3010 MINIFID
PORTABLE HEATED
THC ANALYSER
OPERATING MANUAL

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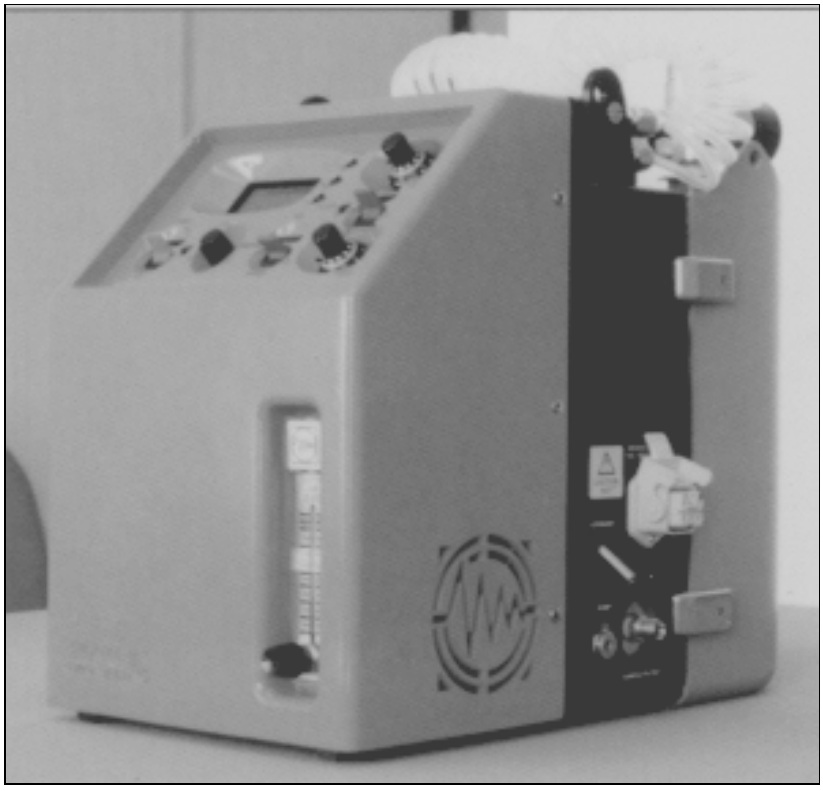


CONTENTS

Figures

1. INTRODUCTION

1.1 3010 MINIFID

1.1.1 The 3010 MINIFID uses the well established principle of Flame Ionisation to detect volatile organic compounds in a gas stream. It incorporates all the knowledge and experience of five generations of product development. **Please read this manual thoroughly before operating the 3010 MINIFID.**

1.1.2 Features include:

1.1.2.1 Improved heated sample conditioning module with built in sample pump.

1.1.2.2 Field replaceable carbon scrubber cartridge to provide hydrocarbon free burner and zero air.

1.1.2.3 Integral heated line, temperature controlled by the 3010 MINIFID (no separate heated line control required).

1.1.2.4 Light weight for easy portability.

1.1.2.5 Simple controls. Non-specialist personnel can operate with the minimum of training.

1.1.3 The analyser will have been configured at the factory for either H_2 or H_2He fuel and calibrated for Propane or Methane equivalence.

1.2 Applications

1.2.1 The main applications for this analyser are in automobile combustion research, mobile emissions compliance monitoring, HSE and emission consultancies, and gas manufacturers.

1.2.2 The prime benefit for these users comes from the heated detector and sample system. Raw gas can be measured with great accuracy and sensitivity, and with very low interference from other emission components normally found in the combustion gas sample.

1.2.3 The 3010 MINIFID is 300mm high, self contained, and fully portable. It is equally convenient for use on the laboratory bench or as a portable on-site measurement tool.

2. WARRANTY

For a period of 12 months from the date on which an instrument is delivered to the Purchaser, Signal Group Ltd. (the 'Company') will exchange or repair at the Company's option any part or parts requiring replacement or repair by reason of defective workmanship or material. This warranty applies to all new instrumentation manufactured by and purchased from Signal Group Ltd. subject to these conditions of sale:

1. The Company's obligations are conditional upon the goods being properly packed and despatched by the Purchaser to the Company's Works with transportation, insurance and other charges prepaid by the Purchaser. There is no charge to the Purchaser for the cost of the materials or labour time expended by the Company in discharge of its warranties. If a site visit is requested a charge will be made to cover the travelling and at the Company's discretion, subsistence expenses.

2. The Company shall not be responsible for any defect which, in the opinion of the Company, was attributable to:

a) Wear and tear. Certain components are, by their nature, consumables, and are excluded from warranty. Such items include catalyst material, lamps, filters etc.

b) Any form whatsoever of improper use or maladjustment or damage caused by the Purchaser, his employees or anyone other than the Company's personnel.

c) Abnormal corrosive or abrasive conditions.

d) Lack of regular servicing and maintenance of the instrument by Signal Group Ltd. or an authorised representative. Regular servicing is required according to the relevant maintenance schedule or every six months after delivery to validate warranty, and will be chargeable at current rates.

e) Non-compliance with any instructions issued by the Company concerning the use and fitting of the instrument.

f) Damage arising from installation or use of the goods in unsuitable environmental conditions.

g) Faulty or irregular supply of electricity, air, water, gas or other site services.

h) Modifications by unauthorised personnel.

3. The Company shall not be responsible for any expense which the Purchaser may incur in removing, replacing or fitting any part.

4. Every other form of liability, including consequential loss, damage or cost, howsoever caused, is hereby expressly excluded except where such loss or damage arises from negligence of the Company or its servants.

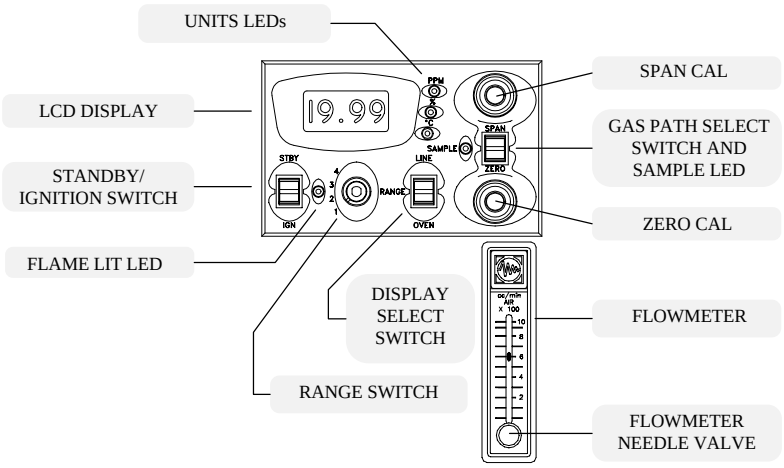
5. This warranty is given in addition to your statutory rights.

