NTK Lambda Sensor

Part Number #57007

Basic Specifications

- Maximum continuous operating temperature is 850 °C
- Maximum temperature for short period is 930 °C (maximum 10 minutes)
- Mounting torque 45 Nm max
- Lifetime estimates:
  Sensor lifetimes are highly dependent on application. Typically sensor lifetime for high performance engines is 500 hours in unleaded fuel and 50 hours in leaded fuel.
  See also Sensor lifetime page 4
- Fuel: Unleaded gasoline, ethanol gasoline blends, methanol, diesel, LNG, CNG, LPG

Other Information

Compatibility

- 'hundred series' ECUs: M400, M600, M800, M880
- PLM - Professional Lambda meter

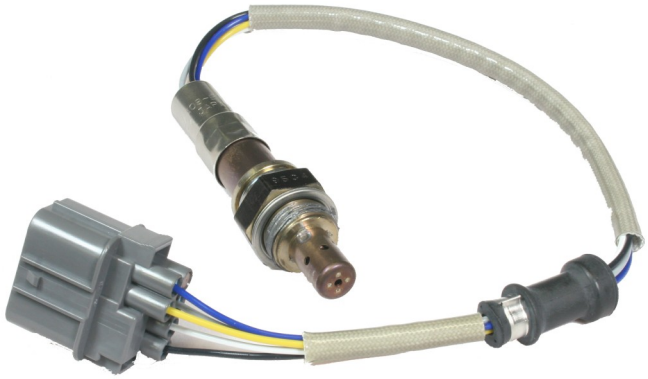
Accessories

- #59001 Mild steel weld-in bung M18x1.5
- #59002 Stainless steel weld-in bung M18x1.5
- #65042 Mating connector
- #61105 Adapter loom (sensor connector to DTM connector)

Complete kit

The complete Lambda kit contains a PLM, NTK Lambda sensor, and all required looms and accessories:

- #15002 kit with short loom - length 2.6 m
- #15002LL kit with long loom - length 6.0 m



The **NTK UEGO** (Universal Exhaust Gas Oxygen) sensor is a 5 wire wideband Lambda sensor. It is used to control fuel and ignition systems to optimize a car's performance in the areas of emissions and fuel economy.

The Lambda sensors can be connected directly to any MoTeC 'hundred series' ECU with a Lambda upgrade enabled. It can also be connected via the PLM to any ECU or Dash Logger.

Lambda gives a measure of the Air to Fuel Ratio (AFR) that is independent of the type of fuel being used.

Lambda 1.00	Stoichiometric ratio: no excess fuel and no excess air
Lambda > 1.00	Lean: excess air
Lambda < 1.00	Rich: excess fuel

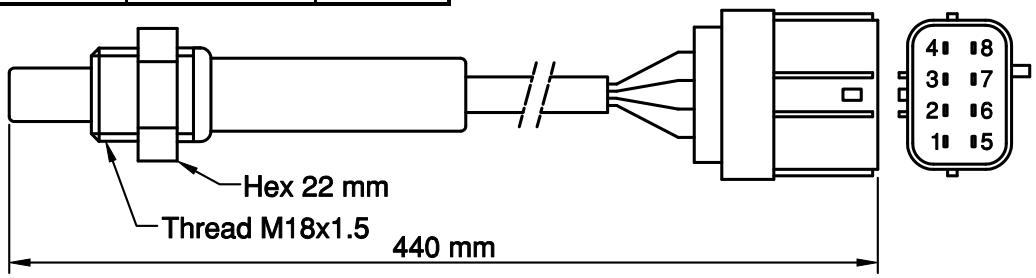
For a quick reference table to convert Lambda to AFR for various fuels see page 3.

MoTeC ECUs allow for a Lambda aim table based on load and RPM. Referencing the measured Lambda, the **Quick Lambda** function in the software adjusts the values in the fuel control table at the specified load and RPM site to achieve the aim Lambda.

