

UAB PNP BMW

PCB R12 (Date: 02.02.2024)

User manual (English)



Use only the instructions that are appropriate for the board revision

**You will find the latest information and
documentation on
www.k-data.org**

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

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1. Introduction

The UAB is a universal adapter board which was developed as an engine control unit with features for tuning.

A wideband lambda controller is also available on the board.

A Bosch LSU 4.2 lambda sensor can be connected directly without the need for another controller.

2. Scope of Delivery

- UAB device ready for use
- SD card with documentation
- User manual
- USB cable
- Plug set

3. Commissioning

It is recommended that the USB driver be installed before connecting the UAB for the first time.

3.1 USB Driver / Connection

To connect to the control unit, the UAB must be supplied with 12V.

You will find the USB driver from FTDI on the SD card in the "USB" directory. This is the FTDI232 chip. The chip simulates an RS232 connection that can be used in 2 ways:

- Tunerstudio – Communications – Settings: RS232 , COM-Port , 115200 Baud
- Tunerstudio – Communications – Settings: FTDI-D2XX, Auto, 115200 Baud

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 control unit.

Any standard USB A-B cable can be used as a connection cable.

3.2 Status LED's

Description	Colour	Function
LD1	red	Connection error
LD2	green	Power Supply OK
LD3	yellow	Data packet from USB
LD4	green	Data packet 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: Standby
	green	Wideband controller LED flashing slowly: Operation
	green	Wideband controller LED lashing fast: Heat sensor
LD13	green	Operation
	green flashing	SD card JSON not available / readable
LD14	yellow	Reserved
LD15	red	DBW error
LD16	blue	Bluetooth
various	red	Output overload

The LEDs LD5 to LD10 can also have other functions depending on the software. These depend on the customer's settings.

3.3 Load Firmware

Tunerstudio must be closed during firmware loading/updating 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!

3.4 Tunerstudio

For tuning, we recommend the Tunerstudio software, which is available on the Internet at www.tunerstudio.com. You will find a description on the manufacturer's homepage.

All settings can be adjusted with the unregistered version.

For DIY tuning, we recommend the registered version, as it has additional functions.

Registration codes for Tunerstudio are not available from us, please purchase them directly from www.tunerstudio.com.

3.5 Assignment of the Controllerports

The following ports are permanently assigned and cannot be configured for other purposes:

- SD card: PH0, PH1, PH2, PH3
- Knocksensing (SPI): PM2, PM3 (SLED), PM4 (ALED), PM5 (WLED), PJ7 (JS11)
- Clock (RTC): PK1, PK3
- Exhaust gas temperature (EGT): AD13

3.6 Speed Measurement

VR Sensor:

An alternating voltage is induced in the coil of the VR sensor by a metal disc with 60-2 teeth. With the UAB, a specialised component was used that adapts to the sensors itself.

Hall Sensor:

Hall sensors output a square wave signal which can be processed directly by the control unit.

With PNP control units, the standard sensors are usually used without the need for adjustments.

M20/M30/M40/S38B36: Crankshaft: VR sensor, induction ring on ignition cable 6 is used as camshaft signal. This can be dispensed with in the case of group injection, e.g. when converting to individual ignition coils.

M42/M43: Crankshaft: VR sensor, Camshaft: VR sensor

M44: PCB revision 12 not yet available

M50: Crankshaft: VR sensor, Camshaft: VR sensor

M50B20TU: Crankshaft: **must be replaced Hella 6PU 009 110-541**, Camshaft: Hall sensor

M50B25TU: Crankshaft: VR sensor, Camshaft: Hall sensor

M52: Crankshaft: VR sensor, Camshaft: **Hall sensor (must be replaced if the engine is to be operated fully sequentially)**

M52TU/M54: Crankshaft: Hall sensor, Camshaft: Hall sensor

M60: PCB revision 12 not yet available

3.7 Sensors

Standard OEM Sensors with 2,49 kOhm Biasresistor

3.8 MAP Sensor

The integrated MAP sensor is a 4 bar absolute pressure sensor of the type MPX4400AP which can measure up to 3 bar boost pressure. The characteristic curve corresponds to the MPXH6400 which should be selected in Tunerstudio.

