

The Greenbank Group UK

Enhancing the performance of our customers plant and equipment



G-CAM Installation and User Guide

REV D



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The Company

Over many years Greenbank has developed a wide variety of specialised services for heavy industry. Greenbank, in accordance with BS EN ISO 9001:2008, designs, manufactures, supplies and installs their own specialised products together with all the associated equipment.

We also offer an 'on site' and 'in workshop' repair and maintenance service together with comprehensive range of replacements and spares.

The quality, accuracy and performance of the Company's products result from over 50 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

Greenbank offers a full range of services from the small unit sale of AD3 pipe repair putty to a complete turnkey ash and dust handling system.

Electrical Safety

This equipment complies with the requirements of EN 61010- 1:2001 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use'. If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of the Technical Publications Department.

Health and Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
4. Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information

Disclosure

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1.0 Unpacking

The G-CAM crate should contain the following items;

- One G-CAM Measurement Device
- One Rain Guard
- One Plinth
- One Eductor Probe
- One to Six sampling probes, subject to customer order
- MOV Valve to suit the Eductor Probe and 1 per sampling probe
- Installation Drawings and Layout Diagrams

If any of the above items are missing or damaged then please contact Greenbank Terotech Ltd immediately.



2.0 G-CAM Installation

2.1 Introduction

This Manual describes in detail how to install a G-CAM. It contains detailed diagrams and instructions that must be adhered to for the correct functions of the device.

The G-CAM is a versatile machine that can be installed on many different types of power station boiler designs. Therefore, there are a number of different installation possibilities that can be chosen. Ultimately, it is down to the end user to decide how many probes they need after they have been presented with the options from Greenbank Terotech.

The G-CAM has a maximum number of 6 probes per machine and a maximum distance from cabinet to probe (measured route of the sample line itself) of 30m.

2.2 Number of G-CAMs and Probes

One of the G-CAM's benefits is that it is able to sample from multiple locations before the air heaters and this in turn shows the distribution of ash across the boilers sides / splits. The first question to ask is how good the combustion is and distribution of the combustion. Indication of this is to investigate the variance of the O₂ and the CO for the left and right hand side of the boiler.

Another consideration is the accessibility between air heaters, if this was more than 15 meters to each air heater then you would consider more than one G-CAM.

Boiler Size	No. Air Heaters	Recommended Total No. of Probes per G-CAM
100 – 300 MW	2	2 – 4
300 – 500 MW	2	2 – 4
	3	2
500 – 700 MW	2	2 – 4
	3	3 – 6
	4	4 – 6

The table above shows the recommended amount of G-CAM's and probes. It is only approximate of G-CAM installation possibilities. These charts have been derived from historical data. The user can make their own decision based on these charts and any other contributing information they have about their boiler.

2.3 Location of the G-CAM

There are various contributing factors that should be noted when choosing a location for the G-CAM. These are as listed below;

- The G-CAM™ cabinet should be located in a convenient place that is close to the ducts as possible without the local ambient temperature being above 40°C for operator safety.
- The eductor should be located as close as possible to the cabinet being the shortest pipe run for best possible suction.
- The minimum amount of compression elbows and compression tee pieces should be used to maximise performance.
- The G-CAM can operate at 60psi at 35 CFM, local air should be available of 80 – 100psi. We recommend dry instrument air. However the G-CAM has oil water and particulate filters to accommodate reasonable quality service air.

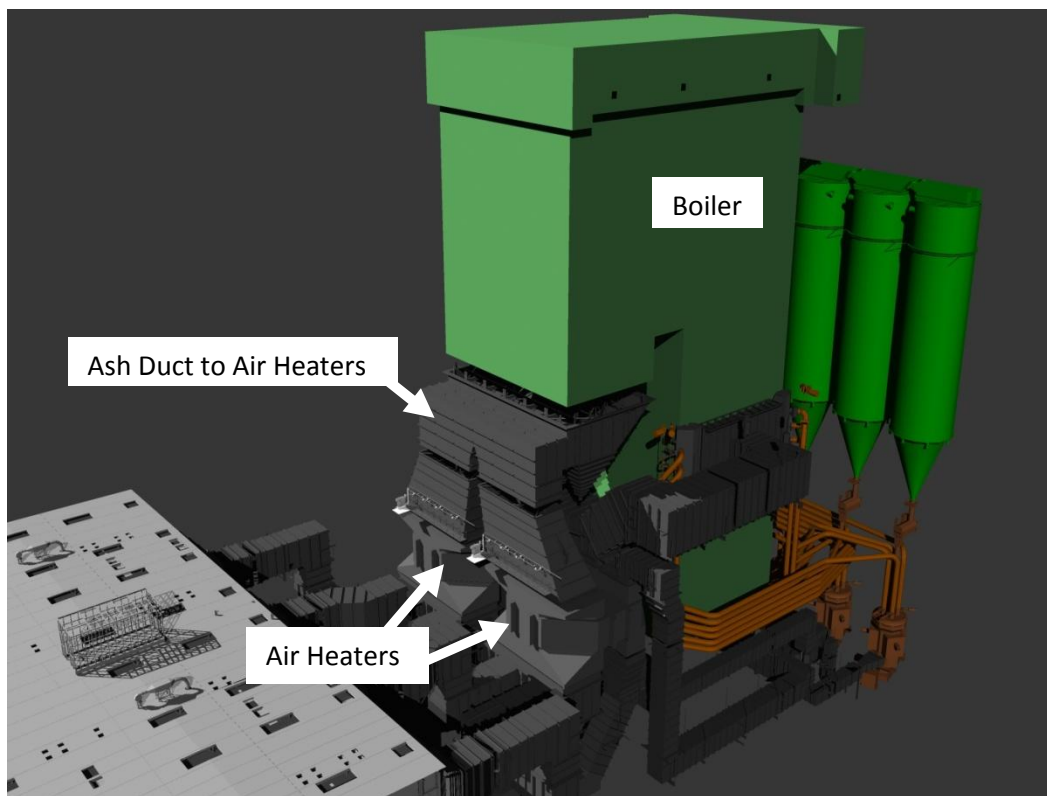


Figure 2.3.1 – Power Station Overview

Above the air heaters there is normally a section of vertical ducting where the ash falls downwards and there is reasonable laminar flow. This is the ideal place to install the G-CAM probes.

The probes should be located equally distance across the duct so that they give a good representation of carbon.

Consideration for any baffles and economiser bypass ducts should also be taken into account.

If advice is required then please contact Greenbank Terotech.

