

STATUS: September 2025



**kdFi V1.4 PNP GM
C20XE/C20LET
R 0 8**



<https://download.k-data.org>

On the website, you will find the latest information and documentation.

USER MANUAL: ENGLISH

WWW.K-DATA.ORG

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1. INTRODUCTION

Engine Management



Numerous motorsport features can be realised with our programmable Engine Management:

- optimize the engine tuning in case of modifications, such as the installation of a turbo, adapt different injectors, camshafts or open intake manifold
- adjust the fuel quantity and ignition timing as desired
- make an individual adjustment to different fuels
- regulate the boost pressure according to your own needs
- directly evaluate the LSU 4.2 wideband lambda sensor
- use motorsport functions such as Launch Control, Anti-Lag, etc.
- parametrize camshaft adjustment
- program your own functions

The existing wiring harness including OEM sensors can be used without changes. Individual tuning through targeted intervention in the parameters of the engine control bring more driving pleasure!
This allows you to exploit the full potential of the engine.

2. SCOPE OF DELIVERY

- kdFi V1.4 device ready for use
- User manual
- USB Cable
- Plug set

3. SOFTWARE

It is recommended installing the software before connecting the kdFi for the first time.

3.1. USB Driver

You will find the USB driver of the FTDI Company in the directory “USB”. It is the FTDI232 Chip. The Chip simulates a serial RS232 connection which you can use in 2 ways:

1. Tunerstudio – Communications – Settings: RS232, COM-port, 115200 Baud
2. Tunerstudio – Communications – Settings: FTDI-D2XX, Auto, 115200 Baud

3.2. Tunerstudio

For tuning we recommend using the software “Tunerstudio” available on the Internet under: www.tunerstudio.com. You will find the corresponding manual on the website of the manufacturer.

All settings can be adjusted with the „free“ version. For DIY tuning we recommend the registered version, because of it’s comfort features. We do not offer Tunerstudio registration codes. Please buy direct at www.tunerstudio.com

4. CONNECTION

To establish a communication the kdFi must be supplied with 12V.

4.1. Cable Types

Recommended Cable Types

| | | | |
|------------|-------------------------|------------|------------------------------------|
| Supply: | min 1.5 mm ² | Ignition: | min 1.5 mm ² |
| Injection: | min 1.0 mm ² | VR sensor: | min 0.5 mm ² , shielded |
| Sensors: | min 0.5 mm ² | Others: | min 0.75 mm ² |

4.2. Fuses

The kdFi must be fused externally.

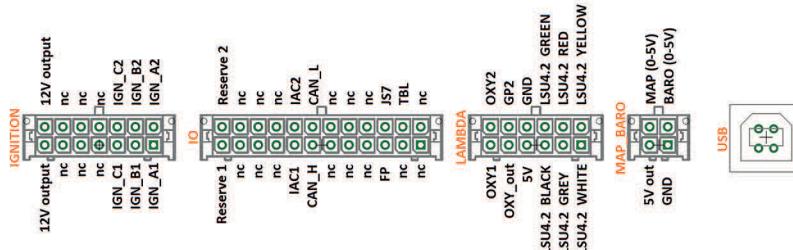
The amperage rating of the fuse must not exceed the maximum allowable amperage of the cable.

4.3. USB Port

The USB chip is „USB powered“ up to the galvanic isolation in order to be able to re-establish a connection more quickly in the event of a reset of the ECU. Each standard USB A-B cable can be used as connection cable.

4.4. Assignment of the Additional Terminals

The programmable inputs/outputs of the kdFi are connected with the corresponding extension circuitry on the PCB.



5. COMMISSIONING

5.1. LEDs

| Description | Colour | Function |
|-------------|--------|--|
| LD1 | red | Connection error |
| LD2 | green | Power supply OK |
| LD3 | yellow | Data packet from USB to MS2 |
| LD4 | green | Data packet from MS2 to USB |
| LD5 | blue | Ignition pulse A |
| LD6 | blue | Ignition pulse B |
| LD7 | blue | Ignition pulse C |
| LD8 | blue | Ignition pulse D |
| LD9 | blue | Ignition pulse E |
| LD10 | blue | Ignition pulse F |
| LD11 | red | Wideband controller error |
| LD12 | green | Wideband controller LED on: Stand-by |
| LD12 | green | Wideband controller LED flashing slowly: operation |
| LD12 | green | Wideband controller LED flashing fast: Heat sensor |

The LEDs LD5 to LD10 may also have other functions according to the software. They depend on the customer's settings.