3.9 Throttle Potentiometer

A throttle potentiometer is present/not present ex works on the following engines:

M20/M30/M40/S38B36: not present, MAP-based basic setting loaded

M42/M43: present

M44: present; PCB revision 12 not yet available

M50: present

M50B20TU: present

M50B25TU: present

M52: present

M52TU/M54: present

M60: present ; PCB revision 12 not yet available

If the engine has a throttle potentiometer, it should at least be used to optimise the acceleration enrichment.

The throttle potentiometer can be omitted when using the intake manifold pressure.

For tuned naturally aspirated engines we recommend the Alpha-N setting, for which a throttle potentiometer is required.

+5V and GND are connected to the outer, static connections of the potentiometer.

The voltage corresponding to the throttle position is tapped via the sliding contact and connected to the TPS (Throttle Position Sensor) input. The possible travel of the potentiometer may be greater than the rotation of the throttle valve axis.

3.10 Tachometer

The "Tacho" output is provided for standard tachometers.

A standard 12V square wave signal suitable for the BMW instrument cluster is output.

With M52TU and M54 UAB, the speed signal and engine temperature are transmitted to the instrument cluster via CAN bus.

Tuner studio: "CAN Bus/Testmodes" , "Dash broadcasting": Must be set: ON, AUTOMATIC

3.11 Idle Speed controller

The serial idler is still used. The settings can be found under "Startup/Idle".

IDLO (open) and FIDLE (close) are used as outputs. If you do not use the idle control, set the PWM control to 0 instead of deactivating the idle control.

3.12 Air Condition

works from PCB revision R12 and firmware from 0v116

Output for air conditioner compressor: PK7

Air conditioning compressor request for M52TU/M54: CANIN1

3.13 EVAP

works from PCB revision R12 and firmware from 0v116

Output: CANOUT8

3.14 Vehicle Speed Sensor

planned for the use of "boost by gear" in the R12 PCB revision, still in the test phase on various vehicles.

The speedometer in the instrument cluster works as usual with all PNP UAB.

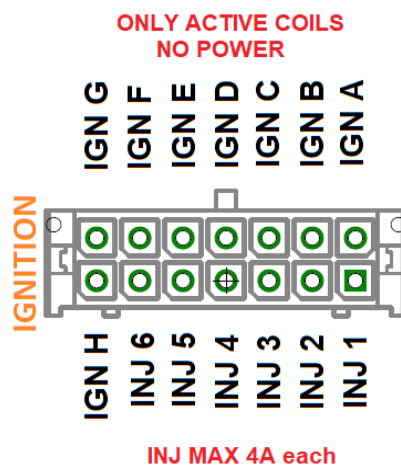
3.15 Ignition / conversion to active ignition coils

The UAB has power drivers which allow direct control of the individual ignition coils.

Self-resetting thermal fuses protect the UAB from damage caused by excessive ignition coil charging currents due to incorrect software settings.

In case of ignition problems, check and reduce the dwell time.

For active ignition coils such as VW / TFSI, the signals can be tapped directly at the 14-pin Microfit connector on the rear.



Alternatively, you can also use our "Ignition Coils Conversion sheet" to retain the assignment of the connector to the engine wiring harness.

You can download this from our product website.

3.16 Injection in groups / full sequential

The injectors are controlled individually according to the standard wiring harness.

Fully sequential as far as possible with the standard wiring harness.

Basically, we recommend only high-impedance injectors (12 - 16 Ohm).

These can be controlled without PWM or Peak&Hold.

Settings: PWM Current Limiting: Off

3.17 Real-time clock / buffer battery

For a better allocation of the data logs by means of time stamps, the UAB has a battery-buffered real-time clock which is connected to the Motorola via the I2C bus.

Software Setting: RTC internal

The service life of the installed battery is calculated for several years.

The battery can be replaced by a 3V button cell. Due to vibrations, soldered versions should be used.

3.18 CAN Bus

The CAN bus is prepared on the hardware side, but must - if desired - still be set accordingly by the user. For more information, please refer to the documentation of the firmware you have loaded.

There is a 120 Ohm CAN terminating resistor on the board of the UAB.

