

SAFR

STANDALONE AIR/FUEL RATIO



**KNOW YOUR MACHINE.
SEE HOW IT WORKS.**

The days of Dyno dependency are over. AFR data viewing, in real driving situations, is the new standard. Troubleshoot in minutes with the **SAFR**, a plug and play diagnostic tool from Dobeck Performance. The **SAFR** provides a simple analog gauge with a wideband O2 system that displays the vehicle's AFR values and allows riders to fully understand how their vehicle is running.

The SAFR is **NOT** intended to be a permanent installation.

The unit is fully compatible with all vehicles.

- Carbureted or Fuel Injected
- 2 stroke or 4 stroke

PARTS LIST

RETURNABLE ITEMS:

- AFR GAUGE
- WIDEBAND CONTROLLER
- BOSCH O2 SENSOR
- OXYGEN SENSOR CHAMBER
- EXHAUST PROBE
- POWER UP HARNESSSES (4x)
- SUCTION CUP MOUNT
- DRILL BIT (25/64)
- NUT INSERT TOOL

CONSUMABLES:

- VELCRO PATCHES & STRAP
- NUT INSERTS/COPPER WASHERS
- ALLEN HEAD BOLT

**PLEASE READ ALL INSTRUCTIONS BEFORE STARTING
INSTALLATION. BE SURE YOUR VEHICLE IS COLD.**

Check out updated information at www.SAFRtool.com.

