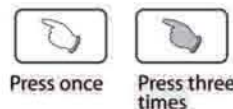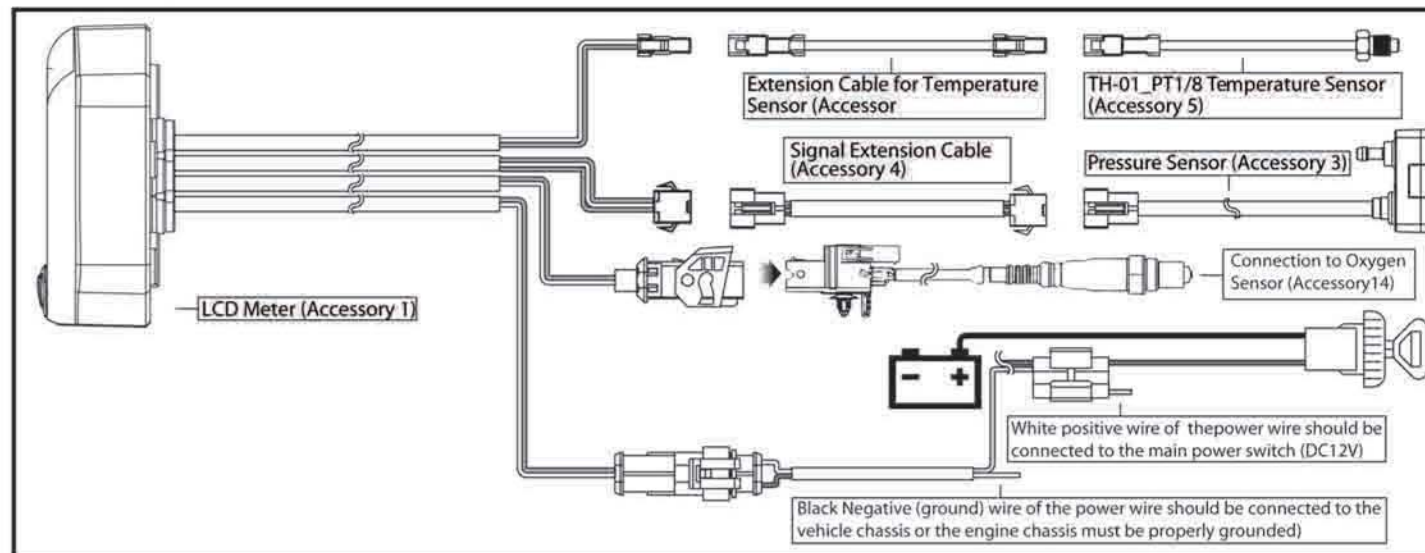Thanks for purchasing our X-2 meter. Before operating this unit, please read carefully these instruction sheets and retain them for future reference.

⚠ Precautions

1- This meter has been designed to work on 12 volts DC applications only. Make sure the power do not exceed 18 volts DC otherwise this might damage the instrument.
2- For proper installation, please follow the steps describes in these instruction sheets. Any damages caused by wrong install ation shall be imputed to the users.
3- Do not disassemble or change any parts.
4- To avoid short circuit, do not pull the wires out of the terminals.
5- The interior examination or maintenance should be executed by our professionals only. Opening the instrument will void the warranty.
6- While riding the vehicle, do not attend to change the settings of the instrument to avoid injuries to yourself or others.

NOTE Some procedures must be followed to avoid damage to the instrument.