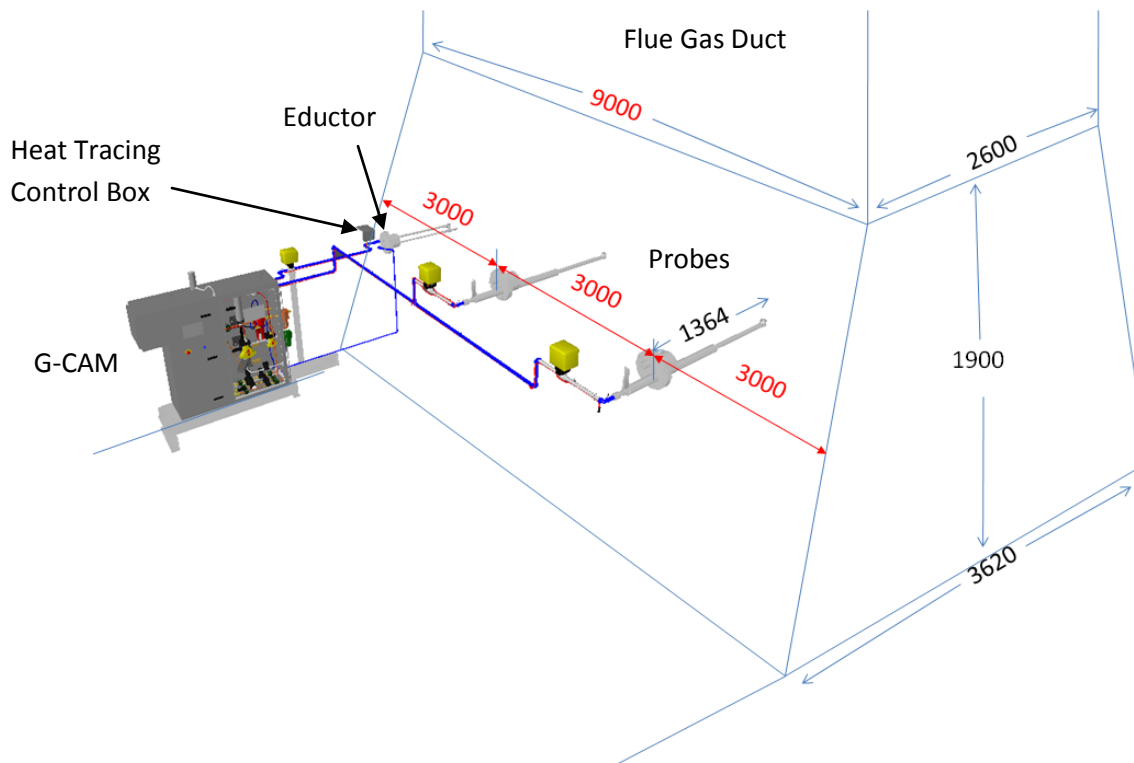


Figure 2.3.2 – Typical Duct above Air Heater (Based on a 2 probe System)

At a closer look the probes are connected together by a common ash pipe, and the MOV's are located close to the probe. Also there are no unnecessary bends that are too close together. The thermal insulation is typically 125mm diameter so any elbows in the 1" ash pipes need to have adequate distance to allow for this.

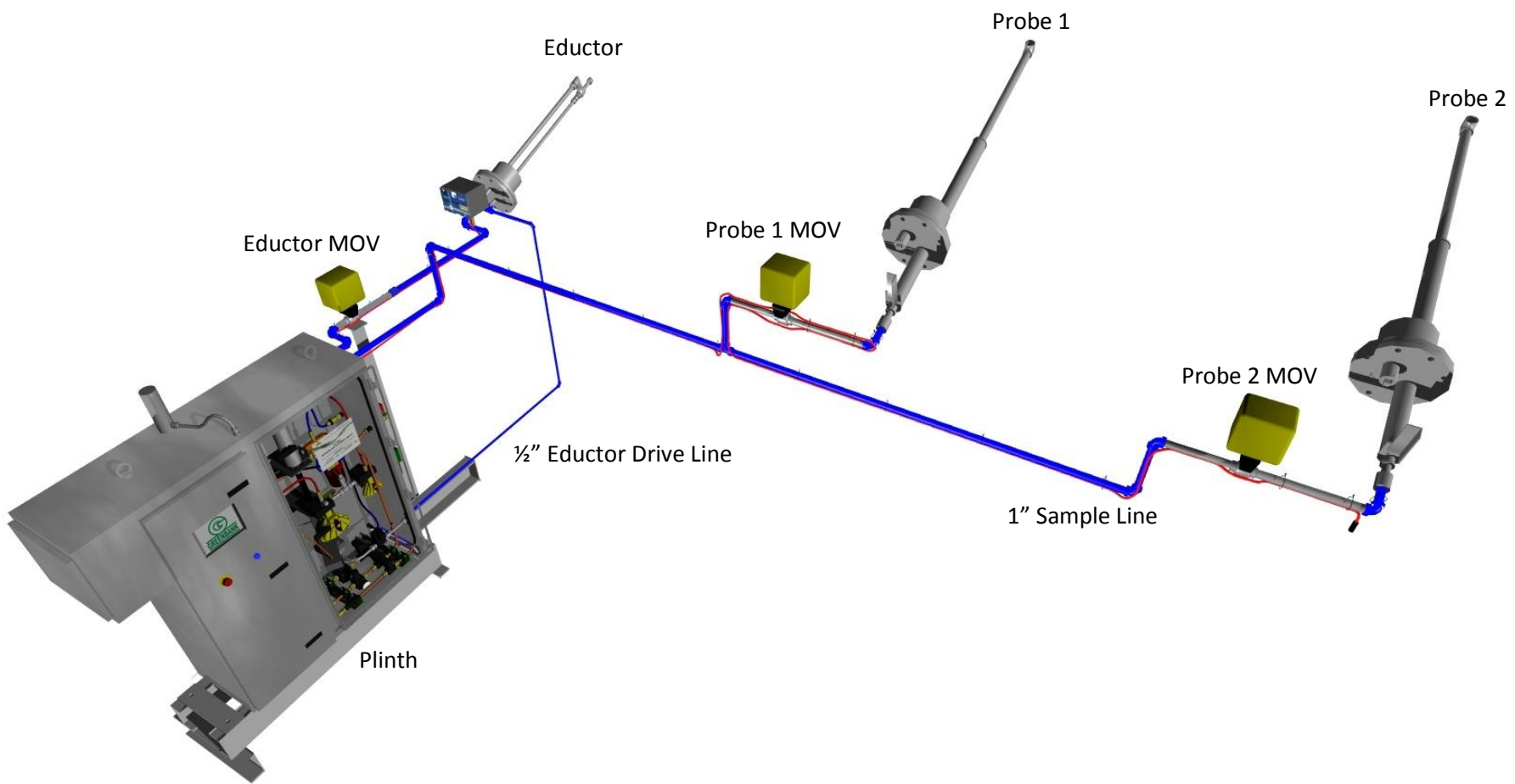


Figure 2.3.3 – Sample Line (Based on 2 probe system)

Points to note with the 1" stainless steel ash pipes:

- The sample line must not be lower than the outlet from the G-CAM and must only step up to the probes.
- The motor operated ball valves (MOV) may be supported by the 1" stainless steel tube.
- We recommend that you use 1" 316 Stainless steel Swagelok or equivalent fittings on tee pieces or elbows
- The sample line is to be supported by 125mm pipe supports to go around the insulation

2.4 Ash Pipe Specification and Routing

Pipe / Fitting	Specification
1" Sample Line	1" OD 316 Stainless Steel Tube
½" Eductor Drive Line	½" OD 316 Stainless Steel Tube
¾" NB Air Supply	¾" NB Mild Steel Tube
1" 90° Elbow	90° 316 Stainless Steel 1" Compression Elbow – Swagelok or equivalent
1" Tee Piece	316 Stainless Steel 1" Compression Elbow – Swagelok or equivalent
½" 90° Elbow	90° 316 Stainless Steel ½" Compression Elbow – Swagelok or equivalent

The table above shows the specifications for the items needed to complete the sample line installation of the G-CAM.

If Greenbank have completed a survey of the installation or sufficient information can be provided then we can supply a general layout drawing for information. This will show the ideal route for the pipes and notes to consider when routing the pipes.

It also identifies the following:

- Mechanical and plumbing connections.
- Installation of the rain hat, plinth and probes.
- Routing of all pipes.
- Thermal lagging.
- Air connections.

Further Notes:

- Make the run of pipe work as short and smooth as possible to suit local conditions
- All welds to be painted with one coat zinc phosphate primer
- Support spans 2.5m MAX
- Refer to order and advice note for item quantities and descriptions
- Main Air inlet to include ¾" lockable ball valve next to G-CAM for isolation
- Pressure test to be carried out when all pipe work installed, see 2.5

2.5 Pressure Testing

Lines to be tested;

- 1" sampling inlet line between G-CAM and probe
- 1" eductor line between G-CAM and probe
- ½" eductor drive line between G-CAM and probe

Procedure

Each line is to be disconnected at the G-CAM end and probe end. At the probe end insert a blank connector to suit the correct size fitting. At the other end, using suitable adapters, connect compressed air and pressurise to 80 psi or 5.5 bar.

Hold pressure for 10 minutes.

Check all joints for leaks using leak detector. If any joint is leaking then re-tighten and pressurise the systems again.

Repeat this procedure for each line.