Similarly, the **Lambda Was** function adjusts the values in the fuel control table using recorded Lambda measurements from a data log.

Connector and Pinout

8 pin connector Mating connector #65042		
Pin no	**Name**	**Colour**
1	Heater +	Blue
2	Heater –	Yellow
3	Rc	
4	Rc 0 V	
5	NC	
6	Vs	Grey
7	Ip	White
8	Sensor 0 V	Black



Connecting to a 'hundred series' ECU

Lambda sensor		'Hundred series' ECU		
Pin	**Name**	**M400/M600/ M800 Pin**	**M880 Pin**	**Name**
1	Heater +	A_26	23, 32, 41	VBAT
2	Heater –	A_1, A_18, A_23, A_24, A_31, A_32, A_33, A_34	8, 9, 43, 51, 58, 59, 65, 64	Any Aux
3	Rc	NC	NC	
4	Rc 0 V	NC	NC	
6	Vs	B_25	54	LA1–S
7	Ip	B_26	60	LA1–P
8	Sensor 0 V	B_16	27	0V–ENG
When connecting a second Lambda sensor (not available on M400)				
6	Vs	B_12	55	LA2–S
7	Ip	B_13	61	LA2–P

Connecting to a PLM

Lambda sensor		PLM	
Pin	**Name**	**Pin**	**Name**
1	Heater +	M_2	Heater +
2	Heater –	M_7	Heater -
3	Rc	M_3	Rc
4	Rc 0 V	M_5	Common
6	Vs	M_8	Vs
7	Ip	M_4	Ip
8	Sensor 0 V	M_5	Common

Configuration in 'hundred series' ECU

Procedure described for Version 3 software. Configuration in Version 2 software is similar.

1. On the **Adjust** menu, click **Sensor Setup** and then **Input Setup**.
   - Double-click the **Lambda 1 (La1)** channel and in the **Input Source** box, select **Lambda 1.**
   - Click **Predefined**, select **#38 Lambda Internal LSU or NTK** and click **OK** twice.
2. On the **Adjust** menu, click **Sensor Setup** and then **Wideband Lambda Setup**.
   - Click **Sensor Type** and enter **2** (NTK Normal) or optional **4** (NTK Fast Heat).
   - Click **ESC**, then click **Calibration Number** and enter the number as explained on screen.
   - Click **ESC,** then click **Quick Lambda MODE** and enter the number as explained on screen.
3. On the **Adjust** menu, click **Auxiliary Output Functions**
   - Click **Auxiliary Out #X -** choose the number of the output to which the sensor heater is connected.
   - Enter **9** (Lambda Sensor Heater) and click **ESC.**
   - Click **Parameters** and enter **1** for Lambda 1.

Repeat the configuration for a second Lambda sensor if required (not available in M400).

Lambda versus Air Fuel Ratio

Examples of typical values.

Lambda	Air Fuel Ratio				
	Gasoline	Methanol	E85 blend	Diesel	LPG
0.70	10.3	4.5	6.8	10.2	10.9
0.75	11.0	4.8	7.3	10.9	11.6
0.80	11.8	5.1	7.8	11.6	12.4
0.85	12.5	5.4	8.3	12.3	13.2
0.90	13.2	5.8	8.8	13.1	14.0
0.95	14.0	6.1	9.3	13.8	14.7
1.00	**14.7**	**6.4**	**9.8**	**14.5**	**15.5**
1.05	15.4	6.7	10.3	15.2	16.3
1.10	16.2	7.0	10.8	16.0	17.1
1.15	16.9	7.4	11.2	16.7	17.8
1.20	17.6	7.7	11.7	17.4	18.6
1.25	18.4	8.0	12.2	18.1	19.4
1.30	19.1	8.3	12.7	18.9	20.2
1.35	19.8	8.6	13.2	19.6	20.9
1.40	20.6	9.0	13.7	20.3	21.7
1.45	21.3	9.3	14.2	21.0	22.5
1.50	22.1	9.6	14.7	21.8	23.3
1.55	22.8	9.9	15.1	22.5	24.0
1.60	23.5	10.2	15.6	23.2	24.8

