Directions For Use
"Zero Air" Gas Generator

ZA300

Peak Scientific Instruments Ltd
Fountain Crescent
Inchinnan Business Park
Inchinnan
Renfrewshire
PA4 9RE

T.(Europe) +44 (0) 141 812 8100
T. (USA) +1 866 647 1649 (sales)
T.(USA) +1 866 732 5427 (tech support)

F.(Europe) +44 (0) 141 812 8200

info@peakscientific.com
sales@peakscientific.com
support@peakscientific.com

www.peakscientific.com

CE

Document Change History

Issue No	Changed	Initials	Date
1	First Issue	SGM	21/10/98
2	Spare Parts	SGM	11/12/98
3	New style front added	FAD	30/03/05

Contents

Safety First

It is important that you thoroughly read and understand this manual before operating or servicing this Peak Scientific Instruments Gas Generator. **PLEASE NOTE THE FOLLOWING CAUTIONS AND WARNINGS FOR YOUR OWN SAFETY.**

! Caution –
Only authorized persons should operate or service this equipment.

! Warning –
To avoid risk of electrical shock, personal injury, or death disconnect power before removing any cover of this equipment.

! Caution –
To avoid risk of personal injury NEVER disconnect any pipe, fitting, or filter bowl while the system is pressurized. Always allow pressure to dissipate before opening the system.

! Warning –
The Catalytic Process requires very high temperatures. Internal surfaces and copper lines are extremely hot and will cause burns. Always allow the generator to cool before carrying out any servicing.

Warranties and Liabilities

1) The Company warrants that it has title to the Goods.

2) Subject to the provisions of this clause the Company warrants that the Goods shall comply in all material respects with any specification referred to in the Order Confirmation (as the same may be amended) and shall, subject thereto, be free from defects in material and workmanship for the lesser of a period of twelve months from the date of delivery or thirteen months from the date of dispatch from the factory.

3) Save as provided in this clause and except where the Goods are sold to a person dealing as a consumer (within the meaning of the Unfair Contract Terms Act 1977) all warranties, conditions or other terms implied by statute or common law are hereby expressly excluded save to the extent they may not be lawfully excluded. When the Goods are sold to a consumer within the meaning of the Unfair Contract Terms Act 1977 their statutory rights are not affected by the provisions of this clause.

4) In the event of the Customer making a claim in respect of any defect in terms of clause 2 hereof the Customer must:-

   4.1) Reasonably satisfy the Company that the Goods have been properly installed, commissioned, stored, serviced and used and without prejudice to the generality of the foregoing that any defect is not the direct or indirect result of lack of repair and/or servicing, incorrect repair and/or servicing, use of wrong materials and/or incorrect spare parts; and

   4.2) Allow the company to inspect the Goods and/or any installation and any relevant packaging as and when reasonably required by the Company.

5) Subject to the Company being notified of any defect as is referred to in sub-clause 2 hereof within a reasonable time of it becoming apparent and subject always to the terms of sub-clause 4 hereof, the Company shall, in its option, replace or repair the defective Goods or refund a proportionate part of the Price. The Company shall have no further liability to the Customer (save as mentioned in sub-clause 6 hereof).

6) The Company shall be liable to indemnify the Customer in respect of any claim for death or personal injury to any person in so far as such is attributable to the negligence or breach of duty of the Company or any failure by the Company to comply with the provisions of sub-clause 2 hereof.

7) Save as provided in sub-clause 2 hereof the Company shall not be liable in respect of any claim by the Customer for costs, damages, loss or expenses (whether direct, indirect, consequential or otherwise) or indemnity in any respect howsoever arising including, but not by way of limitation, liability arising in negligence (other than pursuant to clause 6 above) that may be suffered by the Customer or any third party,

SAFETY NOTICE TO USERS

These instructions must be read thoroughly and understood before installation and operation of your Peak Gas Generator. Use of the Generator in a manner not specified by Peak Scientific Inst. MAY impair the SAFETY provided by the equipment.

When handling, operating or carrying out any maintenance, personnel must employ safe engineering practices and observe all relevant local health and safety requirements and regulations. The attention of UK users is drawn to the Health and Safety at Work Act 1974, and the Institute of Electrical Engineers regulations.

1 Introduction

The Peak Scientific Instruments range of Zero Air Gas Generators is designed to produce a constant flow of Zero Grade Air with a Hydrocarbon content (as Methane) of less than 0.1 ppm.

2 Unpacking and Installation.

Although Peak Scientific take every precaution with safe transit and packaging, it is advisable to fully inspect the unit for any sign of transit damage.

