



DIESELTUNE

Equipment Manual

TES1529
Nov 2006

IMPORTANT

Every reasonable effort has been made to ensure that information within these Operating Instructions is correct at the time of release, but Dieseltune cannot accept responsibility for any errors that may occur.

The information in these Operating Instructions is subject to change without notice, and does not represent a commitment on the part of Dieseltune.

Service & Warranty

The reliability of this equipment is fully supported by our service agents, with repair workshops and field service engineers to provide a full range of After-Sales Care, including installation, contract maintenance, factory overhaul and emergency repairs on site. Please refer to the page at the end of this manual for full details.

Note:

Your attention is drawn to our Terms & Conditions of Sale, particularly paragraph 2. If a service engineer is called out under service warranty where, upon inspection and test the equipment is found to be in full working order and no fault found, the user is liable to be charged the cost incurred for this call out. Before calling out an engineer, ensure your equipment is faulty by checking its operation, particularly mains supply and fault codes/self test if applicable.

Software Licence

Further to our general Terms & Conditions of Sale, the software described in these Operating Instructions is furnished under the following Software Licence Agreement:

1. Licence: You may use the program on the machine provided. You may not copy, duplicate or transmit the program in any form, in whole or in part, without the express prior written permission of Dieseltune.
2. Term: The licence is effective until terminated. You may terminate the licence by destroying the program together with all copies, or returning the program to Dieseltune.
3. Dieseltune does not warrant that the program will meet your requirements or that its operation will be uninterrupted or error free.
4. In no event will Dieseltune be liable to you for any incidental or consequential damages, including lost profits, business operation and the like, arising out of the use or inability to use this program.
You acknowledge that you have read this Agreement, understand it, and agree to be bound by its provisions.

WARNING:

Do not attempt to operate this equipment unless you have read and understood these instructions.

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HEALTH AND SAFETY

1. The equipment is not weatherproof and should not be used outside in rain or snow.
2. The internal circuits and components of the analyser should not be tampered with. No internal parts are operator serviceable.
3. Operators should exercise due caution with regard to the engine fan and associated belts.
4. Always provide ventilation by using an exhaust gas extraction system or by having an adequate supply of fresh air.

Vehicle emissions are dangerous. In particular, Carbon Monoxide (CO) from a vehicle exhaust is a highly poisonous gas. If breathed in, it is absorbed by the blood and will result in greatly slowed reactions and if absorbed in sufficient quantity can be fatal. Published figures show that a concentration of 0.3 % CO in the air can be fatal if inhaled for 30 minutes.

5. Before starting an engine, ensure that the gear selector is in neutral or park.
6. Care should be taken with regard to scalding from the cooling system, burns from the exhaust system and electric shocks from the ignition HT system.
7. When disconnecting the fuel system of a hot engine beware of the fire hazard caused by fuel spilling onto manifolds, ignition distributor, etc.
8. Position the mains cable and sample pipe in such a manner that they do not present a hazard to anyone.
9. The earth lead of the mains supply cable MUST ALWAYS be connected to a good earth point.
10. Operators should not allow themselves to come into contact with water or other similar conductors when using the equipment.
11. Equipment should be sited in an area designated and clearly marked:

FOR USE BY AUTHORISED PERSONNEL ONLY

INSTALLING EQUIPMENT

A number of optional devices may be fitted for use with the Smoke Test. Please refer to the operating instructions for details of usage.

DX260-1 SMOKEHEAD (Cabled)

The DX260-1 Smokehead is plugged in to a connector positioned on its cradle base. The base is then connected to the host equipment. The appropriate Sampling Pipe is then connected to the Smokehead.

The Smokehead should be returned to base when not being used.

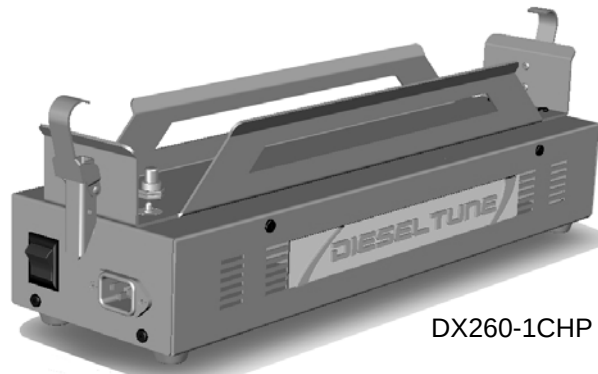


DX260-1IFP Smokehead on its base

DX260-1BT SMOKEHEAD (Wireless)

The DX260-1BT wireless Smokehead uses Bluetooth ® technology to communicate directly with the host computer. The Smokehead has rechargeable batteries built in to enable approximately 1.5 hours of continuous use between charges. The Smokehead is supplied with a charger Base DX260-1CHP.

The Smokehead should be returned to its charger base between tests to keep the batteries charged. The Smokehead will go into hibernation mode if it is not being communicated to by the computer whilst it is off the charger base for periods longer than approximately 6 minutes.



DX260-1CHP Charger base

NOTE: Before fitment of a sampling pipe, inspect its 'O' ring for damage and renew it if necessary (order part number DX210-5/60). Periodically apply a smear of grease to the 'O' ring to assist fitment of the sampling pipe to the sampling head.

CAUTION: The results of free acceleration testing will be affected by changes in sampling pipe diameter and/or length. Only genuine pipes must be used and their design must not be altered in any way.

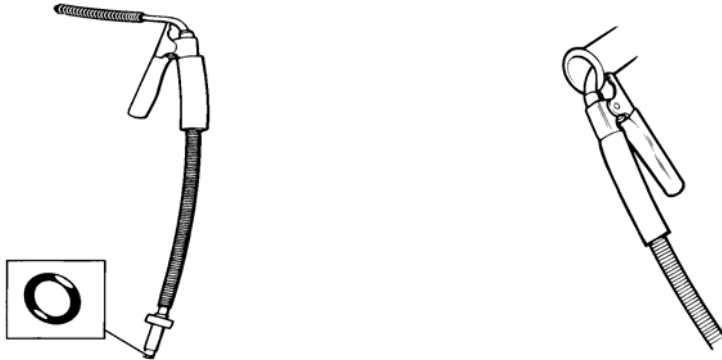


WARNING: Sampling pipes can get very hot; take care when disconnecting from the sampling head.

SAMPLING HEAD AND PIPES

Connect the cable from the sampling head to the interface unit 'SMOKE' connection. Ensure it is securely connected.

Connect the appropriate sampling pipe to the sampling head.