3. QUICK START

3.1.1 Full instructions for operation of the 3010 MINIFID are in section 6 of this Manual.

3.1.2 Instructions for routine maintenance of the 3010 MINIFID are in section 7 of this Manual.

3.1.3 Simple Quick Start instructions are attached to the analyser, and are repeated here:



3010 MINIFID START-UP PROCEDURE

1. Prior to use, inspect the gas bottles and their connecting pipes and fittings, and the heated line. **Do not use if damage is evident.**

2. Connect the Heated Line electrical and pneumatic connections to the MINIFID, and to the sample source. **Do not operate the heated line when coiled as it may overheat.** Connect the fuel and calibration bottles to the MINIFID, and open their on/off valves one full turn only. Check the mains supply is 110Vac, 1000VA minimum continuous. Plug the MINIFID in. Set the GAS PATH SELECT switch to ZERO.

3. Switch on using the mains breaker switch to the rear of the MINIFID. **Do not connect or disconnect the Heated Line's electrical connection when the power is on.**

4. When the Oven and Heated Line have both warmed up above 130°C, flick the STBY/IGN Switch to IGN briefly and the pump will start. Adjust the air flow using the front panel flowmeter for a flow of 600 ml/min.

5. Press and hold the STBY/IGN switch to its IGN position whilst slowly reducing the front panel air flow. Ignition is indicated by a 'popping' sound and an increase in the analyser reading. Also the FLAME LIT LED will illuminate continuously. When the MINIFID is lit, slowly increase the front panel air flow to 600ml/min.

6. Allow the MINIFID to stabilise for a further 10 to 15 minutes. Set the GAS PATH SELECT switch to ZERO, and adjust ZERO CAL for a reading of zero. Set the switch to SPAN, and adjust SPAN CAL for a reading to match the value of the calibration bottle (select the appropriate RANGE for this).

7. Set the GAS PATH SELECT switch to SAMPLE, the SAMPLE LED will light continuously, and the MINIFID will measure the total hydrocarbon content of your sample. Select appropriate RANGE.

8. To shut down the MINIFID, remove the Heated Line from the sample gas source and with the GAS PATH SELECT switch in the SAMPLE position, allow the Heated Line to purge with ambient air for at least 15 minutes. Switch the GAS PATH SELECT switch to ZERO for at least 2 minutes to purge the MINIFID. Move the STBY/IGN switch to STBY (standby), then switch the mains breaker switch to off, and close the gas bottles' on/off valves. **Do not coil the Heated Line until it has cooled**.

CAUTION: SOME PARTS MAY STILL BE HOT

4. TECHNICAL DESCRIPTION

4.1 The Principle of Flame Ionisation

4.1.1 This detector ionises carbon atoms in a hydrogen flame. Normally a hydrogen flame produces very few ions. Any carbon-hydrogen bonded molecules carried into the flame results in the formation of carbon ions. The detector can measure most compounds with a carbon-hydrogen bond provided that they are in gaseous form.

4.1.2 Because the detector responds to carbon ions, a mixture of hydrocarbon compounds result in an output closely proportional to the carbon count. 10 ppm CH_4 mixed with 10 ppm C_3H_8 results in an output of approxamately 40 ppm Methane equivalence or 13.33 ppm Propane equivalence. These are two of the ways that the hydrocarbon concentration can be expressed. The Methane equivalence is mainly used in ambient air monitoring where a comparison against background Methane is required. Propane equivalence is used in most other industries.

4.2 Sample System

4.2.1 Combustion exhaust gases normally contain some hydrocarbons that are liquid at ambient temperatures . The unit includes a 191 °C heated sample handling module which houses the FID, a sample particulate filter, a sample selection solenoid, a sample capillary, and connections to the zero and span selection valves.

4.2.2 The sample module allows the connection of a heated sample line directly to the heated sample inlet, preventing cold spots where sample condensation may occur. It uses a make-up air bypass system to prevent sample condensation problems at the back-pressure regulator. Make-up air is added to the sample path from the bypass air supply at a point down-stream of the sample extraction point. This creates a constant flow at the sample dump port. The sample is never in contact with the pressure control components.

