# KDS-Pro
# Knock Detection System
# User's Manual

**Version 1.0**

**(2010.8)**

## - Check the components -

1) KDS-Pro
2) SENSOR, WASHER
3) MAIN HARNESS
4) LOGGER HARNESS
5) LED FLASHER
6) USER'S MANUAL

## - Introduction -

KDS-Pro can detect knocking by using the plug seat pressure sensor (Plug sensor) inserted between spark plug and cylinder head. If knocking occurred, pressure in cylinder becomes too high. This high pressure could cause serious damage inside the cylinder. If you could detect the knocking, you can change the setting before engine damaged seriously. KDS-Pro analyzes the pressure level of knocking and count the number of knocking occurred.

1) Knocking detection using plug seat pressure sensor.
2) Detect two knocking level (high and low).
3) Two color LED flasher to tell knocking occurred.
4) Peak and average pressure of knocking are logged.
5) Output to DATA LOGGER.
6) Size 70x50x20mm, Weight 100g.
7) Supply power voltage range is 10-16V.
8) Max power consumption 12V 100mA (When backlight and flasher are active).

## - Caution -

1) Proper setting must be changed by every engine spec and tuning type. KDS-Pro might not work correctly when setting is not enough. Please read well the user's manual and set up properly according to order.

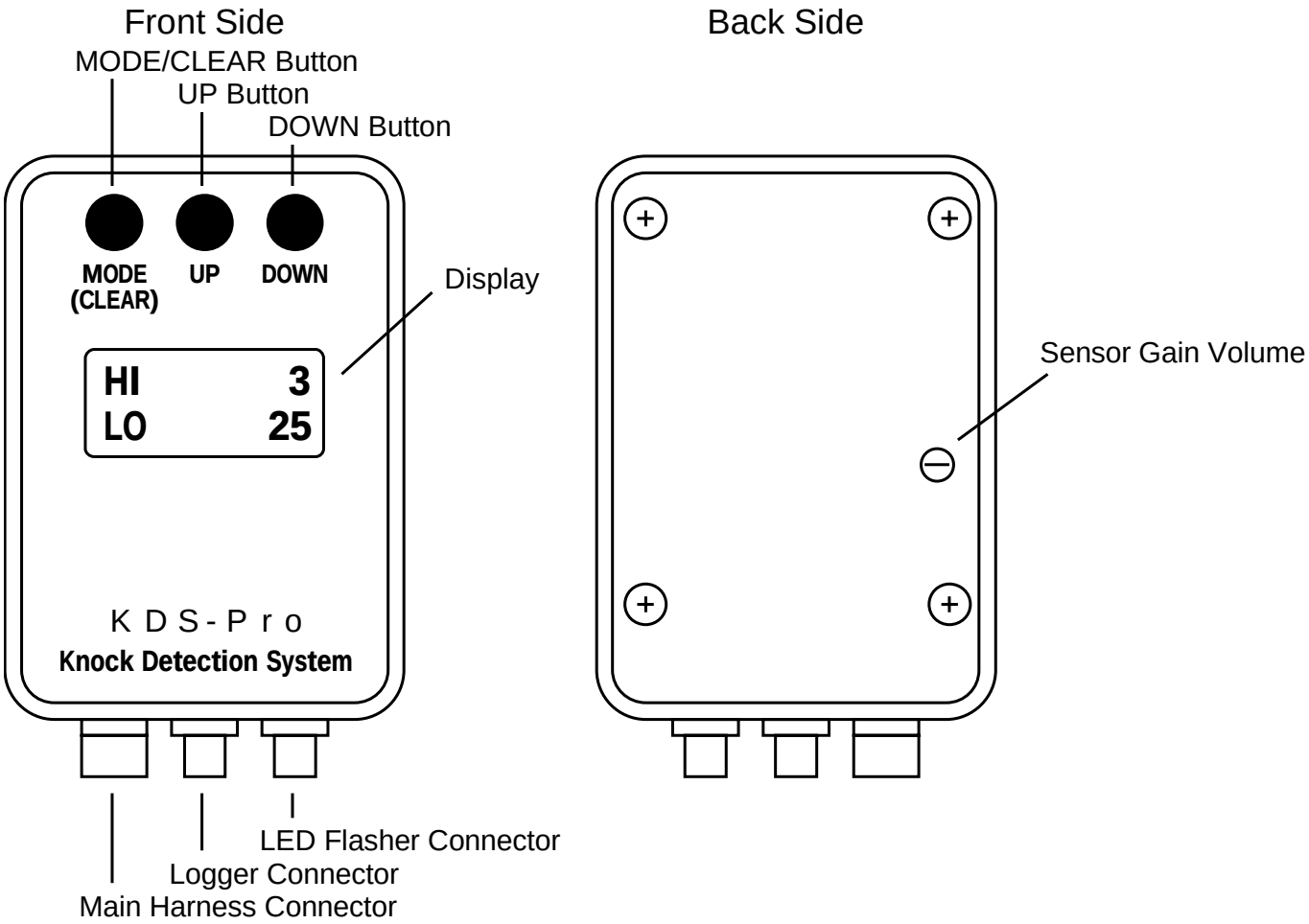
2) Plug pressure sensor can be used only for plugs which diameter is 14mm.
Spark plug must be fixed with 2.5kgf/m of torque.