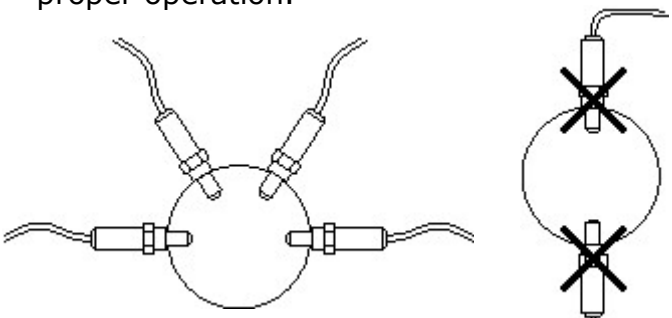
Lambda Sensor Installation

Note: The Lambda sensors are factory calibrated with a trimming resistor embedded in the sensor connector. If this connector is cut off and replaced the sensor will require a free air calibration.

The Lambda sensor should be fitted to the exhaust system with the sensor tip protruding into the exhaust gas flow.

Considerations when fitting a sensor:

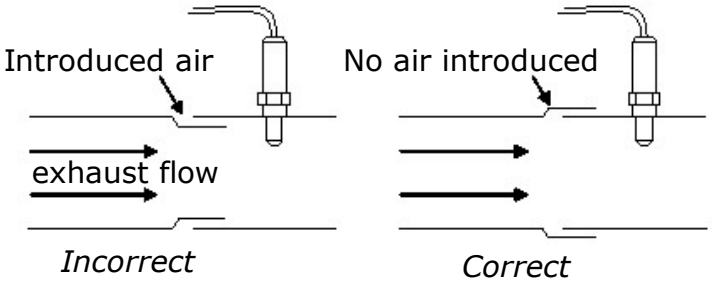
- Place the sensor on an angle between 10 and 90 degrees to the vertical with the tip of the sensor pointing down to prevent condensation build up between the sensor case and the sensor ceramic.
- Do not place the sensor in a vertical position; excess heat soak will prevent proper operation.



Correct *Incorrect*

- Place the sensor at least 1 meter from the exhaust ports to avoid excessive heat (recommended).
- Place the sensor at least 1 meter from the open end of the exhaust system to avoid incorrect readings due to outside oxygen (recommended).
- Place the sensor away from the flame front coming out of the cylinder head and away from areas where one cylinder may have more effect than another.
- If possible, do not place the sensor near exhaust slip joints; some designs allow air to enter resulting in incorrect readings.

If the sensor has to be placed near a slip joint, reverse the slip joints to reduce the influence of introduced air.



Incorrect *Correct*

Sensor Warm-up

The internal heater in the sensor is powerful enough to allow accurate measurement when the exhaust gas temperature is at room temperature. The sensor will take approximately 20 seconds to heat up.

The maximum continuous operating temperature of the sensor is 850 °C. Sensors should not be used at higher temperatures for a prolonged period. The sensor can be heated to 930 °C for a maximum of 10 minutes, but this may reduce the accuracy.

Sensor Lifetime

Sensor lifetimes are highly dependent on application for example the type of fuel used and the volume of gas flow over the sensor.

Some factors that reduce sensor lifetime are:

- Contaminants such as silicon, lead, oil, etc. (use sensor-friendly sealants)
- Thermal cycling and exposure to exhaust fumes without any heating control active
- Incorrect placement in the exhaust that can overheat the sensor
- Leaded fuel – substantially reduces lifetime
- Water jacketed exhaust manifolds as in PWCs – substantially reduces lifetime

At the end of its life the sensor becomes slow to respond and does not read rich properly. Regular free air calibrations will maintain the accuracy of the sensor over its lifetime.