ANY DAMAGE SHOULD BE REPORTED IMMEDIATELY TO THE CARRIER AND PEAK SCIENTIFIC OR THE DISTRIBUTOR FROM WHERE THE UNIT WAS PURCHASED.

After unpacking and a visual inspection, the unit should be placed in a ventilated area away from direct sunlight. Care should be taken not to obstruct the ventilation holes on the sides of the unit not the fan outlet to the rear. The generator will be warm to touch and will give off heat.

The generator should be placed on a steady and level base. It is designed to fit under most workbenches alternatively it may be placed on a bench or in any convenient location.

Performance of the generator (like all sophisticated equipment) is affected by ambient temperatures and humidity. Continuous operation in ambient temperatures exceeding 25°C will lead to a reduction in capacity and prolonged operation in temperatures exceeding 30°C will shorten the life of the unit. Operation in relative humidity exceeding 70% may overload the filtration system and result in moisture carry-over. Additional moisture traps should be installed downstream of the generator should ambient regularly exceed 70% Rh. and also if the generator is any distance from the application. Moisture traps or coalescers should be located as close to the application as possible. Note should also be taken of the proximity of Air Conditioning outlets. These can sometimes give rise to “pockets” of air with high relative humidity. Operation of the generator within such a pocket could adversely affect its performance.

3 Electrical Connection

Important Electrical Notice

This unit is classified as SAFETY CLASS 1 equipment. THIS UNIT MUST BE EARTHED. Before connecting the unit to the mains supply, please check the information on the serial plate. The mains supply must be of the stated AC voltage and frequency.

EARTH/GROUND (E):-	**Green & Yellow**	**or**	**Green**
LIVE (L):-	**Brown**		**Black**
Neutral (N):-	**Blue**		**White**

Fuse

The generator protection fuse is found in the pull out drawer of the mains inlet IEC euro connector located on the bottom right hand side of the cabinet adjacent to the off/on switch. The fuse is rated at 6.3 AMP. A spare fuse is also provided in the drawer.

Connect the generator to a single phase supply using the power cord provided.

4 Air Connection

The inlet and outlet connections are 1/4" BSP female.
The Inlet air should conform to the following specifications:

Minimum Pressure	6.2 Barg / 90 psig
Maximum Pressure	8.96 Barg / 130 psig
Maximum Hydrocarbon Content	100 ppm

The inlet air should be oil free and pre-filtered to remove bulk moisture. Although not essential, an air drier up-stream of the generator will ensure a long and trouble free life.

Note the platinum catalyst within the Zero Air Catalytic Chamber will become poisoned if it comes into contact with any halogenated hydrocarbons, silicone sprays, silicone greases, phosphorous compounds, lead components, high sulphur vapours or other catalyst poisons.

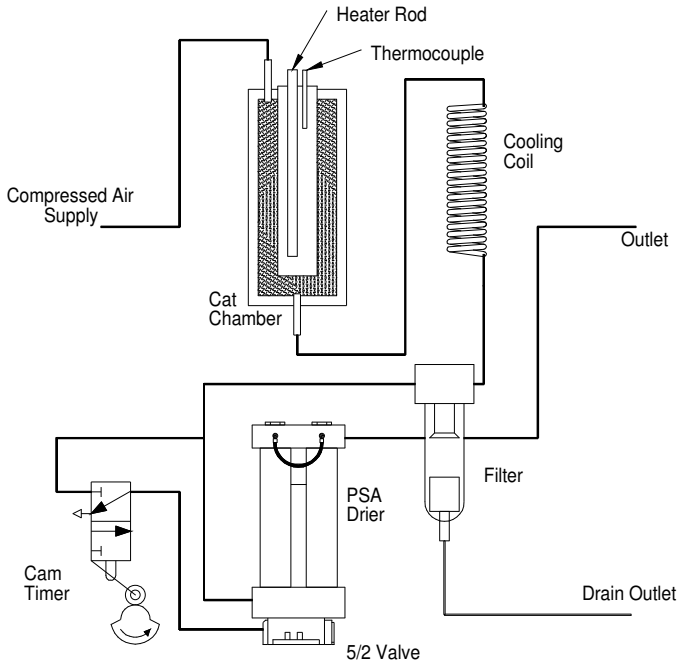
The air supply should be connected to the generator inlet on the left side of the cabinet. The user's application should be connected to the outlet on the right side of the cabinet. To avoid leakage/impurity ingress, use PTFE tape on all fittings.