3) Don't disassemble KDS-Pro.

4) Check the harness carefully. If you break the harness, KDS-Pro doesn't work properly.

5) Don't get gasoline or organic solvent on KDS-Pro and harness. Plastic might dissolve.

## - Component detail -




1) MODE/CLEAR button
   Change mode. Clear counted number.

2) UP button
   Increase value (High/Low Level Setting). Max 63

3) DOWN button
   Decrease value (High/Low Level Setting). Min 5

4) Sensor Gain volume
   Adjustment of sensor gain (sensitivity).

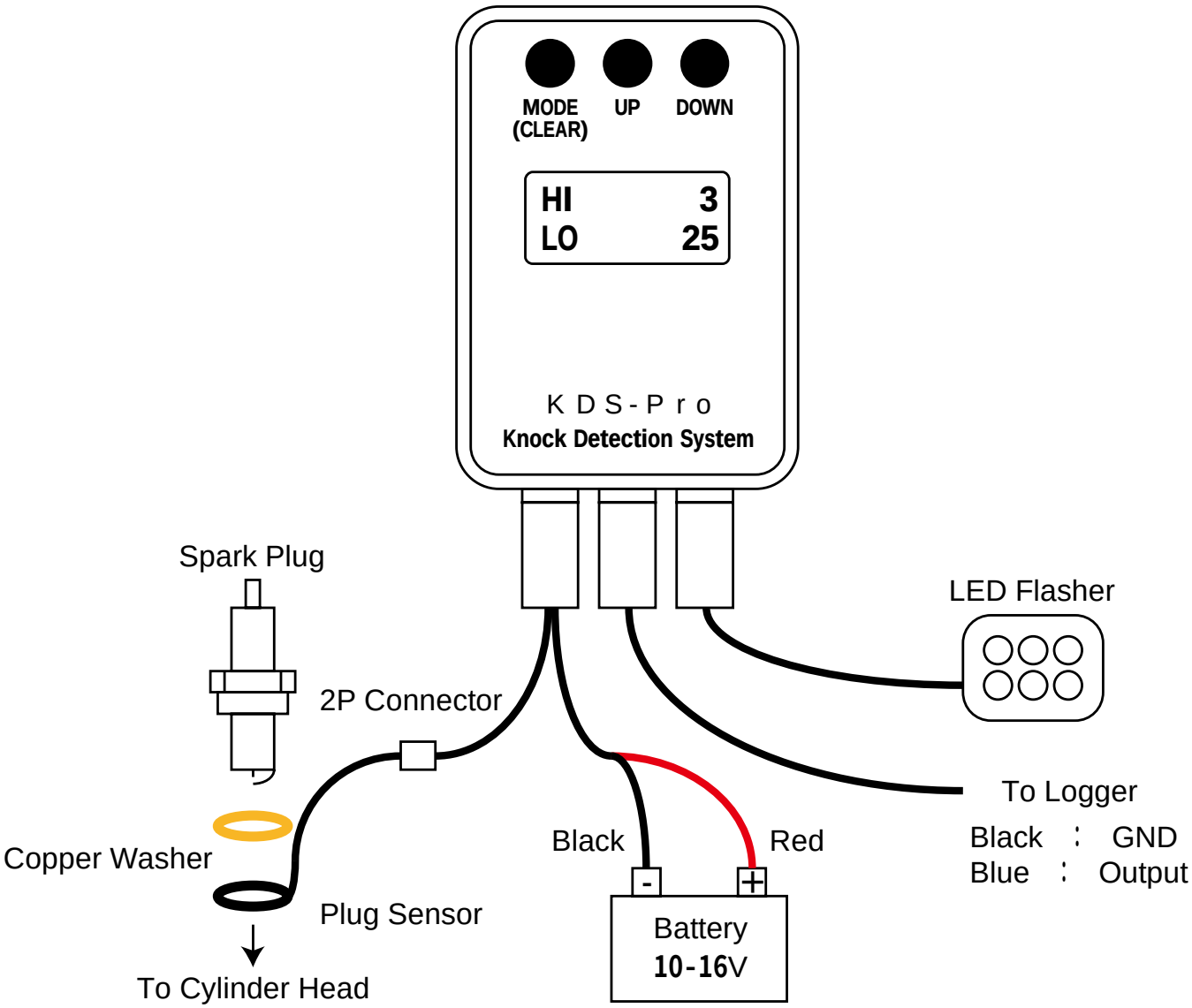
5) Main harness connector
   4 pin male connector.

