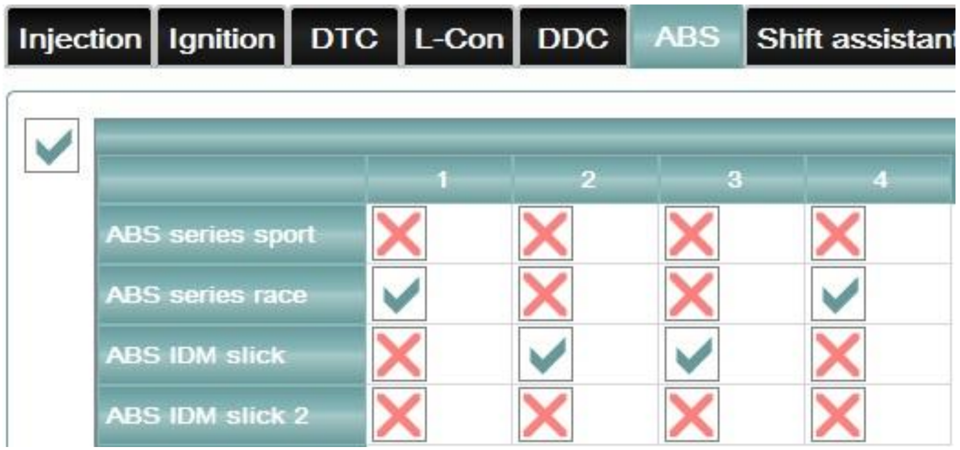
Example 2:

- The nominal lap distance is 3500 metres
- The recording with the BMW HP Race Logger shows a DDC lap distance with your line of 3700 metres.
- Your data input provides for a laptrigger tolerance of 100 metres and your laptrigger transmitter is at the exit of the pit lane.
- You take several laps with section-dependent damping without any problems until you notice that the damping is switching over sooner than what you have set it to do. This can happen when an identical transmitter is set up in the pit lane in front of yours and your tolerance range is set too large.
- Result: do not select the tolerance window for the laptrigger to be too large and it is best to set up the laptrigger transmitter at the beginning of the pit lane.

ABS

In the ABS section, various fixed ABS settings can be assigned to different riding modes. The available settings depend on the type of motorcycle and the ABS software version being used. The settings differ, for example, by deactivating the ABS on the rear wheel for operation of the footbrake and for different versions of the rear wheel lift assistant.

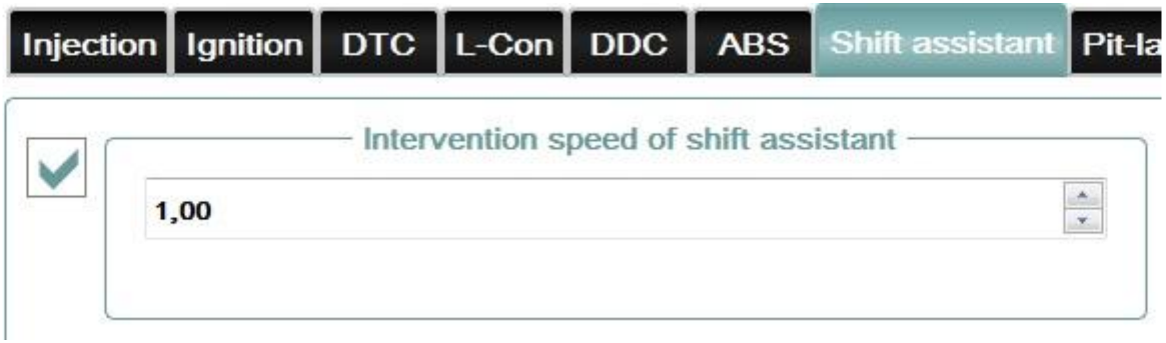
The **ABS series sport** setting is designed for maximum braking stability. Rear wheel lift assistant and deceleration limitation are active.
The **ABS series race** setting is designed for increased deceleration. Rear wheel lift assistant is deactivated while the deceleration limitation remains active.
The setting **ABS IDM slick** is designed for maximum deceleration. Rear wheel lift detection and deceleration limitation are no longer active and the ABS function on the rear wheel is no longer effective if the footbrake is operated. The rear wheel can lock up.
The setting **ABS IDM slick 2** is designed for maximum deceleration. Rear wheel lift assistant is deactivated while the deceleration limitation remains active.The ABS function on the rear wheel is no longer effective if the footbrake is operated. The rear wheel can lock up.