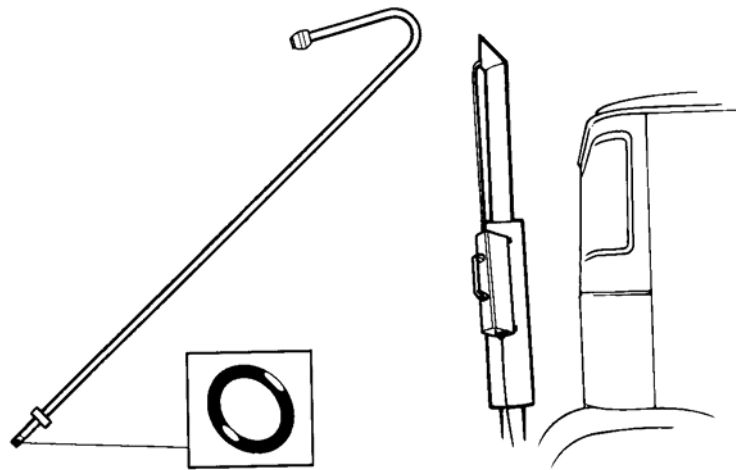


Sampling pipe DX210-4A

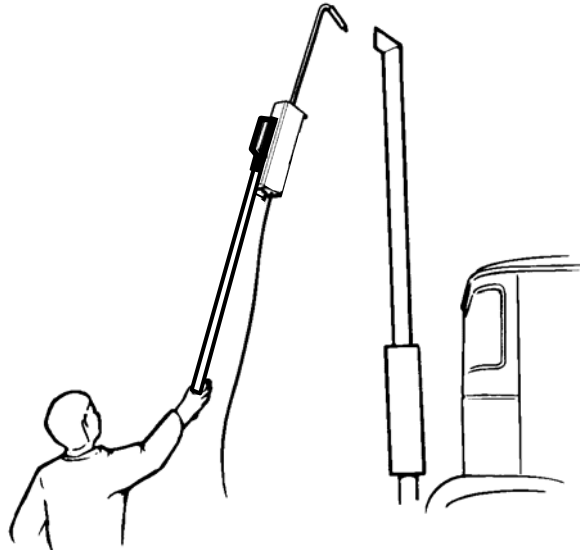
The sampling pipe DX210-4A can be used for all vehicles, but for convenience of use alternative pipes are available.

Sampling pipe DX210-6

Sampling pipe DX210-6 is used for vertical exhausts. Hang the sampling pipe and the sampling head as shown in the illustration.



For very high exhausts, an extension Pole 1.5 m or 2 m length may be fitted to the sampling head using an Extension kit DX260-160L (1.5m) or DX260-160H (2.0m) as illustrated.



Using extension pole

NOTE: Before fitment of a sampling pipe, inspect its 'O' ring for damage and renew if necessary (order part number DX210-5/60). Periodically apply a smear of grease to the 'O' ring to assist fitment of the sampling pipe to the sampling head.

CAUTION: The results of free acceleration testing will be affected by changes in sampling pipe diameter and / or length. Only genuine pipes must be used and their design must not be altered in any way. The smokehead body must always be positioned in clean air and away from exhaust fumes when in use.



WARNING: Sampling pipes can get very hot; take care when disconnecting from the sampling head.

USING THE SMOKEHEAD OUTSIDE

If it is necessary or desirable to test a vehicle outside the workshop, the following points must be borne in mind.

The sampling head is weather resistant and may be used in temperatures down to a minimum of -15°C.

WARNING: The power supply and PC are not weather protected and for the safety of both the operator and the equipment, these parts **MUST** be kept under cover in inclement weather conditions.



WARM-UP

Switch on power to the base unit. The 'Power On' light will illuminate.

There is a warm-up time of 5 to 20 minutes dependent on the outside temperature. During this time the Smokemeter will not function.

NOTE: For details of software controlled procedures, refer to the appropriate software manual.

CABLE-LESS BLUETOOTH[®] SMOKEHEAD OPERATION (DX260-1BT)

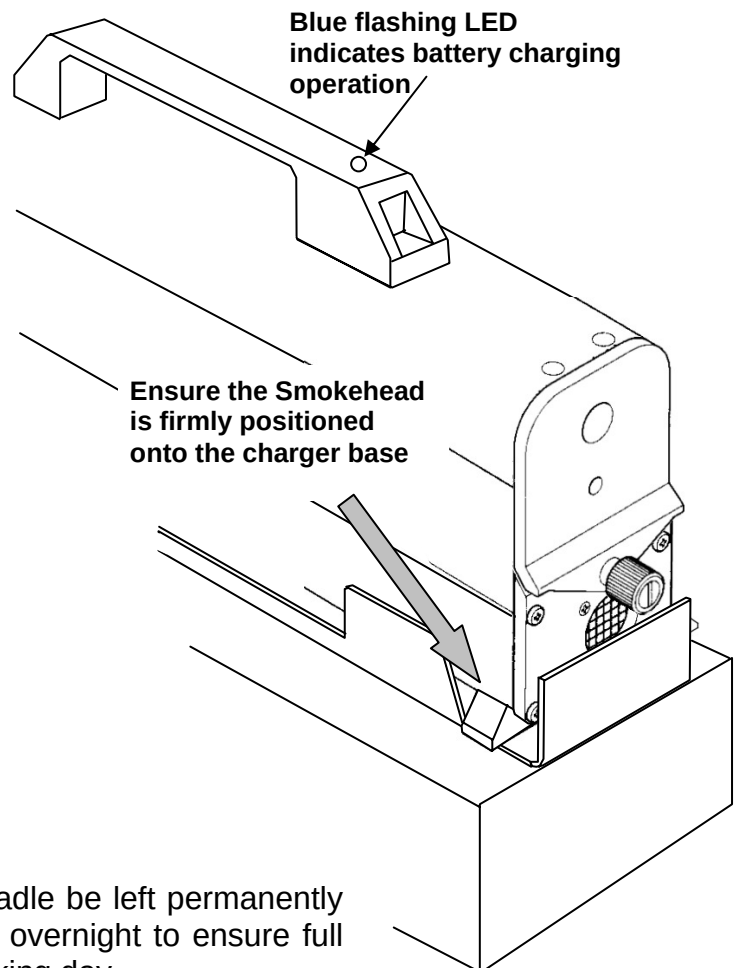
For cable-less (Bluetooth[®]) systems the operation of the equipment is identical but a Bluetooth[®] enabled Smokehead (DX260-1BT) is utilised.

When the equipment is first switched on the smokehead should be firmly positioned onto its charging base and the unit should be allowed to charge for a minimum of five to six hours (or preferably left overnight) to fully charge the batteries.

The equipment screen will prompt the user to return the smokehead to its charging base between tests. This must be obeyed in order to proceed further. Failure to return the smokehead will result in depletion of the battery charge and may result in a shortened lifespan. The test will not continue until the smokehead has been returned.

It is strongly advised that the Charger Cradle be left permanently switched ON with the Smokehead in situ overnight to ensure full operational usage at beginning of the working day.

Please note that rechargeable batteries have a finite lifespan, therefore the battery pack will need to be replaced periodically if the smokehead is no longer sustaining sufficient charge for correct operation. Please contact a Service Engineer through Product Support.



The DX260-1BT Bluetooth® Smokehead contains a Multi-Cell Rechargeable Battery designed to give a maximum of 1.5 hours endurance from a full charge.

To recharge, the Smokehead must be correctly located on its charging cradle. The Smokehead must always be replaced on the charging cradle in between tests. This will maximise the battery endurance and is also necessary for test results to be printed.

On the handle of the Smokehead is a highly visible Blue Light emitting Diode (LED). This LED gives indication of the status of the Smokehead whether or not it is on its charging Cradle.