Slowly, turn on the air supply until the required pressure is attained. There is no physical method of restricting the gas output from the generator. The user should therefore ensure that the application only receives a maximum flow not exceeding the rating for the generator. Demand in excess of the rated capacity of will result in higher levels of hydrocarbons in the delivered gas.

5 Principle of Operation

The Peak Scientific Instruments Zero Air Gas Generator works on the basis of two fundamental processes as illustrated in the following schematic diagram.

Note: - this diagram is only to illustrate the principles involved. For an actual pneumatic diagram please refer to the drawings at the end of this document.



Theoretical
Pneumatic Diagram

Moisture / Removal: -

The first process utilizes a 'Pressure Swing Adsorption' (PSA) method to further treat the air. This is where moisture can be selectively adsorbed from compressed air into a porous crystalline sieve material. The adsorption process is aided by the electrostatic interaction between the adsorbent sieve material and the gaseous adsorbate. The Peak Scientific Instruments Ltd. PSA dryer system utilizes the 'Skarstrom' process where there are two columns of adsorbent used alternatively and described as follows: -

The un-treated air is passed via a '5 port-2 position' (5/2) pneumatic control valve into one of the sieve columns where moisture is removed. Some of the dried gas is back-purged down the other column to atmosphere which creates a regeneration effect. A simple cam timer eventually causes the 5/2 valve to change columns and the other regenerated sieve column now generates the dried gas. Again some dried gas is back purged down the other column to atmosphere to cause a regeneration effect. This process repeats itself approximately every 2 minutes indefinitely.

Zero Air Generation

The second process utilizes a 'Zero Air' catalytic combustion chamber. This works on the principle of catalytic oxidation where hydrocarbons from the incoming compressed air supply are *cracked* to carbon dioxide and water. The hydrocarbon level in the form of methane is reduced to <0.1ppm, for this process to work the catalyst requires to be heated to approximately 400 degrees Celsius. Any CO present in the air supply is also converted to CO_2.

After the catalytic chamber the air passes through a simple cooling coil to a filter which removes bulk moisture and any further particulate down to a level of 5 micron. The filter incorporates an auto-drain mechanism which will release any accumulated water from the filter bowl when the level is sufficiently high. The water passes out through a drain bulkhead at the bottom of the side of the cabinet.

Because water and also carbon dioxide are created in the Catalytic Process there is a necessity to effectively remove them both.

6 Commissioning.

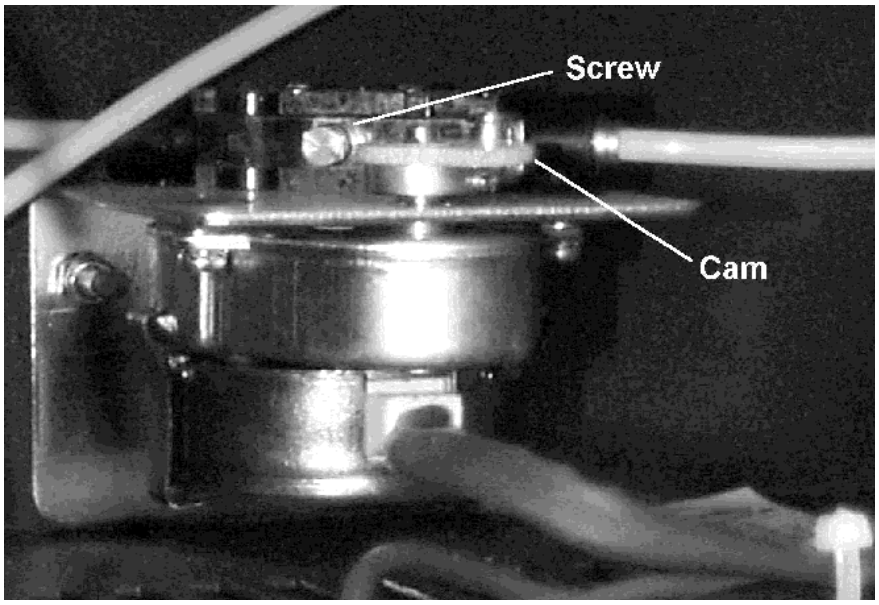
This should be undertaken by a technically competent person

With the generator installed as described earlier remove the front cover. Check that all the internal components are securely located and have not moved during transit.

Open the air supply and turn the unit *ON.* Set the regulator on the Inlet Filter/Regulator to the desired pressure.

Check that the cooling fans are operating and exhausting air out of the generator. Check that the cam on the timer is rotating. Check that the red LED on the Temperature Control Boards is lit.

