

AutoFlame

**Mk8 E.G.A. Set-Up
an Trim Guide**
**Mk8 尾气
分析仪设置
和调节指南**

AUTOFLAME[®]



Mk8 E.G.A. Set-Up and Trim Guide

Mk8 尾气分析仪设置和调节指南



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1 INTRODUCTION

前言

1.1 Overview and Benefits

概述与优点

1.1.1 Features and Benefits

特点与优点

The Mk8 Exhaust Gas Analyser (E.G.A.) monitors the emissions in the flue produced from the burner/boiler system. The E.G.A. can improve combustion, increase efficiency, reduce fuel consumption and improve safety through its 3 parameter trim function and combustion safety limits.

Mk8 尾气分析仪用于监视燃烧器和锅炉系统产生的烟道尾气。尾气分析仪能够改善燃烧、提高效率、减少燃料消耗并通过 3 参数调节功能和燃烧安全限制提高安全性。

1. Stand-Alone: When in stand-alone mode, the E.G.A. can be used without a Micro-Modulation (M.M.) module to monitor the combustion gases. The M.M. trim function and the combustion safety limits are not activated in this stand-alone mode of operation. The emissions levels can be accessed via the full colour E.G.A. touch screen.

单机运行：在单机模式下，尾气分析仪在无微型控制模块的情况下可以用于监视燃烧的烟气。在单机运行模式下不会激活控制模块调节功能和燃烧安全限制。排放等级可以通过全彩色尾气分析仪触摸屏访问。

2. With M.M.: When interfaced with an M.M., the E.G.A. can monitor emissions or the 3-parameter combustion trim and safety limits can be activated. The emissions levels are monitored by the E.G.A. and the M.M. makes small adjustments to the air damper to trim the online exhaust gas data back to the commissioned values. The E.G.A. information is accessible through the full colour E.G.A. touch screen, the Data Transfer Interface module (D.T.I.), or 6 x 4-20mA signals.

带控制模块：尾气分析仪在连接控制模块后可以监视排放，3 参数燃烧调节功能和安全限制可以被激活。排放等级可以通过尾气分析仪进行监视，控制模块对空气挡板进行微调，使在线排气数据返回至调试的数据。尾气分析仪信息可以通过全彩色尾气分析仪触摸屏、数据传输接口模块或 6 x 4-20mA 信号进行访问。

The main benefits of the E.G.A. include the ability to monitor the exhaust gases and bring them to the safe commissioned levels. Setting the combustion limits on the M.M. in conjunction with the E.G.A. prevents unsafe combustion scenarios, reducing the fuel consumed in bad combustion.

尾气分析仪的主要优点包括监视排气并使其保持安全调试水平。在控制模块和尾气分析仪上设置燃烧限值可以防止不安全的燃烧情况、减少在不良燃烧中的燃料消耗。

1.1.2 System Operation

系统运行

The Mk8 E.G.A. samples the combustion gases via the stack mounted sampling probe (purchased separately from the analyser). The exhaust gases are drawn from the stack by a pump mounted internally within the analyser. Only the supplied sample tubing should be used between the sampling probe and analyser. The internal diameter of the sampling tube is 3mm; if a large diameter tubing is used the sample gas remains resident in the tubing for a longer period. The E.G.A. will then not be able to respond in time to combustion changes, resulting in incorrect operation of the trim function.

Mk8 尾气分析仪通过在排气管上安装的采样探头（需单独购买）对燃烧烟气进行采样。废气通

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过安装在尾气分析仪内部的泵从排气管中抽出。在采样探头和尾气分析仪之间仅可使用提供的采样管。采样管的内径为 3mm，如果使用大尺寸采样管，采样气体会在采样管中停留较长的时间。这样尾气分析仪就无法及时对燃烧的变化做出响应，导致无法正确使用调节功能。

Once the exhaust gases have entered the E.G.A. the chiller block reduces their temperature and dries the sample to remove the condensation from the gases prior to entering the cells. The condensate accumulated in the chiller unit is drained every 4 minutes when running, and every 10 minutes when the E.G.A. is in idle mode, automatically through the drain solenoid.

废气进入尾气分析仪后，冷却器组将降低其温度，在其进入设备前通过去除烟气中的冷凝水将样本干燥。运行时在冷却器组中积累的冷凝水每隔 4 分钟排出一次，当尾气分析仪处于空闲模拟时每隔 10 分钟排出一次，冷凝水将通过排放电磁阀自动排出。

The exhaust gas is then filtered through the dry filter, which is a fine filter used to remove any dust particles carried over from the cooling process. If the burner is firing on heavy or dirty oil, an external particulate filter must be used to remove the excess dirt particles. On leaving the filter, the exhaust gas pressure is checked again to ensure that a vacuum is maintained prior to entering the pump and on exiting the pump, the pressure produced by the pump is checked. Both these pressure sensors modulate the flow rate of the sample into the E.G.A. for consistent operation. Once the exhaust gases have been conditioned, they are ready for an accurate sampling by the cells. After the gases have been sampled by all the cells, the remaining sample is pumped out of the E.G.A. from the clear tubing at the bottom of the E.G.A. casing.

然后废气通过干燥过滤器进行过滤，干燥过滤器是一种细过滤器，用于排出冷却过程中携带的各种粉尘颗粒。燃烧器在重油或脏油情况下燃烧时则必须使用外部微粒过滤器，用于排除过多的粉尘颗粒。废气在离开过滤器后将对其压力进行再次检查，确保在其进入泵前保持真空，废气在离开泵时将对泵产生的压力进行检查。压力传感器用于调节进入尾气分析仪的样本流量以确保操作一致。废气经过设备调节后则可以进行准确的采样，废气进行采样后剩余的样本将从尾气分析仪外壳底部的干净管道中排出。

Note: The E.G.A. needs to vent to atmosphere via the drain solenoid on the bottom; this is also where the E.G.A. performs its air calibrations. Care should be taken to ensure the outlet is not restricted or that contamination from exhaust gas occurs.

注：尾气分析仪需要通过底部的排放电磁阀将废气排放到大气中，此时尾气分析仪需要执行空气校准操作。应注意出口没有任何堵塞且废气不会造成污染。

1.1.3 Mk8 E.G.A. vs Mk7 E.G.A. Mk8 和 Mk7 尾气分析仪

The Mk8 E.G.A. has been developed to building on the technology developed in the Mk7 E.G.A. The new features and changes are:

Mk8 尾气分析仪的开发是在 Mk7 尾气分析仪开发技术的基础上进行，包括以下新功能和变化：

- 2 Years Continuous Emissions Monitoring System (CEMS) included as standard
- 标配 2 年连续排放监测系统。
- Single PCB board
- 单个 PCB 板
- New flying leads
- 新型飞线
- New software updater
- 新型软件更新器
- More accurate sampling
- 更多准确的采样
- Longer cell life
- 更长的设备寿命
- CEMS included as standard
- 标配连续排放监测系统
- Cells contain calibration code and serial number in PCB memory
- 设备校准码和序列号储存在 PCB 存储器中
- New air inlet filter construction
- 新型进气过滤器结构
- Self-calibration (optional)
- 自校准（可选）

1.2 3-Parameter Trim 3 参数调节

The 3-parameter trim function can be enabled when the Mk8 E.G.A. is used in conjunction with an M.M. module to manage the combustion. When the E.G.A. detects any differences in the online exhaust gas readings to the original commissioned values, the trim function will make small corrections to the air damper (and channel 5 if optioned for trim), to bring those online values back to the commissioned readings. The trim function controls the combustion of the burner by adding air (air rich) or taking away air (fuel rich) from the commissioned air positions to keep the volume of O₂, CO₂ and CO close to their commissioned values without compromising safety. The air rich and fuel rich limits are set by adding trim data when commissioning the burner or through single point change for 'quick commission.' This trim data is translated into a combustion map, which shows how the burner reacts when air is added or removed from the combustion process during commissioning. The Autoflame system continually monitors 3 parameters O₂, CO₂ and CO to create the safest and most efficient way of trimming the combustion process.

当 Mk8 尾气分析仪和控制模块一同用于管理燃烧时可以启用 3 参数调节功能。当尾气分析仪检测到在线废气读数和原调节数间存在差异时，调节功能将对空气挡板（可以选择通道 5 进行调节）进行微调，使在线数值与调节的读数保持一致。调节功能可以通过增加空气（富氧）或从调试空气中排出空气（富油）控制燃烧，使氧气、二氧化碳和一氧化碳的含量接近其调试值而不影响安全性。当调试燃烧器时或通过单点改变进行快速调试时，富氧和富油限值可以通过增加调节数据进行设置。调节数据被转换成燃烧图，燃烧图将显示添加空气或在燃烧过程中排出空气时的燃烧器反应。Autoflame 系统可以持续监视氧气、二氧化碳和一氧化碳 3 个参数，使调节燃烧过程更加安全有效。

1 Introduction 前言

increase in this value. This results in the E.G.A. reading the tramp air influence in the sample rather than just the actual combustion gases.

通过不匹配锅炉或烟道段进入的空气将改变氧气读数并显示数值增加，这会影晌尾气分析仪在样本中的读数，不会显示实际的燃烧气体。

Single parameter O₂ trim systems would see both of these conditions as rich (excess air) combustion and start to trim back on the air by closing the air damper. In reality this trim process is not trimming the combustion gases at this point, but is in fact trimming the exhaust gases with the excess O₂. This can potentially lead to the formation of excessive amounts of CO but more importantly this can lead to incomplete combustion with dangerous consequences.

单参数氧气调节系统可以检测到富氧（过多空气）燃烧的条件，通过关闭空气挡板调节空气。事实上，调节过程并不是在该点对燃烧气体进行调节，而是调节过多氧气中的废气。这样可能导致过多一氧化碳的形成，更重要的是可能导致燃烧不完全的危险后果。

Similarly, single parameter CO₂ trim systems would interpret of air as lower CO₂ levels in the flue, inflicting similar dangerous conditions in the boiler.

同时，单参数二氧化碳调节系统将检测到烟道空气中存在含量低二氧化碳，使锅炉出现类似的危险。

Another benefit of the 3 parameter trim is that the E.G.A. is continually measuring the formation of CO compared to its commissioned value. A higher CO reading can be contributed to both lean and rich combustion. A lack of air will produce incomplete combustion and the formation of CO. Also, excess air around the flame envelope can chill the flame edge causing incomplete combustion and higher CO levels.

