



KS-4 Instruction Manual



KS-4 Knock Analyser



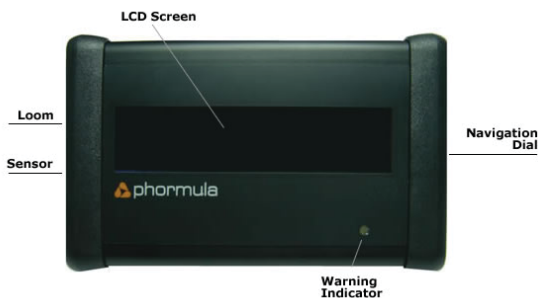
Box Contents:

- Main Unit
- Signal Cable
- Wiring Loom
- Knock Sensor Kit
- Mounting Pads
- Instruction Manual

Introduction

Thank you for purchasing the KS-4 Knock Analyser. This manual provides fitting and usage instructions. For technical support please email support@phormula.co.uk.

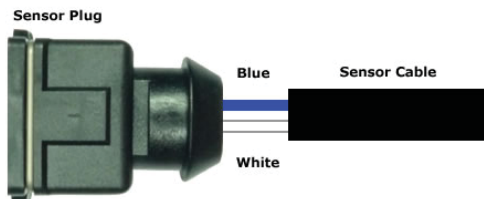
Installation Overview



1. Mount the Knock Sensor
2. Assemble sensor plug
3. Connect signal cable
4. Connect the wiring loom
5. Configure KS-4 settings

Sensor Plug Assembly

TOP VIEW



NOTE: Fit rubber boot (included) to cable prior to plug assembly.

Sensor Mounting

The sensor should be located in a position where engine block vibrations are directly coupled to the sensor. Ideally this location should be on a boss on the engine block, in line with the point of combustion. Care should be taken when selecting a suitable location. Locations of excessive noise, such as the valve train may effect the operation of this device.

Note: The sensor should be located avoiding areas of extreme temperature. The sensor cable must be routed avoiding areas of electrical interference (i.e. do not route the sensor cable next to your HT leads!)

Wiring Loom Instructions

Familiarise yourself with the wiring loom colours prior to connecting the loom. The loom consists of an 8-way connector with 7 leads.

8 way connector



- Black – Ground (3 leads)
- Red – 12v
- Yellow – Data Out 0-5v
- Blue – Triggered Open Collector
- Green – Sensor Output

Connecting the Ground (Black)

Connect one of the black ground leads to an earth point on the vehicle.

Connecting the 12v (Red)

The red lead should be connected to an ignition switched 12v 1a fused source.

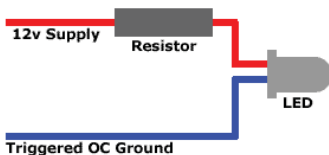
Connecting the 0-5v Data Out (Yellow) - Optional

The data out can be connected to a 0-5v data logging device. One of the additional ground leads can be used as a reference ground.

Connecting the Triggered Open Collector (Blue) – Optional

The blue lead is pulled to ground when the alarm is triggered. This lead can be used to trigger an external device of up to 80mA. Devices requiring more current than this will require a relay.

Example LED wiring:



When the alarm is triggered on the KS-4 the blue open collector lead is pulled to ground allowing the current to flow in the circuit. This triggered ground solution offers the most flexibility as any vehicle power source may be used between 1v and 12v.

Connecting the Sensor Output (Green) – Optional

The green lead and one of the additional ground leads can be connected to a 3.5mm stereo jack socket to allow an alternative location for the Knock Analyser Pro Interface connection.

The green lead is sensitive to interference and must NOT be grounded. If the lead is not used we recommend some heat shrink or insulation tape over the bare end of the lead.

Operation

With the system securely mounted and all connections securely made, switch on the ignition. The display will show the "Phormula" start-up screen.

The system can be tested by tapping adjacent to the sensor with a metal object such as a spanner. Care should be taken to avoid hitting the sensor directly.

Familiarise yourself with the system settings in the following sections before attempting to configure the KS-4.

System Settings

System Settings can be accessed by moving the navigation dial slowly in a down direction repeatedly or holding the dial in a downward direction. The screen orders are as follows:

- 1 Data Display
- 2 Bandwidth Settings
- 3 Gain Settings
- 4 Alert Settings
- 5 Data Out Rate
- 6 Restore Defaults
- 7 Quickstart Settings
- 8 Software Version

Data Screen

The data screen shows the current knock reading, the maximum knock reading and a bar graph display.

Resetting Peak Hold and Trigger

Peak/Max readings and the Trigger can be reset by briefly pressing the navigation dial inwards.

Bandwidth Settings

Bandwidth settings can be accessed by moving the navigation switch downwards repeatedly until the words "System Settings" and "BAND – XXX kHz" are displayed. Press the navigation switch inwards briefly and the words "Scroll to change" will appear. Bandwidth can then be altered by moving the navigation dial upwards or downwards. Press the navigation switch inwards to specify a new setting.