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PICTURES OF KIT CONTENTS



DOBECK AFR GAUGE



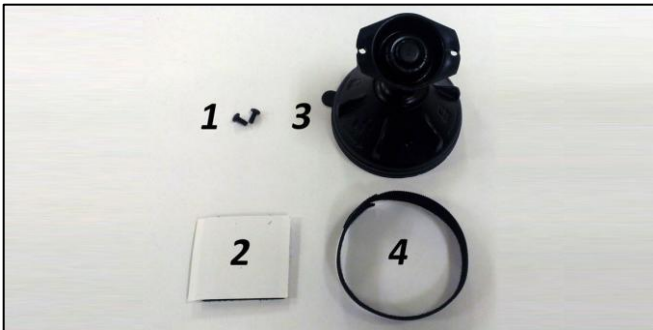
DOBECK WIDEBAND CONTROLLER



WIDEBAND BOSCH O2 SENSOR



DOBECK OXYGEN SENSOR CHAMBER



- 1). TWO MOUNT SCREWS
- 2). VELCRO PATCHES
- 3). SUCTION CUP MOUNT
- 4). VELCRO HARNESS STRAP

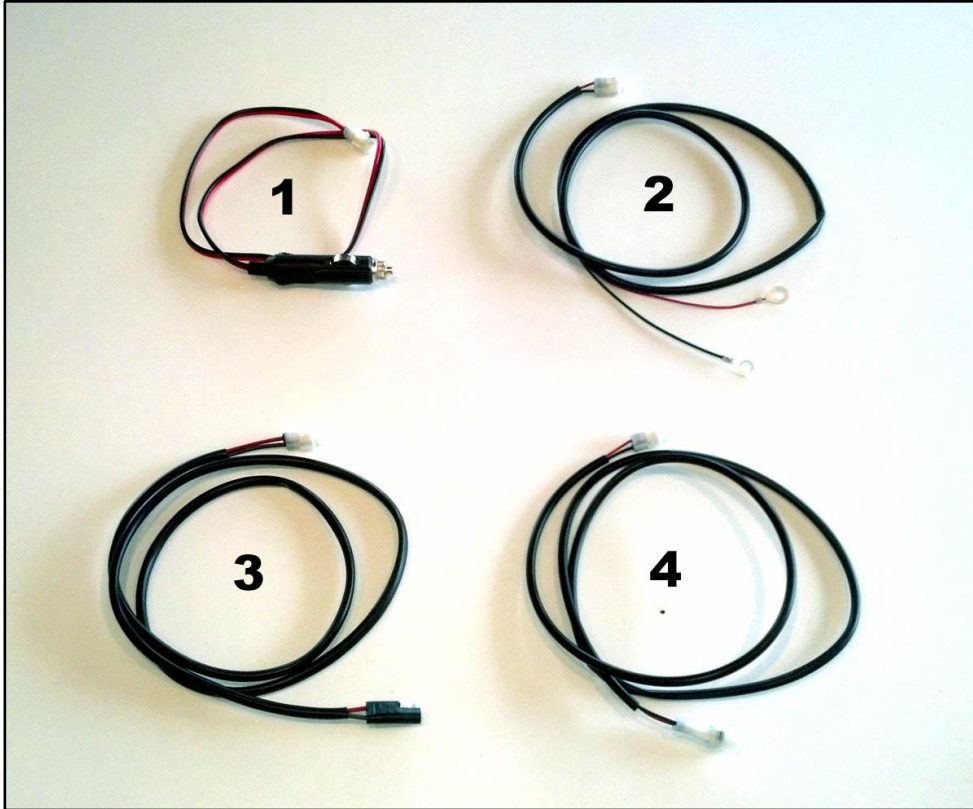


- 1). INSERTS/BOLTS/WASHERS
- 2). 25/64 INCH DRILL BIT
- 3). NUT INSERT TOOL



DOBECK EXHAUST PROBE

PICTURES OF POWER-UP HARNESSSES



- 1). CIGARETTE LIGHTER
- 2). 12V BATTERY DIRECT
- 3). BATTERY TENDER
- 4). POWER EXTENSION

GENERAL TERMINOLOGY EXPLANATIONS

Air Fuel Ratio (AFR) - The most common reference term used for mixtures in internal combustion engines. It is the ratio between the mass of air and the mass of fuel in the air-fuel mix at any given moment.

Oxygen (O₂) sensor - Is an electronic device that measures the proportion of oxygen (O₂) in the exhaust gas.

Wideband vs. Narrowband sensors – A narrowband O₂ sensor is only calibrated to know whether the current AFR is rich, lean, or stoic. A wideband O₂ sensor is much more sophisticated and can supply the exact AFR measurement across a wide range of possible AFR values.

Open loop vs. Closed loop – Open loop means NO fuel trimming is occurring based on the O₂ sensor signal. Closed loop is using the O₂ sensor input signal to react rapidly to the changing conditions and make fuel trims to match the desired air-fuel mixture.

Naturally Aspirated (4 Stroke)

Cruise AFR - 13.5 - 14.5* AFR

Acceleration AFR - 12.0 - 13.0* AFR

Full Throttle AFR - 12.0 - 13.0* AFR

*Optimal AFR will change based on Forced Air Induction vs Naturally Aspirated and Fuel Types

INSTALLATION INSTRUCTIONS – WATCH INSTALL VIDEO ON WEBSITE!

1. Make sure vehicle is cool to the touch before proceeding.
2. Locate optimal spot for installation of the **Nut Insert** and **Oxygen Sensor Chamber** on the exhaust. For a 2-stroke engine, the O2 sensor should be placed at least six inches from the cylinder, as well as, before the constriction of the expansion chamber. In 4-stroke engines, the O2 sensor should be placed at least six inches away from the cylinder, as well as, before the slip on exhaust or baffles. If you have a two into one exhaust system, an ideal place for mounting the SAFR air chamber is right where the two pipes join into one. Allow room for a drill and drill bit.
3. Once the installation spot is located then mark using a punch and hitting with a hammer. This should leave a dimple on the exhaust pipe.
4. Drill a 1/4 inch pilot hole in marked location. Drill hole using the 25/64 inch **Drill Bit** from the package. **To prevent shavings from falling into exhaust pipe apply grease to the drill bit.** Deburr edges with file if necessary.
5. Grab one **Nut Insert** from the bag of parts. Thread the **Nut Insert** onto the **Insert Tool**. Press the **Nut Insert** into the hole drilled in the exhaust pipe.
6. With **Insert Tool** and **Nut Insert** pressed into the exhaust pipe use a 9/16 inch wrench to hold the tool and 7/16 inch socket/wrench to tighten the bolt. Tightening the bolt will squeeze the **Nut Insert** into the pipe similar to a rivet. The **Nut Insert** is installed all the way once the bolt gets hard to turn. Now back off the bolt and remove the **Insert Tool**.
7. Take the **Exhaust Probe** and screw this piece into the **Nut Insert** in the exhaust pipe. Use the nut on the **Exhaust Probe** to determine the depth to allow the probe to enter the exhaust pipe. **NOTE: MAKE SURE TO HAND TIGHTEN THE EXHAUST PROBE IN PLACE SUCH AS THE SCOOP SIDE ON THE PROBE (INDICATED BY THE DIRECTIONAL NOTCH), FACES UP THE EXHAUST FLOW!!**
8. Take the **Oxygen Sensor Chamber** and remove the brass fitting at the end of the pipe. **BE SURE TO NOT LOSE THE BUSHING INSIDE THE FITTING.** Place the brass fitting and the bushing over the **Exhaust Probe** and hand tighten the Chamber into place.
9. Take the **Wideband Sensor** and thread it into the **Oxygen Sensor Chamber**. Using a crescent wrench and a 7/8 inch wrench lightly tighten the **Wideband Sensor**.
10. Carefully bend the tubing into a position that is out of the way. **Position the Chamber so the O2 Sensor is pointing straight up.**
11. Now go back and tighten the brass fitting with 1/2 inch wrench while holding it with a 7/16 inch wrench.
12. Find an appropriate spot for the **Suction Cup Mount**. Recommended location should be visible while riding, flat, and smooth. Lock the **Mount** onto the surface by pressing down on the top and turning the base. Pull on the **Mount** to ensure it is securely fastened to the vehicle. The included adhesive Velcro may also be used.
13. Attach the **Wideband AFR Gauge** to the **Suction Cup Mount** by using the two Black Phillips **Mount Screws**.
14. Plug the **Wideband AFR Gauge** into the **Wideband Sensor** and secure any extra wire with the **Velcro Strap** provided.
15. Decide what **Power Up Option** will work for the vehicle. The **Power Extension** can be used to extend any of the power up options.
 - a. **Cigarette Lighter Option** will plug into any common accessory plug ins.
 - b. **Battery Tender Option** will plug in to all most all Harley Davidson Battery tender plugs located underneath the seat.
 - c. **12V Battery Option** will attach directly to the battery on the vehicle. Red(+) and Black(-)
16. Plug male white connector from **Power Up Option** into the female white connector on **Wideband Gauge**.