3 参数调节的另一个优点是尾气分析仪可以根据调试值持续测量一氧化碳的形成。较高的一氧化碳读数可能是因不完全燃烧和过度燃烧造成。缺少空气将产生燃烧不完全并形成一氧化碳。同理，火焰周围有过多的空气可能冷却火焰边缘，导致不完全燃烧和较高的一氧化碳含量。

By referencing all 3 parameters against mapped combustion performance the burner can be trimmed back to the original commissioned values whilst maintaining the highest degree of safety.

通过参考反应燃烧性能的这 3 个参数可以将燃烧器调节至原始调试值，同时保持最高程度的安全性。

When the trim function adds air to bring back the combustion to the commissioned values, as the burner modulates to a new position, the deviation in air damper movement is added to each air position. In this way, optimum combustion is maintained during modulation, through carry forward trim.

当调节功能增加空气使燃烧与调试值保持一致时，由于燃烧器调节到一个新位置，空气挡板移动的偏差被加入各空气位置。这样在调节过程中通过调节可以保持最佳燃烧。

As a safety feature, as the air is being taken away, the fuel to air ratio will return back to the commissioned positions when the burner modulates, for every 10 degrees of fuel valve movement. Once this new position is held the system will determine whether the air damper should be closing. This ensures safe combustion at all times without any compromise.

至于安全功能，由于空气一直被排出，燃烧器进行调节时油气比将返回至调试位置，燃料阀将移动 10 度。一旦新位置固定时，系统将确定是否关闭空气挡板。这样可以始终确保安全燃烧。

1.3 Continuous Emissions Monitoring System 持续排放检测系统

The Mk8 E.G.A. now has the CEMS function included as standard, logging the exhaust gas and fuel data for up to 2 years. This data includes the gas readings, flue temperature, calculated efficiency and fuel consumption.

Mk8 尾气分析仪目前标配持续排放检测系统功能，可以记录两年的废气和燃料数据。该数据包括燃气读数、燃料温度、计算效率和燃料消耗。

When using a standalone Mk8 E.G.A. a direct connection as shown in section 2.2.3 will be required to view and log up to 2 years of data on the Mk7 D.T.I. The D.T.I. will need to be set-up as 'E.G.A. direct' through the 'Edit Boiler' screen and the E.G.A. setup for standalone operation (E.G.A. selects fuel).

使用单机 **Mk8** 尾气分析仪时，需要进行 2.2.3 节显示的直接连接并记录 **Mk7** 数据传输接口上的数据。在‘编辑锅炉’屏幕上和尾气分析仪（EGA）单机操作中（EGA 选择燃料）需要将数据传输接口设为‘EGA direct EGA 直接’。

Using the E.G.A. in conjunction with the Mk7 M.M. module and D.T.I, a data link will be required between the M.M. and E.G.A. and from the E.G.A. to the D.T.I. (see section 2.2.4). The D.T.I. will need to be setup as 'E.G.A. Direct' **not** 'E.G.A. through M.M.'

使用安装 **Mk7** 控制模块和数据传输接口的尾气分析仪时，控制模块和尾气分析仪以及尾气分析仪至数据传输接口（见 2.2.4 章节）间需要有数据连接。数据传输接口需设为‘E.G.A. DirectEGA 直接’而非‘E.G.A. through M.M EGA 通过控制模块’。

For multiple M.M.s, each with the E.G.A.s, refer to both sections 2.2.3 and 2.2.4. There will need to be data cable connected as a daisy chain between the E.G.A.s and D.T.I., a data cable daisy chain between the M.M.s and D.T.I., and data cable links between each M.M. and its corresponding E.G.A.

使用多个控制模块时，每个模块都需要连接尾气分析仪，见 2.2.3 和 2.2.4 章节。尾气分析仪和数据传输接口间要有菊花链连接的数据电缆，控制模块和数据传输接口间有菊花链连接的数据电缆，每个控制模块和对应的尾气分析仪间有数据电缆连接。

2 WIRING AND COMPONENTS 接线和组件

2.1 Flying Lead Wiring Diagram

飞线接线图

Data Connector 数据连接器

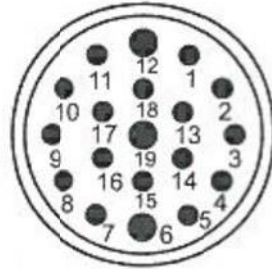


Figure 2.1.i Data Connector – Insert Pin Mating View

图 2.1.i 数据连接器-插针匹配图

1	4-20 mA Output Channel (1+) 4-20 mA 输出通道 (1+)
2	4-20 mA Output Channel (2+) 4-20 mA 输出通道 (2+)
3	4-20 mA Output Channel (3+) 4-20 mA 输出通道(3+)
4	4-20 mA Output Channel(4+) 4-20 mA 输出通道(4+)
5	4-20 mA Output Channel(5+) 4-20 mA 输出通道(5+)
6	4-20 mA Output Channel(6+) 4-20 mA 输出通道(6+)
7	4-20 mA Output Common (-) 4-20 mA 输出命令 (-)
8	Fuel 1 Select Input 燃料 1 选择输入
9	Fuel 2 Select Input 燃料 2 选择输入
10	Fuel 3 Select Input 燃料 3 选择输入
11	Fuel 4 Select Input 燃料 4 选择输入
12	Fuel Select Input common 燃料选择输入命令
13	MM Comms (-) 控制模块通信 (-)
14	MM Comms (+)控制模块通信 (+)
15	DTI Comms (-) 数据传输接口通信
16	DTI Comms (+)数据传输接口通信
17	4-20mA Input (-)4-20mA 输入
18	4-20mA Input (+)4-20mA 输入
19	Not Connected 未连接

Note: Fuel Select Inputs in standalone mode are low voltage. To select a fuel, put a link on the 'Fuel X Select Input' to the Fuel Select Input Common e.g. to select fuel 1, link pin 8 to pin 12 to select fuel 1 in standalone mode.

注：在单机模式下燃料选择输入为低电压。选择燃料时将‘燃料 X 选择输入’连接至燃料选择输入命令，例如：选择燃料 1 时，在单机模式下将针 8 连接至针 12。

Mains Connector 电源连接器

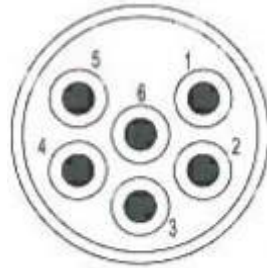


Figure 2.1.ii Mains Connector – Insert Pin Mating View
图 2.1.ii 电源连接器-插针匹配图

Pin Number 针号	Assigned function 分配的功能
1	Live 火线
2	Live for HSL HSL 火线
3	Earth for HSL HSL 地线
4	Neutral for HSL HSL 零线
5	Neutral 中性
6	Earth 接地

Auxiliary Connector 辅助连接器

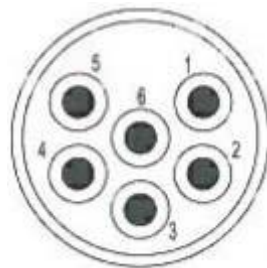
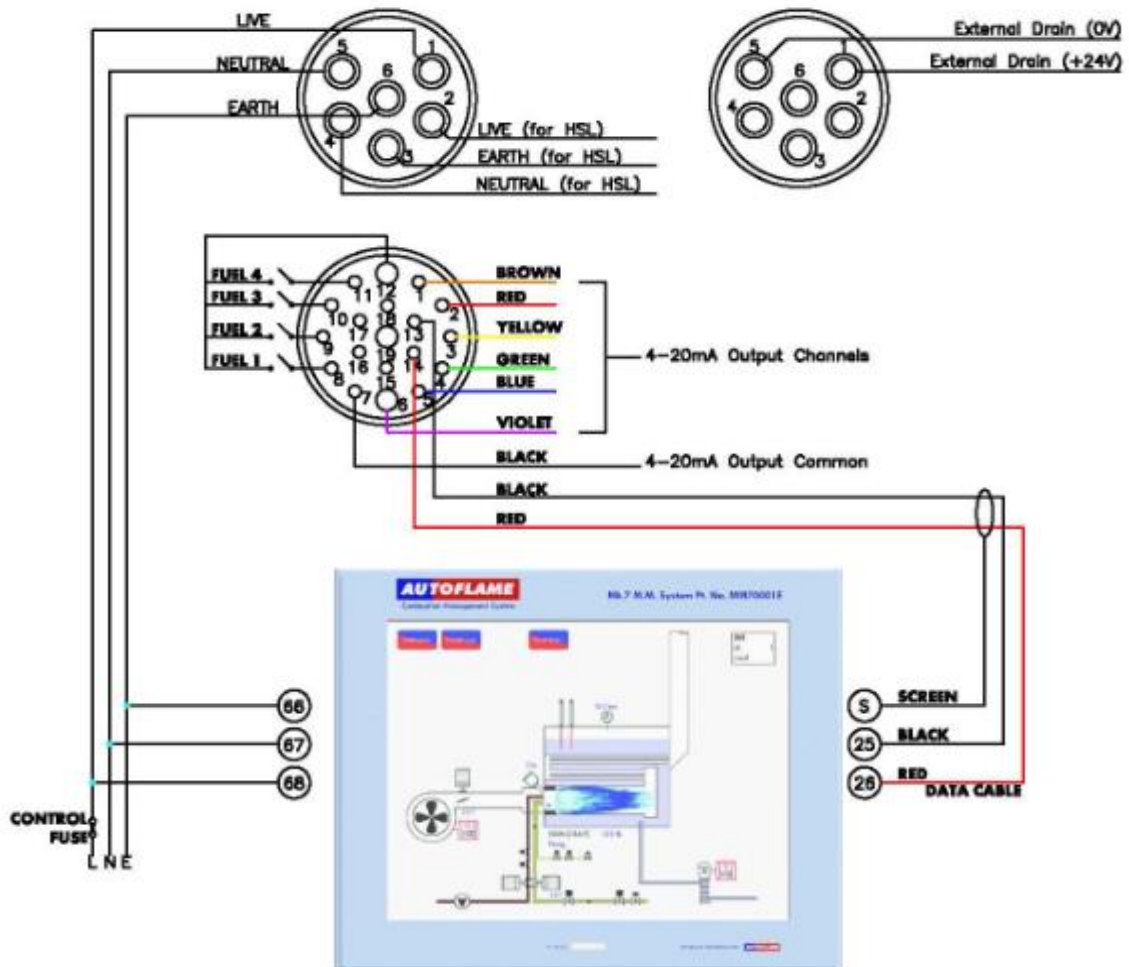
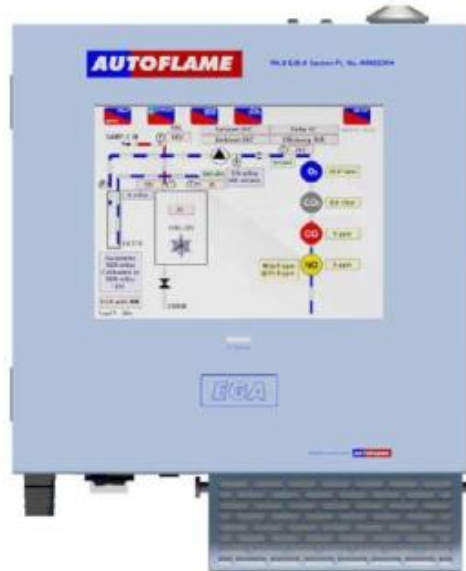