BATTERY CHARGING Modes and Endurance:

The nominal endurance of the internal Battery pack is 1.5 hours continuous use from a full charge and cold start. This will vary according to ambient temperature. For optimum use and battery life, the smokehead should be removed from the charging cradle for the minimum amount of time and returned to the charger immediately after testing as prompted by the smoke test Software.

The rate of charging is dependant on a combination of Battery Voltage and Battery Temperature. If the Smokehead has seen reasonable use the charger will switch to 'Fast Charge', taking approximately 1.5 hours to fully recharge. Once full terminal Voltage has been reached, the battery charging rate is reduced to 'Trickle Charge'. When charging for a protracted period, for example overnight, a trickle charge of 15 hours will completely recharge the internal battery. A blue LED on the Handle indicates the Charging Status.

LED Indication

1. Smokehead removed from Charging Cradle:

LED 'On' continuously: Smokehead is running on internal Battery.

LED pulsing 'ON' for 2 seconds, 'OFF' for 0.5 seconds: Smokehead battery has reached a Low Voltage condition, and has less than 10 minutes life left before Auto-shutdown.

LED 'OFF' : Low Voltage condition. Smokehead will Auto Shut down. No more testing possible until Smokehead battery has been recharged.

If the Smokehead has received no Communication from Host Computer for over 6 minutes it will go into 'Sleep' Mode. Return the Smokehead to the Charging Unit to invoke a response.

If the Smokehead is taken outside its maximum operating range of about 100 metres, and Bluetooth® communication is no longer possible, after 6 minutes the Smokehead will go into 'Sleep' mode.

To recover from 'Sleep' mode, the Smokehead should be put back in its Charging Cradle, and the LED function observed.

2. Smokehead returned to Charging Cradle:

FAST CHARGE:

LED Flashing quite rapidly (2.5 times per second): This shows the Smokehead is in 'Fast Charge' Mode. The battery should be fully charged within 1.5 hours.

SLOW CHARGE:

LED Flashes ON/OFF (On for 1 second, Off for 1 second) The Smokehead battery is in 'Slow Charge' mode, the charging rate determined by either Terminal Voltage or, Battery Cell temperature.

TRICKLE- CHARGE:

LED Flashing ON/OFF (On for 1 second, Off for 2 seconds) The Smokehead battery is in 'Trickle-Charge' mode indicating that the batteries are fully charged.

Fault Diagnosis:

No LED Lit on Smokehead: Return the Smokehead to Charging Cradle. LED should display according to Charging level required.

No LED lit on Smokehead after returning Smokehead to Charging Cradle: Check that the Smokehead is correctly seated on the charging Cradle. The Smokehead has twin connectors on each insulated foot, and may be connected either way round.

Check the Charging Cradle is connected to the 240 V AC Mains.

Check that the sprung connectors that transmit the Charging Current on the Charging Cradle are clean and not stuck in a depressed condition.

Check that the Charging Connectors on the insulated mounts on underside of the Smokehead are clean and free of dirt and obstructions.

To check the charging Voltage at the Charging Cradle: Connect a Digital Multimeter set to measure up to 30V DC to the two charging Connectors on the charging Cradle, and depress the Central Charging Sensor. A Voltage of 28 V to 30 V DC should register on the Multimeter Display.

The internal battery pack has a finite lifespan and will need to be replaced periodically. This can only be carried out by a qualified Service Engineer.

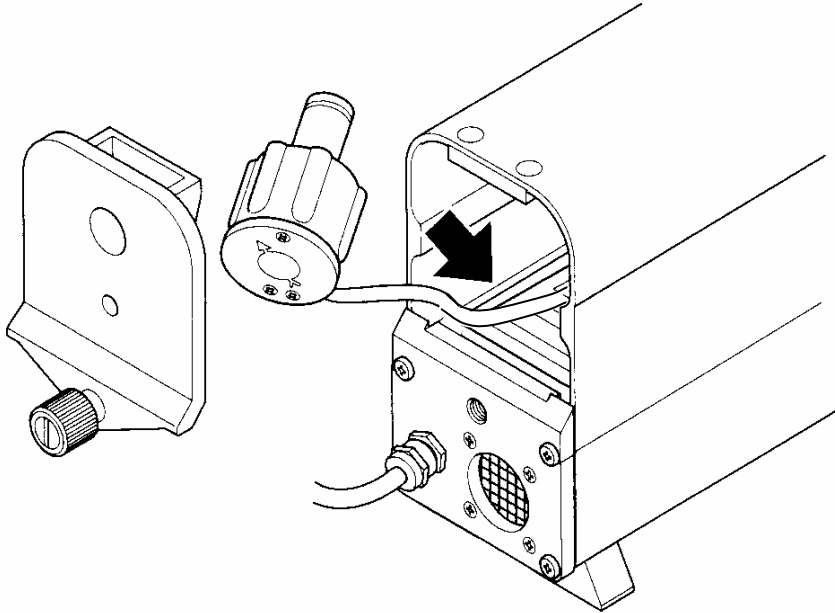
There are no user serviceable parts in the Smokehead.

MAINTENANCE OF THE SMOKEHEAD

Serial numbers

Serial number locations are as follows:

- Smokehead internal - Underneath the lens housing (remove end cap for access).
- Smokehead external – on underside of Smokehead.



Smokehead serial number

CLEANING SAMPLING PIPES

Under normal circumstances the sampling head does not require cleaning.
If a sampling pipe becomes restricted with deposits, test results can be affected.

To clean a sampling pipe, remove the sample probe from the smokehead. Blow through the sample pipe only, using compressed air. **DO NOT BLOW THROUGH THE SMOKEHEAD.**

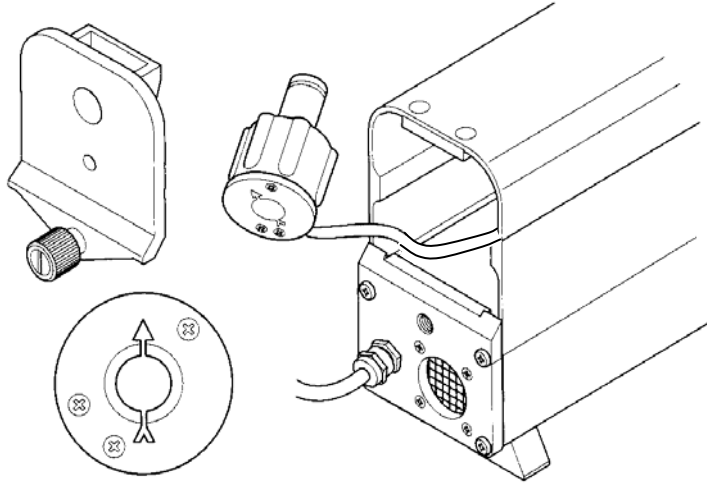


WARNING: Wear eye protection and provide a suitable container to catch the soot that will be blown out from Sample Pipe. **DO NOT** use compressed air on the Smokehead body.

LENS CLEANING

Two lenses are fitted in the smokehead, one at either end.

The Smokemeter checks the cleanliness of the lenses at the start of each test, and the PC will provide a warning when cleaning is required.