4.2.3 An internal dual headed pump provides sample flow and bypass air.

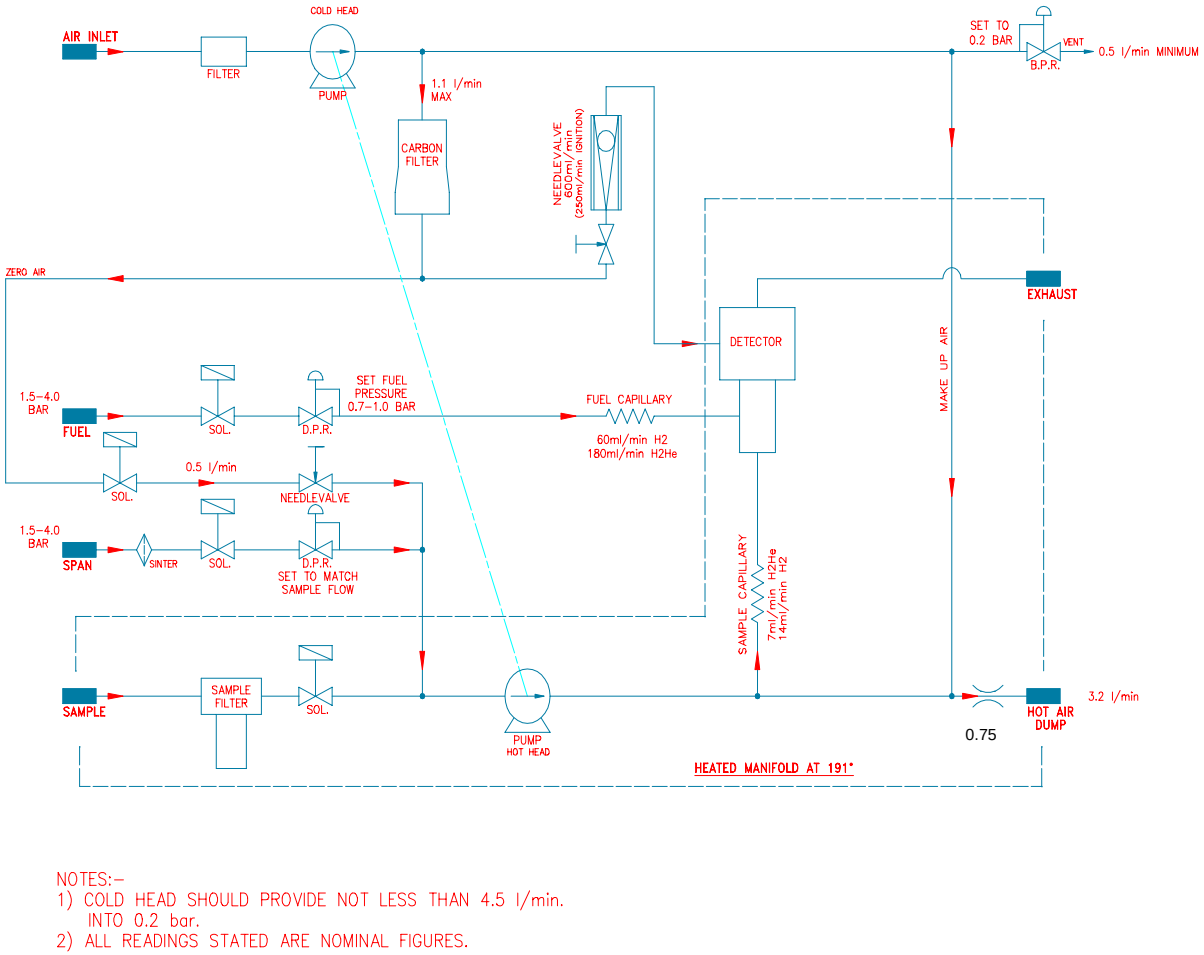
4.2.4 A portion of the bypass air is passed through a disposable Carbon Scrubber to provide very low hydrocarbon FID combustion and zero air.

4.2.5 Sample gas cannot be selected until the oven and heated line are above 130°C and the flame is lit.

4.3 Fuel System

4.3.1 The instrument has been designed so that no possibility of hydrogen gas build-up can occur inside the enclosure. A *flame-out* sensor shuts off the fuel whenever the FID flame extinguishes. The shut-off valve is mounted on the rear panel so that any possibility of leaks upstream of the valve will occur on the outside of the instrument where it will be diluted and ventilated.

4.4 Flow Schematic



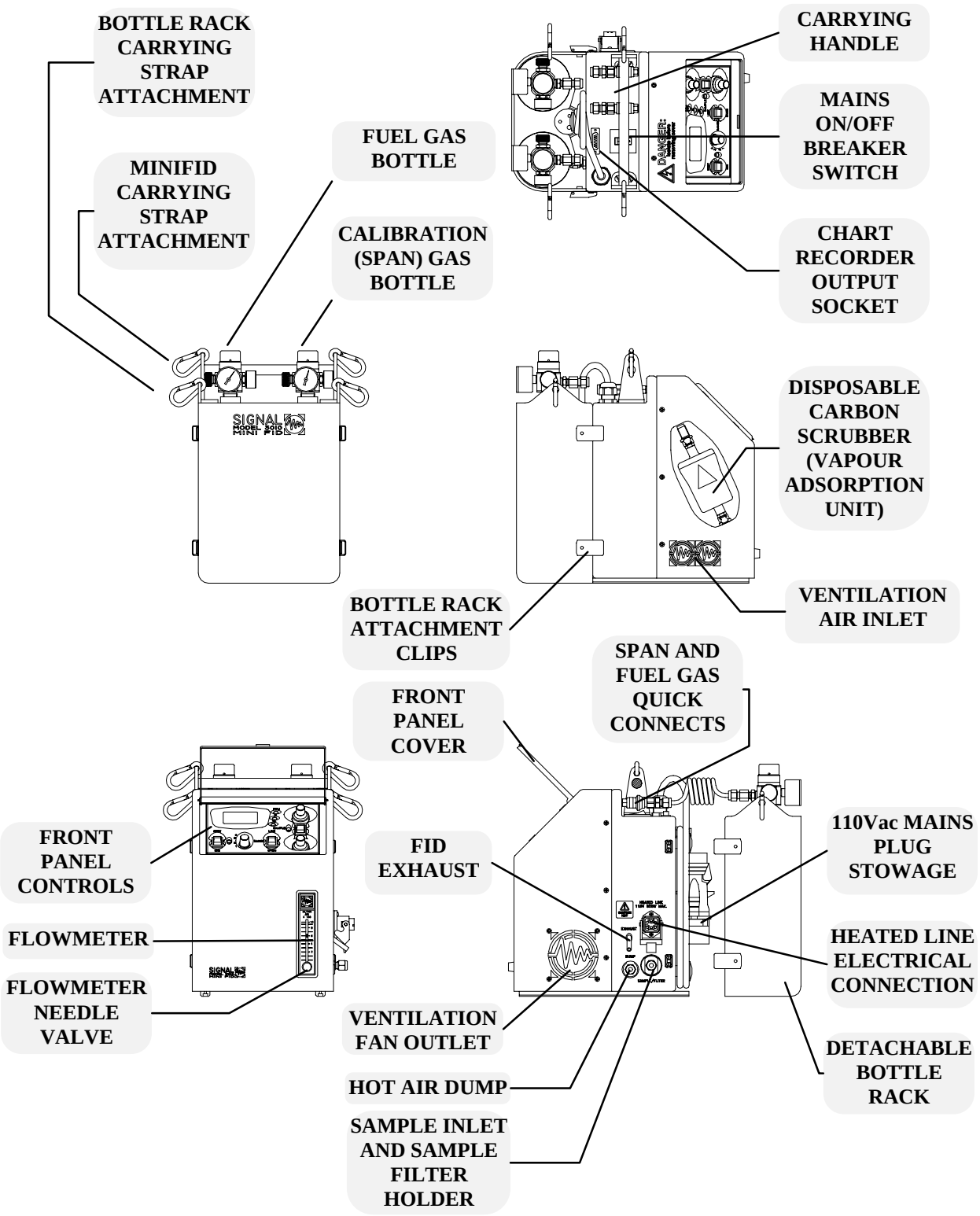
NOTES:-
1) COLD HEAD SHOULD PROVIDE NOT LESS THAN 4.5 l/min. INTO 0.2 bar.
2) ALL READINGS STATED ARE NOMINAL FIGURES.