Figure 2.1.iii Auxiliary Connector – Insert Pin Mating View
图 2.1.iii 辅助连接器-插针匹配图

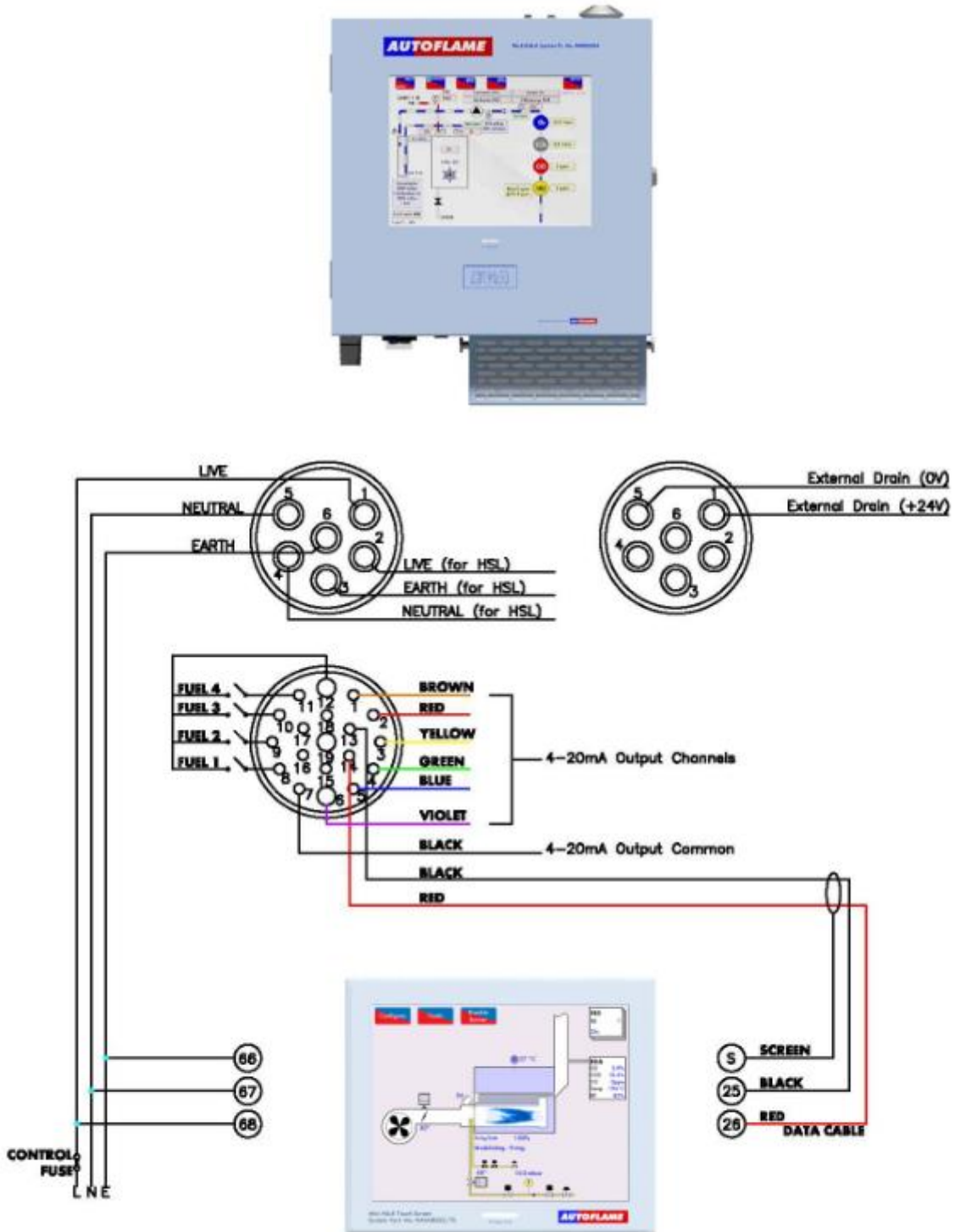
Pin Number 针号	Assigned function 分配的功能
1	External Drain (0V) 外部排放 (0V)
2	
3	
4	
5	External Drain (+24V) 外部排放(+24V)
6	

2.2 Electrical Schematics 电气原理图

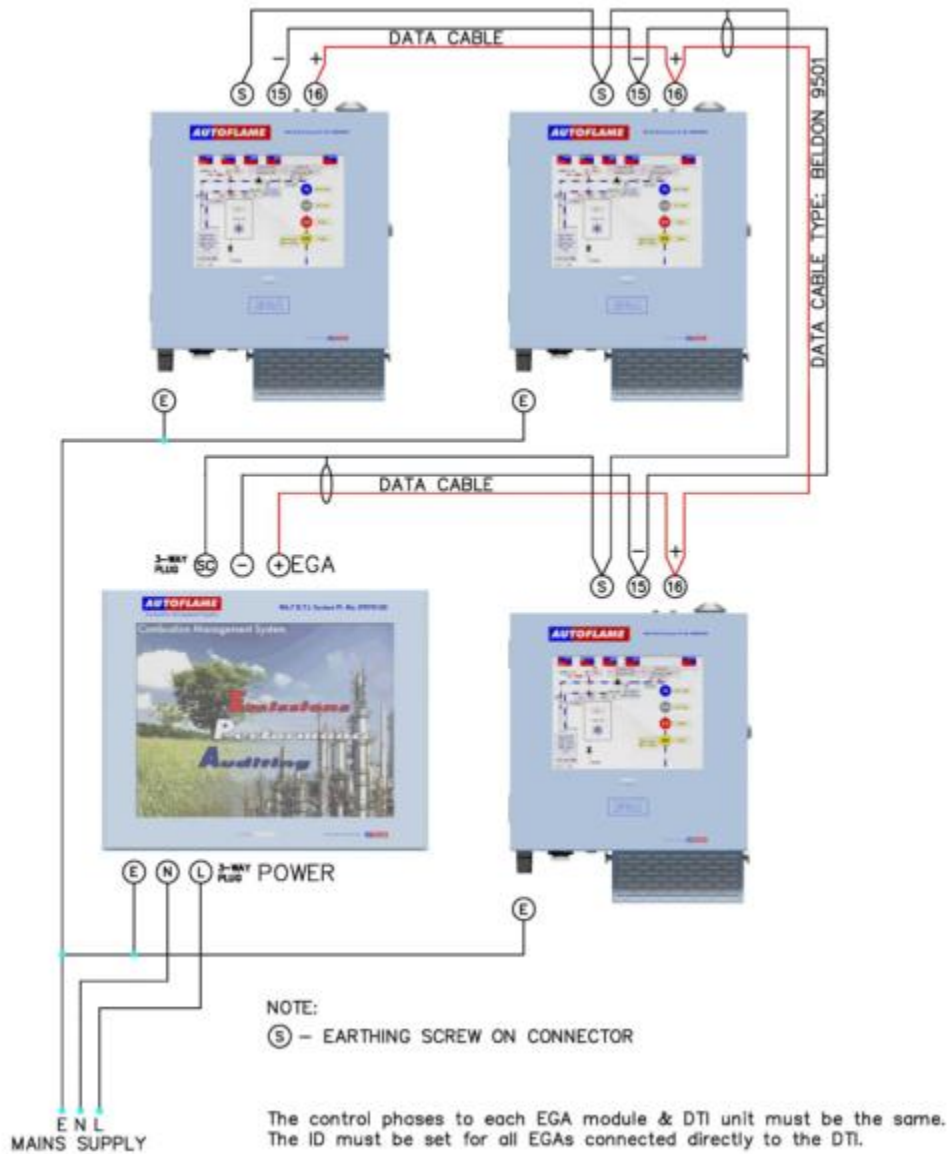
2.2.1 Interconnection between E.G.A. and Mk7 M.M.
尾气分析仪和 Mk7 控制模块的互连