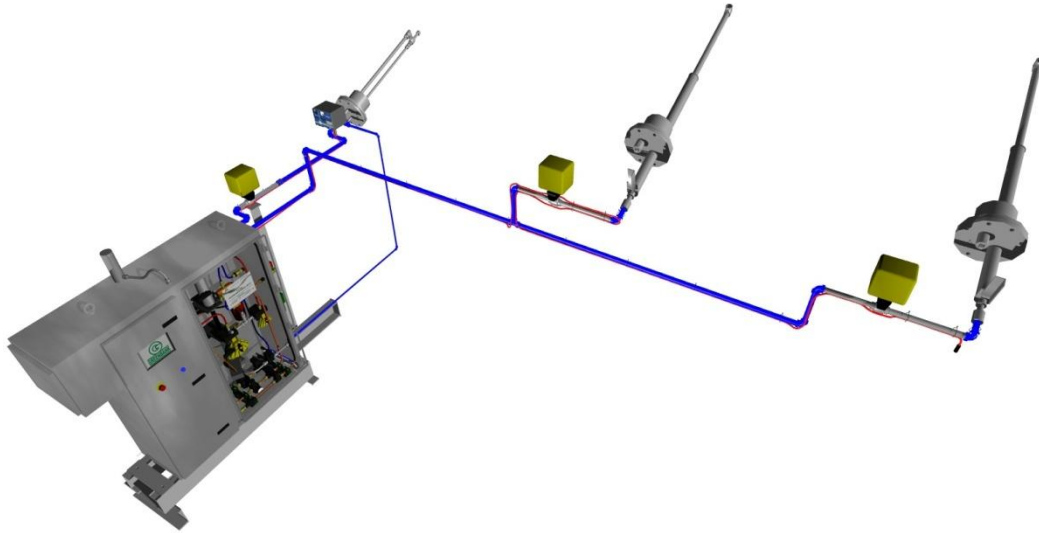
Reference for this can also be found on Greenbank Drawing '27580 A3' on the next page.

Ensure that all MOVs are in the closed position after pressure testing.



3.0 Heat Tracing

Once installation of the G-CAM has been completed and the sample lines have been connected to the probes and pressure tested then the heat tracing can be installed. This must be installed to the 1" sample line and ½" eductor line. Below is a typical G-CAM installation without any insulation, from this drawing the heat tracing is shown by the orange lines.



3.1 What is Heat Tracing?

Heat Tracing is a system used to maintain the hot temperature of the sample line. It is tied to the sample line and eductor line and then insulated, this then keeps the lines hot and prevents ash from sticking to the pipes.

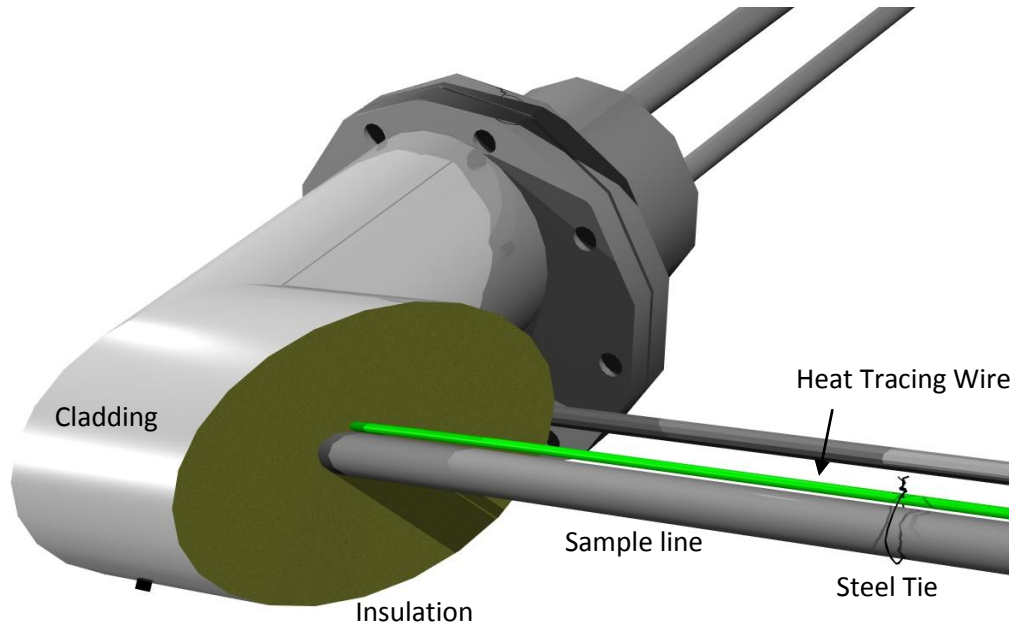


Figure 3.1.1 – Heat traced sample line

The heat traced wire runs along the pipe and conducts its heat to the pipe. Steel ties keep the wire tight against the pipe so the wire conducts its heat to the pipe. Insulation is then wrapped around the sample line to keep the heat in. Aluminum Zinc cladding is then applied to prevent the insulation getting damaged by water along with wear and tear.

Thermal jackets are used in area where access will be needed, e.g. probes and MOVs. It is not necessary to clad these as access would be limited. Ensure all probes and MOVs have thermal jackets.

3.2 The Circuit

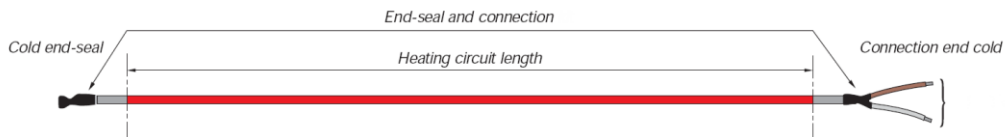


Figure 3.2.1 – Heat tracing wire

The image above shows the heat tracing wire. The heat tracing has two connections, this is a circuit consisting of a coil of wire inside an insulated metal sheath. Each end has a cold end connection and seal. This must be located away from pipe to be insulated and must not be insulated. Care is also to be taken to make sure to heat tracing exceeds the insulation to prevent any damage to the heat tracing and prevent possible burning.

The heat tracing runs alongside the sample line and connects to a heat tracing junction box. There is typically a live, neutral and earth that is connected to the outer sheath. The junction box can accept many heat tracing circuits and is controlled from the G-CAM.

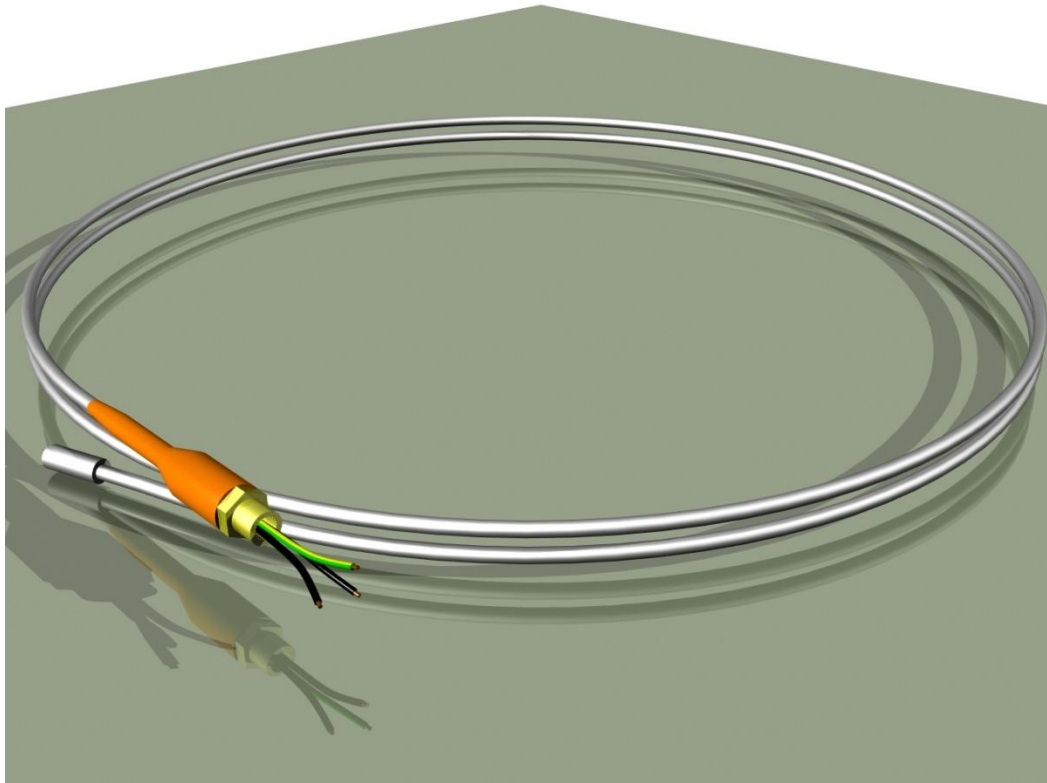


Figure 3.2.2 – Heat tracing coil

3.3 Installing the Heat Tracing

The heat tracing junction box is attached to the 1" sample line. The G-CAM provides power to the box and also controls the heat tracing.