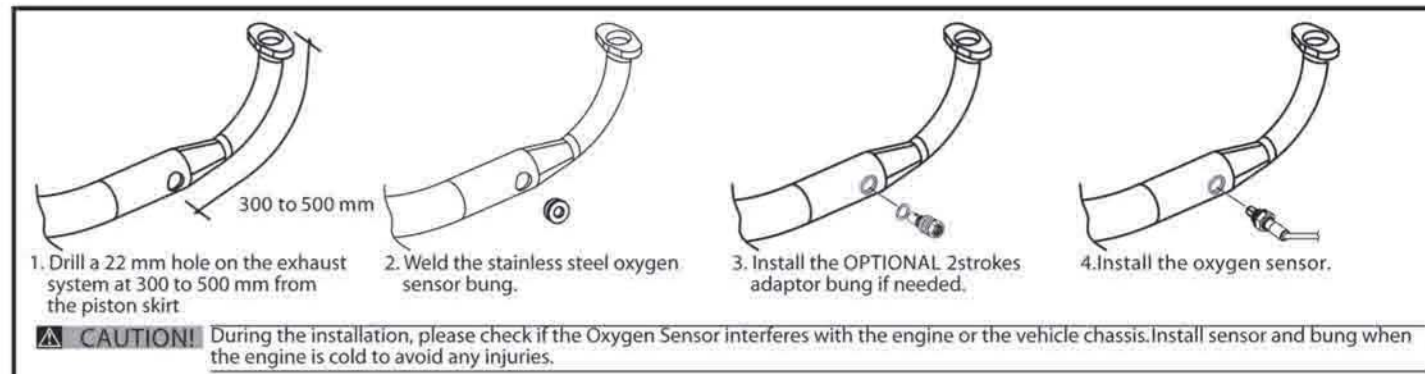⚠ **WARNING!** Some procedures must be followed to avoid injuries to yourself and others.

⚠ **CAUTION!** Some procedures must be followed to avoid damages to the vehicle

Press once   Press three times
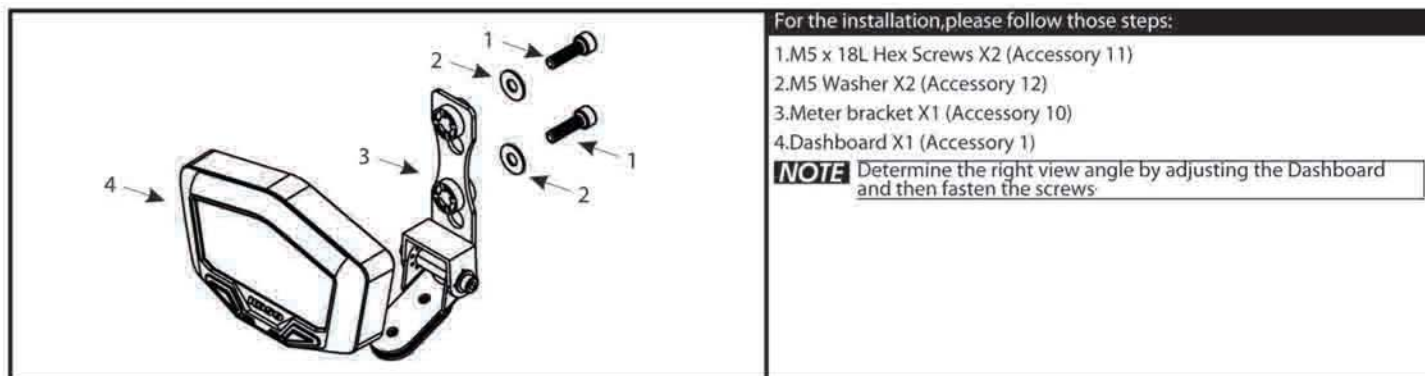
1-1 Accessories

1 Meter X1	2 Power wire X1	3 Pressure Sensor X1	4 Signal Extension Cable X1
5 1/8 NPT Temperature Sensor X1	6 Extension Cable for Temperature Sensor X1	7 Hose X1	8 Hose Clamps X2
9 M6 x P1.0 Hex Screws X2	10 Dashboard Mounting Bracket (x1)	11 M5 x 18L Hex Screws X2	12 M5 Washers X2
13 Jumper Terminals X2	14 Boost O² Sensor X1		

NOTE Contact your local distributor if the items listed above are not the same as the one received.

2-1 Wiring Installation

Extension Cable for Temperature Sensor (Accessor
TH-01_PT1/8 Temperature Sensor (Accessory 5)
Signal Extension Cable (Accessory 4)
Pressure Sensor (Accessory 3)
Connection to Oxygen Sensor (Accessory14)
LCD Meter (Accessory 1)
White positive wire of thepower wire should be connected to the main power switch (DC12V)
Black Negative (ground) wire of the power wire should be connected to the vehicle chassis or the engine chassis must be properly grounded)

2-2 Installation of Oxygen sensor and bung.

1. Drill a 22 mm hole on the exhaust system at 300 to 500 mm from the piston skirt
2. Weld the stainless steel oxygen sensor bung.
3. Install the OPTIONAL 2strokes adaptor bung if needed.
4. Install the oxygen sensor.