2.2.2 Interconnection between E.G.A. and MiniMk8 M.M.Module
尾气分析仪和 Mk8 微型控制模块的互连



2.2.3 Interconnection between Stand-Alone Mk8 E.G.A and Mk7 O.T.I.
单机 Mk8 尾气分析仪和 Mk7 OTI 的互连



ENL MAINS SUPPLY ENL 主电源

NOTE: 注

Ⓢ - EARTHING SCREW ON CONNECTOR 连接器接地螺丝

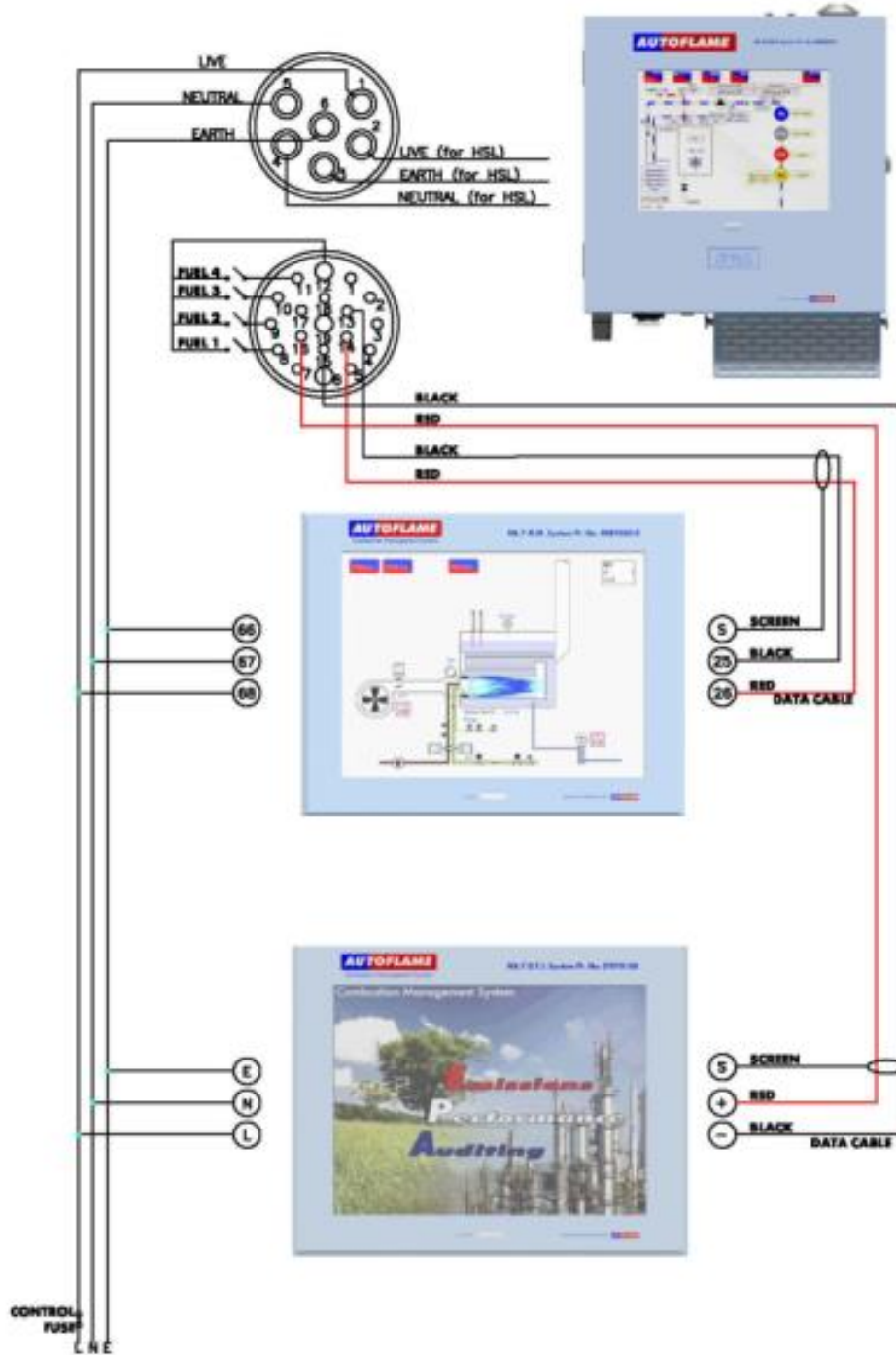
The control phases to each EGA module & OTI unit must be the same.
The ID must be set for all EGAs connected directly to the OTI.

各尾气分析仪模块和数据传输接口单元的控制相必须相同。

ID 必须设为 EGA 直接连接 DTI。

2.2.4 Interconnection between Mk7 M.M Mk8 E.G.A. and Mk7 D.T I.

Mk7 控制模块、Mk8 尾气分析仪和 Mk7 数据传输接口的互连



2.3 Components 组件

2.3.1 Inside View

内视图

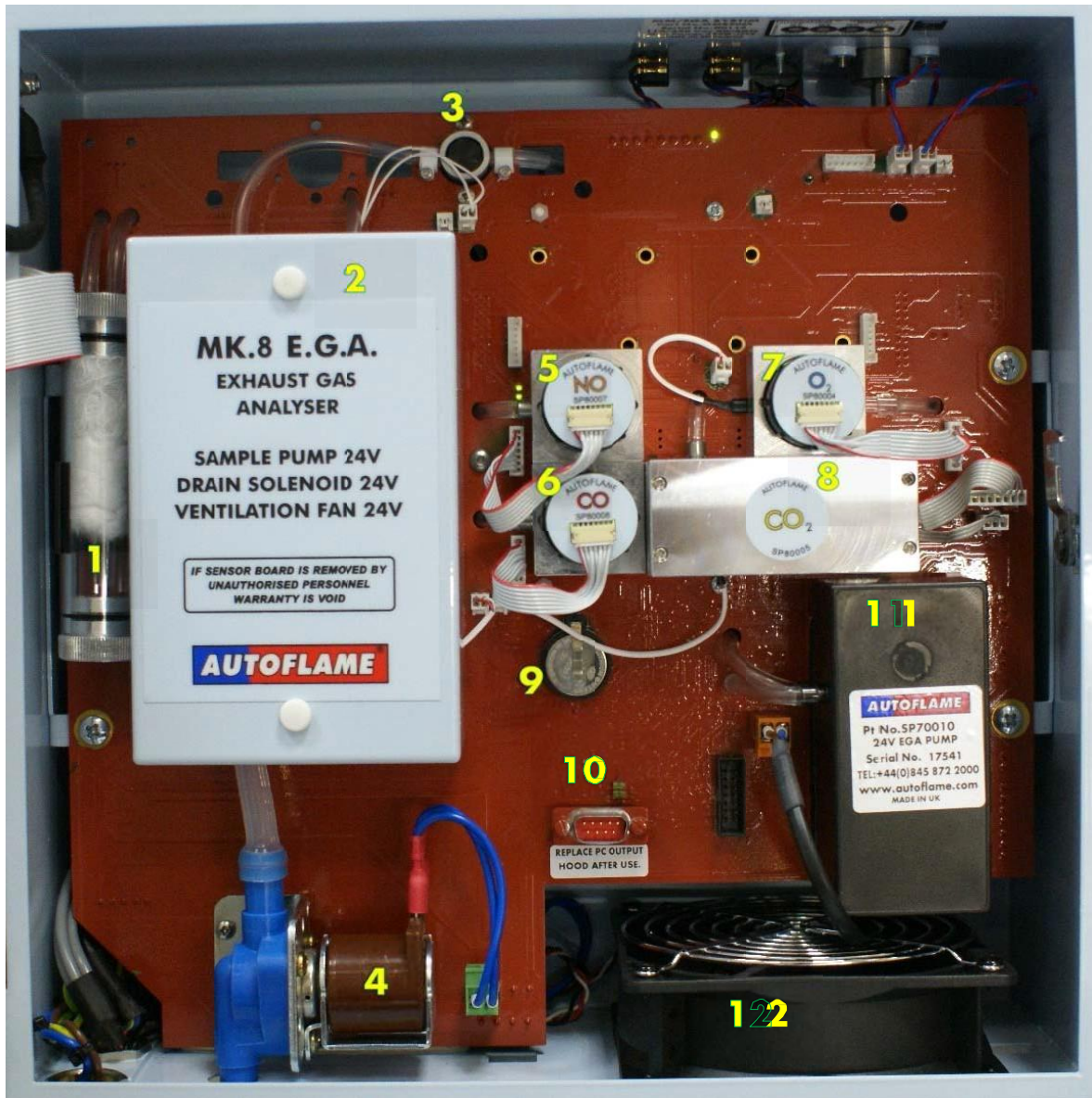


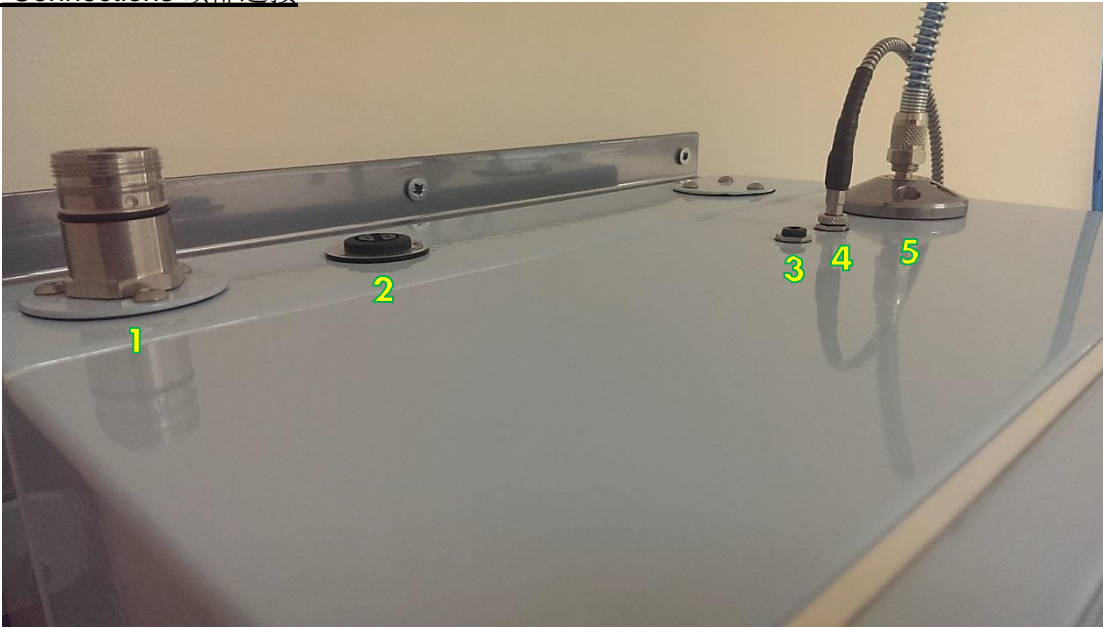
Figure 2.3.1.i Inside View

图2.3.1.i 内视图

1. Particulate Filter 微粒过滤器
2. Chiller Block 冷却器组
3. Pinch Valve 夹管阀
4. Drain Solenoid 排放电磁阀
5. NO Cell NO 感应器
6. CO Cell CO 感应器
7. O₂ Cell O₂ 感应器
8. CO₂ Cell CO₂ 感应器
9. CR Battery CR 蓄电池
10. Software Update Jumpers 软件更新跳线
11. Cell Pump 组件泵
12. E.G.A. Fan 尾气分析仪风机