In the side cabinet of the G-CAM the heat tracing is connected to a relay for live and two terminals blocks for neutral and earth. This can be seen in the image below.

Please see Greenbank Drawing 26859 for full wiring diagram.

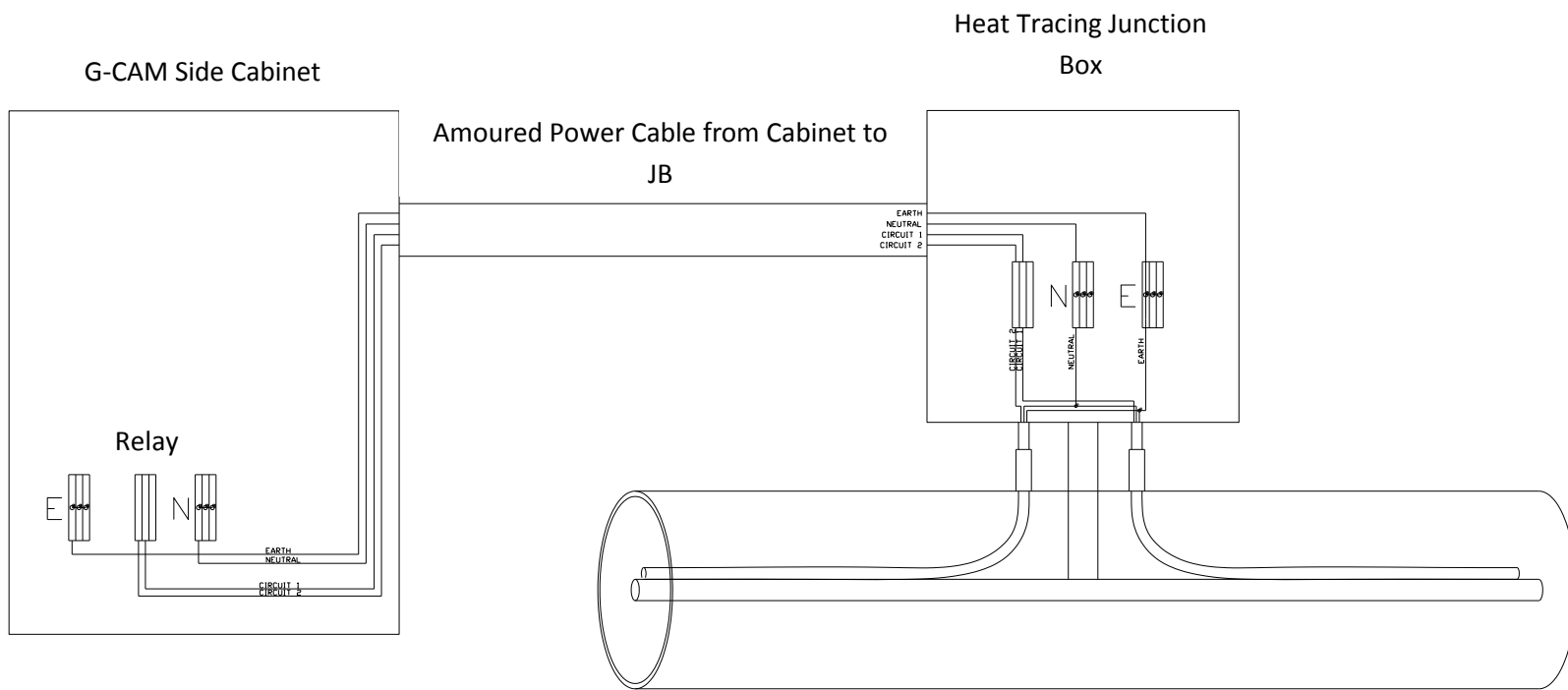


Figure 3.3.1 – Heat Tracing Circuit

G-CAM configuration

Before the heat tracing circuits can be planned, the layout of the probes has to be evaluated. The electronic relays that switch the heat tracing circuits can handle 5A max at 110Vac. This limits the length of the heat tracing wire to 12 meter per circuit.

Greenbank Terotech limited will use a sketch of the probe layout to work out how many circuits of heat tracing are required. They will also provide the cables cut to the correct length and labeled appropriately.

Positioning the junction box

There is normally only one junction box per G-CAM installation, although this can be increased if necessary. As the wires to the heat tracing are single ended, this end is normally located at the end of the ash sample line.

Measuring the Pipe Work

The route of the heat tracing starts at the flange of the eductor probe and runs towards the G-CAM cabinet, once this distance is reached the heat tracing steps down to the sample line. It runs along the sample line and up to any probe on route.

Please note that if a probe tees off the sample line the heat tracing must run to the flange of the probe then back to the sample line to continue the run.

Attaching the Heat Tracing

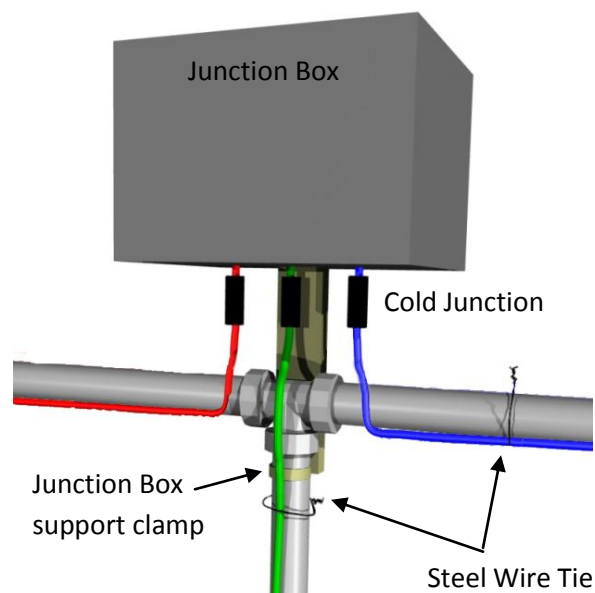


Figure 3.3.2 – Heat Tracing Junction Box

The cold junction is where the live feed changes to a heated coil so this needs to be kept away from the sample line and must not be bent within 50mm either side. It should also be tied to the junction box support, making sure that it is not insulated.

Steel ties should be used every 500mm to firmly press the heated wire against the sample line. All heat tracing wire should be applied to the underside of the line.