Gain Settings

Gain settings can be accessed by moving the navigation switch downwards repeatedly until the words "System Settings" and "GAIN – XX" are displayed. Press the navigation switch inwards briefly and the words "Scroll to change" will appear. Gain can then be altered by moving the navigation dial upwards or downwards. Press the navigation switch inwards to specify a new setting.

Alert Settings

Alert settings can be accessed by moving the navigation switch downwards repeatedly until the words "System Settings" and "ALERTS" are displayed. Press the navigation switch inwards briefly and the words "Scroll to change" will appear. Alert levels can then be altered by moving the navigation dial upwards or downwards. Press the navigation switch inwards to specify a new setting.

When the knock readings exceed the Alert threshold the system will display a visual warning and an audible alert will sound. A white LED indicator will illuminate until the peak values are reset.

Data Rate Settings

Data Rate settings can be accessed by moving the navigation switch downwards repeatedly until the words "System Settings" and "DATA/SEC" are displayed. Press the navigation switch inwards briefly and the words "Scroll to change" will appear. Data rate levels are displayed as number of outputs per second. Data Rate can then be altered by moving the navigation dial upwards or downwards. Press the navigation switch inwards to specify a new setting.

IMPORTANT – The KS-4 is capable of outputting up to 100 samples per second. This is significantly faster than some logging systems can process. It is important NOT to set the data output rate of the KS-4 to a higher data rate than your logging software can process. Doing so will result in the logging software dropping (ignoring) samples of data from the KS-4. By default the KS-4 is set to 5 samples per second, please refer to your data logging software/device to ensure this rate is suitable.

Restore System Defaults

The system can be reset to factory defaults by accessing the "RESTORE DEFAULT" screen.

Quickstart

By setting Quickstart to "OFF" in the settings menu, the system will display all system settings during start-up.

Graphical Display

If the alert setting is switched off the bar graph will display a range from 0-100. If an alert limit has been set the bar graph will display a fraction of the alert limit i.e. at an alert threshold of 40 the bar graph will be at its maximum when a value of 40 is reached.

Configuring the KS-4

The engine must be operating correctly prior to configuring the KS-4.

1. Ensure KS-4 Alerts are turned off.
2. Set the Bandwidth setting to the expected engine knock frequency.
3. Run the engine under load to full power and check the peak readings.
4. Repeat step 3 adjusting the Gain settings until the KS-4 peak readings display approx 40.
5. Configure the Alert to trigger above the peak value.

An increase in the peak reading when the engine is under load is an indication of detonation occurring. Tests showed readings of greater than 80 when detonation was occurring, however this value will vary depending on the engine and location of the sensor.

The bandwidth settings are a centre frequency. Frequencies either side of the centre frequency are also detected, but to a lesser extent.

FAQ

Id	Question	Answer
1	Why does the device display a value for Knock when the engine is operating normally?	All engines produce a wide range of frequencies during normal operation. The KS-4 will read and display engine noise.
2	I can't locate the sensor directly on the block. Will the device operate correctly?	The KS-4 is sensitive to sensor location. Readings may be taken from other locations such as the engine head; however the distinction between engine noise and detonation may not be as clear.
3	Can I cut and extend the sensor cable?	The sensor cable is shielded to reduce interference. The cable can be extended using a similar shielded cable. Additional cable can be purchased from www.phormula.co.uk
4	I'm getting occasional spikes and I'm certain my engine is not knocking.	Check connections to the sensor plug. Check sensor location is suitable. Check the the green lead is insulated if not in use.
5	Why do the peak readings fluctuate?	The KS-4 is very sensitive to vibration. When repeatedly taking the engine under load to high RPM the KS-4 may display a slightly different peak reading. You should also check that the sensor cable is routed away from any source of interference.

System Screen Navigation

The following table shows navigation through the system screens.

Current Screen	Action		
	Button Down	Button Up	Button Click
Data Screen	Bandwidth Settings	-	Reset Max Knock Reading
Bandwidth Settings	Gain Settings	Data Screen	Change Bandwidth Settings
Gain Settings	Alert Settings	Bandwidth Settings	Change Gain Settings
Alert Settings	Data Out Rate	Gain Settings	Change Alert Settings
Data Out Rate	Restore Defaults	Alert Settings	
Restore Defaults	Quickstart	Data Out Rate	Restore Default Settings
Quickstart	Version Information	Restore Defaults	Change Quickstart Settings
Version Information	-	Quickstart Settings	-

Warning: This product is for off road use only and should be installed by a qualified Automotive Electrician.

This device should not be used as the sole method of knock detection whilst tuning an engine. Incorrect configuration, electrical interference or poor electrical connections may result in incorrect knock readings. This device may not register knock when using E85. We do not recommend the 0-5v output be used for ECU/EMU knock control.

For Technical Support email: support@phormula.co.uk

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