Figure 1 Flow Schematic

4.4.1.1 The 3010 MINIFID has a bypass flow system which uses the air pumped by the cold head to compensate for variations in the sample flowrate. The Hot Air Dump flowrate of 3.2 l/min is maintained mostly by the sample flow, and made up to 3.2 l/min by the make up air, supplied at constant pressure by the pump cold head, and the back pressure regulator. The constant 3.2 l/min Hot Air Dump causes a constant back pressure in the bypass system. The small detector sample is taken through a capillary to the detector from the bypass. The constant back pressure in the bypass system maintains a constant flow to the detector. Any variation in the sample flow to the analyser is made up to 3.2 l/min Hot Air Dump by the Make-up Air. The sample flow to the analyser must never exceed the Hot Air Dump flow else the compensation system will go out of control, allowing sample gas to be vented into the analyser through the BPR. Also the sample flow must never fall below 0.4 l/min else the Make-up Air may backstream through the bypass system to the sample capillary, and dilute the sample. The system has the benefit of maintaining accurate control through large variations in sample bypass flowrate (0.4 to 3.0 l/min), without the necessity of having a mechanical pressure regulator in the sample gas stream.

4.5 Major Component Location

4.5.1 The location of the 3010 MINIFID major components is illustrated in the diagram below.



4.6 Analyser Controls

4.6.1 The 3010 MINIFID controls are illustrated, and their function detailed in the diagram below.

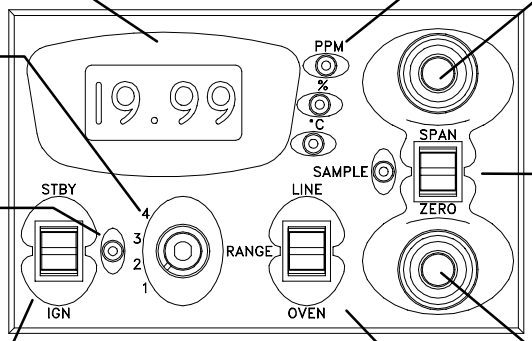
LCD DISPLAY
Indicates analyser reading in ppm or % as shown by illuminated units led. Will also indicate oven or heated line temperature depending on position of display select switch.

UNITS LEDS
Appropriate led will illuminate to show which units apply to current lcd display, e.g. ppm, % or °C. Led will flash if display is over range.

SPAN CALIBRATION
Scales reading to calibrate analyser to known concentration when span gas is selected. Pot gives 10:1 gain change allowing calibration for CH_4 or C_3H_8 equivalence.

RANGE SWITCH
Selects the analyser range
1 - most sensitive
4 - least sensitive

FLAME LIT LED
Illuminated when FID flame successfully lit

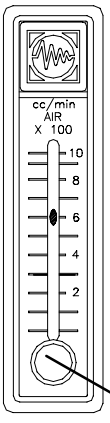


GAS SELECT & SAMPLE LED
Selects zero or span gas for calibration or sample gas for measurement. Sample is inhibited if oven or heated line are not at temperature, or FID flame not lit.
Sample led is illuminated when sample is measured.

STANDBY/IGNITION SWITCH
Use centre position for start up: oven and line will warm up and when at temperature, pump will start. Set air flow and depress switch (momentarily) for ignition. Once ignited re-adjust air flow.
In stby position, heaters are maintained but pump and fuel are turned off.

ZERO CALIBRATION
Sets zero point of analyser. Use when zero gas is selected.

DISPLAY SELECTION
Selects temperature or hydrocarbon level for display.



FLOWMETER
Indicates FID air flow. Set to ~250 ml/min for ignition and 600 ml/min for normal operation.

FLOWMETER NEEDLE VALVE
Sets FID air flow

5. INSTALLATION

THIS INSTRUMENT REQUIRES A SAFETY EARTH CONNECTION AND IS SUITABLE FOR 110Vac OPERATION ONLY

Sample inlet and bypass output ports

WILL BE HOT

while the analyser is ON, and for some time after switching off

TAKE PRECAUTIONS AGAINST BURNS BY USING GLOVES

5.1 Carrying Options

5.1.1 The entire instrument and bottle rack may be carried either by the carrying handle or the strap. The bottle rack may be detached and carried by its own strap.
On no account should the bottle rack strap be used to carry the entire instrument.

5.2 Analyser Location

5.2.1 The analyser should be mounted on a flat surface, and should be placed in a dry and sheltered location out of direct sunlight, avoiding drafts, and protected from water ingress.

5.2.2 Observe the environmental limitations listed in the specification section.

5.2.3 The analyser relies on ventilation through the sides. Do not obstruct these areas.

5.3 Mains Power Connections

5.3.1 The analyser is supplied with a 2 m long mains lead with a BS4343 plug for connection to a 110Vac 50/60Hz supply. This will normally be provided by a safety isolation transformer of 1000VA continuous rating minimum.

5.3.2 This instrument requires a safety Earth and must not be used without one.

5.4 Gas Connections

5.4.1 If your sample contains toxic gases, as defined by your local legislation, the analyser exhaust and (hot air) dump must be routed to a safe area that complies with your local safety regulations. Condensate will form as the exhaust gas cools and for this reason any external pipework must run downwards. **Take care as the exhaust and dump will be hot if the analyser has been switched on.**

5.4.2 The analyser is a very sensitive detector of hydrocarbons. It is very important that all gas and sample tubing is clean and free from contaminants, and does not retain volatile organic compounds which may be released later. PTFE tube is suitable for most applications. Contaminated PTFE tubing can be cleaned by heating it in an oven at 200 °C while passing clean air through it.

5.4.3 The Sample and Hot Air Dump gas connections have the same assembly method. Cut the tubing to length ensuring that the ends are cut square. Slide the nut and ferrule over the tube. Insert the tube into the end of the fitting and hold it firmly against the internal shoulder. Slide the nut and ferrule to the fitting and tighten the nut until it is "finger tight". Tighten the nut a further 1¼ turns with a suitable spanner. When connections are remade, it is only necessary to tighten the nut slightly with the spanner after making it "finger tight".