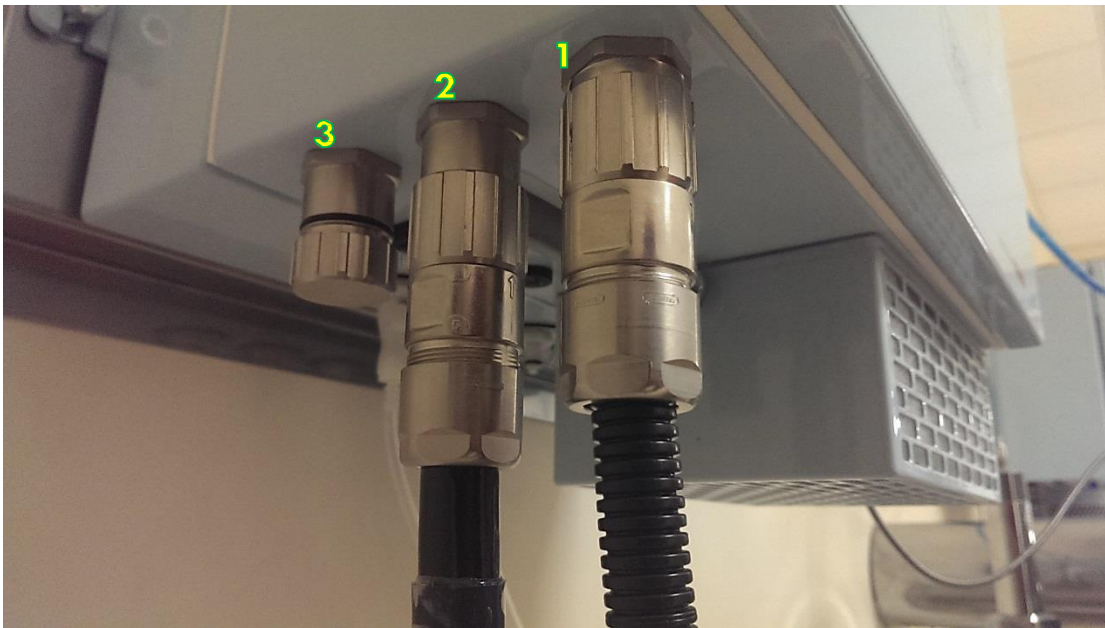
2.3.2 E.G.A. Connections 尾气分析仪的连接

Top Connections 顶部连接



1. Heated Sample Line (HSL) Power Connection (EPA only)
加热采样线 (HSL) 电源连接 (仅适用 EPA)
2. Heated Sample Line Fuse (EPA only)
加热采样线熔断器 (仅适用 EPA)
3. Pre-Heated Air Thermocouple Connection
预加热空气热电偶连接
4. Exhaust Temperature Thermocouple
排气温度热电偶
5. Sample Line connection
采样线连接

Power and Data Connections 电源和数据连接



1. Power Connector 电源连接器
2. Data Connector 数据连接器
3. External Particulate Filter/ External Drain Connector 外部颗粒过滤器/外部排放连接器

2.4 Cell Characteristics

感应器特点

2.4.1 O₂ Cell

O₂ 感应器

This electrochemical cell is used for the detection of oxygen covering a concentration range of 0 to 20.9%. Due to the construction of the cell they offer a long life and a high resistance, even when used with high sulphur content fuels, therefore making it capable of analysis when firing heavy or light fuel oil.

电化学感应器用于检测浓度范围为 0 至 20.9% 的氧气。感应器结构可以提供更长的寿命和高电阻，即使在使用高硫含量燃料的情况下，因此该感应器可以在燃烧重或轻质燃料油时用于分析。

The oxygen cell incorporates a lead oxygen cell with a Lead anode and a Gold cathode, using a specific acid electrolyte. Oxygen molecules which diffuse through a non-porous Teflon membrane into the electromechanical cell are reduced at the Gold electrode. The current flow between the electrodes is proportional to the oxygen concentration in the flue gases measured. The O₂ readings are not influenced from CO, H₂, S, NOX and SOX so there is no cross-sensitivity.

氧气感应器包括一个带有铅阳极和金阴极的主氧气感应器，阳极和阴极使用特殊的酸性电解质。通过非多孔聚四氟乙烯膜扩散至电化学感应器中的氧气分子在金电极减少。电极间的电流流量与测量的烟气中氧浓度成正比。氧气读数不受 CO、H₂、S、NOX 和 SOX 的影响，因此没有横向灵敏度。



Figure 2.4.1.i O₂ Cell

图2.4.1.i 氧气感应器

Operation Ranges:

运行范围

Detection Range 检测范围	0 – 20.9% O ₂
Accuracy 精度	± 0.3 % Vol O ₂
Operating Temperature 工作温度	5°C to 40°C (41°F to 104°F) 5°C 至 40°C (41°F 至 104°F)
Shelf Life 保质期	6 months from date of dispatch 发货日算起 6 个月
Long Term Output Drift 长期输出偏差	< 1% signal/month typically < 1% 信号/月 < 10% over operating life < 10% 运行寿命

2 Wiring and Components 接线和组件

As the O₂, CO, NO, SO₂ and NO₂ cells all have a 6 month shelf-life, it may be better to request for the cells to be shipped when the E.G.A. is being installed on site. Depending on the conditions and environment the E.G.A. is in, the cell's life expectancy can go up to 2 years. It is important to replace the cells when the E.G.A. flags this up on the screen. Cells will need to be changed every 9 to 12 months firing on gas, and 6 to 9 months firing on oil.

O₂, CO, NO, SO₂和 NO₂感应器的保质期为 6 个月。当尾气分析仪在现场安装后最好要求发送感应器。根据尾气分析仪使用的条件和环境，感应器的寿命可以达到两年。当尾气分析仪在屏幕上出现相应标记后则需要更换感应器。在燃气燃烧中感应器每隔 9 至 12 个月需要更换一次，在燃油燃烧中每隔 6 至 9 个月需要更换一次。

2.4.2 CO, NO, NO₂ and SO₂ Cells CO, NO, NO₂ 和 SO₂ 感应器

The CO, NO, NO₂ and SO₂ electromechanical cells which are specifically managed by the calibration philosophy within the Mk8 E.G.A. unit. The accuracy of these cells is within limits of $\pm 5\%$ at 100ppm. From experience we would expect to see a drift of $\pm 10\text{ppm}$ per annum without calibration. In our view, this drift would not be detrimental to the operation or application of the E.G.A. The life of the cells depends on the concentration of the gases measured over time. In order to optimise the life of the CO cell, the electronics will detect when the signal level from the cell reaches or exceeds 500ppm and will stop sampling and purge the system. The sample gas flow to these cells is restored once the O₂ and CO₂ readings are restored to a level within the pre-programmed limits.

CO, NO, NO₂ 和 SO₂ 电化学感应器在 Mk8 尾气分析仪组中根据校准原理进行管理。在 100ppm 情况下感应器的精度控制在限值的 $\pm 5\%$ 。根据经验表明感应器每年的偏差为 $\pm 10\text{ppm}$ ，无需校准，这种偏差不会对尾气分析仪的运行或应用造成影响。感应器的寿命取决于测量的燃气浓度。为了优化 CO 感应器的寿命，电子元件将检测感应器的信号电平是否达到或超过 500ppm，如果达到或超过感应器将停止采样并开始清洁系统。当氧气和二氧化碳读数恢复到设定范围内时流经感应器的样气将被储存。



Figure 2.4.2.i NO and CO Cells 图 2.4.2.i NO 和 CO 感应器

	Gas (range) 燃气 (范围)	Fuel Oil (range) 燃料油 (范围)	Resoluion at 20°C 分离度 (20°C)	Repeatability 重复性	Shelf Life 保质期
CO	0-1000ppm	Optional 可选	1ppm	1% of signal 信号的 1%	6months from dispatch 发货日算起 6 个月
NO	0-1000ppm	Optional 可选	1ppm	2% of signal 信号的 2%	6months from dispatch 发货日算起 6 个月
SO ₂	Optional 可选	0-1000ppm	1ppm	1% of signal 信号的 1%	6months from dispatch 发货日算起 6 个月
NO ₂	Optional 可选	0-200ppm	0.5ppm	2% of signal 信号的 2%	6months from dispatch 发货日算起 6 个月

2.4.3 CO₂ Sensor CO₂ 传感器

The CO₂ sensor is manufactured in-house at Autoflame; the technology used is non-dispersive Infra-red. This sensor has no moving parts and is not an electrochemical cell. The accuracy of the reading is $\pm 0.3\%$ of the reading. The cross-sensitivity is virtually zero to other gases due to the method of calibration within the E.G.A. unit. The lifetime is usually no less than two years of gas firing. The lifetime on oil firing is dependent on the Sulphur content of the fuel.

CO₂ 传感器是由 Autoflame 生产，使用了非色散红外线技术。该传感器没有移动部件，不是电化学感应器。读数的精度为读数的 $\pm 0.3\%$ 。根据尾气分析仪组件的校准方法，其横向灵敏度相对其他气体几乎为零。在燃气燃烧中其寿命通常不低于两年，在燃油燃烧中其寿命取决于燃料中的硫含量。