300 to 500 mm

⚠ **CAUTION!** During the installation, please check if the Oxygen Sensor interferes with the engine or the vehicle chassis.Install sensor and bung when the engine is cold to avoid any injuries.

2-2 Bracket Installation

For the installation,please follow those steps:
1.M5 x 18L Hex Screws X2 (Accessory 11)
2.M5 Washer X2 (Accessory 12)
3.Meter bracket X1 (Accessory 10)
4.Dashboard X1 (Accessory 1)
NOTE Determine the right view angle by adjusting the Dashboard and then fasten the screws.

3-1 Screen Functions

Warning Indicator for low AFR (LEAN)
Setting Range:14.7 ~ 24.0
Setting Unit:0.1

The settingva lue for the AFR indicator is14.7 as the standardvalue. When the setting value isloweror higher than the standar dvalue,the LEAN or RICH warning indicators will turn on.

Warning Indicator for high AFR (RICH)
Setting Range:9.0~14.7
Setting Unit:0.1

Temperature Meter
Display Range:0.0~250.0 °C (32.0 ~ 482.0 °F)
Display Unit:0.1°C (°F)

Warning Indicator for Over-temperature
Setting Range:60.0~250.0 °C (140.0~482.0°F)
Setting Unit :1 °C (°F)

Warning Indicator for Pressure
Positive Pressure Setting Range: 1.0 30.0 PSI
Negative Pressure Setting Range: -1.0 -30.0 PSI
Setting Unit: 1 PSI

Level Display for AFR
Display Range:9~21
Display Unit:0.2
Level Display for Pressure (15 psi)
Display Range:± 0~15 PSI
Display Unit:0.5 PSI
Level Display for Pressure (30PSI)
Display Range:±0~30 PSI
Display Unit:1 PSI

Digital Display for AFR	Digital Display for Pressure
Display Range: 9~24	Display Range: ± 0.0~30 .0 PSI
Display Unit:0.1	Display Unit:0.5 PSI

AFR Meter	Display Range: 9.0 24.0, flashes when the current value exceed the set value. Display Unit:0.1		Thermometer	Display Unit :°C /°F Switchable
AFR Level Display	Display Range:9~21		Temperature Gauge	Display Range:0.0~250°C (32.0~482.0 °F) Flashes when the current value exceed the set value Display Unit: 0.1°C (°F)
	Display Unit:0.2			
AFR Warning Indicator	Setting Range for RICH:9.0~14.7 (when the AFR value is lower than this setting,the RICH Warning Indicator will turn ON.) Setting Range for LEAN (when the AFR value is higher than this setting,the LEAN Warning Indicator will turn ON.) Setting Unit:0.1		Temperature Warning Light	Setting Range:60.0~250.0°C (140.0~482.0 °F) Flashes when the current value exceed the set value Display Unit: 0.1°C (°F)
			Backlight voltage	DC 12V
			Temperature range of body	-10~+60°C
Pressur Meter	Display Range:±0.0~30.0 PSI flashes when the current value exceed the set value. Display Unit:0.5 PSI		Body specifications	JIS D 0203 S2
			Dimensions	100 X 60 X 20 mm
			Weight	Approx 200g
Pressure Level Display	Display Range:± 0~15PSI Display Unit:0.5 PSI Display Range:± 0~30PSI Display Unit:1 PSI		Indicators	⊙ AFR (Green) ⊙ Pressure (Red) ⊙ High AFR (Red) ⊙ Temperature (Red) ⊙ Low AFR (Red)
Pressure Warning Indicator	Positive Pressure Setting Range:1.0 ~ 30.0 (when the pressure is higher than the positiv epressure setting,the warning indicator will turn ON.) Negative Pressure Setting Range:-1.0 ~ -30.0 (when the pressure is lower than the negative pressure setting the warning indicator will turn ON.) Setting Unit:1 PSI			

NOTE Design and specifications are subject to change without notice.

4-1 Adjust Button Operation

In the AFR screen, press the Adjust button to enter the Pressure screen.

NOTE When the display is in the Pressure screen,press the Adjust button to enter the ATR sereen.

AFR Screen

In the Pressure screen, press the Adjust button to enter the AFR screen. Press and hold the Adjust button for 3 seconds to enter the Pressure Level Range screen.