6) Logger harness connector
   3 pin female connector.

7) Flasher connector
   4 pin female connector.

8) LCD display

## - Connection -




1) Mount KDS-Pro to front panel.

2) Mount flasher to handle.
Check carefully cable tension when you steer the handle.

3) Connect Plug sensor connector to 2 pin connector of main harness.
Plug -> Copper washer -> Plug sensor -> Cylinder head (Check above figure).
Spark plug must be fixed with 2.5kgf/m of torque.

4) Black line of main harness is GND. Red line of main harness is power.
Range of power supply is 10V to 16V. Use 12V battery normally.

5) When you connect to DATA LOGGER, attach appropriate connector to logger harness.
Black line is GND. Blue line is Output. Output signal range is 0V to 5V.

* Push slowly when you insert the connector, because coupling is tight.
* Pull slowly when you remove the connector, because coupling is tight. Never pull harness.
* Harness must be mounted appropriately.(Not too tight, not too loose)

## - MODE -

Push MODE/CLEAR button to change mode.
COUNT MODE on when turned on power.
Mode will get back to COUNT MODE when any key input is not done for 25 second.

1) COUNT MODE
   HI ： It counts up when knocking pressure exceeds high level threshold.
   LO ： It counts up when knocking pressure exceeds low level threshold.

2) PEAK/AVRG MODE
   PEAK ： It records the max value of peak pressure caused by knocking. Max value 63
   AVRG ： It records the average for counted knocking pressure. Max value 63

3) HIGH LEVEL SETTING MODE
   LVL HIGH ： It shows the value of high level threshold.
   Red lamp flashes when knocking pressure level exceeds this value.

4) LOW LEVEL SETTING MODE
   LVL LOW ： It shows the value of low level threshold.
   Green lamp flashes when knocking pressure level exceeds this value.

5) OPTION MODE
   OPTION ： Option setting and test mode. Mode changes by UP button.
   5-1) FLASHER TEST ： Checked operation for Flasher.
   5-2) ANALOG TEST ： Analog signal pattern (5V -> 0V -> 5V) is output to DATA LOGGER.
   5-3) DIGITAL TEST LO ： A low level digital signal(0V) is output to DATA LOGGER.
   5-4) DIGITAL TEST HI ： A high level digital signal(5V) is output to DATA LOGGER.
   5-5) GAIN ADJ ： Set up sensor gain (sensitivity).
      Select this mode and adjust value by back side volume. Use small minus driver.
      Turn the volume to right to increase the sensor sensitivity.
      Turn the volume to left to decrease the sensor sensitivity.
      Sensitivity becomes half if the gain value becomes half.
   5-6) OUT MODE ： Set up for output signal type to DATA LOGGER.
      Push DOWN to change signal ANALOG/DIGITAL.
      Choose ANALOG to connect analog port of DATA LOGGER.
      Pressure level is output just when knocking level exceeds low level.
      Choose DIGITAL to connect digital port of DATA LOGGER.
      5V of digital pulse is output just when knocking level exceeds low level.
   5-7) LOG RATE ： Set up sampling rate of DATA LOGGER.
      Push DOWN to choose 10Hz/100Hz.
      Choose 100Hz if sampling rate of your DATA LOGGER is more than 100Hz.
   5-8) VERSION ： Displayed version of Hardware and Software.