4. Extension

4.1 Wiring / Fuse

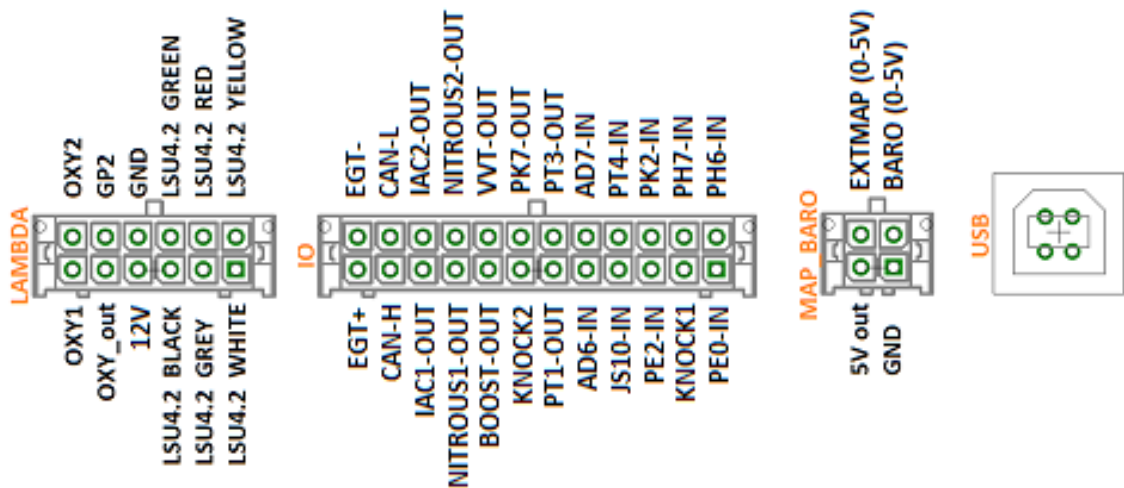
A fuse must be connected upstream of the UAB as well as all other parts supplied with voltage. The amperage of the fuse must not exceed the maximum permissible amperage of the cable.

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
Other cables:	min 0.75 mm ²

4.2 Assignment of the additional terminals

The programmable inputs/outputs of the UAB are connected to the corresponding expansion circuit on the board.



4.3 Digital inputs

Digital inputs are available, which can be used e.g. for the "Launch Control".

The corresponding function must be set in Tunerstudio.

To protect the circuit board, the inputs have galvanic isolation and are tolerant of both 5V and 12V. To activate the input, it must be connected to ground.

4.4 Digital outputs

All pins available on the IO connector that end with "-OUT" can be used for additional functions. Depending on the software setting, both as relay outputs and as PWM outputs. e.g. for a boost pressure control valve.

These are lowside outputs that switch ground. The power supply of the actuator must be connected to 12V (terminal 15).

Switching current max. 4 amperes

It is not possible to supply the devices with continuous voltage as other parts of the UAB could be supplied via flyback diodes, which could lead to permanent battery discharge.

4.5 Analogue inputs 0-5V

AD6 and AD7 are available as universal 0-5V inputs. OXY2 (ADC12) can also be used as a further 0-5V input if it is not required for a second lambda sensor.

4.6 Barometric correction

The 0-5V signal of a pressure sensor must be connected to one of the free analogue inputs. In R12, the "BARO" input is not connected to AD6-IN.

4.7 Additional sensors

Further inputs for analogue sensors are not available in the R12, but can be read in via the CAN bus if required.

4.8 Knock sensor

The UAB has 2 inputs for standard piezo knock sensors which are connected to the engine wiring harness via the connector on the PNP variants.

If there are no knock sensors in the standard wiring harness, a maximum of 2 sensors can be connected via the 24-pin additional connector on the rear.

Each sensor must be connected to one input and GND.

It is important to observe the torque when fastening the knock sensor. An incorrect torque can distort the sensor signal.

4.9 Exhaust gas temperature

A K-type exhaust gas sensor can be connected directly to EGT+ and EGT-.

It is essential to observe the polarity.

Connected to controller port: Port ADC13 (spare input)

5. ESP32 Coprozessor

The additional controller extends the UAB by some functions and provides additional computing power for more modern features that are not provided for in the Motorola. During the start-up of the ESP32, the configuration file "DM88_cfg.json" in the root directory of the SD card is read out and used to configure the corresponding parameters. If this file is missing, standard parameters are used. If the SD card or this file is missing or faulty, the green LED on the back flashes. If the system starts up correctly, the LED lights up green continuously.

5.1 SD Karte / Datenlogging

Change the SD card with care. Due to their small design, micro SD card holders are sensitive to the effects of force.

After the ESP32 has completed the start-up process, the SD card is transferred to the Motorola and the recognition of the SD card for the Motorola is triggered.