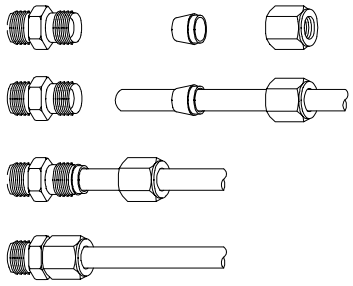
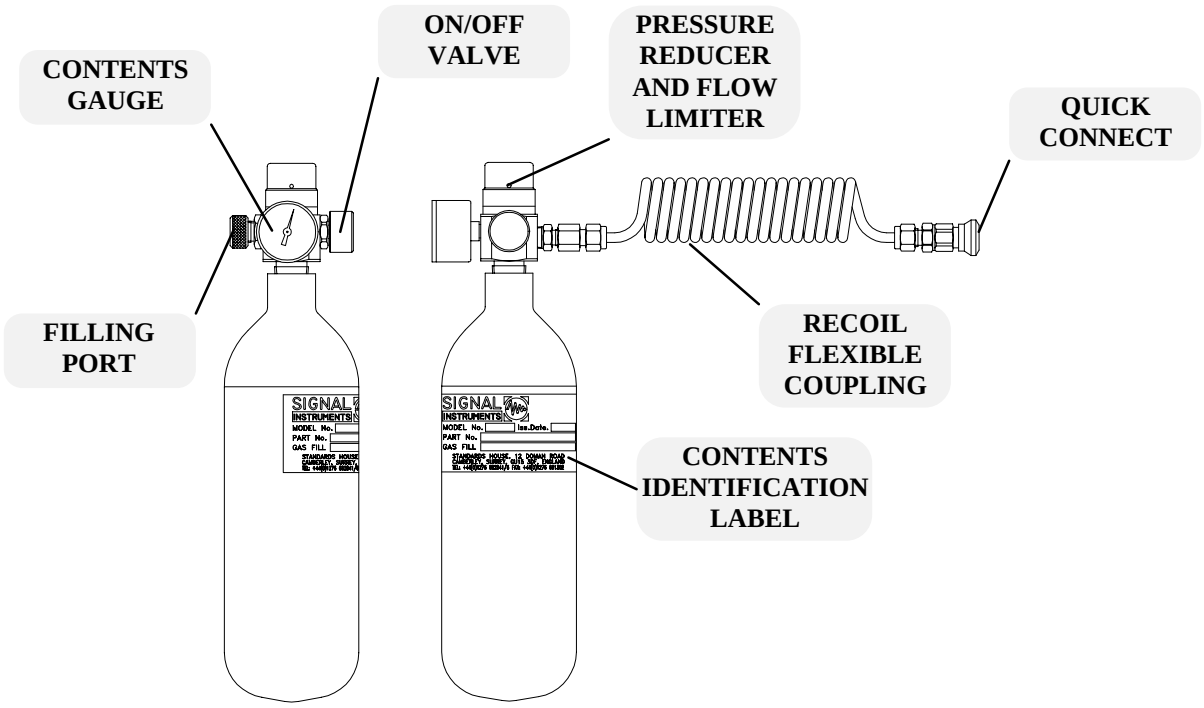


Figure 2 Tube Fitting Assembly

5.5 Fuel

5.5.1 The analyser is supplied with a fuel bottle containing either H_2 or a 40%/60% mixture of H_2/He. The bottle comes complete with a single stage pressure reducer, flow limiter, ON/OFF valve, coiled connecting tube and quick fit connector for easy connection to the analyser fuel inlet. The analyser will have been configured at the factory for either H_2 or H_2/He fuel. Check the test certificate shipped with the analyser to confirm which type you require. You may connect an alternate source of the fuel gas to the fuel inlet if the supply is regulated within the limits described in the specification section of this manual. Ensure that the regulator and piping are clean and not contaminated. If they have been used with high concentrations of volatile organic compounds they should be purged with clean air for at least 24 hours.



5.6 Span Calibration Gas

5.6.1 The analyser is supplied with a calibration bottle containing either 1000ppm Propane or 500ppm Methane in air (Alternate concentrations can be supplied. Contact Signal or your local agent). The bottle comes complete with a single stage pressure reducer, flow limiter, ON/OFF valve, coiled connecting tube and quick fit connector for easy connection to the analyser span inlet. Total Hydrocarbon measurements are normally made in Propane or Methane equivalence, and you should use an appropriate calibration gas accordingly. The actual concentration should be similar to the expected range of results for best accuracy. You may connect an alternate source of the calibration gas to the span inlet if the supply is regulated within the limits described in the specification section of this manual. Ensure that the regulator and piping are clean and not contaminated. If they have been used with high concentrations of volatile organic compounds they should be purged with clean air for at least 24 hours.

5.7 Zero Calibration Gas

5.7.1 This is internally generated from room air via a field-replaceable carbon scrubber cartridge. If there is a high hydrocarbon local ambient background, the carbon scrubber cartridge will require regular replacement, or you may require an external source of hydrocarbon free air to connect to the air inlet of the analyser

5.8 Sample

5.8.1 Depending on your application, the source of sample gas may be at an elevated temperature. The analyser sample system is heated to 191 ºC in order to prevent condensation of sample contents which can lead to inaccurate concentration readings and blockages in the sample path. It is normal in many applications for the sample to be routed to the analyser using a heated line, and the 3010 MINIFID is supplied as standard with a 5 metre heated line. There is an optional 10 metre heated line available. Both are powered and temperature controlled by the analyser.

5.8.2 Connect the heated line to the port labelled SAMPLE/FILTER. The nut only requires to be ‘nipped’ tight with a spanner and excessive force should be avoided. **Take care - this port will be hot if the analyser has been switched on.** Connect the heated line’s electrical plug to the MINIFID’s heated line electrical socket. **Do not connect or disconnect the heated line electrical connections to the analyser when the analyser is switched on. Do not operate the heated line when coiled as it may overheat.**

5.9 FID Exhaust

5.9.1 The FID produces a small quantity of waste gas as a by-product. This is normally vented to the local ambient. If the sample contains toxic gases as defined by your legislation, this outlet must be vented to a safe area or in a manner as described by the local legislation. The exhaust gas contains water vapour which as it cools, condenses. This condensate may be corrosive.