5.2. Speed Measurement

VR Sensor

In Opel engines C20XE and C20LET Bosch ECU's the speed is sensed via a VR sensor. An AC voltage is induced in the coil of the VR sensor by a metal wheel with 60-2 teeth. A specialised component performing an auto-adaptation to the different sensors is integrated in the kdFi V1.4. The camshaft signal is not used because the engine runs with a distributor or „wasted spark“ and „grouped injection“.

5.3. Sensors

The factory settings of kdFi are adapted to OEM sensors. A separate calibration of the sensors is possible via software.

5.4. Throttle Potentiometer

The Opel engines C20XE and C20LET are factory equipped with a throttle potentiometer which is used with the kdFi.

The corresponding calibration is done via “Tools” – “Calibrate TPS”.

The throttle can be omitted when using the MAP. For natural aspirated engines, we recommend the Alpha-N setting, which needs a throttle potentiometer. +5V and GND are connected to the outer pins of the potentiometer. The voltage relating to the throttle position is tapped via the sliding contact and connected to the input TPS (Throttle Position Sensor). The covered distance of the potentiometer may be longer than the rotation of the throttle axle.

5.5. Digital Input

There is a digital input that can be used for example as “Launch Control”. The corresponding function has to be defined in Tunerstudio.

Input: **JS7**

5.6. Table Switch

Via the input „TBL“, a second set of parameters can be activated in the controller. With a switch setting the input to ground, you can switch between two stored ignition and injection maps. This is useful for various tunings such as road/racing, petrol/LPG, petrol/E85 etc.

Input: **PE1**

**Connecting to a higher voltage than 5V will damage the processor of the kdFi.
Digital inputs must only be connected to ground for activation.**

5.7. MAP Sensor

To use an external MAP sensor, the integrated MAP sensor (characteristic: MPX4250AP) must be deactivated (off) via DIP switch no. 1.

The 3 bar MAP sensor offered by us (characteristic: MPXH6400) must be selected accordingly in Tunerstudio.

The internal sensor can then be used as an altitude correction sensor by activating DIP switch 2 „int MAP for BARO“. (not available on all board revisions).

5.8. Barometric Correction

For using the constant barometric correction there must be connected a second absolute pressure transmitter (MPX4250) at the back side that is not installed ex works.

The option “Barometric Correction” has to be adjusted in Tunerstudio “Basic Settings” - „General Settings“.

Input: **JS4**

5.9. Tacho Output

For standard tachometers, a 12V square-wave signal is generated at the „JS10“ output. The parameters have been pre-set accordingly in Tunerstudio under „Basic Settings“ - „Tacho Output“. These settings should not be changed.

Output pin: **JS10**

5.10. Idle Speed Controller

The standard idle actuator is still used. The settings can be found under „Startup/idle“. If you do not use the idle control, set the PWM control to 0 instead of deactivating the idle control.

5.11. Ignition

(option Coil on Plug, wired on terminals)

The kdFi V1.4 controls the ignition coils via the standard ignition module. To use active ignition coils such as those from the TFSI, you need to remove the ignition module and connect the output direct to the coil. Power supply for the coil needs to be wired separately.

5.12. Injection

With the kdFi the injectors are controlled in groups. Please change the values below only if it is really necessary.

We generally recommend only high impedance injectors. (around 12 – 16 Ohm)

Attention:

The PWM Current Limit always needs to be set to 100%, also on low impedance injectors. If low impedance injectors are used 1 output can handle only 1 injector.