4-2 Select Button Operation

In the AFR screen, press the Select button to enter the peak AFR (LEAN) record screen. In the startup screen, press and hold the Selectbutton for 3 secondsto switch between the temperature units.

In the peak AFR (LEAN) screen, press the Select button to enter the peak AFR (RICH) record screen.

⚠ CAUTION! In the peak record screen,the temperature indicator may display the current peak record.

In the peak AFR (RICH) screen, press the Select button to return to the startup screen.

Startup screen

In the Pressure screen, press the Select button to enter the peak positive pressure record screen.

In the peak positive pressure screen, press the Select button to enter the peak negative pressure record screen.

In the peak negative pressure record screen, press the Select button to return to the Startup screen.

Startup screen

4-3 Adjust + Select Buttons Operation

In the Startup screen, press and hold the Adjust + Select buttons at the same time for 3 seconds to enter the setting screen (please refer to Section 5-1 Settings) Press the Adjust button to select the function screen that need to be configured

Startup screen   Temperature Setting Screen   AFR Setting Screen   Pressure Setting Screen

5-1 Function Settings

In the Startup screen, press and hold the Adjust+Select buttons at the same time for 3 seconds to enter the Setting Screen.

Press the Select button to enter the Over-temperature Warning Setting

Example: set the over-temperature warning at 68 C°
Press the Adjust button to adjust the setting value

⚠ Press the Select button to move the cursor to the level to be configured.

NOTE Temperature Setting Range : 60~250°C (140~482°F)

Example:The over-temperaturesetting value is now configured from 60 °C to 68 °C.
Press the Select button to return to the temperature setting screen.

Press the Adjust button to enter the AFR Warning setting screen

PresstheSelect Button to enter the AFR RICH warning setting.

Example:to configur e the AFR RICH Warning setting at 13.
Press the Adjust button to set the needed value.

⚠ Press the Select button to move the cursor to the level to be changed.

NOTE AFR RICH Setting Range:9.0 to 14.0

Example:to configure the AFR RICH Warning setting from 10 to 13
Press the Select button to enter the AFR LEAN Warning setting screen.

Example:to configure the AFR LEAN Warning setting at 18.7.
Press the Adjust button to set the value to be changed

⚠ Press the Select button to move the cursor to the level to be configured.

NOTE ATR LEAN S etting Range:14.7 to 24

Example:to configure the AFR RICH Warning setting from 14.7 to 18.7.
Press the Select button to reture to the AFR Warning setting screen.

Press the Adjust button to enter the Pressure Warning setting screen.

Press the Select button to enter the Negative Pressure Warning Setting screen.

Example:to configure the Pressure Negative Pressure Warning setting at 10.
Press the Adjust button to set the needed value.

⚠ Press the Select button to move the cursor to the level to be configured.

NOTE Negative Pressure Setting Range:-1.0 to -30.0

Example:to configure the Negative Pressure Setting from-30 to -10.
Press the Select button to reture to the Positive Pressure Warning Setting screen.

Example:to configure the Positive Pressure Warning setting at 15.
Press the Adjust button to set the needed value to be configured.

⚠ Press the Select button to move the cursor to the level to be configured.

NOTE Positive Pressure Setting Range:1.0 to 30.0

Example:to configure the Positive Pressure Warning setting from 10 to 15.
Press the Slect button to reture to the Pressure Warning Setting screen.

Press the Adjust button to reture to the Startup screen.

Startup screen.

6 Troubleshooting

If you encounter operational failure,please check the following steps. If the problem still occur,please contacy your KOSO dealer.

Problem	Cause
The Dashboard has nothing displayed.	The power wire is not properly connected.
The AFR value is not displayed.	The Signalwire for the Oxygen Sensor is not properly connected. Please check if the Signal Wire for the Oxygen Sensor is properly connected.

Problem	Cause
The Temperature is not displayed.	The Signal wire for the Temperature Sensor is not properly connected. Please check if the Signal wire for the Temperature Sensor is properly connected.
The Pressure is not displayed.	The signal cable for the pressure Sensor is not properly connected. Please check if the Signal wire for the pressure Sensor is properly connected.

wh029ba003

Wide band Air Fuel ratio meter

Instruction manual

Warning

This Wide Band air/fuel gauge must be installed by a certified mechanic. Koso North America is not responsible for any damages that might be cause to the vehicle or it's users.