5.9.2 The detector is very sensitive to the back pressure on this port. In particular, variations due to an external pump used to force flow in the safe vent area can cause excessive detector noise.

5.9.3 Only if necessary, connect the exhaust to a safe vent area using the largest possible tubing. This tubing must run downwards due to the condensate.

5.10 Hot Air Dump

5.10.1 Unused sample gas and make-up air leave the analyser at the DUMP port. This is normally vented to the local ambient. If the sample contains toxic gases as defined by your legislation, this outlet must be vented to a safe area or in a manner as described by the local legislation. As it cools, condensate may form, which may be corrosive.

5.10.2 Only if necessary, connect the exhaust to a safe vent area using the largest possible tubing. This tubing must run downwards due to the condensate.

5.11 Chart Connections

5.11.1 Figure 3 shows the CHART socket pin-out connections, viewed from above.

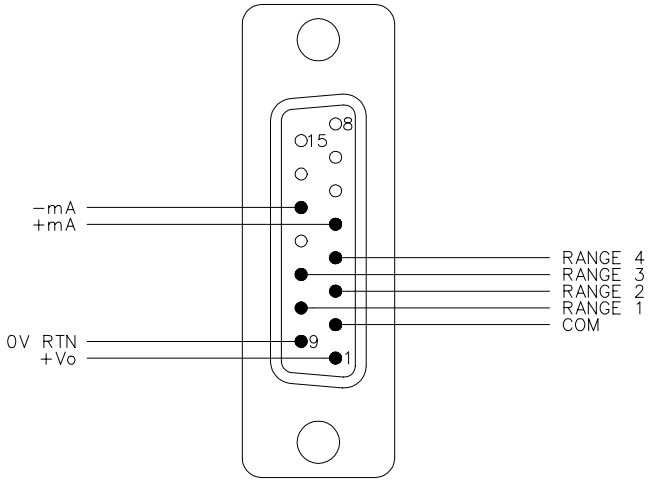


Figure 3 Chart Socket

5.11.2 Pins 1 and 9 provide a 0-10V output where fsd corresponds to the selected range full scale. Note this signal is not isolated: the return is internally connected to Earth.

5.11.3 Pins 5 and 13 provide a 4 - 20mA output where fsd corresponds to the selected range full scale. This signal is isolated from ground to ensure trouble-free current loop performance.

5.11.4 Pins 2 and 10, 3, 11 & 4 provide volt-free contact closures to indicate range. COM connects to each of the RANGE pins corresponding to the selected range. Observe the electrical ratings of these contacts listed in the Specifications.

6. OPERATION

6.1 Introduction

6.1.1 Analyser operation is controlled directly by the operator from the front panel.
This section explains in detail how to operate the analyser using the front panel controls.

6.2 Switch on and Temperature Monitoring

6.2.1 Before using the instrument, inspect the gas bottles and their connection tubing and the heated line. Do not use the instrument if any damage is evident.

6.2.2 Connect the heated line electrical lead to the socket on the right hand side **before** applying mains to the instrument. This is to avoid unnecessary arcing, and connection or disconnection of the heated line should be avoided while mains is on. Do not operate the heated line when coiled as it may overheat.

6.2.3 Connect the heated line gas connection to the sample inlet. The nut only requires to be 'nipped' tight with a spanner and excessive force should be avoided.

6.2.4 Connect to a suitable 110Vac power source: this will normally be a safety isolation transformer. Switch instrument ON.

6.2.5 The oven and heated line will now heat up to the set temperature of 190°C. Their temperatures can be monitored by use of the display selection switch.

6.2.6 Ignition is inhibited until the oven and heated line have reached approximately 130°C to prevent water condensation within the FID.

6.3 Ignition

6.3.1 Open the gas bottle valves by turning anti-clockwise. A single full turn is sufficient.

6.3.2 Select zero gas using the gas select switch.

6.3.3 Depress momentarily the ignition switch. This starts the pump and turns on the fuel. The front panel flowmeter should be adjusted for a flow of 600ml/min.
The FLAME LIT LED will flash to indicate that the *flame-out sensor* has been over-ridden and a flame lit condition has not yet been sensed. The override period is set at approximately 2 mins. to give time for the flame to be sensed. If the flame is not sensed within this time, the pump and fuel are turned off.

6.3.4 Depress and hold the ignition switch whilst slowly reducing the front panel air flow. This operation energises the igniter and provides the fuel enrichment necessary for ignition. Ignition is indicated by a 'popping' sound and the display reading will rise. Also the FLAME LIT LED will light continuously when the flame has been detected.
Upon successful ignition, the front panel air flow should be slowly increased to 600ml/min and then the ignition switch released.

6.4 Calibration

6.4.1 Upon successful ignition the instrument should be allowed to stabilise for 15mins.

6.4.2 Select zero gas using the gas select switch and adjust the ZERO CALIBRATION control to achieve a zero reading. The most sensitive range, 1, is normally selected for this operation. Make sure the DISPLAY SELECT switch is in its centre position otherwise temperature will be displayed.

6.4.3 Select span gas using the gas select switch and adjust the SPAN CALIBRATION control to achieve a reading to match the calibration gas. The appropriate range will need to be selected for this operation.

6.5 Sample Measurement

6.5.1 Select the centre position of the gas select switch to measure the hydrocarbon level of the sample gas entering via the heated line. The SAMPLE LED will light.
Select appropriate range. The units LED, ppm or %, will flash to indicate over-range.

6.5.1.1 As part of the instrument's safety philosophy, sample selection is only allowed if the flame is lit and the heaters are above 130°C. The SAMPLE LED flashes to indicate that sample has been selected but has been internally inhibited and the instrument defaults internally to zero gas.

6.6 Standby

6.6.1 Selecting STANDBY with the IGNITION switch will immediately stop the pump and shut off all gas valves: the flame will extinguish. The oven and heated line temperatures are maintained ready for a subsequent ignition sequence.

6.7 Shut-down

6.7.1 To prevent hydrocarbons condensing as the instrument cools down, it is important to purge the system, as follows:

6.7.2 Remove the heated line from the sample source and with sample gas selected, purge the line with ambient air for at least 15 mins.

6.7.3 Select zero gas and purge the analyser for at least 2 mins.

6.7.4 Select STANDBY with the IGNITION switch. The pump will stop and all gas valves will shut off: the flame will extinguish.