Figure 2.4.3.i CO₂ Cell
图 2.4.3.i CO₂ 感应器

Measurement Range: 0-20%

测量范围: 0-20%

Shelf-Life: 12months from dispatch

保质期: 发货日算起 12 个月

Accuracy of reading: 0.3%

读数精度: 0.3%

3 SET-UP 设置

3.1 E.G.A. Set-Up 尾气分析仪的设置

3.1.1 Sampling Screen 采样屏幕

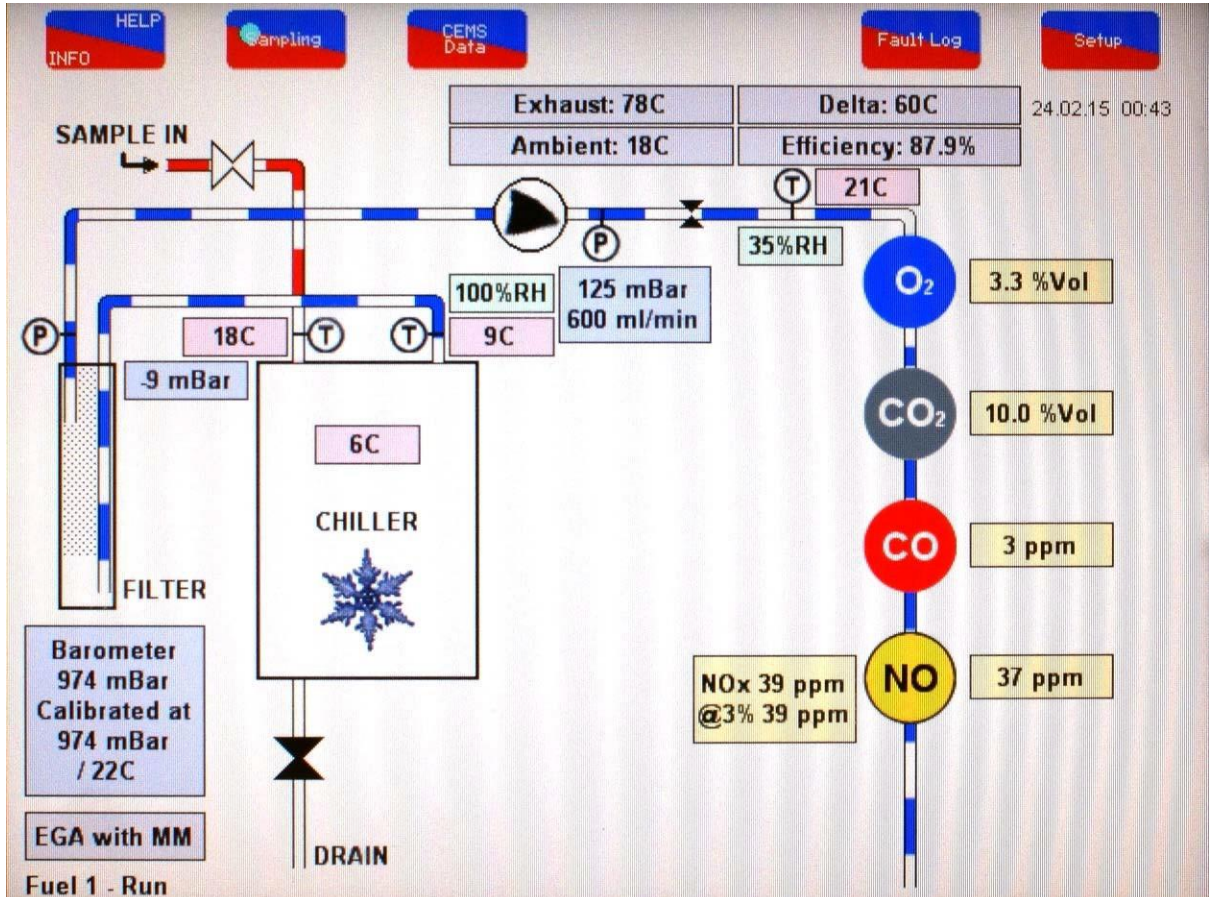


Figure 3.1.1.i. Sampling Screen

图 3.1.1.i 采样屏幕

The sampling screen presents the user with detailed information about the current operation of the E.G.A. components shown on this screen.

如上图所示采样屏幕向操作员显示关于尾气分析仪组件当前运行的详细信息。

- Fuel being fired and current E.G.A. status (Air calibration, run etc.)
- 正燃烧的燃料和当前尾气分析仪状态（空气校准、运行等）
- Exhaust gas temperature
- 废气温度
- Ambient air temperature surrounding E.G.A.
- 尾气分析仪周围的环境空气温度
- Delta temperature (difference between the exhaust gas and ambient temperatures)
- Delta 温度（废气和环境温度间的差值）
- Current combustion efficiency (see section 3.6.7.)
- 当前燃烧效率（见 3.6.7 节）。

Cells 感应器



Carbon Monoxide
一氧化碳



Nitric Oxide
一氧化氮



Oxygen 氧气



Carbon Dioxide 二氧化碳



Nitrogen Dioxide 二氧化氮



Sulphur Dioxide 二氧化硫

System Components 系统组件



Piping (no flow)
管道 (无流动)



Piping (gas flowing)
管道 (气体流动)



Piping (water/condensate draining or air sample flowing)
管道 (水/冷凝水排出或气流流动)



Pump
泵



Pinch Valve Open
夹管阀开



Pinch Valve Closed
夹管阀关闭



Temperature Sensor
温度传感器



Pressure Sensor
压力传感器



Chiller Status
冷却器状态



Restrictor
限流器

Note: Components that are not ready/malfunctioning are denoted by a .

注：组件未就绪或组件故障时显示 .

3.1.2 Mk8 E.G.A. SettingsMk8 尾气分析仪的设置

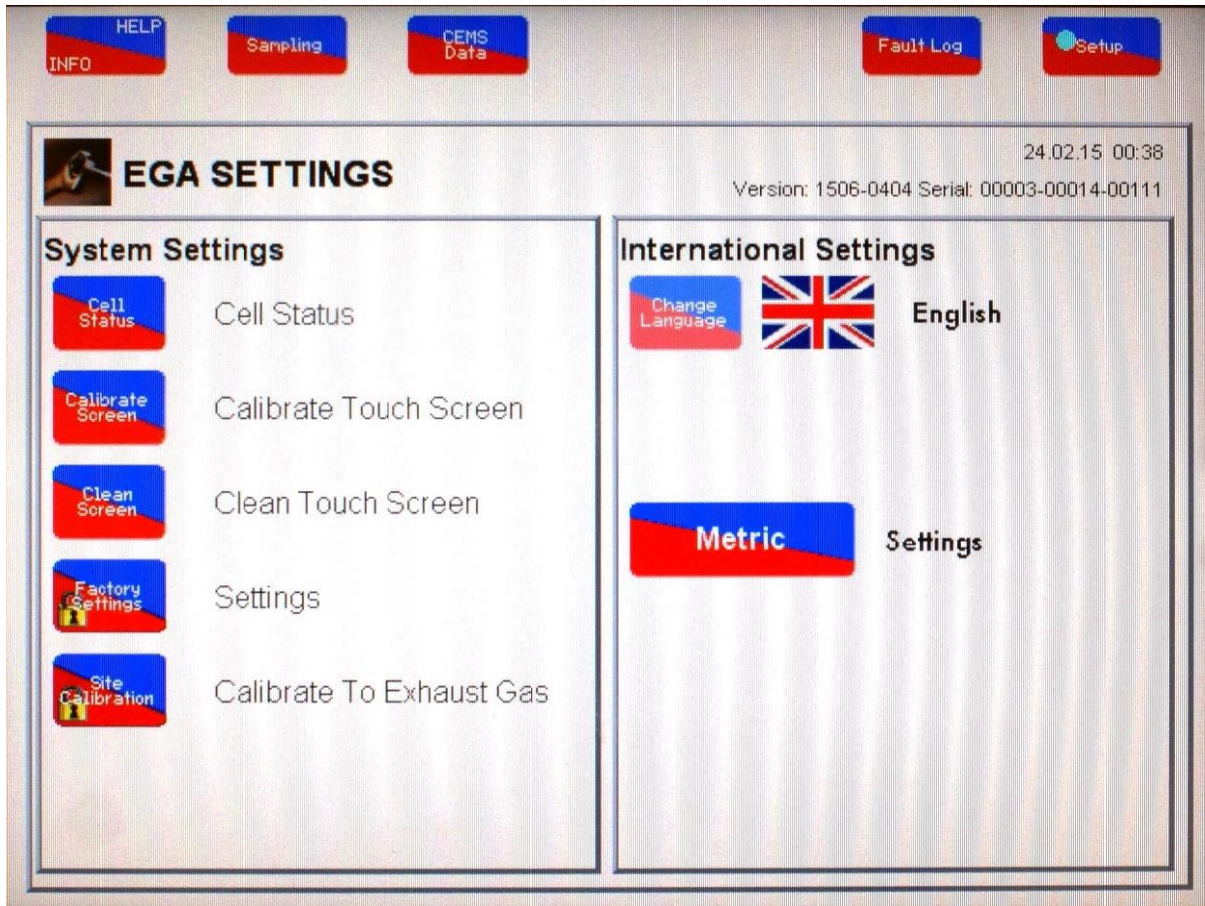




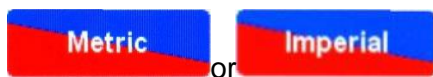
Figure 3.1.2.i. E.G.A. Settings Screen 图3.1.2.i 尾气分析仪设置屏幕

The E.G.A. settings screen is the first of two main settings screens. It displays the following information:
尾气分析仪设置屏幕是两个主设置屏幕中的第一个屏幕，主要显示以下信息：

1. Date and time.日期和时间
2. Software versions.
3. Serial number of the unit.设备序列号
4. System language.系统语言
5. Units being used (Imperial/Metric). 使用的单位（英制/公制）

Note: Buttons with the  symbol are password protected.

注：带有  符号的按钮带有密码保护。



Press either of these buttons to toggle the units used by the system. The text displayed indicates the unit currently selected.

按下任一按钮可以切换系统使用的设备。显示的文字是指当前选择的设备。



Press here to calibrate the touch screen. Follow the on screen commands to calibrate the touch screen.

按下该按钮可以校准触摸屏。按屏幕提示的命令可以校准触摸屏。



Press this button to clean the touch screen. Pressing this button will lock the screen for 30 seconds to allow the screen to be cleaned.