Note orientation of lens housing (arrow up)

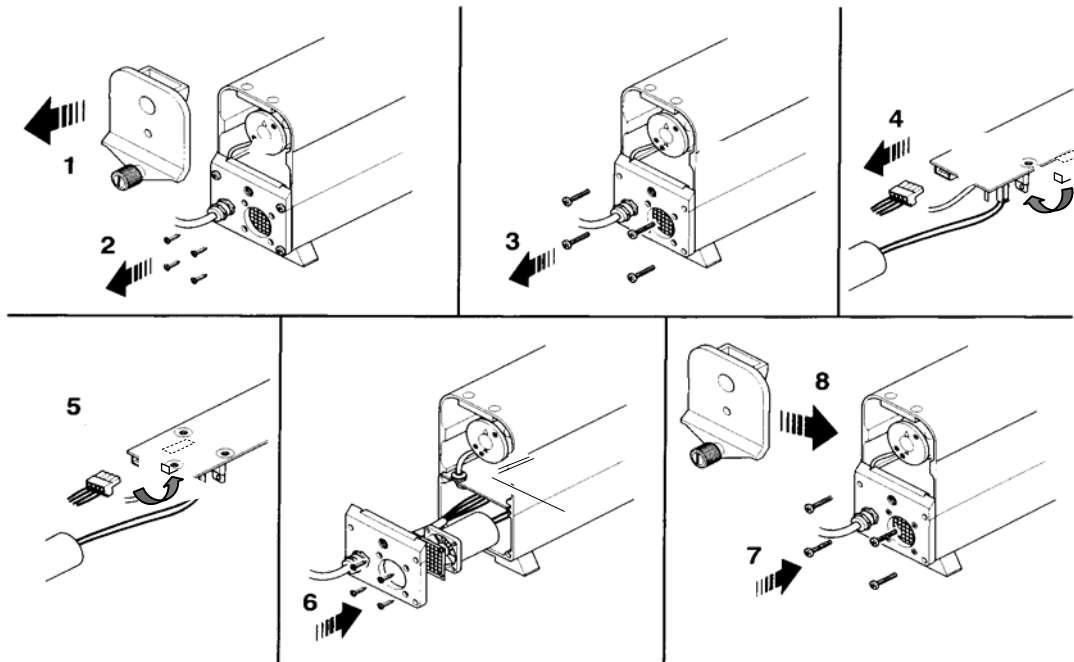
Accessing a lens

The cleaning procedure is as follows.

1. If fitted, remove the sampling pipe.
2. Unscrew the knurled knob at the sampling pipe end of the sampling head and remove the end cap.
3. Carefully pull out the lens housing and wipe the lens with a soft cloth (if required, a little methylated spirit will assist cleaning).
4. Refit the lens housing with the arrow pointing upwards (a little silicon grease on the 'O' ring will assist fitment – but do not get on lens!).
5. Refit the end cap and tighten the knurled knob.
NOTE: Ensure the end cap locates fully against the body of the sampling head before tightening the knob. If not correctly located, the lens housing is probably not fully home.
6. Clean the lens at the other end of the smokehead in the same way.

NOTE: The end cap for the sampling pipe must be fitted at the end away from the sampling head cable.

SMOKEHEAD CABLE RENEWAL (DX260-1)



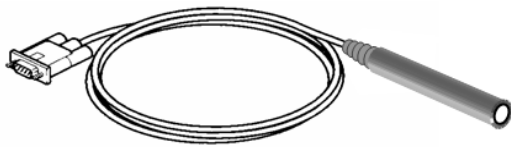
Should the cable become damaged and require renewal, the procedure is as follows.

1. Unscrew the knurled knob (1) and remove the end cap.
2. Remove the four countersunk screws (2) which secure the internal fan and grille to the smokehead end plate.
3. Remove the four panhead screws (3) securing the end plate and carefully ease the plate clear of the housing.
4. Disconnect the 4-pin multiplug (4). Do not disconnect the 2-pin plug to the fan.
To fit the replacement cable:
5. Connect the 4-pin multiplug.
6. Carefully fit the fan and fan grille to the end plate (4 countersunk screws) without disturbing the fan supply wires.
7. Locate the end plate to the smokehead (cable on left hand side) and loosely secure with 4 panhead screws.
8. Check that the lens housing is fully in, then fit the end cap and secure with the knurled knob. Fully tighten the knurled knob then slacken half a turn.
9. Push the end plate upwards as far as it will go, and then fully tighten the 4 panhead screws.
10. Fully tighten the knurled knob on the end cap.

OIL TEMPERATURE PROBES

ADAPTERS

The DX211-11 and DX211-11BT Temperature Probe Adapters are used in conjunction with the DX210-25A or DX210-26 oil probes for engine temperature measurements. The DX211-11 is hard-wired to the smokemeter; the DX211-11BT communicates via Bluetooth® wireless technology.



DX211-11
Wired Temperature Probe Adapter



DX211-11BT
Wireless Temperature Probe Adapter

Connection to the Smokemeter

The DX211-11 utilises an RS232 communications cable for connection to the Smokemeter. The unit connects to the smokemeter via a serial port. When not in use the flexible probe should be stored in a holster

The DX211-11BT is a wireless device that will communicate with a Bluetooth® Smokemeter via Bluetooth® wireless technology. A charging holster is supplied which should be used to store and charge the unit when not in use. The DX211-11BT batteries will be charging at all times whilst stored in the holster, indicated by the status indication light on the probe adapter glowing red.

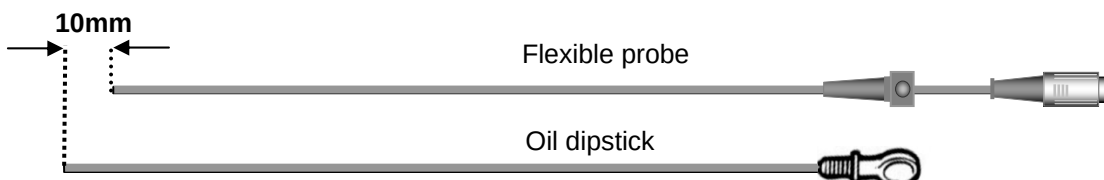
Temperature probes

There are two flexible temperature probes which can be plugged into the adapter. The DX210-26 is a standard 0.75M probe, the DX210-25A is a 2.5M long-reach probe. Connect the flexible oil probe to the socket of the DX211-11 or DX211-11BT. This connector includes a snap-lock feature that ensures a reliable connection between the two devices.

Adjusting oil temperature probe length

Before testing, the probe must be adjusted to the correct length as follows:

Lay it alongside the vehicle dipstick (see illustration) and adjust the position of the depth stop until the effective length of the probe is approximately 10mm shorter than the dipstick.