5.13. Relay Output/Boost Pressure Control

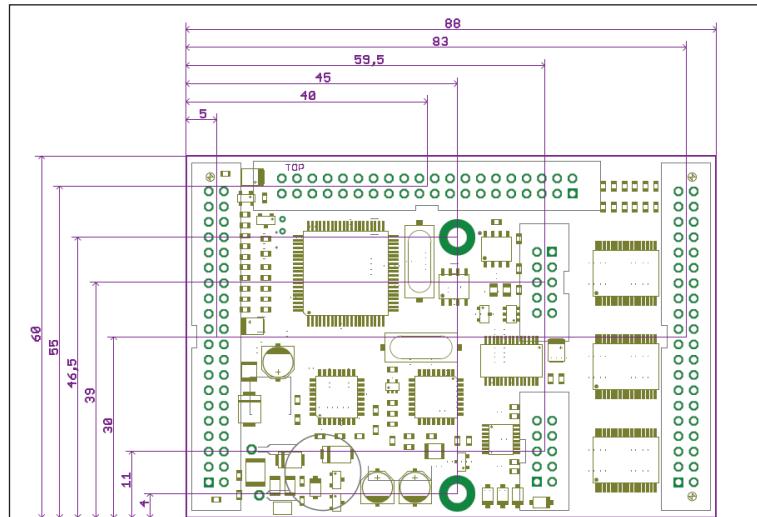
„IAC1“ and „IAC2“ can be used both as relay outputs and as PWM outputs, e.g. for the boost pressure control valve. Switching current max. 2 amps.

5.14. CAN Bus

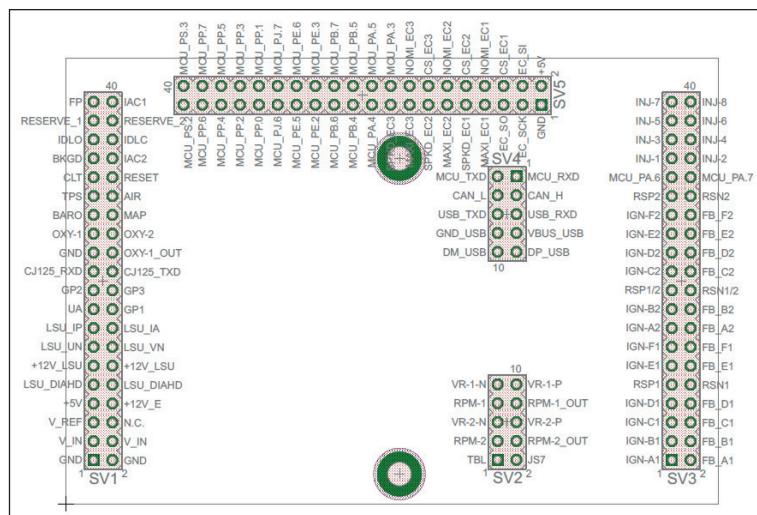
Like for the Megasquirt 2 the CAN Bus is equipped concerning the hardware, but must - if desired - still be set accordingly by the user. For further information on this item please read the respective Megasquirt/MSextra websites on the internet.

6. BASIC PCB

Dimensions:



Assignment:



Pinout:

| Con | Pin | Signalname | Description | Typ | Application | I/O | Type |
|-----|-----|------------|--|-------------------|-------------|--------------|--------------|
| SV1 | 1 | GND | Power In (Ground) | Main GND | | I | |
| SV1 | 2 | GND | Power In (Ground) | Main GND | | I | |
| SV1 | 3 | V_IN | Power In (12V) | 12V Ignition on | | I | |
| SV1 | 4 | V_IN | Power In (12V) | 12V Ignition on | | I | |
| SV1 | 5 | V_REF | REF Out | | | | |
| SV1 | 6 | - | Not Connected | | | nc | |
| SV1 | 7 | +5V | +5V Out for sensors and circuits | | | O | |
| SV1 | 8 | +12V_E | +12V Out sensors and circuits | | | O | |
| SV1 | 9 | LSU_DIAHD | Lambda-Sensor Heat PWM | LSU 4.2 grau | | | |
| SV1 | 10 | LSU_DIAHD | Lambda-Sensor Heat PWM | LSU 4.2 grau | | | |
| SV1 | 11 | +12V_LSU | Lambda-Sensor Heat +12V | LSU 4.2 weiß | | | |
| SV1 | 12 | +12V_LSU | Lambda-Sensor Heat +12V | LSU 4.2 weiß | | | |
| SV1 | 13 | LSU_UN | Lambda-Sensor Signal UN | LSU 4.2 schwarz | | | |
| SV1 | 14 | LSU_VM | Lambda-Sensor Signal VM | LSU 4.2 gelb | | | |
| SV1 | 15 | LSU_IP | Lambda-Sensor Signal IP | LSU 4.2 rot | | | |
| SV1 | 16 | LSU_IA | Lambda-Sensor Signal IA | LSU 4.2 grün | | | |
| SV1 | 17 | UA | Lambda Amplifier Out | | | nc | |
| SV1 | 18 | GP1 | I/O-Port ATmega8 | | | I | TTL |
| SV1 | 19 | GP2 | Start Lambdacontroller | | | I | TTL |
| SV1 | 20 | GP3 | I/O-Port ATmega8 | | | I | TTL |
| SV1 | 21 | CJ125_RXD | RS232-Interface to CJ125 | | | | TTL |
| SV1 | 22 | CJ125_TXD | RS232-Interface to CJ125 | | | | TTL |
| SV1 | 23 | GND | Ground for Pin 24 | GND | | | |
| SV1 | 24 | OXY_1_OUT | Wideband Sensor Output | SV1-25 | O | 0-5V | |
| SV1 | 25 | OXY-1 | Analogsignal OXY 1 | Lambdasensor 1 | I | 0-5V | |
| SV1 | 26 | OXY-2 | Analogsignal OXY 2 | Lambdasensor 2 | I | 0-5V | |
| SV1 | 27 | BARO | Analogsignal BARO | Barometric Sensor | I | 0-5V | |
| SV1 | 28 | MAP | Analogsignal MAP | Map Sensor | I | 0-5V | |
| SV1 | 29 | TPS | Analogsignal TPS | Throttle Position | I | 0-5V | |
| SV1 | 30 | AIR | Analogsignal AIR | Airtemp Sensor | I | Resistor | |
| SV1 | 31 | CLT | Analogsignal CLT | Coolant Sensor | I | Resistor | |
| SV1 | 32 | RESET | Signal Reset Low-Active | | | nc | |
| SV1 | 33 | BKGD | Signal Background Interface Pin | | | nc | |
| SV1 | 34 | IAC1 | Signal IAC1 (e.g. RPM in Instr. cluster) | | O | | |
| SV1 | 35 | IDLO | Idle Valve Open | | O | switched GND | |
| SV1 | 36 | IDLC | Idle Valve Close | | O | switched GND | |
| SV1 | 37 | RESERVE_1 | Reserve 1 | | | nc | |
| SV1 | 38 | RESERVE_2 | Reserve 2 | | | nc | |
| SV1 | 39 | FP | Fuel Pump | | | O | switched GND |
| SV1 | 40 | IAC2 | Signal IAC2 | | | O | |