PLEASE DISCONNECT POWER UP OPTION FROM VEHICLE WHEN NOT IN USE.

GAUGE FUNCTIONALITY

When the SAFR is powered up the needle on the AFR Gauge will sweep across the face. This is when the Wideband O2 Sensor is being warmed up. The warm up cycle will take approximately 10-20 seconds. After the warm up cycle is finished the Gauge will display the AFR of the vehicle and the Green LED will be on.

NOTE: THE BUTTONS AND LEDS DO NOT AFFECT THE FUNCTION OF THE GAUGE IN USE AS A SAFR.

IMPORTANT

While driving you will notice the needle at times go all the way to the lean side of the gauge. **THIS IS A NORMAL DRIVING CONDITION.** Almost all vehicles SHUT OFF the injectors when letting off the throttle to start de-accelerating. AFR values are only displayed while cruising or accelerating.

USE OF THE SAFR

The SAFR is simply a DIAGNOSTIC TOOL. The SAFR can not be used to adjust the fueling to target your desired AFR. A separate EFI controller or carb jet kit is required to make fuel changes to actually tune your vehicle.

Air/Fuel Mixture and Characteristics

AFR	Comment
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6.0	Rich burn limit (fully warm engine)
9.0	Black smoke / low power
11.5	Approximate rich best torque at wide-open throttle
12.2	Safe best power at wide-open throttle
13.3	Approximate lean best torque
14.7	Stoich AFR (chemically ideal)
15.5	Lean cruise
22.0	Lean burn limit

Recommended AFR values to target under different driving conditions - Naturally Aspirated (4 Stroke)

Cruise AFR - 13.5 - 14.5* AFR (13.5 provides better torque – 14.5 provides better fuel mileage)

Acceleration AFR - 12.0 - 13.0* AFR

Full Throttle AFR - 12.0 - 13.0* AFR

*Optimal AFR will change based on Forced Air Induction vs Naturally Aspirated and Fuel Types

REMOVAL OF SAFR

1. To remove the SAFR repeat installation instructions in reverse order. Use a 1/2 inch wrench and loosen brass fitting off the exhaust pipe. If the screw doesn't come out of the exhaust pipe with the brass fitting then use a 7/16 inch wrench to remove fitting out of exhaust.
2. Take **Allen Bolt** and **Washer** from the bag of parts and install into the **Nut Insert** in the exhaust pipe to plug hole.
3. **RENTAL CUSTOMERS - Please place all returnable items from Page 1 back in the box. Items on Page 1 under Consumables do not have to be returned. You will be charged for any unreturned non-consumable items.**

WARRANTY

This product holds a warranty of one year from original date of purchase against defects in materials or workmanship. The customer must provide a valid proof of purchase to obtain the benefits of the warranty. Any modifications of the unit (cut wires, soldered wires, extensive abuse, etc.) will void the warranty. A customer must call tech support and obtain a RMA number before sending in a unit for warranty claim. A unit may be repaired or replaced at the discretion of the manufacturer.

RENTAL CUSTOMERS – CHECK LIST FOR PARTS TO RETURN

Part Description	Cost	Checkbox
Dobeck AFR Gauge	\$100.00	
Dobeck Wideband Controller	\$100.00	
Bosch 4.2 O2 Sensor #17018	\$62.00	
Nut Insert Tool	\$15.00	
Suction Cup Mount	\$15.00	
25/64 Inch Drill Bit	\$10.00	
Dobeck Oxygen Sensor Chamber	\$50.00	
Dobeck Exhaust Probe	\$10.00	
12V Battery Direct Power-Up Harness	\$10.00	
Cigarette Lighter Power-Up Harness	\$10.00	
Battery Tender Power-Up Harness	\$10.00	
Power-Up Extension Harness	\$10.00	