After a maximum of 2 minutes the cam timer valve should operate to change over the columns on the PSA drier unit. This is accompanied by an audible rush of exhaust air from one of the exhaust ports. Should this not happen the position of the Cam Follower will need adjusted. This is done by the adjusting screw on the arm of the Cam Follower. (Note: - the 5/2 valve will not operate if the system pressure is below 60 psig. If the system pressure has not reached 60 psig wait a few minutes until the next cycle.)

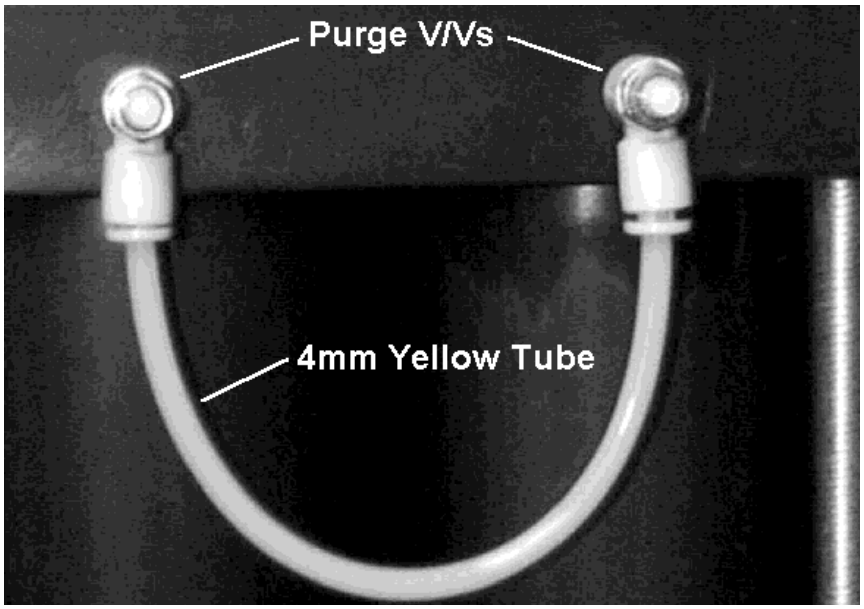


After a maximum time of 40 minutes the Catalytic Chambers should have reached temperature. When this happens the relay on the Temperature Controllers will “click” and the LED's will go out. The heaters will then cycle as required.

Do not touch any part of the Catalytic Chambers or Copper Lines, as they will be VERY hot.

Purge Setting

The PSA Purge has been set in the factory and should not require adjustment. The purge can be checked by connecting a simple *Rotameter* type flow meter to the outlet of the drier purge valves in turn. The connection is for 4mm plastic hose. The correct setting is 12 l/min. This assumes a maximum generator output of 30 l/min. A reduced purge rate will result in higher levels of contaminate gases over a period of time.



7 Routine Maintenance

WARNING: Servicing and/or repair of the Generator should only be undertaken by a TECHNICALLY COMPETENT PERSON with the Generator safely isolated.

Due to the simplicity of the design and the small number of moving parts the Peak Gas Generator will have a long and trouble free life. However the following components should be replaced as follows:

Filter/Separator/Silencers	**Every 12 months**

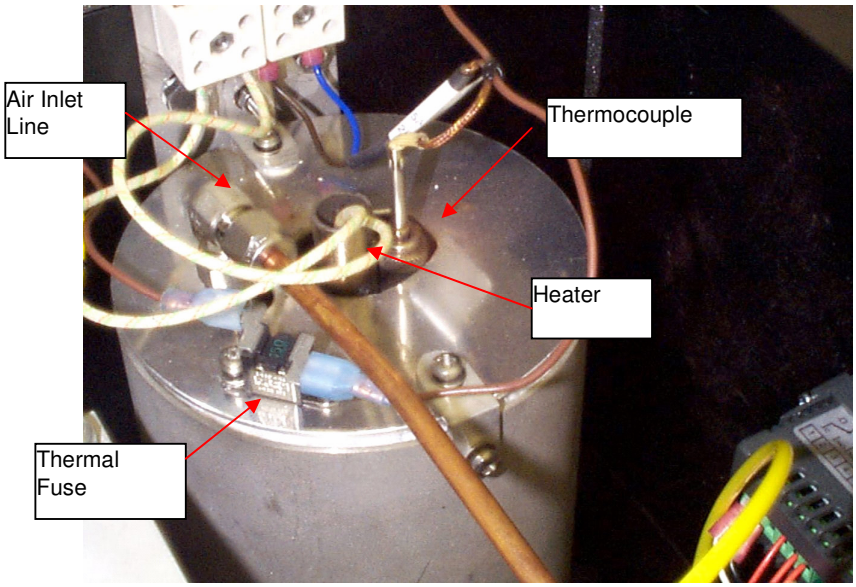
Service kits are available for all routine maintenance; please contact the factory for further details.