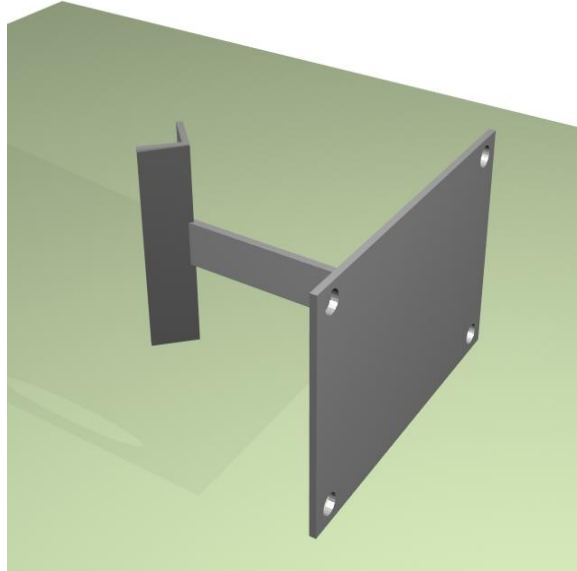


Figure 3.3.3 – Junction Box Bracket

Bending the Heat Trace Cable

When bending the heat tracing care is to be taken to make sure that radius of the bend does not go tighter than 30mm as this damages the internal coil.

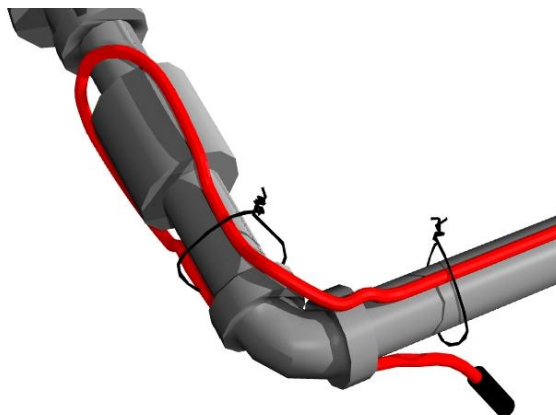


Figure 3.3.4 – Bending the Heat Tracing

Terminating and insulating the Heat Tracing

Once the heat tracing has been installed the cold end junction must be bent downwards. This is done because to prevent water ingress into the insulation. The cold end connection must not be insulated.

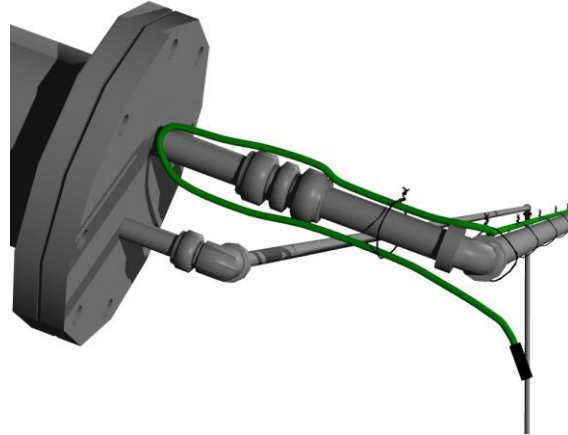


Figure 3.3.5 – Cold End Junction

We recommend that 50mm mineral wool insulation should be used to insulate the sample line once the heat tracing has been installed. At each probe connection there should no insulation, instead there should be an insulated jacket that can be removed easily for removal of the probe.

Once all insulation has been applied then aluminum-zinc cladding to be wrapped around to prevent the insulation getting damaged.

The ½” eductor drive does not need to be heat traced or insulated.

3.4 Specification

Item	Specification
Thermal Insulation	Mineral rock insulation for 1” sample line Run from probes to G-CAM sample inlet Clad insulation using aluminum-zinc sheet 0.5mm thick Minimum insulation thickness of 50mm Finished cladding O/D of 133mm
Electrical Trace Heating	Cupro-nickel or Inconel sheathed, mineral insulated heat tracing Run from probes to G-CAM sample inlet and 1” eductor line Maintain temperature of 180°C All electrical units to be IP65 rated



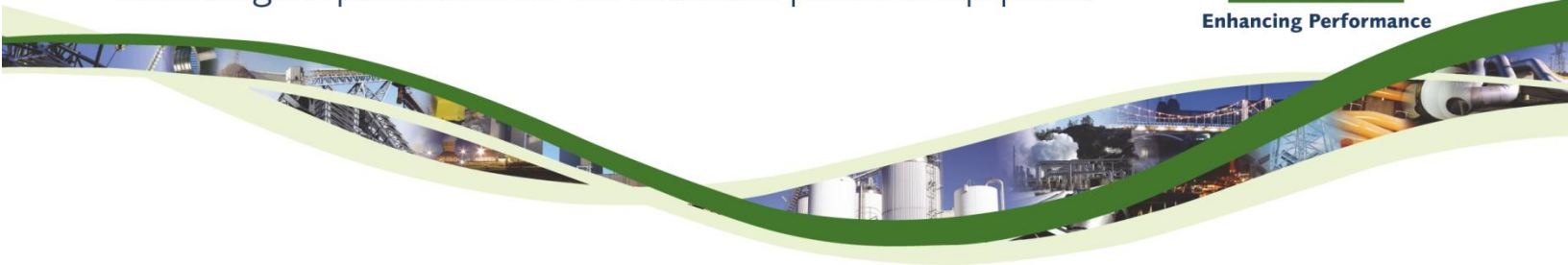
4.0 Electrical Installation

Please Greenbank Terotech drawing 26859 for Customer connections.

Requirements	Description
Power	110 – 120 VAC 50 – 60 Hz, 15 Amp fuse – 30 Amp heat tracing
Output	One 4 – 20mA output per probe
	Ethernet to PC (not exceeding 100m) used for commissioning and maintenance. Fibre optic conversion used where necessary.
	One armoured four core cable for each MOV rated @ 110VAC 5A
Input	Two thermocouple output per probe, one connected into side cabinet per probe

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5.0 User Manual

5.1 Touch Screen

From the touch screen you can control the functions of the G-CAM and view what the G-CAM is currently doing. The system is easy to use and all the functions are displayed below.

When the G-CAM has been commissioned the G-CAM will run itself without any need for attention except for the quarterly and annual check shown later in this manual.

The G-CAM will shut down when the duct gets below certain temperature and will automatically start up again when this temperature is reached. The text displayed is shown in the top right of the screen and displays as the table below;

Duct Temperature	Text Displayed	Description
Below 80°C	Boiler Off	G-CAM off, Heat tracing and cyclone heater on to keep lines warm
Between 80°C and 230°C	Purging through all probes	G-CAM blows clean air through probes to prevent it ash settling in and blocking
230°C +	Warm up pause	G-CAM stops purging and warms the sample line and cyclone up
230°C +	Sampling Probe 1	G-CAM is sampling from probe one and will sample from each probe in turn

5.2 Functions of the G-CAM

The G-CAM is a very versatile machine and the parameters of which can be set according to customers requirements. The functions are listed below with regards to how to run and change settings.

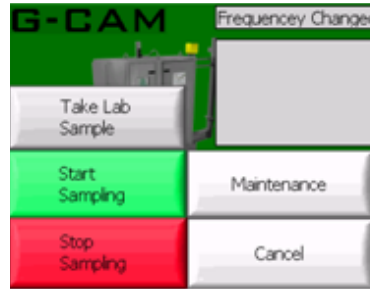
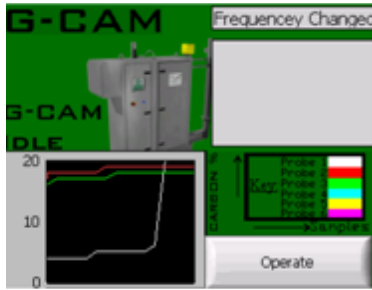
5.2.1 Sampling

This fully automatic process can be left unmanned. To start this process, simply press 'Operate' then 'Start Sampling'. The G-CAM, if never run, will start sampling from probe 1. If however, the G-CAM has been running and stopped, it will start sampling on the next probe.

When the sample is complete it will display the carbon output on the graph, main screen. This is also outputted through the 4 – 20mA to the station control room. After each sample the G-CAM will move onto the next probe for sampling.

If for any reason you wish to stop the G-CAM you must press 'Operate', then 'Stop Sampling'.