Shift assistant

The shift assistant facilitates upshifting the transmission without operating the clutch. It is optional equipment and a modification of the shift assistant is only possible if the motorcycle is equipped with it. While the reduction of the engine torque for setting the actual gear shift remains predefined in a fixed manner, you can influence the buildup of the engine torque after the gear shift via the **Intervention speed of shift assistant** factor. Larger values lead to a faster buildup of the engine torque, smaller values to a slower one.

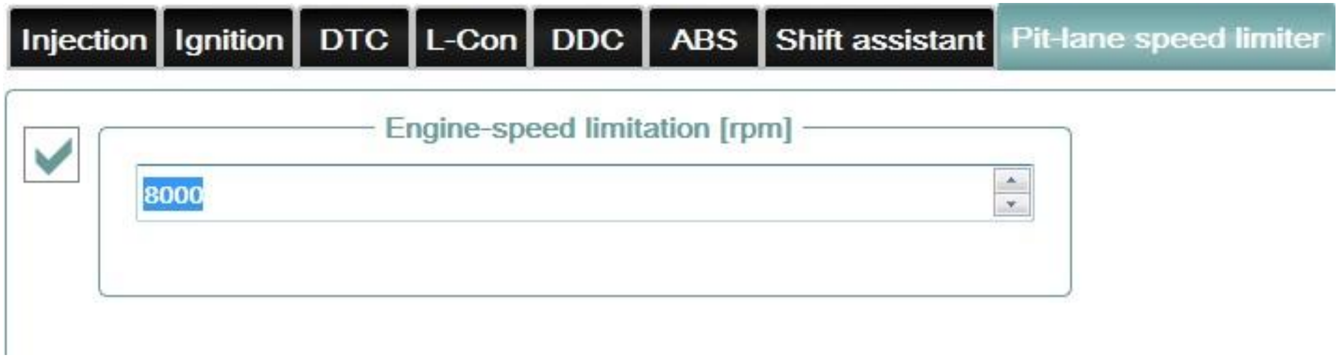
NOTE: observe that the speed of the buildup of the engine torque also influences the drivetrain's reactions to the load change after the gear shift and that this can lead to unexpected behaviour of the motorcycle.



Pit Lane Limiter

This function allows you to use a speed limiter that is only active in the first gear with the starter switch pressed. You can set it using **Engine-speed limitation [rpm]** so that the permitted speed is not exceeded in the pit, for example.

NOTE: observe that the changes to the ratio or other tyres at the same engine speed can lead to different top speed limitations and revise your tuning if you make modifications here. The factory-set, maximum engine speed limitation cannot be exceeded by this setting.



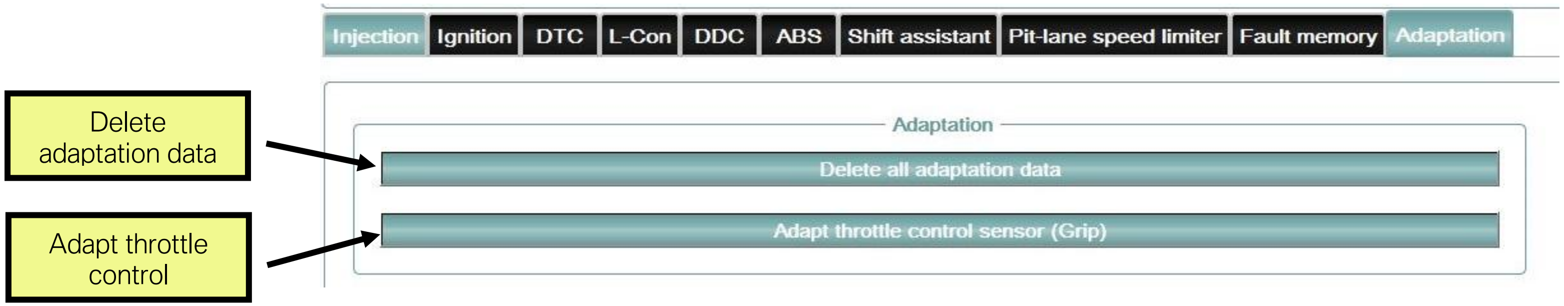
Adaptation

If you have changed the following parts on the motorcycle, you must perform a new adaptation:

- Throttle control (electromotive throttle controller)
- Gear lever sensor
- Crankshaft drive
- Throttle valve system
- Transmission controller barrels potentiometer
- Inclination sensor

We recommend carrying out an adaptation after changing electrical components.