FAILURE TO FOLLOW THE PRESCRIBED MAINTENANCE PLAN WILL INVALIDATE THE PRODUCT WARRANTY.

Catalytic Chamber

The Catalytic Chamber is heated to 400ºC and will cause severe burns if touched. If for any reason the chamber or its associated parts need to be examined the generator must be switched off and allowed to cool. THIS COULD TAKE UP TO 10 HOURS.

The Catalytic Chamber takes the form of cylindrical chamber with a heated central core. The annular space is specifically designed to allow the required contact time with the catalyst to ensure complete oxidization. The complete chamber is contained within an insulated enclosure as shown below.



Heater

Regardless of the supply voltage the heater is rated at 110 Vac. This minimizes the volt drop across the conductors and prolongs the life of the element. The Heater is contained within a stainless steel sleeve to facilitate removal should replacement be required.

Thermocouple

The thermocouple is “K” type spring-loaded bayonet fitting to ensure good contact with the chamber core.

Thermal Fuse

The thermal fuse is provided as a safety feature to cut supply to the heater thus preventing chamber overheating in the event of a control or ventilation failure. It is a fail-safe device and if blown requires replacing.

Note: - The thermal fuse will not blow under normal operation. A blown thermal fuse indicates that a fault exists which MUST be rectified before attempting to replace the thermal fuse. Refer to the trouble shooting chart on page 15 for guidance.

Inlet Filter / Separator Elements

These should be changed at intervals as indicated below. In addition filter bowls should be cleaned and the operation of the auto-drains should be checked.

The Generator MUST be de-pressurised prior to attempting to remove ANY filter bowl. Failure to do this may cause injury.

Inlet Filter

This should be changed at 6-month intervals. Part Number is 02-4187 and the filter is located as shown.

Inlet Filter
(02-4187)

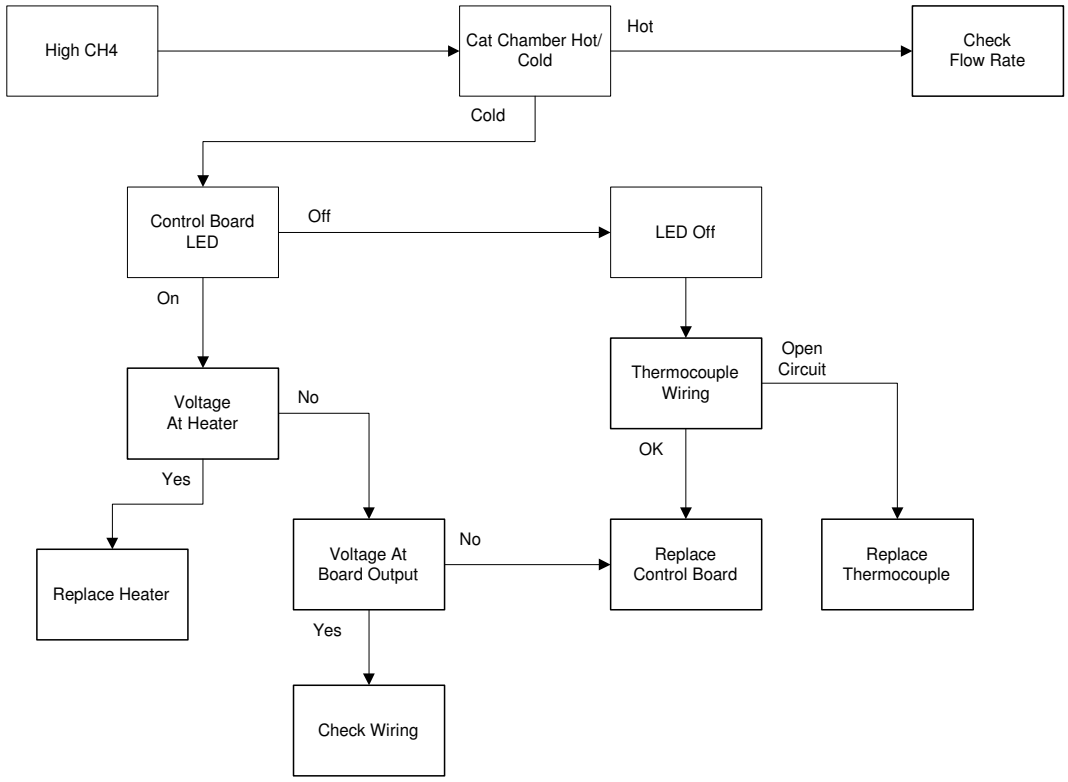
Remove the cover by rotating it anti-clockwise ¼ turn. The element can then be removed. Re-fitting is the reverse procedure.