This can be seen with the screenshots below



5.2.2 Lab Sampling

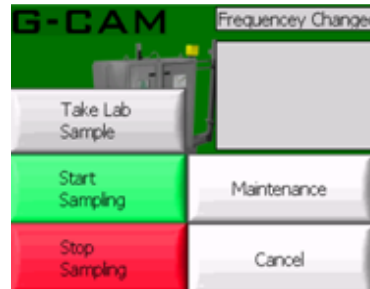
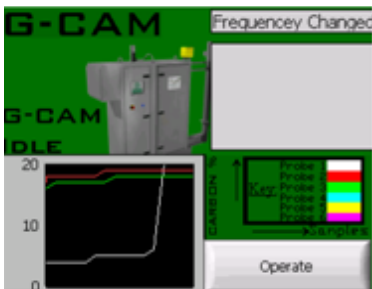
This is used to take a sample for calibration or to verify the G-CAM. To put the G-CAM into sample mode simply press 'Operate'. Once in the mode the G-CAM will run through the sampling process, once completed will show the time completed and carbon output. The carbon output does not need attention if you are sampling for calibration.

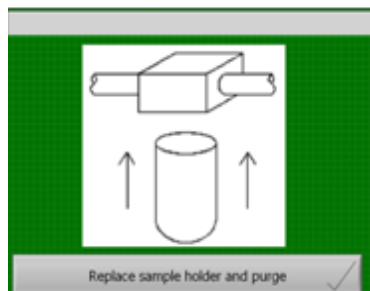
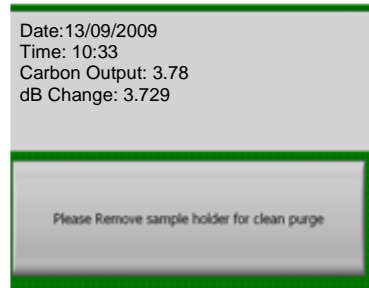
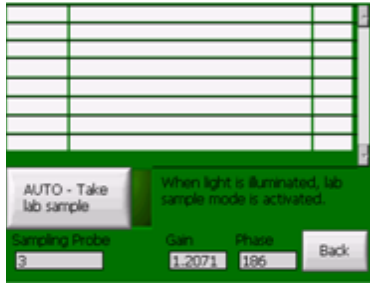
Write on a sealing bag the sample number, the unit on which you are sampling, the date on which you are sampling the time of which the sample was completed (see touch screen).

Once this is completed you will need to remove the sample holder and allow the G-CAM to purge through to clean the line, and then press the button at the bottom. When the next screen appears replace the sample holder and press the button. The sample will now be blown out and the touch screen will show 'Sample Purged Out – OK'. You can now remove the sample holder carefully and empty the contents into the sealing bag prepared.

'Sample Purged Out – OK' can now be pressed and the G-CAM will start sampling on the next probe. To take another sample repeat the same process.

If you are taking samples for calibration you will also need to obtain the log files (for the specific days) from the G-CAM and send to Greenbank Terotech Ltd along with the results from the lab.





5.2.3 Idle Mode and Shut Down Procedure

When the machine is in idle mode you can change various settings on how the G-CAM runs. To get the machine in idle mode, press 'Operate' then 'Stop Sampling'. The G-CAM will now display 'Manual Mode'. In this mode the all the probes are shut.

The G-CAM can now have power isolated without the worry of damaging any of the machine.

The can be seen from the screenshots on previous page.

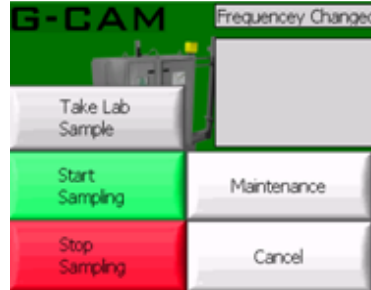
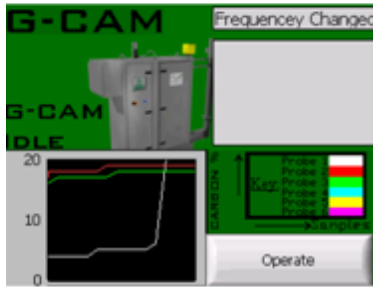
5.2.4 Setting Screen

Many screens are password protected for Greenbank Terotech Ltd to access for commissioning and maintenance purposes only.

For the end user the settings option is available without a password protected screen. To gain access to this then press 'Operate' then 'Maintenance' and then 'Settings'.

From this screen you can change settings such as the number of probes the G-CAM has, change the start up and shut down temperatures.

To change these values then select the one you want to change and press 'Change Value', a new screen will appear in which you can type in the new figures and press 'Accept'. You will now come back to the settings screen, to change another setting repeat the process. Once all settings have been changed you will need to press 'Save New Settings'.

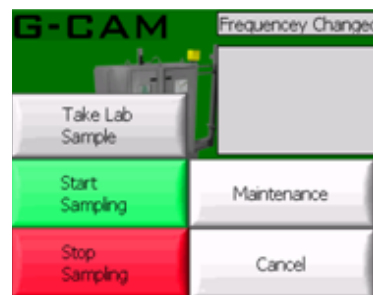
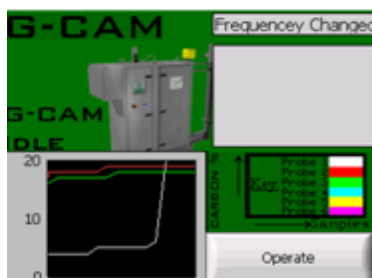


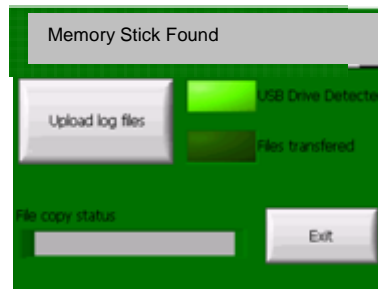
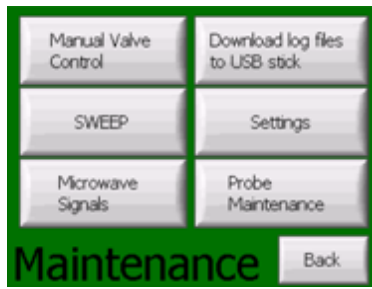
5.2.5 Download Log Files to USB

When the customer is taking samples for calibration then they will need to get the log off the G-CAM for the specific days of sampling, then sent to Greenbank Terotech Ltd. This can be done by using a USB memory device.

The log files can be copied to a USB memory device whilst the machine is running. This is done by pressing 'Operate', then 'Maintenance' then 'Download log files to USB Stick'. You will come a screen that will show you if your USB memory device has been recognised, if it has then it will light up green.

The next step is to press 'Upload log files'. This will take two minutes and when complete another green light will appear to show this task is complete. Once complete simply remove the USB memory device and press back until you arrive at the main screen.







6.0 Maintenance

Greenbank Terotech Ltd recommend that customer take out an extended warranty for peace of mind. The extended warranty covers labour, parts and travel and lasts for four years. If you require an extended warranty then please contact Greenbank Terotech Ltd for a quote.

6.1 Quarterly Checks

Greenbank recommend that the customer checks general parts on the G-CAM every 3 months. These parts being

- Check for damage to cabinet, exterior and interior
- Check for any air leaks
- Check for excess dust inside the cabinet
- Check the empty phase of waveguide read approximately 150.00

If any of these items require attention then please contact Greenbank Terotech Ltd immediately.

6.2 Annual Checks

Greenbank Terotech can provide an annual service, during this service every item in the G-CAM will be checked service and/or replaced. This will ensure the G-CAM runs at its optimum. If you require an annual service then please contact Greenbank Terotech for the latest price list and quote.