If no SD card is present, the ESP32 starts with default parameters and does not give an "SD-in" signal to the Motorola

5.2 JSON Parameter

The configuration is stored in the file DM88_cfg.json in the root directory of the SD card. Example (the text highlighted in colour is not permitted in JSON format and is for explanatory purposes only):

```
{
  "ENGINE": "M54", only important for M52TU and M54
  "BLUETOOTH-ON": 0, Bluetooth on/out
  "BLUETOOTH-PIN": 1234, Bluetooth Pairing Code
  "THROTTLE-CTRL": 1, always „1“
  "SD_POS_kp": 1, PID parameters DBW
  "SD_POS_ki": 2, PID parameters DBW
  "SD_POS_kd": 0, PID parameters DBW
  "PEDAL_ADC_low_value": 212, Analogue value accelerator pedal
  "PEDAL_ADC_high_value": 1487, Analogue value accelerator pedal
  "PEDAL_ADC2_low_value": 105, Analogue value accelerator pedal
  "PEDAL_ADC2_high_value": 747, Analogue value accelerator pedal
  "TH_ADC_low_value": 143, Analogue value throttle valve
  "TH_ADC_high_value": 1448, Analogue value throttle valve
  "TH_ADC2_low_value": 87, Analogue value throttle valve
  "TH_ADC2_high_value": 1395, Analogue value throttle valve
  "POS_TH_Input_Internal": 0, do not modify
  "EGAS_ENABLED": 1, do not modify
  "CAN_MSG_IDLE_THRESHL": 1000 do not modify, development for automatic transmission
}
```

5.3 Backup in EEPROM / no SD card

During the start-up process of the ESP32 processor, all settings of the JSON file are compared with the data in the internal EEPROM and, in the event of deviations, the EEPROM is updated accordingly to ensure unrestricted functionality at the next start-up without an SD card.

5.4 Bluetooth

As an alternative to USB, the connection to the UAB can also be established via Bluetooth. Pairing code and activation are set via the JSON file on the SD card. In addition, apps for mobile devices such as Android and iOS can be used.

5.5 Mini Terminal

During start-up, the ESP32 outputs various messages via the serial interface. For diagnostic purposes, the Mini Terminal in Tunerstudio can be used to read out the status messages of the ESP32 (115200 baud).

5.6 ESP32 Firmware Update

Firmware updates of the ESP32 can be carried out in a user-friendly way via the SD card.

- Copy the firmware as "DM88_FW.bin" into the root directory of the SD card.
- Reset the UAB (switch off the ignition, wait 3 seconds, switch on again).
- As soon as the update starts, the 4 LEDs at the rear edge of the board light up.
- Update is finished as soon as the LEDs are off again.
- Reset UAB again to start the new firmware
- File "DM88_FW.bin" is automatically deleted after successful update.

Do not interrupt the power supply during the update process!

5.7 Watchdog

From software version 0v116, a hardware watchdog is supported which performs a reset if the ESP32 is stopped unintentionally. This deactivates the H-bridge of the DBW controller (M52TU/M54), causing the throttle valve to fall into the emergency position by spring. If you notice such problems, please inform us immediately.

5.8 Changelog

0v054 initial release

0v055

0v116 DBW Features, Bugfixes (Update recommended for PCB R12 and later)

6. Functionality and differences between DBW / Bowden cable

The **M52TU** still has a Bowden cable which is connected to the electric throttle valve via a spring. The e-gas actuator on the M52TU is not yet controlled in software version 0v116. The **M54** is controlled exclusively via DBW. This control is carried out via the additional ESP32 processor and an H-bridge.

A conversion to Bowden cable can be easily carried out by replacing the throttle valve. The "DBW error" caused by missing signals has no further influence on the engine control unit and can be deactivated if necessary with the entry "Engine-Type: M52TU" in the JSON file on the SD card.

6.1 General information / safety instructions

Although the E-Gas function has many safety features such as testing the counter-rotating potentiometers, we recommend using it only on private property and taking appropriate safety measures to prevent personal injury.

6.2 Basic setting

Please use our MSQ with the basic settings and do not change any CAN addresses or settings. These have been carefully selected to optimally integrate the UAB into the vehicle communication.

6.3 DBW Error / safety features / red LED

The control of the electric throttle valve is interrupted immediately in the event of a fault and therefore returns to the spring position (limb home mode).