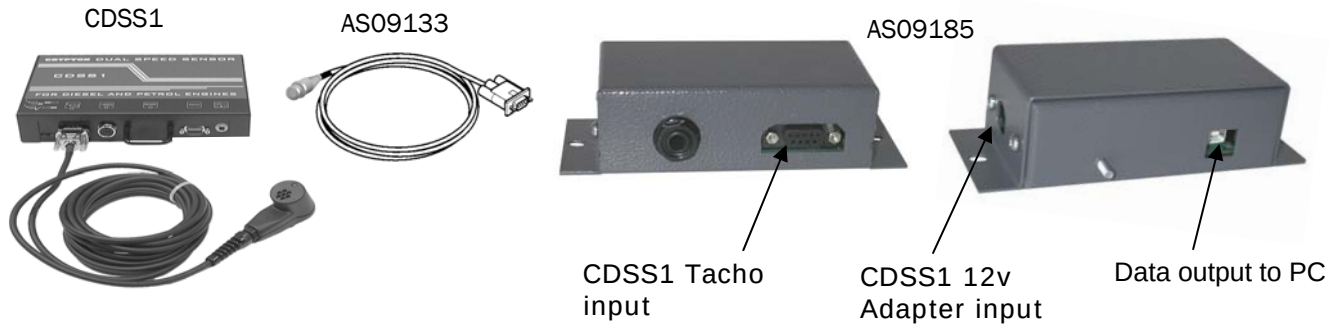


WARNING: ENSURE THAT THE OIL TEMPERATURE PROBE IS SET TO THE CORRECT DIPSTICK LENGTH AND THAT IT IS CLEAN FROM DEBRIS BEFORE INSERTING INTO THE ENGINE. FAILURE TO DO SO MAY RESULT IN SERIOUS DAMAGE TO THE PROBE AND/OR ENGINE.

ENGINE TACHOMETERS

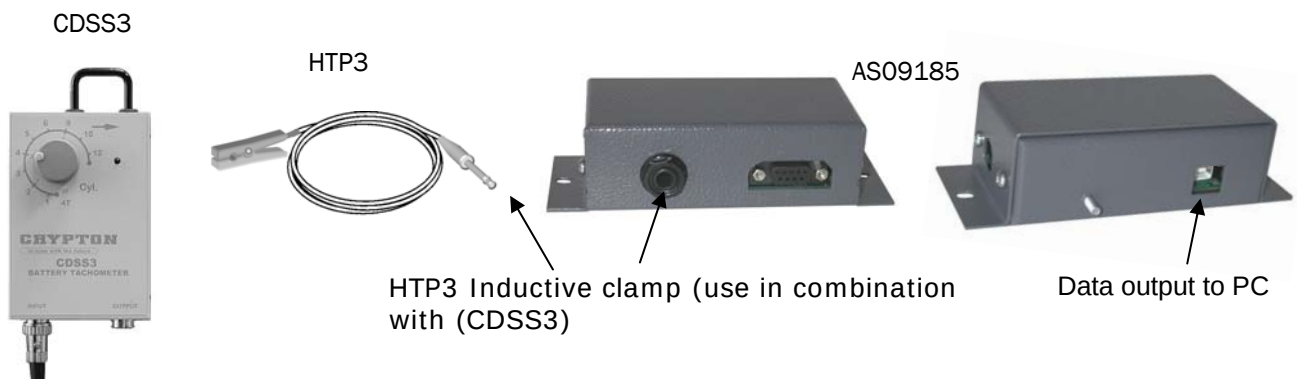
CDSS1 RPM TACHO - Acoustic

The CDSS1 RPM Adapter is connected to the Tacho input port of the AS09185 Tacho Adapter. The CDSS1 can derive its power via AS09133 data lead.



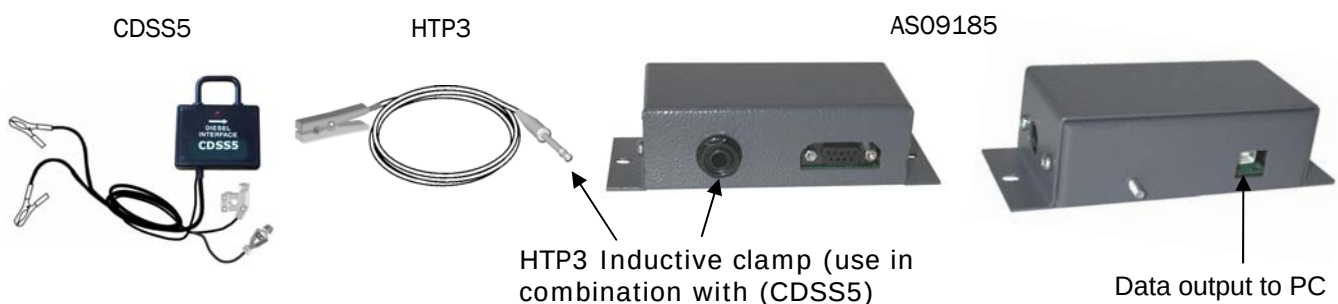
CDSS3 RPM TACHO - Battery

The CDSS3 RPM Adapter provides a signal via an inductive loop. An inductive clamp (HTP3) is used to pick up this signal. The HTP3 is connected to the clamp input on the rear panel of the unit. The CDSS3 derives its power from the vehicle battery.



CDSS5 RPM TACHO - Piezo

The CDSS5 RPM Adapter provides a signal via an inductive loop. An inductive clamp (HTP3) is used to pick up this signal. The HTP3 is connected to the clamp input on the rear panel of the unit as shown above. The CDSS5 derives its power from the vehicle battery.



USING THE ENGINE TACHOMETERS

Ensure the vehicle engine is switched off before connecting engine speed adapters to the vehicle. The following types of engine speed adapter are available:

CDSS1 ACOUSTIC TACHOMETER

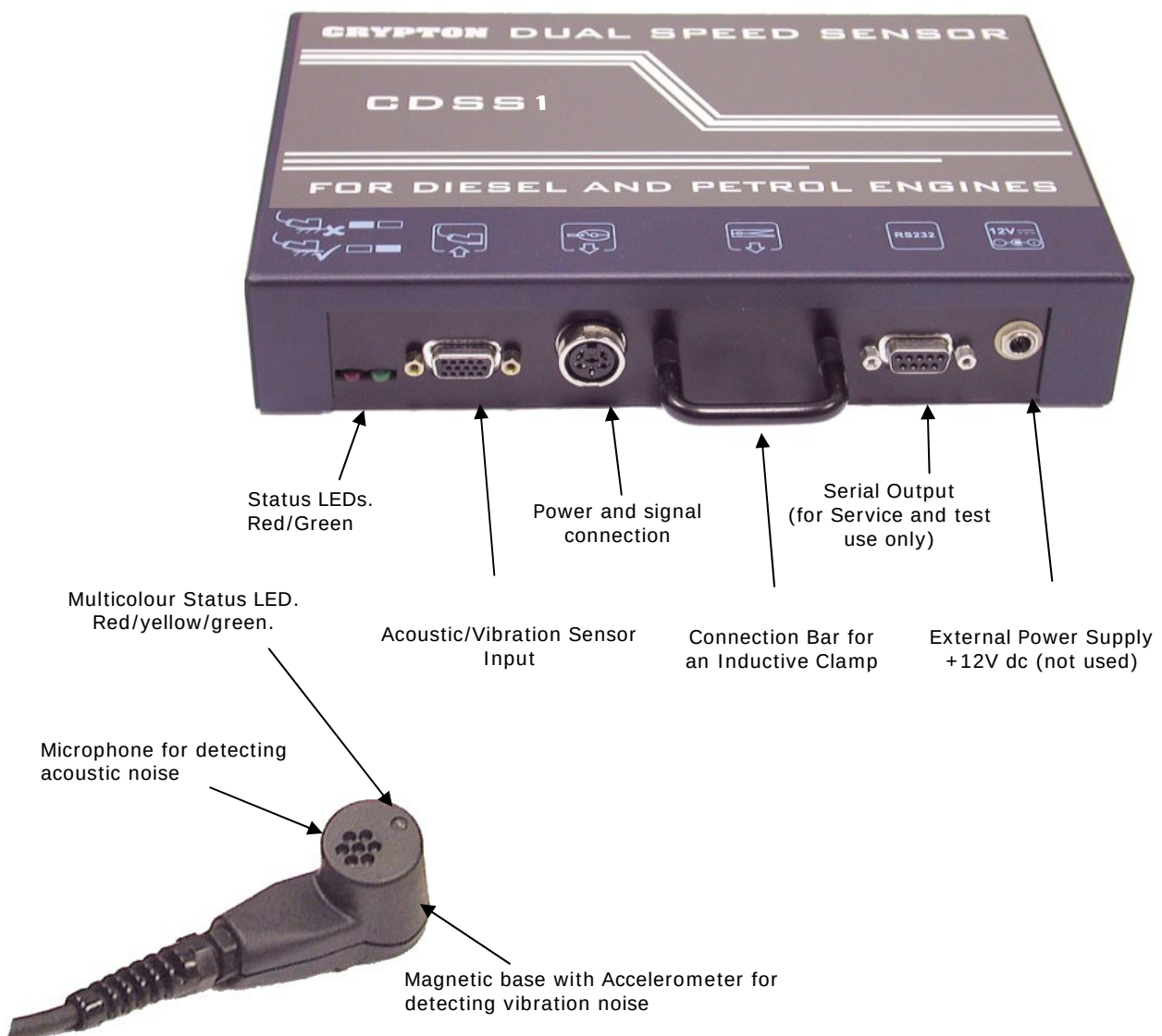
Acoustic sensor type for Petrol and Diesel engines