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7.0 Trouble Shooting

7.1 Ethernet

Problem	Possible Cause	Solution
FTP Server not accessible	Connection to Ethernet switch interrupted	Check cables to Ethernet switch
	Power supply to G-CAM interrupted	Check G-CAM supply is live Check 24VDC PSU inside the G-CAM is active Check circuit breaker in side cabinet Check fuse in fuse 1
FTP log files out of date/not updating	Windows caching files and not displaying new ones	Close all windows down in windows then reopen and access log files to empty cache
	Folder on PLC deleted	Contact Greenbank Terotech
Ethernet connected but no activity	Ethernet cable too long for 100Mbps/s full duplex	Change the network adapter to run at 10Mbps/s half duplex

7.2 4 – 20mA Outputs

Problem	Possible Cause	Solution
All probes are reading 0% CIA	Power has been lost to G-CAM cabinet	Check there is power to the cabinet, reset circuit break if tripped, check fuse in fuse 1
	Average duct temperature is too low to sample	Wait until duct has warmed up sufficiently and wait until G-CAM cyclone has warmed up
Outputs temporarily dropped to zero	G-CAM lost power then regained power	Investigate the cause of the power fault
	Boiler temperature suddenly dropped below minimum sampling temperature	Investigate boiler thermal characteristics to indicate standard operational range
Values frozen over a long period of time	Air pressure lost to cabinet	Check air supply
	Check Pi system	Contact I.T department
	Eductor probe blocked with foreign body	Contact Greenbank Terotech
	Microwave box has become disconnected	Check microwave box connections
	Microwave cables have become interrupted	Check microwave cable for damage and tightness
One probe hasn't changed over last three samples	Probe blocked	Contact Greenbank Terotech
Output are	-	Contact Greenbank Terotech

abnormally low		
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7.3 Mechanics

Problem	Possible Cause	Solution
No Vibration	Air Pressure too low	Turn air pressure for vibrator up to 50 psi
	Solenoid failure	Replace with solenoid from service items list
Air Leak	Compression fitting loose	Use leak detector device to determine where leaking from and tighten any loose fittings
Solenoid buzzing	Possible partial failure	Identify which solenoid is buzzing and replace with same from service items list
Cooler not operating	Thermostat faulty	Check solenoid by bypassing thermostat, replace if faulty, check temperature if high enough for cooler to operate
Pinch valve not closing	Faulty solenoid	Check to make sure solenoid works correctly, if not replace with item from service items list
	Insufficient air supply	Check air supply is healthy

8.4 Software

Problem	Possible Cause	Solution
G-CAM running but touch says idle	Ethernet connection to screen interrupted	Check Ethernet connection from Ethernet switch to touch screen
	Touch screen crashed	Turn the touch screen off then back on
Probe temperature shows 1770°C	Probe had become open circuit	Check thermocouple connections are connected Change the thermocouple lead at the probe
Touch screen unresponsive	Abnormal power surge interrupted program	Turn the touch screen off then back on

If the solutions above do not solve any problem or you have a problem not listed then please contact Greenbank Terotech.

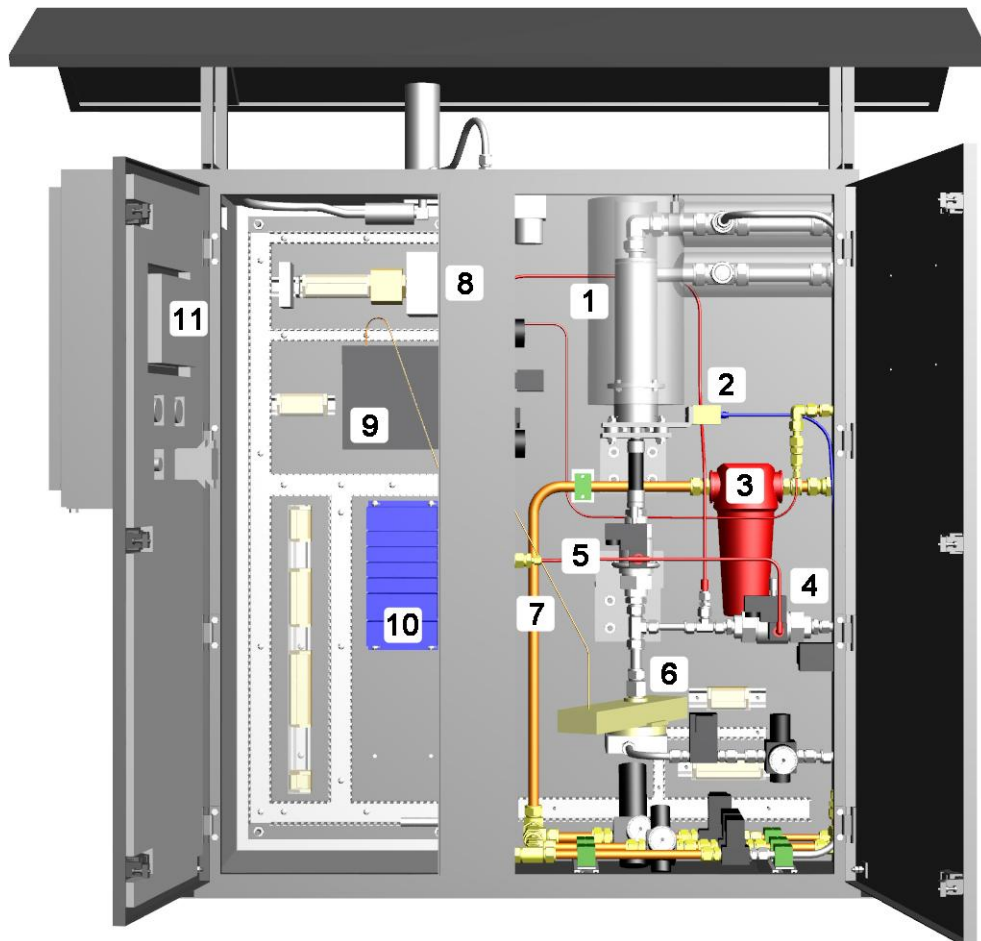
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8.0 Service Items