6.7.5 Switch off the mains breaker switch and shut off the gas bottle valves.

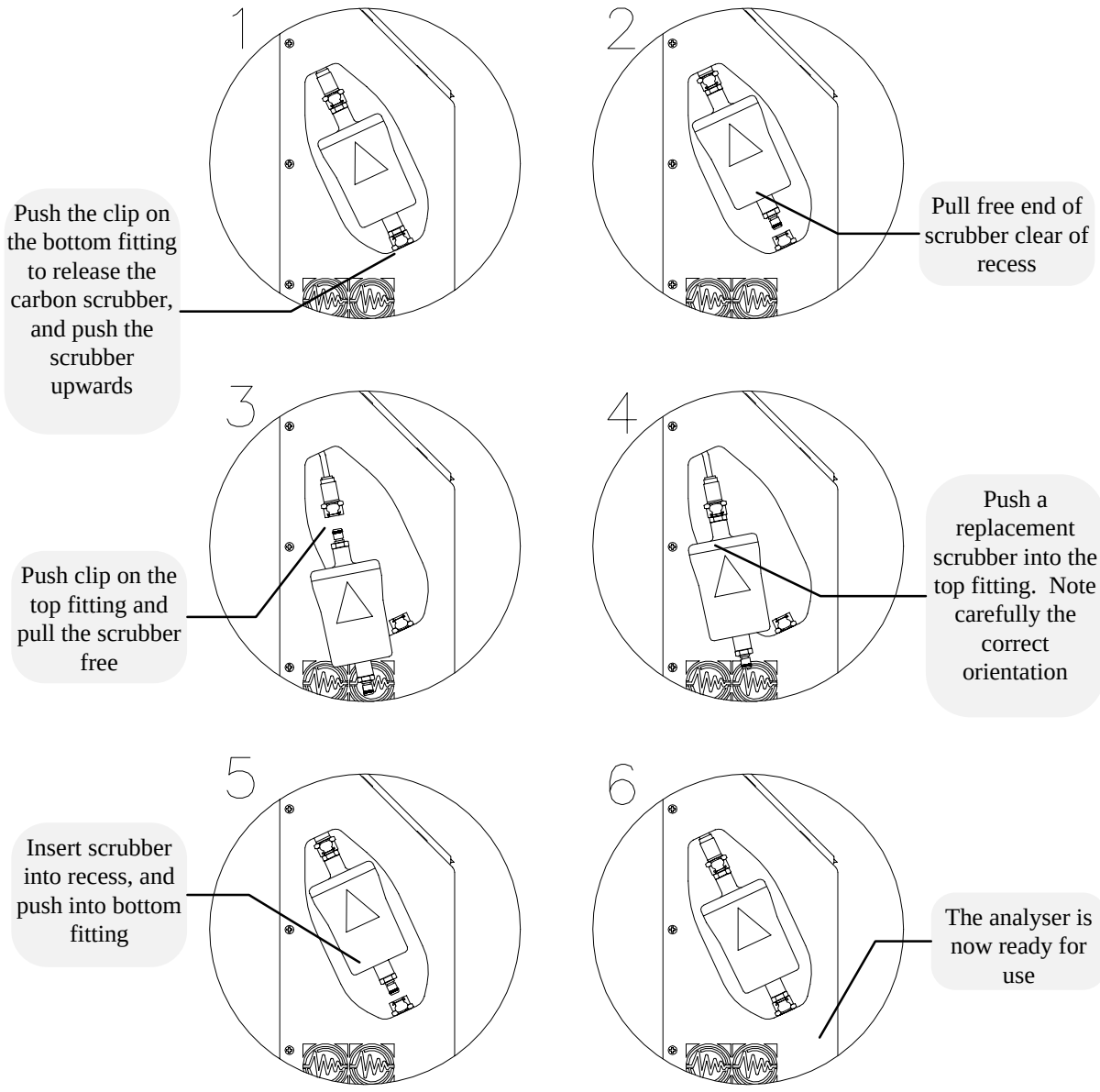
6.7.6 Do not coil the heated line until it has cooled.

7. ROUTINE MAINTENANCE

7.1 Replacing the Carbon Scrubber

7.1.1 The lifetime of the carbon scrubber depends entirely on the hydrocarbon level of the local ambient air. Replacement will be necessary when an elevated zero is evident. Replacement scrubbers can be ordered under part number 3010/342120.

7.1.2 Ensure the analyser is either switched off, or that the STANDBY/IGNITION Switch is at STBY. Follow the six steps below:



7.2 Sample Filter Replacement

CAUTION

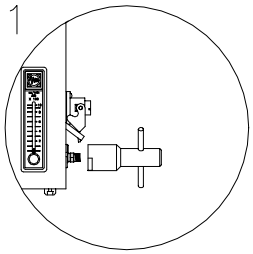
If the analyser has been switched on, the filter housing will be too hot to touch. The filter replacement tool provides a method for changing hot filter elements.

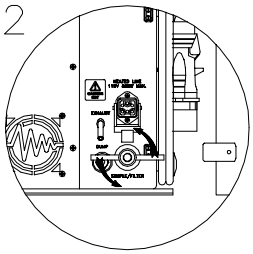
Dirty filters may contain corrosive compounds. Use gloves.

7.2.1 Signal recommend and supply PTFE filters. Replacements can be ordered under part number FILT/023.

Disconnect the sample gas line. The sample filter and filter retainer are removed using the filter replacement tool supplied with the MINIFID

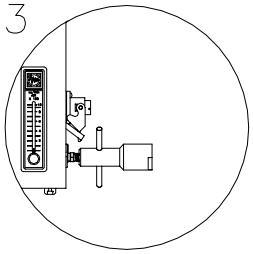
Locate the filter replacement tool against the filter retainer

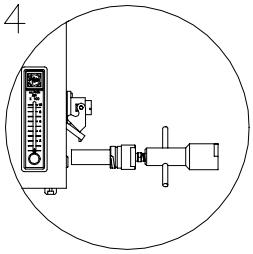




Push in and turn the tool 90 degrees anti-clockwise

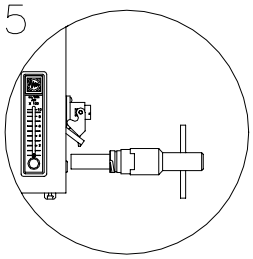
Reverse the tool and screw the thread onto the end of the filter retainer pipe fitting

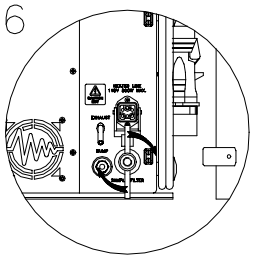




Pull out the filter retainer and sample filter. Replace or clean the filter.