This adapter measures the noise and vibration of an engine, and converts this information to engine speed.

Note: The CDSS1 connects to the host equipment via a signal interface cable (AS09107). This cable also carries the power supply to the CDSS1.

The engine speed signals produced are equivalent to a conventional ignition system (i.e. one pulse per engine cycle). When defining the ignition system on the host analyser, It is therefore imperative that a conventional system is selected, irrespective of that fitted to the vehicle. Selecting DIS (Distributor-less Ignition System) for example will result in the readings being divided by 2.

Connections



Suggested mounting Positions for the sensor (CDSS1)

The sensor has a powerful magnetic base and should therefore be attached to an iron or steel part of the engine, such as a bolt or lifting bracket. Always ensure that the Sensor is attached to the Engine itself and not to a part of the vehicle where the vibrations may be cushioned by the engine mountings e.g. wing or bulkhead.

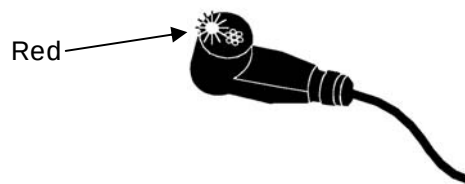
Examples of good mounting positions are: Lifting brackets, Cylinder head bolts (where they are accessible), Oil drain plug etc.



CDSS1 Operation

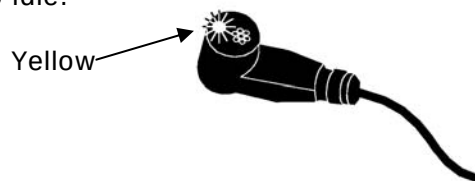
Prior to starting the vehicle attach the magnetic sensor to a part of the engine. The LED on the sensor should be RED

1. Switch engine OFF.



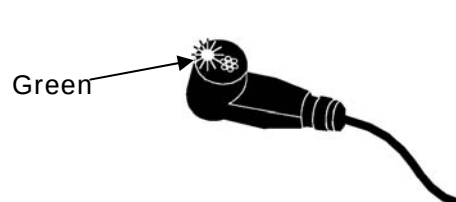
Attach Sensor to a suitable point as described in 'Suggested mounting positions'. The Status LED should be red.

2. Start Engine and allow to idle.



After approx 3 – 10 seconds the status LED will change to Yellow.

3. Rev Engine to high speed (2000 – 6000 rpm) and hold.
Note: In the case of a Diesel this may be 70 – 90% of Governor.



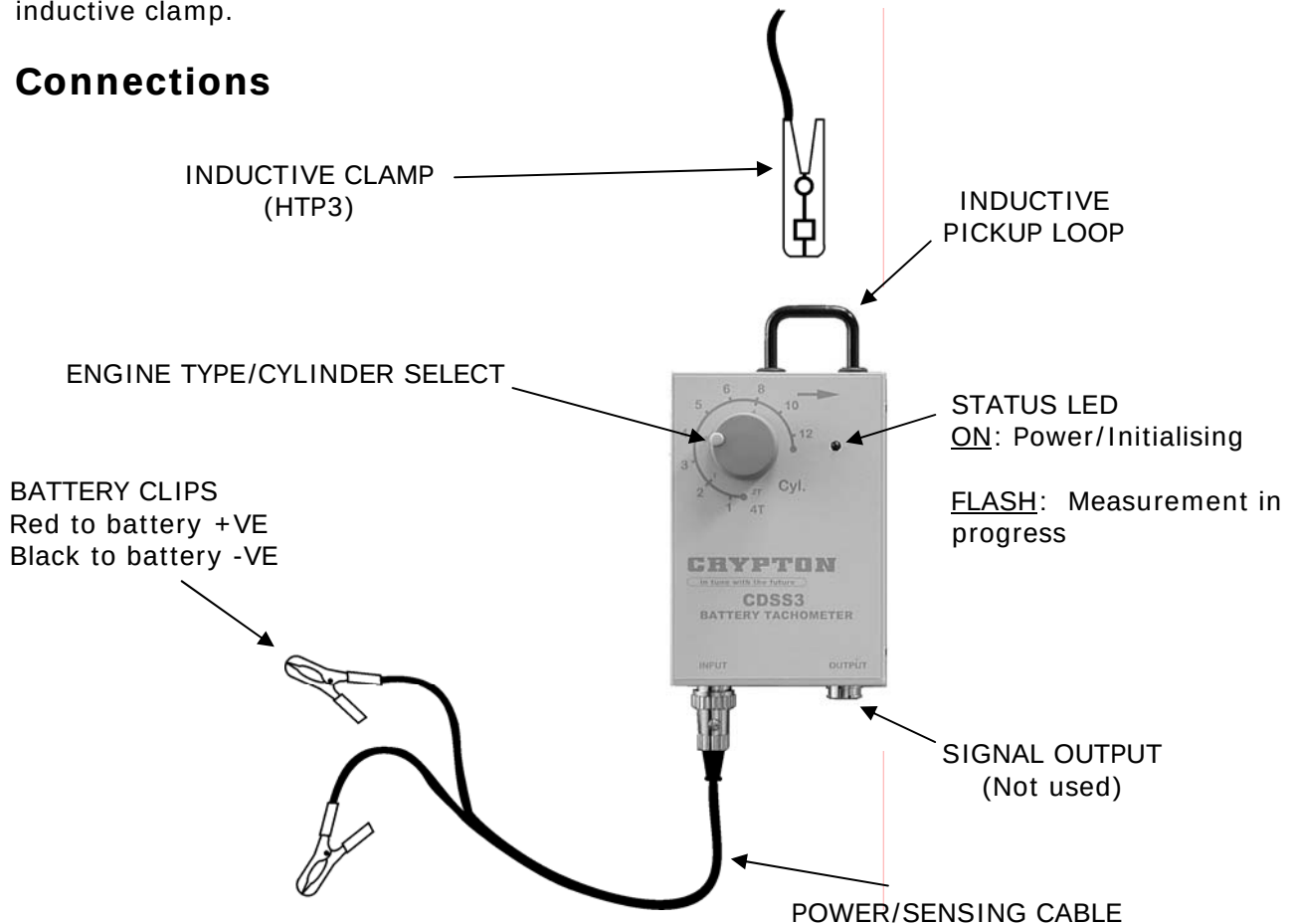
Hold Engine speed until yellow status LED changes to Green. This should take a maximum of 5 seconds. If the status LED does not change, try another mounting position.