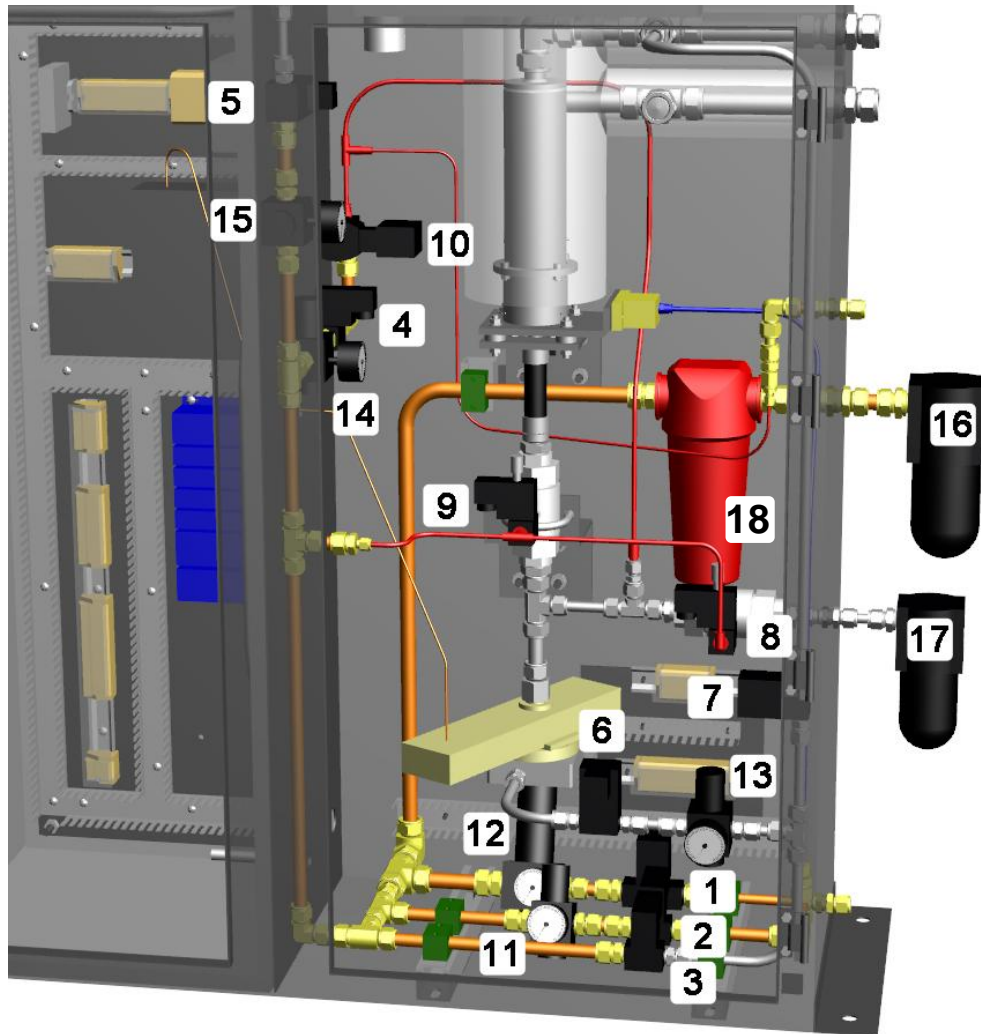
9.1 Main Components



Item	Description	Greenbank Stock No.
1	Cyclone	GCAM0017
2	Vibrator	GCAM0023
3	Main Air Filter	GCAM0067
4	Sample Pinch Valve	GCAM0041
5	Main Pinch Valve	GCAM0042
6	Wave Guide	GCAM0001
7	Microwave Cables	-
8	24 VDC PSU	GCAM0079
9	Microwave Box	GCAM0002

10	PLC	GCAM0003
11	Touch Screen	GCAM0010

9.2 Solenoids, Regulators and Filters

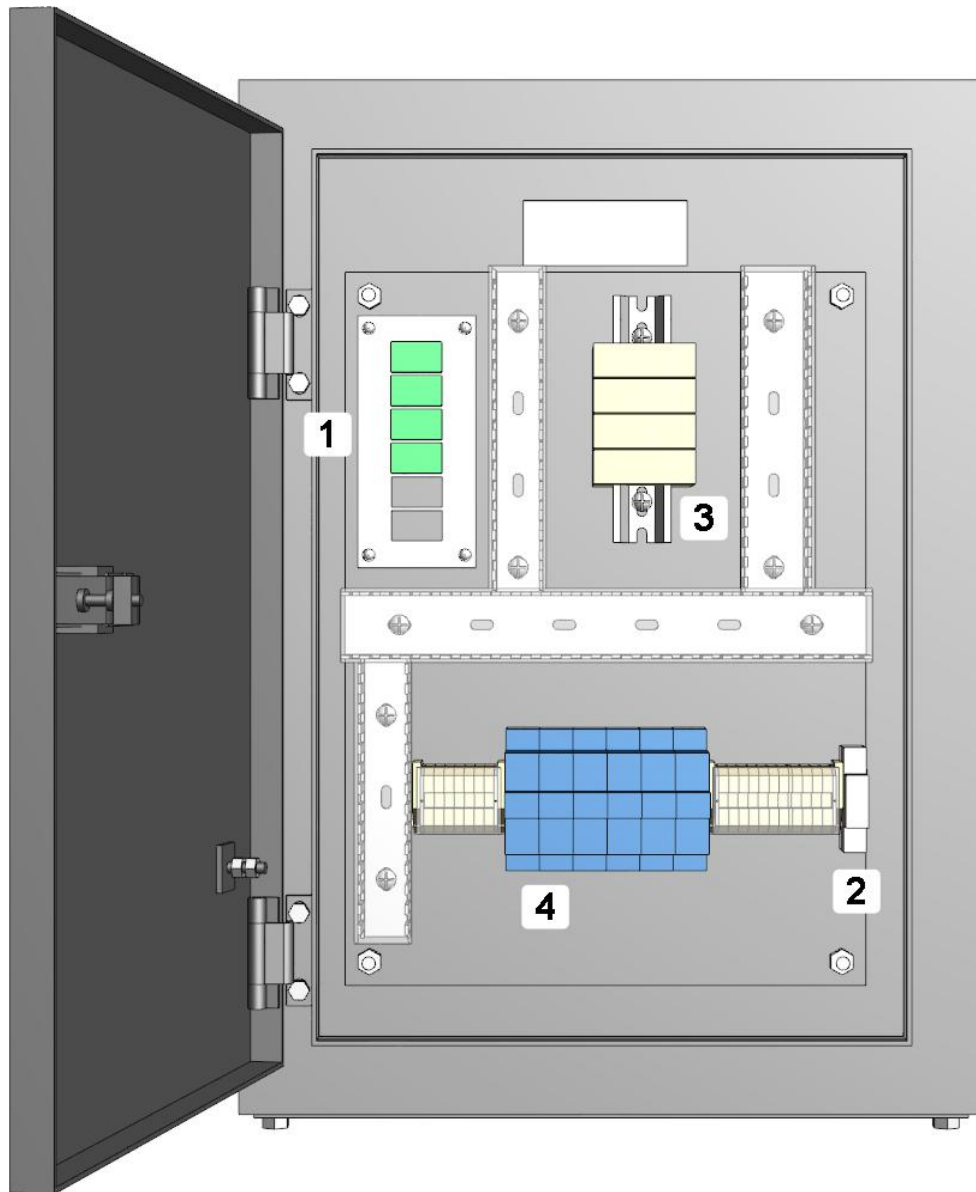


Item	Description	Greenbank Stock No.
1	Eductor Solenoid	GCAM0052
2	Vibrator Solenoid	GCAM0049
3	Purge Solenoid	GCAM0049
4	Compression Solenoid	GCAM0049
5	Cooler Solenoid	GCAM0049
6	Bypass Solenoid	GCAM0050

7	Bypass 2 Solenoid	GCAM0050
8	Sample Pinch Valve Solenoid	GCAM0047
9	Main Pinch Valve Solenoid	GCAM0047
10	Flow Control Valve	GCAM0043

Item	Description	Greenbank Stock No.
11	Vibrator Regulator	GCAM0062
12	Eductor Regulator	GCAM0061
13	Bypass Regulator	GCAM0062
14	Compression Regulator	GCAM0062
15	Cooler Regulator	GCAM0062
16	Water Filter	GCAM0068
17	Sample Ash Holder	GCAM0069
18	Air Filter Element	GCAM0070

9.3 Side Cabinet



Item	Description	Greenbank Stock No.
1	Thermocouple Input Socket	-

2	Circuit Breaker	-
3	4 – 20mA Isolators	GCAM0078
4	Relay	GCAM0048

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9.0 Technical Specifications

General	
Standards	IEEE 802.3 10BASE-T Ethernet IEEE 802.3u 100BASE-TX Fast Ethernet
Protocol	CSMA/CD
Outputs	4 – 20mA Outputs Per Probe (typical load 100 Ohms)
Motor Operated Ball Valve	110 – 120 VAC ~ 50/60 Hz, 5A per Valve
Thermocouple Inputs	Standard Round Plug K Type Thermocouple Inputs
Physical and Environmental	
AC Inputs	110 – 120VAC ~ 50/60 Hz
Power Consumption	600 Watts typical, Recommended 15Amp Supply
Temperature	Operating: 0°C ~ 50°C (32°F ~ 135°F) Storage: -10°C ~ 70°C (14°F ~ 158°F)
Humidity	Operating: 10% ~ 90% RH, Non – Condensing Storage: 5% ~ 90% RH, Non – Condensing
Dimension (W x H x D)	1110 x 1219 x 405 mm + Filters
EMI	CE Class B
Performance	
Transmission Method	Constant Current Output for Each Probe 4 – 20mA output
Flash Memory	64MB
Sample Times	10 – 25 Minutes

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10.0 Other Boiler Optimisation Products

Coal Feeders
Mill Master
VARB
PfMaster
Dampers
Leak Detection
H-CAM
StackMaster

For more information on any products listed above please contact Greenbank Terotech Ltd



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