This can have the following causes:

- Maximum deviation of the two position sensors in the pedal exceeded
 - Maximum deviation of the two position sensors in the throttle valve exceeded
 - min/max values of an analogue value exceeded or not reached
- Deviations can also occur due to incorrect or missing calibration
- CAN bus fault (timeout)
 - Incorrect settings in Tunerstudio

6.4 LED

Red status LED lights up for DBW Error.

Flashing means an internal hardware error on the circuit board. Please contact us.

The "EML" warning light is activated in the instrument cluster at the same time as the red LED.

6.5 Calibration / read out analogue values

The displays of the individual potentiometers can be read out as user-defined CAN inputs. In Tunerstudio, it is possible to change the measured values by right-clicking on the display. For addresses, see 7.4

6.6 JSON Parameter

see 5.2

7. CAN Bus

7.1 Basic settings

Please use our MSQ with the basic settings and do not change any CAN addresses or settings. These have been carefully selected to optimally integrate the UAB into the vehicle communication.

7.2 Integration in the car

- Instrument cluster functions normally without illuminated fault lights in the E46
- ABS in the E46 has been successfully tested
- ESP works except for torque reduction by e-gas (software 0v116)
- Automatic transmissions are not yet supported (software 0v116)
- "Fuel consumption" is not yet implemented in software version 0v116.

7.3 Assignment: CANIN/CANOUT

Extended Frame: 12C03B8

Inputs

CANIN1: Request air condition (E46)

CANIN7: ESP off

CANIN6: Brakelight switch

CANIN8: DBW fault (Evaluation if greater than 127)

Outputs (1-4 are virtual DO and control the E46 instrument cluster via CAN)

CANOUT1: Check Engine yellow light

CANOUT2: CRUISE CONTROL green light

CANOUT3: EML yellow light

CANOUT4: FUEL CAP (USA only)

CANOUT5: Reserve

CANOUT6: Reserve

CANOUT7: Reserve

CANOUT8: EVAP

CANOUT 9: Disable E-GAS safety functions (only with RPM=0 for calibration)

CANOUT 10: DBW control 100% OPEN

CANOUT 11: DBW control 100% CLOSED

7.4 Addresses used (changes only by professionals)

Potentiometer positions:

HEX 0x1536 2 bytes each: PEDEAL_A, PEDAL B, THROTTLE A, THROTTLE B

DBW communication:

HEX: 0x256, 0x257, Response: 0x260, 0x261

Override DBW PID controller parameters:

CAN messages "User defined"

0x270 data1=p * 100 , data2=i , data3=d

8. Pinout to engine wiring loom

8.1 M20/M30/M40/S38B36

PIN Signal

1 : IGNA
2 : GND
3 : FP-OUT
4 : IDLO-OUT
5 : EVAP
6 : TACHO-OUT
7 :
8 : VR-2-P
9 :
10 : GND
11 :
12 :
13 :
14 : GND
15 :
16 : INJ1
17 : INJ2
18 :
19 : GND
20 :
21 :
22 :
23 :
24 : GND
25 :
26 : GND
27 : IGNITION_SET
28 :

PIN Signal

29 :
30 :
31 : VR-2-N
32 : FIDLE-OUT
33 :
34 :
35 :
36 : DME_ACTIVATE
37 : +12V_IN
38 :
39 :
40 :
41 :
42 :
43 :
44 : AIR
45 : CLT
46 :
47 : VR-1-P
48 : VR-1-N
49 :
50 : GND
51 :
52 : TPS
53 : +5V
54 :
55 :

8.2 M42/M43

PIN Signal

1 : FP-OUT
2 : FIDLE-OUT
3 : INJ2
4 : INJ4
5 :
6 : GND
7 :
8 :
9 :
10 :
11 :
12 : TPS
13 :
14 : GND
15 : KNOCK1
16 : VR-2-N
17 :
18 : INJ8 (DISA)
19 :
20 :
21 :
22 :
23 :
24 : IGNB
25 : IGNA
26 :
27 : DME_ACTIVATE
28 : GND
29 : IDLO-OUT
30 :
31 :
32 : INJ1
33 : INJ3
34 : GND
35 :
36 : EVAP
37 :
38 :
39 : GND
40 : GND
41 :
42 : KNOCK2
43 : GND
44 : VR-2-P