8 Troubleshooting

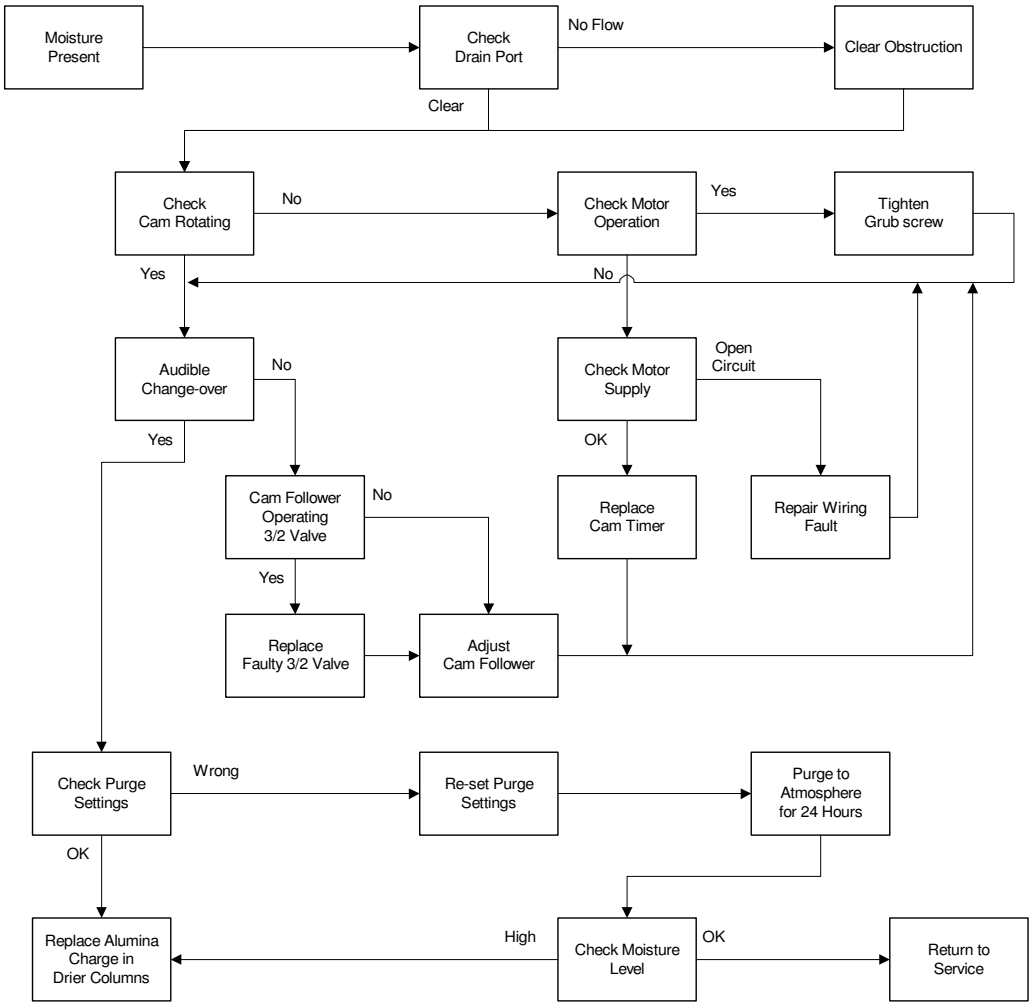
Problems with the ZA300 will most probably be shown up by increased levels of Hydrocarbons or CO_2 being detected on the baseline. The following procedure should be followed to identify the source of the problem.

Reference should be made to the following Fault Finding Charts.