| Con | Pin | Signalname | Description | Typ | Application | I/O | Type |
|-----|-----|------------|-----------------------|-----------------|-------------|-----|------|
| SV2 | 1 | TBL | Signal TBL | | | I | TTL |
| SV2 | 2 | JS7 | Signal JS7 | | | I | TTL |
| SV2 | 3 | RPM-2 | Signal RPM-Sensor 2 | SV2-4 | | I | |
| SV2 | 4 | RPM-2_OUT | RPM-Sensor_2 Output | SV2-3 | | O | |
| SV2 | 5 | VR-2-N | Cam Signal Negative | VR Sensor | | I | |
| SV2 | 6 | VR-2-P | Cam Signal Positive | VR Sensor | | I | |
| SV2 | 7 | RPM-1 | Signal RPM-Sensor 1 | SV2-8 | | I | |
| SV2 | 8 | RPM-1_OUT | RPM-Sensor_1 Output | SV2-7 | | O | |
| SV2 | 9 | VR-1-N | Crank Signal Negative | VR Sensor | | I | |
| SV2 | 10 | VR-1-P | Crank Signal Positive | VR Sensor | | I | |
| | | | | | | | |
| | | | | | | | |
| Con | Pin | Signalname | Description | Typ | Application | I/O | Type |
| SV3 | 1 | IGN-A1 | Ignition_A1 | Gate IGBT | | O | |
| SV3 | 2 | - | do not connect | Collector IGBT | | I | |
| SV3 | 3 | IGN-B1 | Ignition_B1 | Gate IGBT | | O | |
| SV3 | 4 | - | do not connect | Collector IGBT | | I | |
| SV3 | 5 | IGN-C1 | Ignition_C1 | Gate IGBT | | O | |
| SV3 | 6 | - | do not connect | Collector IGBT | | I | |
| SV3 | 7 | IGN-D1 | Ignition_D1 | Gate IGBT | | O | |
| SV3 | 8 | - | do not connect | Collector IGBT | | I | |
| SV3 | 9 | GND | Ground | GND | | | |
| SV3 | 10 | GND | Ground | GND | | | |
| SV3 | 11 | IGN-E1 | Ignition_E1 | Gate IGBT | | O | |
| SV3 | 12 | - | do not connect | Collector IGBT | | I | |
| SV3 | 13 | IGN-F1 | Ignition_F1 | Gate IGBT | | O | |
| SV3 | 14 | - | do not connect | Collector IGBT | | I | |
| SV3 | 15 | IGN-A2 | Ignition_A2 | Gate IGBT | | O | |
| SV3 | 16 | - | do not connect | Collector IGBT | | I | |
| SV3 | 17 | IGN-B2 | Ignition_B2 | Gate IGBT | | O | |
| SV3 | 18 | - | do not connect | Collector IGBT | | I | |
| SV3 | 19 | GND | Ground | GND | | | |
| SV3 | 20 | GND | Ground | GND | | | |
| SV3 | 21 | IGN-C2 | Ignition_C2 | Gate IGBT | | O | |
| SV3 | 22 | - | do not connect | Collector IGBT | | I | |
| SV3 | 23 | IGN-D2 | Ignition_D2 | Gate IGBT | | O | |
| SV3 | 24 | - | do not connect | Collector IGBT | | I | |
| SV3 | 25 | IGN-E2 | Ignition_E2 | Gate IGBT | | O | |
| SV3 | 26 | - | do not connect | Collector IGBT | | I | |
| SV3 | 27 | IGN-F2 | Ignition_F2 | Gate IGBT | | O | |
| SV3 | 28 | - | do not connect | Collector IGBT | | I | |
| SV3 | 29 | GND | Ground | GND | | | |
| SV3 | 30 | GND | Ground | GND | | | |
| SV3 | 31 | MCU_PA.6 | Signal MCU_PA.6 | | | nc | |
| SV3 | 32 | MCU_PA.7 | Signal MCU_PA.7 | | | nc | |
| SV3 | 33 | INJ-1 | Injector_1 | Ground Injector | | O | |
| SV3 | 34 | INJ-2 | Injector_2 | Ground Injector | | O | |
| SV3 | 35 | INJ-3 | Injector_3 | Ground Injector | | O | |
| SV3 | 36 | INJ-4 | Injector_4 | Ground Injector | | O | |
| SV3 | 37 | INJ-5 | Injector_1 | Ground Injector | | O | |
| SV3 | 38 | INJ-6 | Injector_2 | Ground Injector | | O | |
| SV3 | 39 | INJ-7 | Injector_3 | Ground Injector | | O | |
| SV3 | 40 | INJ-8 | Injector_4 | Ground Injector | | O | |