Reverse the tool again and locate it on the filter retainer with a replacement or cleaned filter fitted





Push filter and filter retainer into the MINIFID with the T-bar vertical, then rotate the tool 90 degrees clockwise to lock the filter retainer in position

7.2.2 Glass fibre filters are not recommended. They can be damaged during installation into the heated manifold and fibres can become detached and block critical sample paths. The PTFE filters are not fibrous and can be installed by unskilled personnel. They have been found to contribute significantly to analyser reliability.

8. ROUTINE SERVICING

8.1 Policy

8.1.1 Full Service Manuals are only issued to distributors and agents. All warranty will cease if a customer carries out his own servicing during the warranty period unless special arrangements have been made in writing.

8.1.2 If you wish to carry out your own servicing, contact Signal, your local distributor, or agent.

9. SPECIFICATION

9.1 Detector

9.1.1 Heated Flame Ionisation Detector (FID)

9.2 Ranges (methane or propane equivalence)

9.2.1 0-10 ppm, 0-100 ppm, 0-1,000 ppm, 0-10,000 ppm (1%) OR

9.2.2 0-100 ppm, 0-1,000 ppm, 0-10,000 ppm (1%), 0-100,000ppm (10%)

9.3 Linearity

9.3.1 Better than ±2% of point or ±0.5% FSD on all ranges down to 10% of range. If 0-100,000 ppm range option selected, this may be expected to be non-linear, and readings should be corrected for actual analyser response.

9.4 Stability

9.4.1 Zero drift less than ±0.2ppm or ±2% of range, whichever is greater

9.5 Noise

9.5.1 Less than ±0.1ppm or ±1% of range, whichever is greater

9.6 Carbon Number Correlation

9.6.1 Less than 5% difference in carbon count between toluene, hexane, propylene and propane when using H_2He fuel

9.7 Oxygen Synergism

9.7.1 100ppm C_3H_8 in air, changed to 100ppm C_3H_8 in N2 has less than 2% effect when using H_2He fuel

9.8 Sample System

9.8.1 Type 316 stainless steel

9.8.2 Internal 191°C oven

9.8.3 Internal heated sample pump

9.8.4 0.4 micron PTFE sample filter, field replaceable

9.9 Sample Flow Rate

9.9.1 0.4 - 2.5 litres per min

9.10 Sample Flow Sensitivity

9.10.1 Less than 4% change in reading from 1 to 2.5 l/min into ambient pressure exhaust

9.11 Response Time

9.11.1 From 2 seconds (5%-95%) at 2 l/min flow rate, dependant on range

9.12 Heated line

9.12.1 Built-in controller for 5m or 10m heated line, temperature 191°C

9.13 Gas Supplies

9.13.1 Detachable bottle rack, with separate carrying strap, to hold fuel and calibration gas bottles

9.14 Pneumatic Connections

9.14.1 $^{1}/_{4}$" compression fittings, stainless steel

9.15 Inlet Pressures

9.15.1 CALIBRATION: 1.5 to 4.0 bar maximum. Flow internally regulated

9.15.2 FUEL: 1.5 to 4.0 bar maximum. Flow internally regulated

9.16 Zero Air

9.16.1 Internally generated from room air via field-replaceable carbon scrubber cartridge. If there is a high hydrocarbon local ambient background, the carbon scrubber cartridge will require regular replacement, or you may require an external source of hydrocarbon free air to connect to the air inlet. 4.5 l/min typical requirement.

9.17 Ignition

9.17.1 Simple quick start instructions allow use with the minimum of instruction and training. Fuel enrichment for ignition is achieved via a front-panel needle valve and flow meter, with a momentary action switch activating the flame igniter.

9.18 Safety Interlocks

9.18.1 Fuel shut-off if flame fails

9.18.2 Sample inhibit until oven and heated line at temperature, and FID flame lit

9.19 Display

9.19.1 3 1/2 digit LCD display with backlight

9.19.1.1 19mm (0.75") digit height

9.19.1.2 Automatic decimal point placement

9.19.2 Switch selectable readout of oven and heated line temperatures

9.19.3 LED indication of LCD display units (ppm, % or °C)

9.19.3.1 Flashing ppm or % LED to indicate over-range

9.19.4 LED indication of FID flame status

9.19.5 LED indication of Sample gas path selection

9.19.5.1 Flashing LED to indicate sample inhibit

9.20 Outputs

9.20.1 0-10V fsd into load resistance of greater than 5kΩ. Non-isolated from earth

9.20.2 4-20mA fsd into load resistance of less than 350Ω total. Isolated from earth

9.20.3 Volt-free contacts for analyser range indication. Rating 24Vdc 20mA

9.21 Options

9.21.1 H_2 fuel for applications where the oxygen content of the sample is constant, e.g. ambient monitoring

9.21.2 H_2He fuel for applications where the oxygen content of the sample varies, e.g. automotive emissions or variable rate burner monitoring

9.21.3 500 ppm CH_4 Calibration Bottle

9.21.4 1000 ppm C_3H_8 Calibration Bottle

9.21.5 User defined Calibration Bottle

9.21.6 Spare Bottles and refills are available

9.21.7 Custom Colour Front Cover and Bottle Rack

9.22 Power

9.22.1 115 Vac ±15% via BS4343 industrial mains plug

9.22.2 350VA + 400VA for 5m heated line (maximum power during warm-up)

9.22.3 350VA + 800VA for 10m heated line (maximum power during warm-up)

9.23 Environment

9.23.1 Ambient temperature 5°C to 40°C, relative humidity up to 95%, non-condensing

9.24 Dimensions

9.24.1 Less bottle rack: 210mm(W) x 300mm(H) x 240mm(D), 7kg weight

9.24.2 With bottle rack: 210mm(W) x 300mm(H) x 353mm(D), 12kg weight

DUE TO A POLICY OF CONTINUOUS DEVELOPMENT, THESE SPECIFICATIONS MAY CHANGE WITHOUT NOTICE