1. High CH_4



2. High Moisture Level



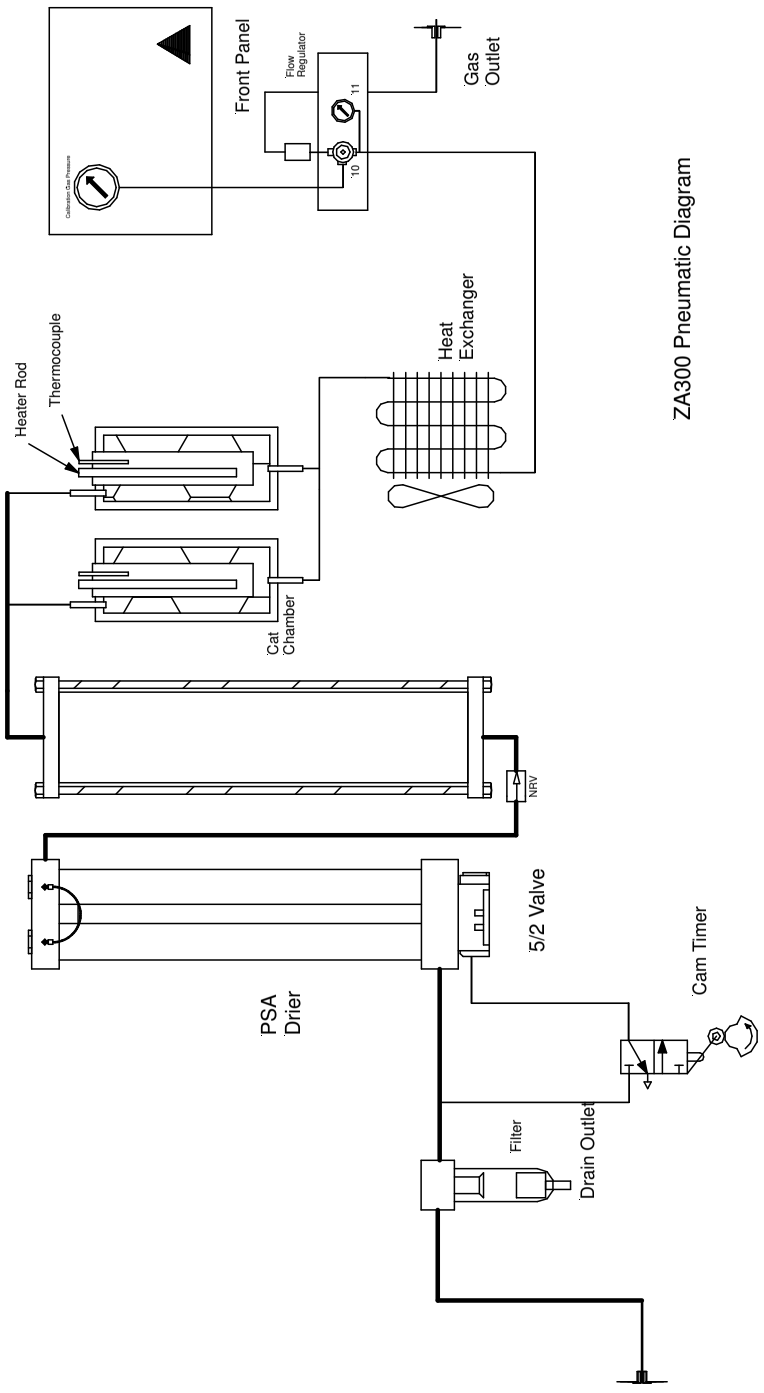
7 Technical Specifications

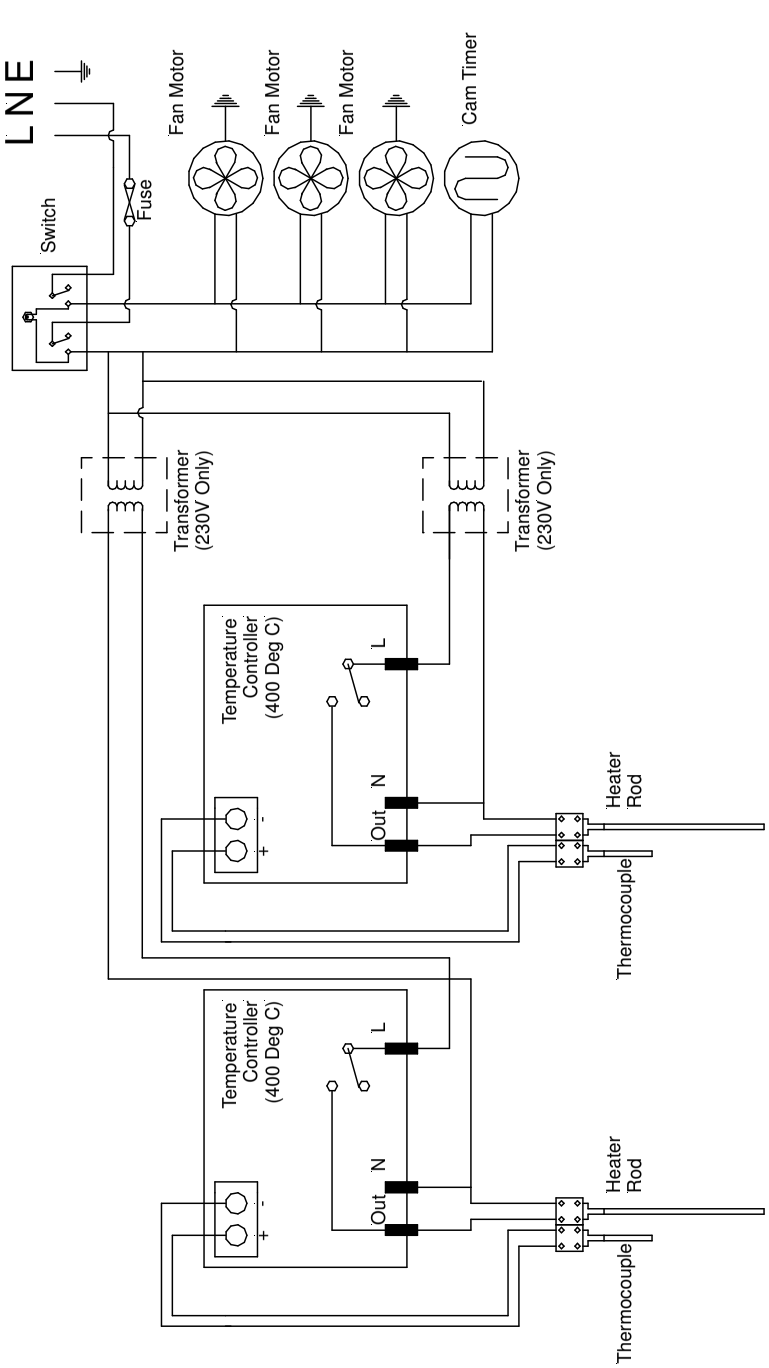
General Details

Minimum Operating Ambient Temperature	5 °C (41 °F)
Maximum Operating Ambient Temperature	45 °C (113 °F)
Inlet Conditions (Free of oil and bulk moisture)	
Minimum Air Inlet Pressure	90psig
Maximum Air Inlet Pressure	130psig
Minimum Air Inlet Flow Rate	Gas outlet flow & Purge flow 36LPM
Outlet Gas	
Maximum Pressure Drop (Outlet-Inlet) δP	N/A
Maximum Gas Outlet Pressure	100 psig (6.8 Barg)
Maximum Gas Outlet Flow for specified hydrocarbons	30 Litres/min (ATP)
Pressure Dewpoint	-30°C (-22°F)
Start up time for dewpoint	8 hrs
Particles	0.01um
Hydrocarbon concentration (as methane)	<0.1ppm
Start up time for hydrocarbon concentration	45 minutes
O_2 level	20%
Electrical Requirements	
@230V ac (50 Hz)	8.9 AMPS
Electrical Connection	IEC-Euroconnector
General	
Dimensions W x D x H cm	43 x 41x 88
Weight Kg	64
Shipping Dimensions W x D x H cm	100 x 57 x 67
Shipping Weight Kg	91

Parts List

Item	Part No
Transformer	04-4356
Heater Element	04-1059
Thermocouple	04-1050
Temperature Controller	04-1170
Cooling Fan	04-1022
Cam Timer	04-1042
Coalescer	02-4366
Element	02-4335


ZA300 Pneumatic Diagram
Front Panel
Flow Regulator
Gas Outlet
Heat Exchanger
Heater Rod
Thermocouple
Cat Chamber
NRV
5/2 Valve
Cam Timer
PSA Drier
Filter
Drain Outlet


ZA300A Electrical Diagram
L N E
Switch
Fuse
Fan Motor
Fan Motor
Fan Motor
Cam Timer
Transformer (230V Only)
Transformer (230V Only)
Temperature Controller (400 Deg C)
L
N
Out
+
-
Heater Rod
Thermocouple
Temperature Controller (400 Deg C)
L
N
Out
+
-
Heater Rod
Thermocouple

Maintenance Log

Model- **Serial number**

Work Done	Remarks	Date	Name

Notes