| Con | Pin | Signalname | Description | Typ | Application | I/O | Type |
|-----|-----|------------|---|------------|-------------|-----|------|
| SV4 | 1 | MCU_RXD | RS232-Interface to MC9S12C64 | SV4-6 | | | |
| SV4 | 2 | MCU_TXD | RS232-Interface to MC9S12C64 | SV4-5 | | | |
| SV4 | 3 | CAN_H | CAN-BUS-Interface to MC9S12C64 | | | | |
| SV4 | 4 | CAN_L | CAN-BUS-Interface to MC9S12C64 | | | | |
| SV4 | 5 | USB_RXD | RS232-Interface to FT232R (Optocoupler) | SV4-2 | | | |
| SV4 | 6 | USB_TXD | RS232-Interface to FT232R (Optocoupler) | SV4-1 | | | |
| SV4 | 7 | VBUS_USB | USB-Interface | USB red | | | |
| SV4 | 8 | GND_USB | USB-Interface | USB black | | | |
| SV4 | 9 | DP_USB | USB-Interface | USB green | | | |
| SV4 | 10 | DM_USB | USB-Interface | USB white | | | |
| | | | | | | | |
| | | | | | | | |
| Con | Pin | Signalname | Description | Typ | Application | I/O | Type |
| SV5 | 1 | GND | Power | | | nc | |
| SV5 | 2 | +5V | Power | | | nc | |
| SV5 | 3 | EC_SCK | SPI Bus | | | nc | |
| SV5 | 4 | EC_SI | SPI Bus | | | nc | |
| SV5 | 5 | EC_SO | SPI Bus | | | nc | |
| SV5 | 6 | - | do not connect | | | nc | |
| SV5 | 7 | - | do not connect | | | nc | |
| SV5 | 8 | - | do not connect | | | nc | |
| SV5 | 9 | - | do not connect | | | nc | |
| SV5 | 10 | - | do not connect | | | nc | |
| SV5 | 11 | - | do not connect | | | nc | |
| SV5 | 12 | - | do not connect | | | nc | |
| SV5 | 13 | - | do not connect | | | nc | |
| SV5 | 14 | - | do not connect | | | nc | |
| SV5 | 15 | - | do not connect | | | nc | |
| SV5 | 16 | - | do not connect | | | nc | |
| SV5 | 17 | - | do not connect | | | nc | |
| SV5 | 18 | MCU_PA.3 | Signal MCU_PA.3 | | | nc | |
| SV5 | 19 | MCU_PA.4 | Signal MCU_PA.4 | | | nc | |
| SV5 | 20 | MCU_PA.5 | Signal MCU_PA.5 | | | nc | |
| SV5 | 21 | MCU_PB.4 | Signal MCU_PB.4 | | | nc | |
| SV5 | 22 | MCU_PB.5 | Signal MCU_PB.5 | | | nc | |
| SV5 | 23 | MCU_PB.6 | Signal MCU_PB.6 | | | nc | |
| SV5 | 24 | MCU_PB.7 | Signal MCU_PB.7 | | | nc | |
| SV5 | 25 | MCU_PE.2 | Signal MCU_PE.2 | | | nc | |
| SV5 | 26 | MCU_PE.3 | Signal MCU_PE.3 | | | nc | |
| SV5 | 27 | MCU_PE.5 | Signal MCU_PE.5 | | | nc | |
| SV5 | 28 | MCU_PE.6 | Signal MCU_PE.6 | | | nc | |
| SV5 | 29 | MCU_PJ.6 | Signal MCU_PJ.6 | | | nc | |
| SV5 | 30 | MCU_PJ.7 | Signal MCU_PJ.7 | | | nc | |
| SV5 | 31 | MCU_PP.0 | Signal MCU_PP.0 | | | nc | |
| SV5 | 32 | MCU_PP.1 | Signal MCU_PP.1 | | | nc | |
| SV5 | 33 | MCU_PP.2 | Signal MCU_PP.2 | | | nc | |
| SV5 | 34 | MCU_PP.3 | Signal MCU_PP.3 | | | nc | |
| SV5 | 35 | MCU_PP.4 | Signal MCU_PP.4 | | | nc | |
| SV5 | 36 | MCU_PP.5 | Signal MCU_PP.5 | Bootloader | | nc | |
| SV5 | 37 | MCU_PP.6 | Signal MCU_PP.6 | | | nc | |
| SV5 | 38 | MCU_PP.7 | Signal MCU_PP.7 | | | nc | |
| SV5 | 39 | MCU_PS.2 | Signal MCU_PS.2 | | | nc | |
| SV5 | 40 | MCU_PS.3 | Signal MCU_PS.3 | | | nc | |

7. WIDEBAND LAMBDA CONTROLLER

The integrated lambda controller is activated by connecting the input „GP2“ to ground. This can be done continuously with a bridge as the kdFi is only powered as long as the ignition is turned on. In the connector plug, the signal from OXY_out must be connected to the input OXY1. Our connection cable already has the necessary connections.

The measurement signal is output to OXY_out in form of a 0-5V signal and corresponds to the **PLX signal 0-5V = AFR10-AFR20**. This characteristic is stored in Tunerstudio and has already been loaded during the test of the control device.

After a firmware update this characteristic must be loaded again.

We highly recommend to use only following setting:

Tunerstudio Settings: EGO Control - Algorithm: Simple

unless you exactly know what you are doing. PID Setting is the main cause for lambda problems.

In case of problems with your Lambda reading do not contact us before you tried Algorithm „Simple“.



8. FIRMWARE UPDATES

Firmware updates are always performed at your own risk. It may happen that the existing firmware is deleted by disconnections or incompatible computers/software and it can only be reloaded via a BDM interface. We offer this service, but it is not covered by warranty!

Tunerstudio must be closed during the firmware update to prevent access conflicts. The ignition coils must be disconnected during the firmware update, until the appropriate configuration has been reloaded via MSQ file. In the case of major version jumps, the MSQ file must be created again. Please read the documentation of your new firmware!

More Power with
Hightech and Know-how!



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