First, delete the old adaptation values with **Delete all adaptation data**. The throttle controller and the gear positions of the transmission can then be set up again. To adapt the throttle controller, you must press **Adapt throttle control sensor** and then follow the instructions. To reprogramme the gear positions of the transmission, all gears must be shifted through for at least 10 seconds without using the throttle, including idle/neutral.

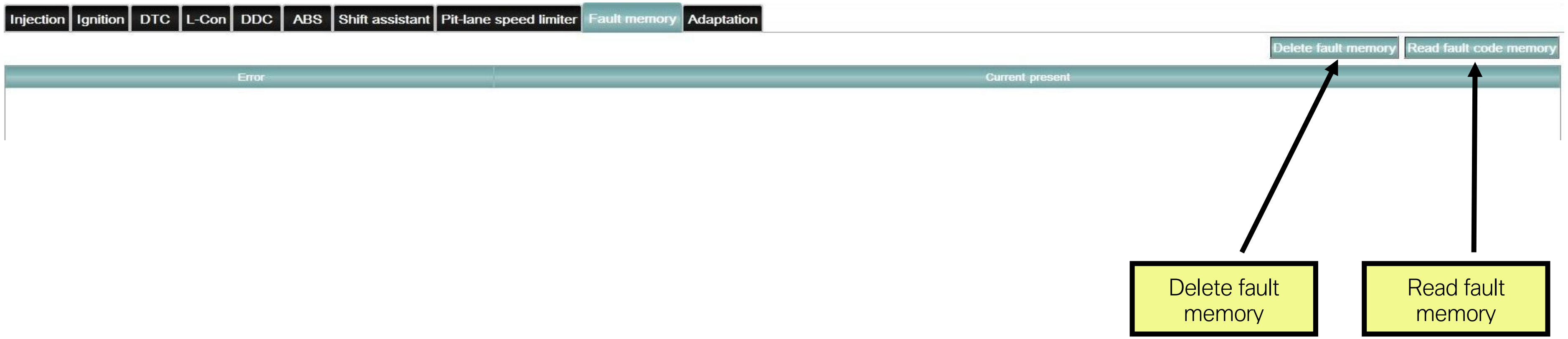


Fault memory

By pressing the **Read fault code memory** button, the fault memory of the engine control unit is read out. Detected faults/system faults are displayed by the system diagnosis.

The **Delete fault memory** button deletes the entries in the fault memory of the engine control unit. If a fault persists, this will be entered again directly and displayed again.

If no faults/system malfunctions are present, nothing is displayed. You can see whether the fault memory was read out correctly by the update of the read-out time.



Troubleshooting

Problem	Cause	Rectification
No communication	Encoder plug not plugged in	Plug in encoder plug
	No enabling or incorrect software version on the engine control unit	Please contact your Authorised BMW Retailer, or the BMW HP Race Support (hp-race-support@bmw-motorrad.de)
	DDC removed.	Activate DDC removed in the motorcycle administration for the corresponding motorcycle.
	Terminal 15 off	Turn ignition key
Data are not transmitted	Data record of a different motorcycle or a modified configuration of the motorcycle	Try to transmit data to the control unit with a new data record via File -> File (factory setting). This is best achieved by copying the old data into Excel and then copying this data back into the new data record. This provides you with the old data again and a new data record (backup).
	Engine turning	Turn off the engine
General information	unknown	Download and install the latest version of the software from the www.BMW-Motorrad.com website. Please contact your Authorised BMW Retailer, or the BMW HP Race Support (hp-race-support@bmw-motorrad.de)

Attachment RCK VCI

BMW

Race Calibration Kit

Double click on the image to open it!

RCK3 VCI

User Guide

Version 1.0.2

January 28, 2015

BOSCH