CDSS3 BATTERY TACHOMETER

Battery sensing type for Petrol and Diesel Engines

This adapter measures the frequency modulation ripple of the alternator across the battery terminals, and converts this information into engine speed signal that is used to drive the inductive clamp.

Connections



CDSS3 Operation

Before starting the vehicle, attach the crocodile clips on CDSS3 power/sensing cable to battery terminals, ensuring that the polarity is correct. Use the selector knob to set engine type and number of cylinders.

Example: For a four cylinder four stroke engine, the selector should be set to 4 on the 4T scale. For a vehicle fitted with a Distributor-less Ignition System (DIS) the setting will be the same.

Start engine, switch on vehicle lights and allow to idle.

The unit will search for a steady speed each time it is powered up, if the engine speed falls or the engine type is changed. This is the initialisation period and may last up to 17 seconds. During this time, the status LED will flash slowly and the rpm will read zero.

Once the speed has been detected, readings will appear on the host analyser. The CDSS3 updates 10 readings per second.

Note: On some vehicles readings may be unstable or inaccurate. To minimise the risk of this:-

Ensure that the vehicle headlights are switched on.

Keep engine speed stable during initialisation time (<17 Seconds.)

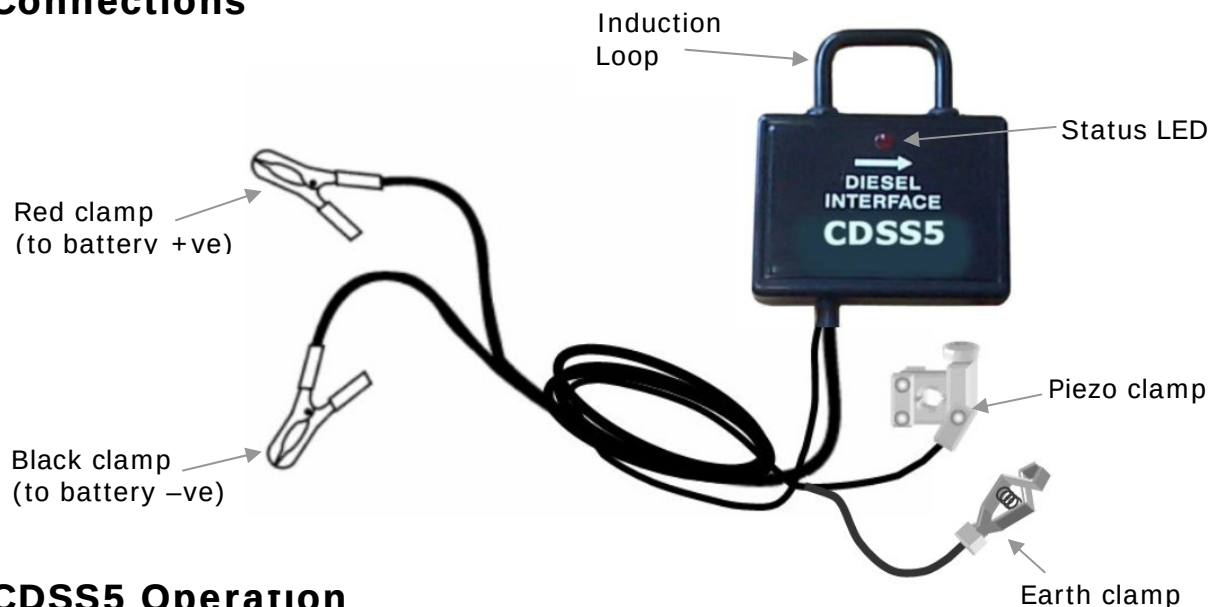
If, after initialisation the speed is stable but reading double, change the cylinder setting until the correct value appears.

CDSS5 PIEZO CLAMP TACHOMETER

Piezo RPM adapter for Diesel Engines

This adapter measures the pulses through the injection pipe of the cylinder No1 and converts this information into engine speed signal that is used to drive the inductive clamp HTP3.

Connections



CDSS5 Operation

Before starting the vehicle, place the Piezo clamp on the injector pipe of the No1 cylinder as close as possible to the pump, and tighten moderately (as soon as the clamp screw cannot turn anymore is sufficient)

CAUTION

The pipe must be straight under the clamp (no curve) and without paint, dust or grease: if necessary, clean with glasspaper or solvent.

The clamp must not touch any other part: either the pump, engine mounting or hose

Connect the Earth clamp to the cleaned part of the injector pipe.

Connect the CDSS5 from the vehicle battery 12V: red clamp to the battery +ve, and black clamp to the battery -ve

Ensure the HTP3 induction clamp is connected to the host equipment and clamped onto the loop CDSS5 induction loop.

Start the engine. The LED flashes briefly with each injection. The correct RPM measurement should be displayed on the host screen

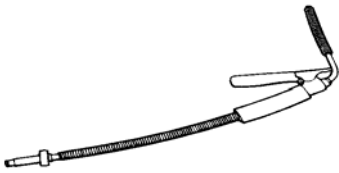
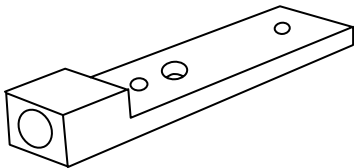
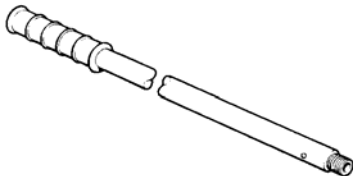
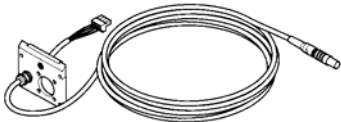
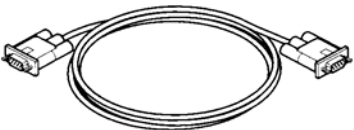
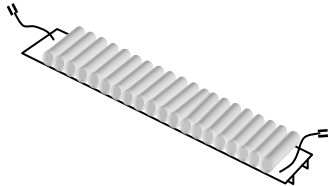
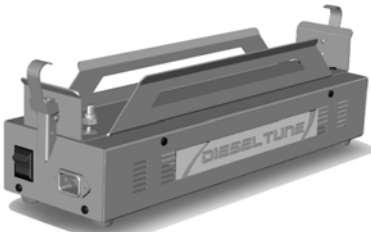
IN CASE OF FAULTY FUNCTIONING

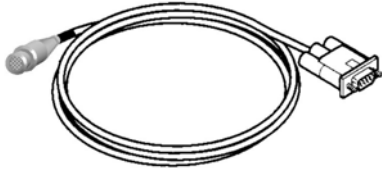
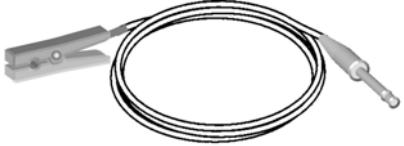
Check the supply: Red clamp and black clamp must be correctly connected.