## - How to set up parameter -

You will find various types of knocking caused engine type and how your engine is tuned up. So only one setting is not enough to detect all kind of knocking and proper setting must be done to analyze your engine. Required settings are high/low threshold level and sensor gain (sensitivity).

Proper setting value must be found by yourself in case that you use KDS-Pro for the engine that you use for the first time.

1) At first, you must decide the sensor gain (sensor sensitivity).
Set up following value on the device.
GAIN ADJ 80 (sensor gain volume is on the back side of the device.)
LVL LOW 5 (Minimum value)
LVL HIGH 63 (Maximum value)

After counter cleared, start run and adjust better carburetor setting. If knocking occurred, green lamp flashes. In this case you may get many flashes because of high sensitive sensor setting. Just continue to advance carburetor setting as usual.

After carburetor setting, check the peak pressure level in PEAK menu. If you could see the green flash, some information of knocking are logged. Peak level of 30-40 means sensor gain is ideal level. But if you got 60 or more, it means sensitivity is too high and you must reduce sensitivity. Larger GAIN ADJ value means high sensitivity. If you adjust the GAIN ADJ value from 80 to 40, sensitivity becomes half and PEAK value also becomes half.
In case that you don't get any knocking with high sensor sensitivity or peak pressure is too small (less than 10), maybe carburetor setting is still rich or engine compression is low.
What is more, driver who accelerates smoothly doesn't get many.

2) Low level threshold setting (LVL LOW)
Knocking pressure level over low level threshold causes flash of green lamp and count up of LO. You can adjust low level threshold in LVL LOW menu. LVL LOW value effects flashing frequency (green color) to tell knocking to driver. Too low value causes too much flash and annoy drivers. Too high value causes oversight because of few flashing. Start with 10 and adjust so that it could be best frequency for drivers.

3) High level threshold setting (LVL HIGH)
Knocking pressure level over high level threshold causes flash of red lamp and count up of HI. You can adjust high level threshold in LVL HIGH menu. Proper value for LVL HIGH should be 1.5-2 times as many as the LVL LOW. When temperature and track condition changes and knocking come to increase, knocking pressure becomes high and rising up its average.

Now basic setting is completed. Run and check the information of knocking and engine damage. It's important to know the deadline of knocking (counts and pressure level) to avoid engine trouble.

## - How to use -

1) 12V is supplied to Unit, power could be turned on.

2) Push MODE/CLEAR button for 4 seconds to clear any counted value to 0(zero).

3) Check values on HIGH/LOW level. Modify values pushing UP/DOWN button.

4) Check that Count mode is selected before driving.

5) Red lamp flashes when knocking pressure level over high level threshold line.
Green lamp flashes when knocking pressure level over low level threshold line.

6) Please memorize all the data that you got. (Count High/Low, Peak, Average)
The value on Count, Peak and Average are saved on unit memory.

## - Connection to DATA LOGGER -

KDS-Pro can output knocking information to DATA LOGGER. If you connect KDS-Pro to DATA LOGGER, you can check the information of knocking by analyzing the DATA LOGGER after you drive.

If DATA LOGGER has analog input port (0-5V input), KDS-Pro can output the knocking pressure level by analog value. Select OUT MODE ANALOG in OPTION menu. Maximum pressure level 63 correspond to 5V output and minimum pressure level 0 correspond to 0V output.

If you select the OUT MODE DIGITAL in OPTION menu, 5V pulse is output when knocking occurred.

## - Spark plug -

Plug sensor is inserted between spark plug and cylinder head, so spark plug must be longer. For example, if your spark plug size is 14(D) x 19(L) mm, use 14(D) x 22(L) mm size plug for plug sensor.
Spark plug must be fixed with 2.5kgf/m of torque.
Use register plug to reduce the spark noise.

## - Setting example -

1) IAME Parilla Reedster
GAIN ADJ 40
LVL HI 20
LVL LO 10

2) VORTEX RAD
GAIN ADJ 40
LVL HI 30
LVL LO 15

* In case of Japan.