按下该按钮可以清洁触摸屏。按下该按钮后将锁定屏幕30秒进行屏幕清洁。

3.1.3 Cell Status Screen 感应器状态屏幕

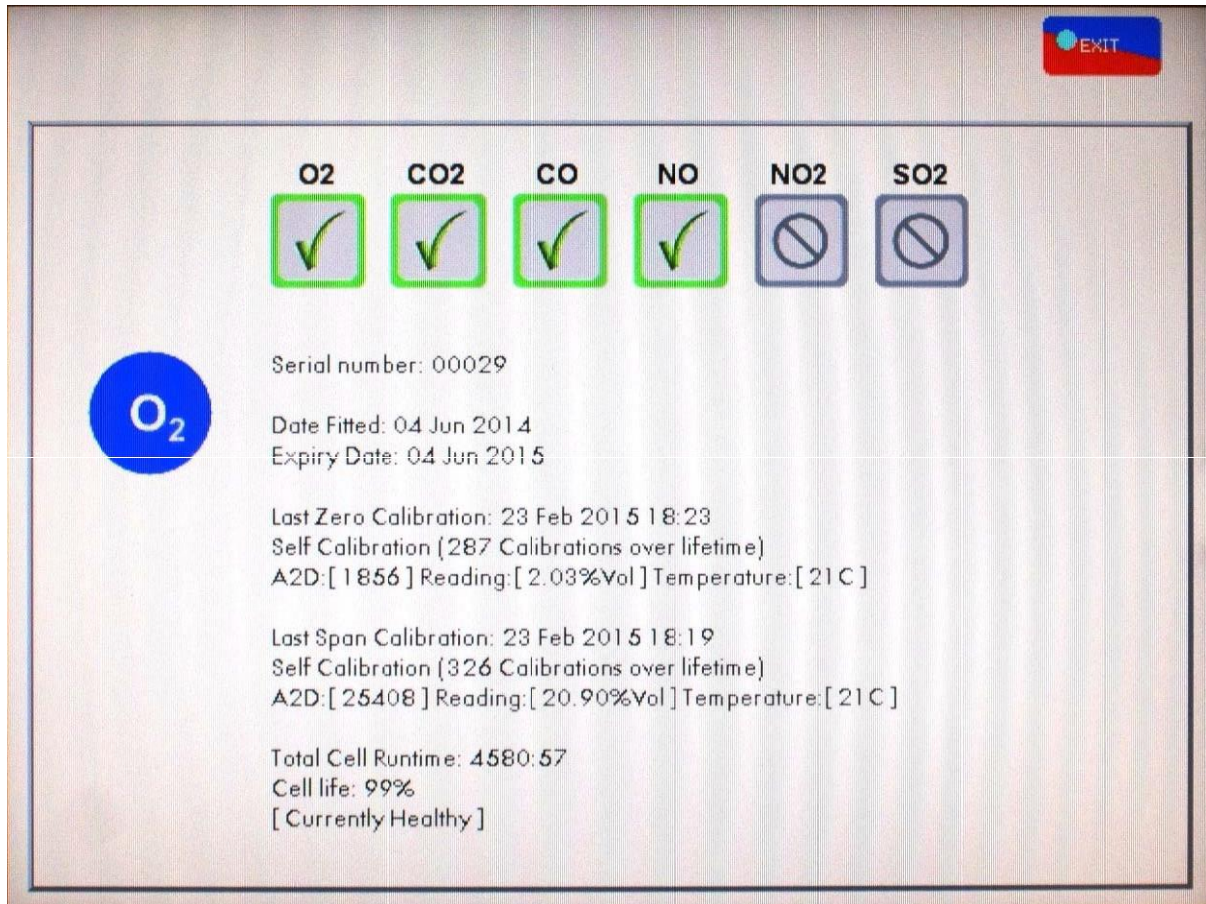


Figure 3.1.3.i Cell Status Screen

图 3.1.3.i 感应器状态屏幕

The cell status screen displays information of all fitted cells. This information is arranged as follows:
感应器状态屏幕显示所有匹配感应器的信息，信息按以下方式排列：

1. Image of the cell currently selected. 当前选定的感应器图片。
2. Detailed information on the cell currently selected. 当前选定的感应器详细信息。

The status icons are 状态图标包括：



OK – Indicates the cell is healthy.
正常-表明感应器正常。



Not Fitted – Indicates the cell is not fitted. Refer to Section 3.1.7 on how to enable cells if they are present.
未安装-表明未安装感应器。参考 3.1.7 节关于安装感应器后如何启用感应器。



Error – Indicates there is an error with the cell. Press to get further information.
错误-表明感应器存在错误。按下按钮获得更多信息。

3.1.4 Fault History 故障历史

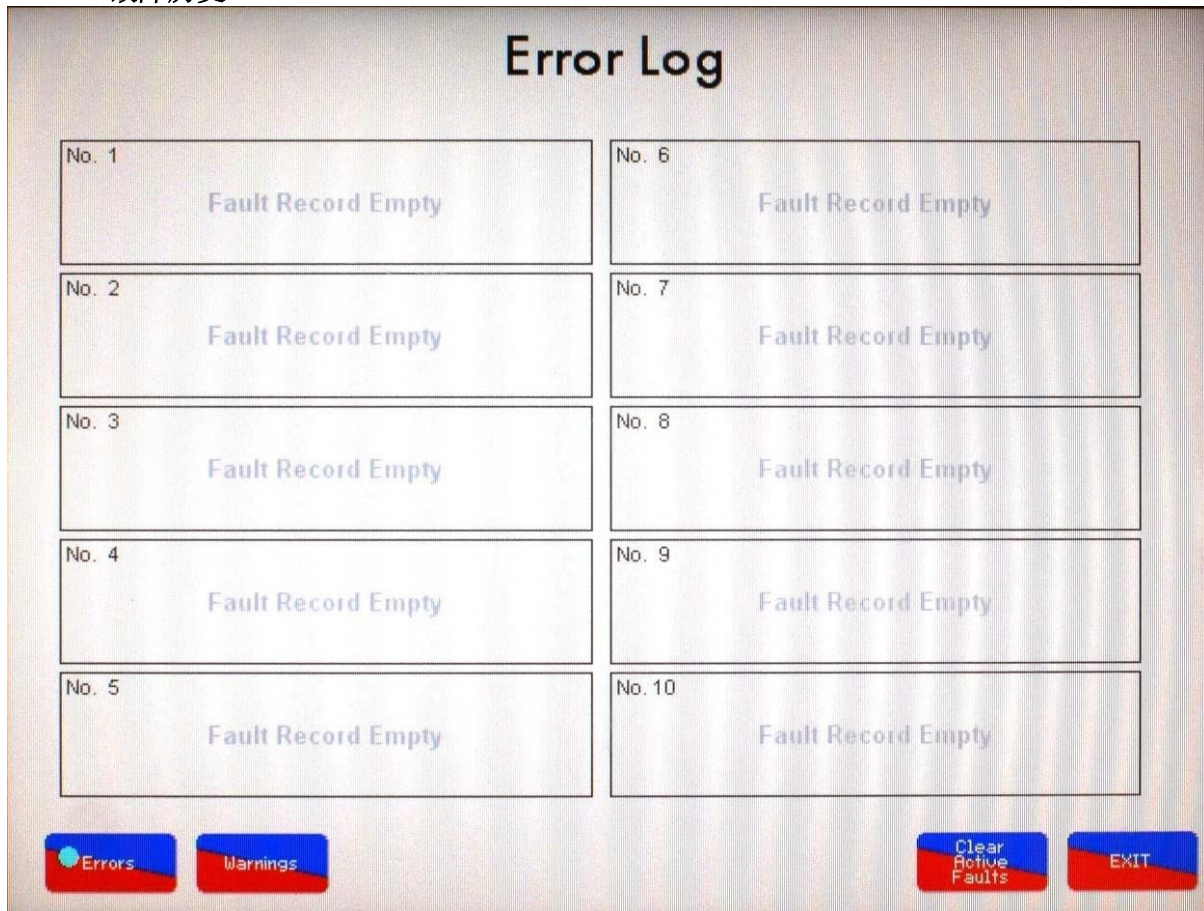




Figure 3.1.4.i Error Log Screen

图 3.1.4.i 错误日志屏幕

When an error is detected a popup box will appear with information on the error. This error is then logged onto the Error Log and can be accessed at any time by pressing the  button on the sampling screen.

检测到错误时将出现一个带有错误信息的弹出框。该错误将记录在错误日志中，操作员可以按下采样屏幕上的  按钮随时查看该错误信息。

The last 10 errors are logged on this record and can be downloaded through an MM (if used). Each error contains the following information:

最后 10 个错误将记录在日志中，操作员可以通过控制模块（如使用）下载。每个错误都包含以下信息：

1. Fault number (in reverse chronological order).
故障号（按时间顺序）
2. Type of fault.
故障类型。
3. Date and time at which the fault occurred.
故障发生的日期和时间。

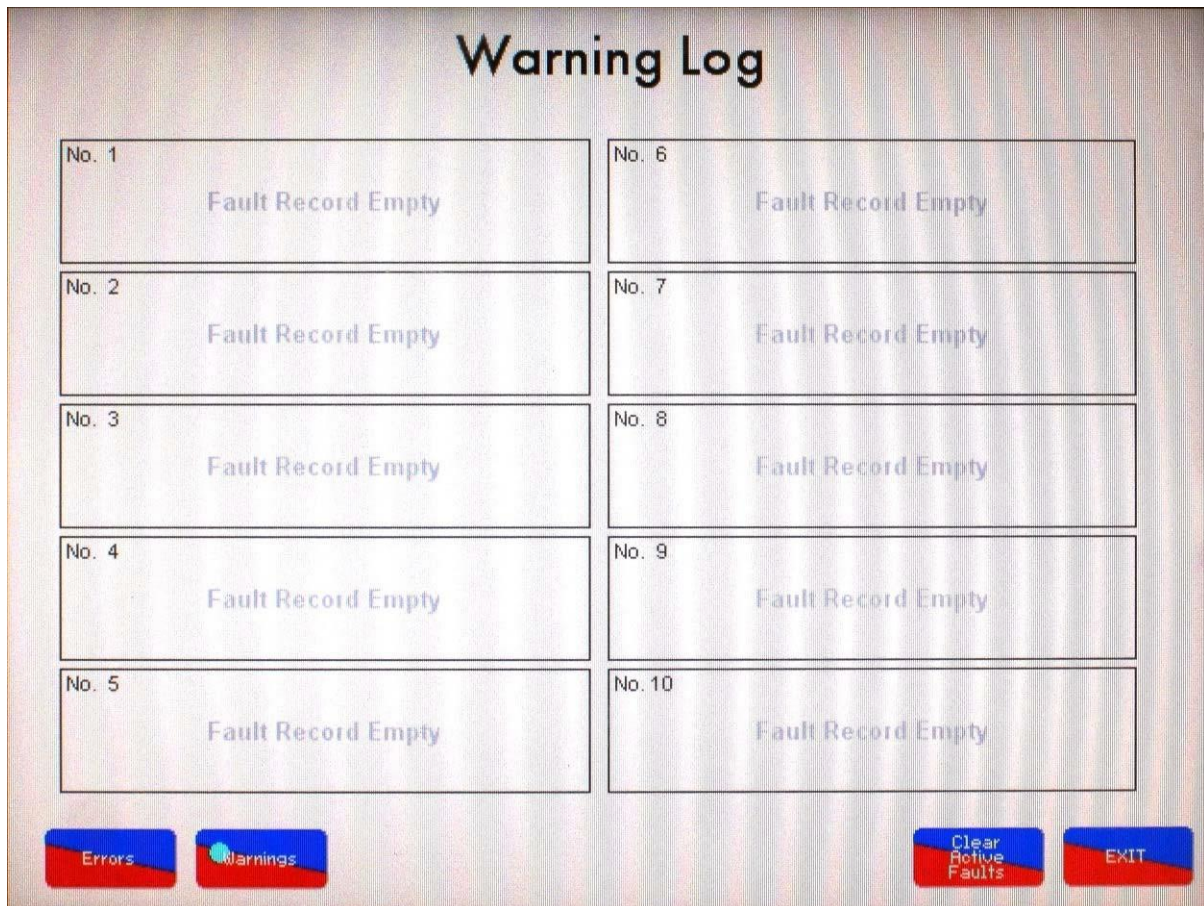


Figure 3.1.4.ii Warning Log Screen 图 3.1.4.ii 警告日志屏幕

With the Mk8 E.G.A. there are now 2 types of faults, errors and warnings. Any error that occurs will cause the E.G.A. to stop sampling to avoid damage to the unit or inaccurate combustion readings. Errors are more serious/damaging faults than warnings, and would require immediate rectification. Any warnings that occur are less damaging than errors, however they should still be dealt with as soon as possible. When the E.G.A. has a warning, the E.G.A. will continue to operate and sample.