● Do not cut or modify the sensor or wiring harness.
● Do not connect or disconnect the sensor when the instrument is working.
● Do not apply voltage above 18 volts DC.
● Do not open or modify the instrument or sensor.
● This instrument should be used as a tuning tool or race instrument.
● Connect the instrument only on DC power.
● Due to the nature of it's use, the BOSCH LSU4.2 sensor is not covered by any warranty.
● Koso air/fuel ratio instrument is covered for any manufacturing defect for a period of 6 months following the date of purchase.

Facts about Air/fuel ratio

The first role of and oxygen sensor is to communicate to the ECU or the gauge if the engine is running lean or rich. The goal is to have the motor run at 14.7 parts of air for 1 part of fuel (Lambda 1). Having the engine running at 14.7 to 1 would represent the optimal exhaust combustion.

Oxygen sensor facts

The Koso Wide Band air/fuel ratio meter is currently using the BOSCH LSU4.2 sensor. The 5 wires Wide Band oxygen sensor is the most accurate sensor on market. This sensor is able to read between 10.0 to 24.0 to 1. The operating temperature of the sensor should not exceed 1 700 degree F. Using the sensor with leaded fuel or on 2 strokes engine will shorten the life of the sensor. Using a sensor bung adaptor will help extend the life of the sensor.

Calibration of the instrument

Each BOSCH LSU 4.2 oxygen sensor is individually laser trimmed with is own value for better results. The LSU 4.2 sensor is using a unique "breather" system located on the connector (figure 1) to calibrate himself. This mean the sensor is self calibrating with the ambient air so there is no need to calibrate the sensor. This process replace the "free air" calibration procedure when changing the sensor or using the unit on another exhaust system was needed. It would be very important not to block the cap above the breather (figure 2)due to the fact that the sensor is self calibrating by "breathing" air from this hole.

Breather

Figure 1

Cap

Figure 2
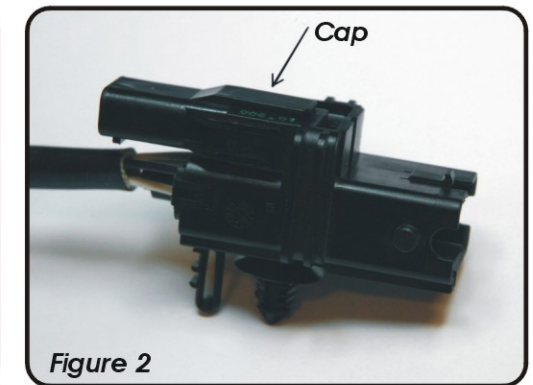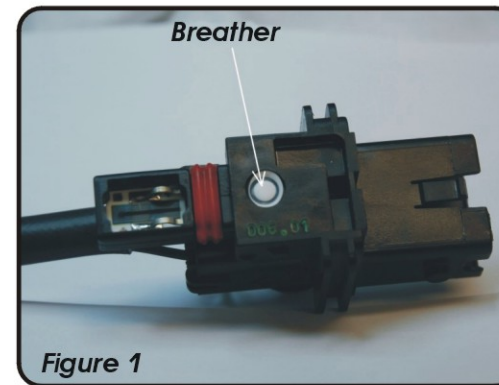
Oxygen sensor installation

According to the oxygen sensor manufacturer, for better results, the sensor should be installed at the warmest location on the exhaust system. This would usually represent the first part of the exhaust which would be **300 to 500 millimeters** from the piston skirt (figure 3). On a 2 strokes engine, it is strongly recommended to use a sensor bung adaptor to lower the impact of oil contamination (figure 4) on the O2 sensor. The sensor should be assembly with high temperature non permanent grease and tighten at 40-60 Nm. The use of cleaning fluids at the sensor plug is not permitted. Avoid any water or condensation on the tip of the sensor otherwise it might damage the internal components. Sensor must be installed with an angle of at least 10 degree (figure 5). Thus preventing the collection of liquids between sensor housing and sensor element during the cold start phase.

Figure 4

300 to 500 mm from piston skirt

Figure 3

Minimum 10° degree angle

Minimum 10° degree angle

Figure 5