PIN Signal

45 :
46 :
47 :
48 : PK7-OUT
49 :
50 :
51 : IGNC
52 : IGND
53 :
54 : +12V_IN
55 : GND
56 : IGNITION_SET
57 :
58 :
59 : +5V
60 :
61 :
62 :
63 :
64 :
65 :
66 :
67 : VR-1-P
68 : VR-1-N
69 :
70 :
71 : GND
72 :
73 :
74 : TACHO-OUT
75 :
76 :
77 : AIR
78 : CLT
79 :
80 :
81 :
82 :
83 :
84 :
85 : AC_PRESSURE
86 : AC_KOMPRESSOR_ANF
87 :
88 :

8.3 M44: PCB revision 12 not yet available

8.4 M50

PIN Signal

1 : FP-OUT
2 : FIDLE-OUT
3 : INJ1
4 : INJ3
5 : INJ5
6 : GND
7 :
8 :
9 :
10 :
11 :
12 : TPS
13 :
14 : GND
15 : GND
16 : VR-2-N
17 :
18 :
19 :
20 :
21 :
22 :
23 : IGNE
24 : IGNC
25 : IGNA
26 :
27 : IGNITION_PULL
28 : GND
29 : IDLO-OUT
30 :
31 : INJ2
32 : INJ4
33 : INJ6
34 : GND
35 :
36 : EVAP
37 :
38 :
39 : GND
40 : GND
41 :
42 : VR-3-P
43 : GND
44 : VR-2-P

PIN Signal

45 : GND
46 :
47 :
48 : PK7-OUT
49 :
50 : IGNF
51 : IGND
52 : IGNB
53 :
54 : +12V_IN
55 : GND
56 : IGNITION_SET
57 :
58 :
59 : +5V
60 :
61 :
62 :
63 :
64 :
65 :
66 :
67 : VR-1-P
68 : VR-1-N
69 :
70 :
71 : GND
72 :
73 :
74 : TACHO-OUT
75 :
76 :
77 : AIR
78 : CLT
79 :
80 :
81 :
82 :
83 :
84 :
85 : AC_PRESSURE
86 : AC_KOMPRESSOR_ANF
87 :
88 :

8.5 M50B25TU

BMW M50B25TU

PIN Signal

1	: FP-OUT
2	: FIDLE-OUT
3	: INJ2
4	: INJ4
5	: INJ6
6	: GND
7	: VVT-OUT
8	:
9	:
10	:
11	:
12	:
13	:
14	:
15	: GND
16	: VR-1-P
17	: CAM-HALL-IN
18	:
19	:
20	:
21	:
22	:
23	: IGNF
24	: IGND
25	: IGNB
26	:
27	: IGNITION_PULL
28	: GND
29	: IDLO-OUT
30	:
31	: INJ3
32	: INJ5
33	: INJ1
34	: GND
35	:
36	: EVAP
37	:
38	:
39	:
40	: GND
41	:
42	: VR-3-P
43	: VR-1-N
44	: GND

PIN Signal

45	: GND
46	:
47	: TACHO-OUT
48	: PK7-OUT
49	:
50	: IGNA
51	: IGNE
52	: IGNC
53	:
54	: +12V_IN
55	: GND
56	: IGNITION_SET
57	:
58	:
59	: +5V
60	:
61	:
62	:
63	:
64	: KOMPRESSOR_SIGNAL
65	: AC_PRESSURE
66	:
67	:
68	:
69	: KNOCK2
70	: KNOCK1
71	: GND
72	:
73	: TPS
74	:
75	:
76	:
77	: AIR
78	: CLT
79	:
80	:
81	:
82	:
83	:
84	:
85	:
86	:
87	:
88	:

8.6 M52

PIN Signal

1 : IGNE
2 : IGNF
3 : IGND
4 : GND
5 : INJ5
6 : INJ1
7 : GND
8 :
9 :
10 : CLT
11 :
12 : TPS
13 :
14 : AIR
15 : VR-3-P
16 :
17 :
18 :
19 :
20 :
21 : VVT-OUT
22 : INJ3
23 : INJ4
24 : INJ6
25 : GND
26 :
27 : FIDLE-OUT
28 : GND
29 : IGNA
30 : IGNC
31 : IGNB
32 : GND
33 : INJ2
34 : GND
35 :
36 : TACHO-OUT
37 :
38 : GND
39 : GND
40 : GND
41 : GND
42 : GND
43 : GND
44 : +5V