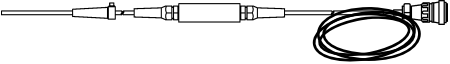
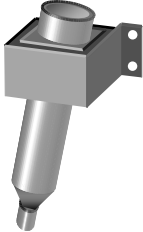
Check the cleanliness of the pipe and the sensor as well as its tightness - Do not overtighten.

If necessary, separate the pipe No1 from the others during the tests

OPTIONAL EQUIPMENT & CONSUMABLES

	DX210-4A Sampling pipe
	DX210-6 Sampling pipe For vertical stack exhausts
	DX260-160L Bracket kit Includes 1.5m Extension Pole (DX210-145) DX260-160H Bracket kit Includes 2.0m Extension Pole (DX210-146) Fits to DX260-1 sampling head. Use with DX210-6
	Additional Extension pole for vertical exhausts DX210-145 Length 1m5 for exhaust outlets approx. 4m above ground level. DX210-146 2m for use up to 4m5 above ground level.
	Sampling Pipe (Special) For use with Zero Emissions Box only SP12 – For RAM-1 (Cars) SP13 – For RAM-2 (HGV)
	Cable – Smokehead to Interface DAS00281 10m Standard (DAS00282 20m Optional)
	Cable – Interface to PC Serial Null Modem 2m DX230-261 9 way D (Fe -> Fe)
	Cable – Serial comms cable from PC to VOSA Smartcard reader (UK). AS08804 (Note: May already be fitted if host PC has EGA)
	DX260-1BT/01 Battery Pack (For use with DX260-1BT Head only) Service Engineer fit only (recalibration required)
	DX260-1IFP Base (For use with DX260-1 Smokehead only) DX260-1CHP Charger Base (For use with DX260-1BT Smokehead only)

	Engine Tachometer - Acoustic Acoustic/Vibration type CDSS1
	Engine Tachometer - Battery Battery sensing type (supplied with CABL3016) CDSS3
	Engine Tachometer - Piezo Piezo Clamp Transducer CDSS5
	Tachometer Adapter Use with CDSS1, CDSS3 & CDSS5 AS09185
	CDSS1 Comms Cable CDSS1 to Tacho Adapter AS09185 AS09133 5m Standard
	CDSS3 Power/Sensing cable CDSS3 to vehicle battery CABL3016
	CDSS3 Power/Sensing cable CDSS3 to vehicle accessory socket CABL3023
	Inductive RPM Clamp For use with CDSS3/CDSS5 HTP3

	TMP7 1m Oil Temperature Probe (with integral 5m cable) Gas analyser only
	Oil Temperature Probe (Use with DX211-11/DX211BT Adapter) DX210-25A - 2.5 metre DX210-26 - 0.75 metre
	Temperature Probe Adapter DX211-11 – 5m cabled Adapter DX211-11BT – Wireless Probe Adapter
	Wireless Temperature Probe Charger (For use with DX211-11BT) DX211-11CH Wall Mount Holster/Charger Allows remote mounting & charging of the DX211-11BT Bluetooth Temperature Probe
	Remote Monitor DX211-15W – Wall Mount Monitor Kit DX211-15P – Floor Standing Monitor Kit DX211-16 – Video Signal Splitter

TECHNICAL SPECIFICATION

A. SMOKEHEAD

Sampling type	Partial flow.
Light source	Green LED, wave length 560 nm.
Light intensity	8-step autoranging for optimum light level
Effective optical path length	250 mm.
Physical response time	Less than 0.4 seconds (varies with gas velocity).
Range	0 - 100% opacity, 0 - 10.00 m ⁻¹ .
Accuracy	1.0% full scale (static).
Measuring cell temperature	70°C min.
Warm-up time	10 minutes approx. at - 15°C ambient
Operating conditions	- 15° to + 40°C. 10 to 90% relative humidity
Smoke temperature	Checked at the inlet to the measuring cell.
Smoke pressure	Controlled at ambient $\pm$ 3.75 mbar.
Sampling pipes	Flexible stainless steel, internal diameter 10 mm, Length 510 mm
Lens cleaning	Wipe with soft cloth every 250 vehicle tests approx.
Calibration	Electronic (patented). Manual (using neutral density filters).
Security	Sampling head serial number and software version held in permanent memory.
Fault diagnosis	Condition monitoring for: - Dirty lenses. - Calibration failure. - Incorrect measuring cell temperature. - Excessive smoke temperature etc.
Power	24V DC, 75W.
Housing	Aluminium extrusion with aluminium die cast end caps.
Finish	Grey textured polyester paint (other colours to order).
Protection	IP22.
Size	450 x 200 x 80 mm.
Weight	3.2 Kg.

B. CONNECTING CABLE - SMOKEHEAD TO CONTROL UNIT

Construction	4-core screened.
Sheath	Polyurethane (for low temperature operation).
Length	10m (standard), 20m max. (optional).

C. POWER SUPPLY

Power	100 – 250V AC, 50 / 60 Hz, 3.2A max @100V, full load.
Operating conditions	0 to + 40°C. 10% to 90% relative humidity (non condensing).
Inputs	Smoke sampling head.
Outputs	RS232, 9-way 'D' (opacity, smoke temperature) 9,600 BAUD.
Security	Interface unit serial number and software version held in permanent memory.
Protection	IP20.

D. OIL TEMPERATURE PROBE ADAPTER

Measurement range	7°C – 116°C
Accuracy	±5°C below 45°C ±1°C above 45°C
Response	<1 Second
Handle Dimensions	22mm Ø x 170mm Length (DX211-11)
Cable Length (Wired)	5 Metres

After Sales Service

Service / Repairs

There are no user serviceable parts inside the equipment. Apart from the standard routine maintenance and adjustments stipulated in this manual the equipment must not be tampered with in any way. All further servicing must be carried out only by an engineer from an Authorised Agent. Failure to observe these conditions will invalidate the Warranty.

On-Site Service / Overhaul / Spare Parts

If you require a Service Engineer to attend ON SITE, either due to an equipment fault, or for machine calibration, or if the equipment covered by this manual requires to be sent back for factory overhaul, or if you need spare parts, please contact your local agent.

If you are asked to return goods for inspection/repair

Please include the following:

- Returns Number if applicable
- Name of person returning the unit
- Name, address and telephone number of garage/organisation
- Full description of the problem

The returned unit will be examined and the sender notified of any cost before any repair work is undertaken.

Service and Calibration Contracts

Where units require Legislative calibration please contact your local agent.