PIN Signal

45 :
46 :
47 :
48 : +5V
49 : IGNITION_SET
50 :
51 :
52 :
53 : IDLO-OUT
54 :
55 : GND
56 : GND
57 : KNOCK1
58 : GND
59 : KNOCK2
60 :
61 : GND
62 :
63 : GND
64 : CAM-HALL-IN
65 : +12V
66 :
67 : GND
68 :
69 : FP-OUT
70 : GND
71 : GND
72 : GND
73 : IGNITION_PULL
74 :
75 :
76 :
77 :
78 :
79 : GND
80 :
81 :
82 :
83 : CRANK-HALL-IN
84 :
85 : CAN_L
86 : CAN_H
87 : +12V_IN
88 :

8.7 M52TU/M54

BMW M52TU M54

Stecker/Plug 60001

PIN	Signal
1	+12V_IN
2	
3	
4	GND
5	GND
6	GND
7	
8	+12V_IN
9	+12V_IN

Stecker/Plug 60002

PIN	Signal
1	
2	
3	CAN_L
4	CAN_H
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	GND
21	GND
22	GND
23	DME_ACTIVATE
24	GND

Stecker/Plug 60003

PIN	Signal
1	
2	CAM-HALL2-IN
3	
4	+5V
5	CAM-HALL-IN
6	
7	+5V
8	CRANK-HALL-IN
9	
10	TPS2
11	
12	
13	
14	GND
15	GND
16	
17	GND
18	GND
19	TPS
20	GND
21	GND
22	AIR
23	GND
24	CLT
25	GND
26	
27	AD6-IN
28	GND
29	KNOCK1
30	GND
31	KNOCK2
32	GND
33	INJ1
34	INJ2
35	INJ3
36	INJ4
37	INJ5
38	INJ6
39	
40	VVT-OUT (VANOS_IN)
41	JS10-OUT (VANOS_OUT)
42	EVAP
43	DBW
44	DBW
45	INJ8 (THERMOSTAT)
46	FIDLE-OUT
47	IDLO-OUT
48	GND
49	PT1-OUT (DISA)
50	
51	
52	

Stecker/Plug 60004

PIN	Signal
1	
2	
3	
4	NITROUS1-OUT (FAN)
5	
6	
7	GND
8	PEDAL1
9	+5V
10	FP-OUT
11	
12	GND
13	PEDAL2
14	+5V
15	
16	
17	TACHO-OUT
18	NITROUS2-OUT (Exhaust Flap)
19	
20	
21	
22	
23	PK2-IN (Launch)
24	
25	
26	IGNITION_SET
27	
28	
29	PK7-OUT (AC Compressor)
30	
31	
32	
33	
34	
35	
36	CAN_H
37	CAN_L
38	GND
39	
40	

Stecker/Plug 60005

PIN	Signal
1	IGNC
2	IGNE
3	IGNA
4	GND
5	GND
6	GND
7	IGND
8	IGNB
9	IGNF

8.8 M60: PCB revision 12 not yet available

9. Wideband Lambda-Controller

9.1 Integrated Wideband Lambda-Controller

The integrated lambda-controller is activated by connecting the input "GP2" to ground. This can be done permanently with a jumper, as the UAB is only live as long as the ignition is switched on.

In the connection plug, the signal from OXY_out must be connected to the input OXY1. Our connection cable already has the necessary connections.

The measuring signal is output as 0-5V at OXY_out and corresponds to the setting **PLX signal 0-5V = AFR10-AFR20**.

This characteristic curve is stored in Tunerstudio and was already loaded when the control unit was tested.

After a firmware update, however, this characteristic curve must be loaded again.

We recommend only using the following setting:

Tunerstudio settings: EGO Control - Algorithm: Simple

The "PID" setting is the main cause of lambda problems.

If you do not SELF know exactly why you have entered which value at the corresponding position you should select "Simple".

If problems occur with your lambda sensor, do not contact us before you have set have set "Simple".

9.2 External Wideband Lambda-Controller

Alternatively, external lambda controllers can also be connected to the OXY1 and OXY2 inputs via a 0-5V signal. To avoid potential shifts, the earth of the UAB and that of the lambda controller must be connected.

When using 2 lambda controllers, we generally recommend the use of identical hardware to minimise deviations due to different measurement errors.