Mk8 尾气分析仪目前有两种故障、错误和警告类型。发生错误时尾气分析仪将停止采样，以防止对设备造成损坏或避免不准确的燃烧读数。错误是比警告更严重的故障或警告故障，需要立即进行校准。所有警告都比错误的损坏性小，但也应进口处理。尾气分析仪出现警报时将连续运行和采样。

All E.G.A. errors and warning are detailed on the E.G.A. screen, and on the M.M. screen, they will display as 'Refer to E.G.A. for fault description.'

所有尾气分析仪错误和警报都在尾气分析仪屏幕上显示，在控制模块屏幕上，错误和警报将显示为‘参考尾气分析仪故障说明’。

3.1.5 Factory Settings Screen 出厂设置屏幕

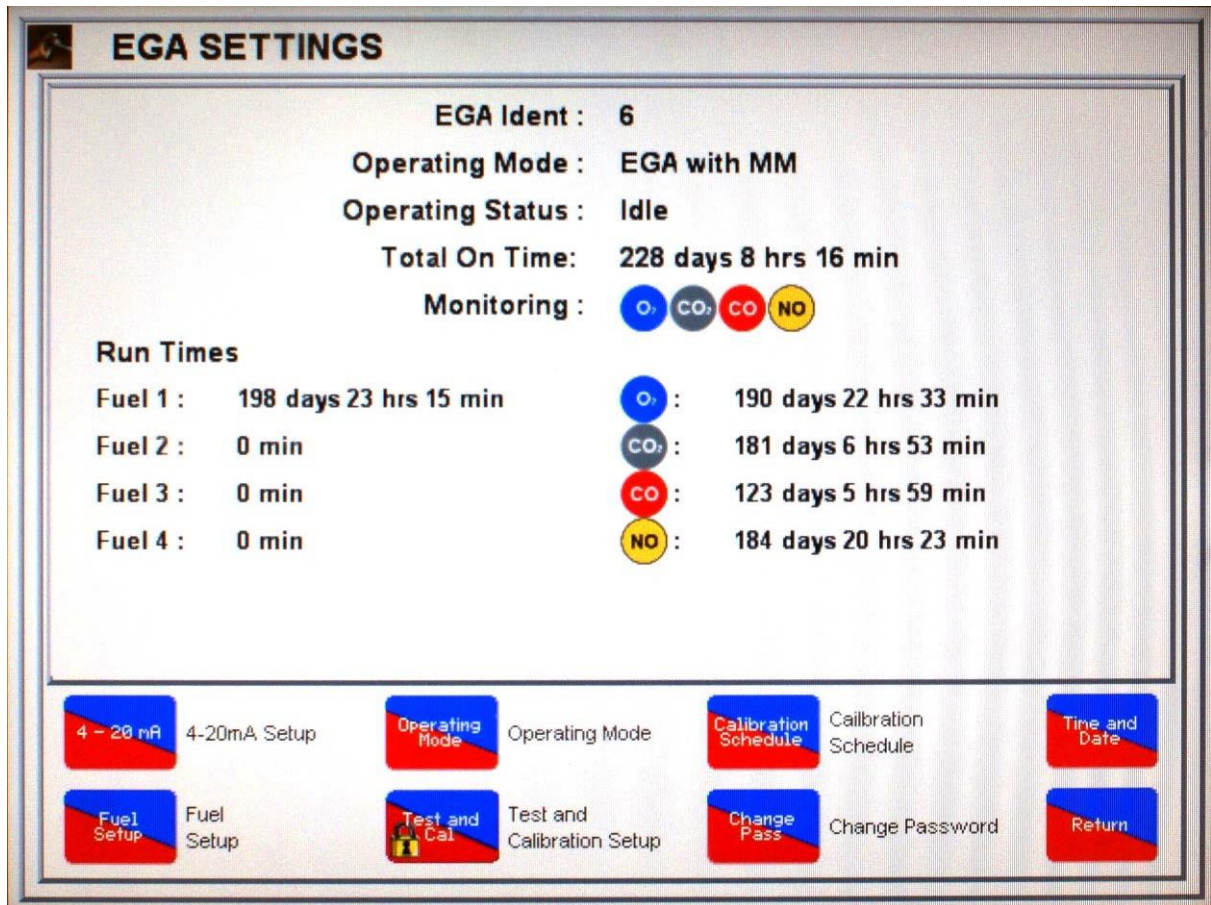



Figure 3.1.5.i Factory Settings Screen 图 3.1.5.i 出厂设置屏幕

To access this screen press the  button from Figure 3.2.2.i and enter the password on the keypad displayed.

要访问该屏幕请按下图 3.2.2.i 所示的  按钮，然后在显示的小键盘上输入密码。

Upon entering the factory settings screen, an overview of the E.G.A. is displayed:

进入出厂设置屏幕后可以查看显示的尾气分析仪信息：

1. The E.G.A. ID, current operating mode, E.G.A. status and cells selected.
尾气分析仪 ID、当前运行模式、尾气分析仪状态和选择的感应器。
2. The run times for each fuel and totalised run time.
每种燃料的运行时间和总运行时间。
3. Each cells run time.
每个感应器的运行时间。
4. Navigational Keys.
导航键

Use the navigational keys to select the following screens.

使用导航键可以选择以下屏幕。

3.1.6 4-20mA Set-up 4-20mA 设置

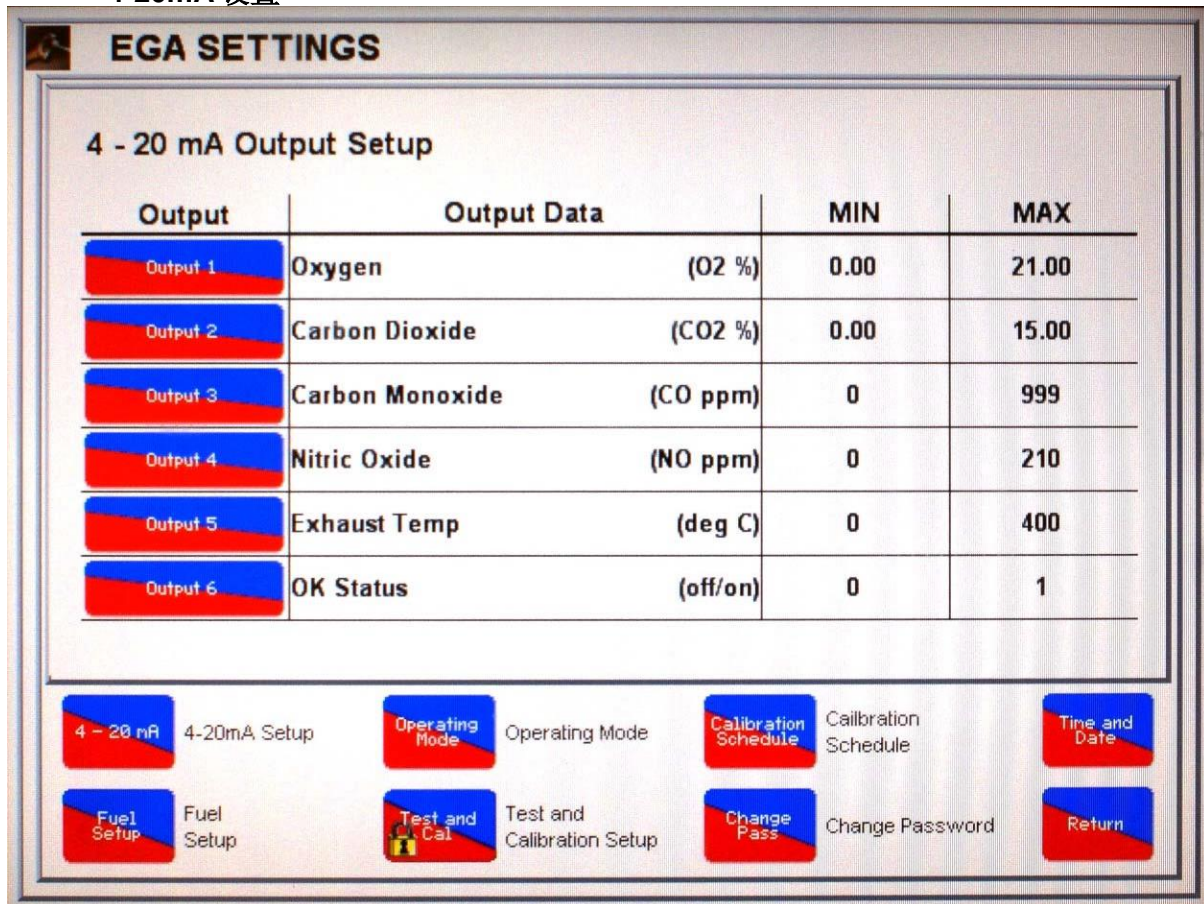

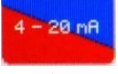


Figure 3.1.6.i 4-20mA Set-up Screen


图 3.1.6.i4-20mA 设置屏幕


Press the  button to display the screen above. The above screen is used to set-up the 4-20 mA outputs. The 4-20mA setup screen has the following layout:

按下  按钮可以显示以上屏幕。以上屏幕用于设置 4-20 mA 输出。4-20 mA 设置屏幕显示以下信息。

1. Output number.
输出号
2. Data to be outputted with units being used.
设备的输出数据。
3. Minimum and maximum value of outputted data (range).
输出数据（范围）的最小值和最大值。

To setup each 4-20mA output: 各 4-20mA 输出的设置方法:

1. Press . This will display a menu showing all possible data types that can be outputted.

按下  按钮后将显示一个菜单，菜单上显示所有可以输出的数据类型。



2. Select the desired data to be outputted by pressing on the appropriate button from the menu.

3 Set-Up 设置



按下菜单上对应的按钮选择需要输出的数据。


3. A number pad will now appear allowing the minimum value of the data selected to be entered.

Enter the minimum value on the key pad followed by  to confirm. If the value is entered

incorrectly press the  button on the keypad to delete the last number entered. To cancel press the  button.

此时将出现另一个数字键，操作员可以输入数据的最小值。在小键盘上输入最小值后

按下  按钮确定。如果数值输入错误，则在小键盘上按下  按钮删除最后一个

输入的数字。取消时可以按下  按钮。

4. Once the minimum value has been entered the system will require the maximum value for the data to be entered. This is the same procedure as entering the minimum value.
输入最小值后，系统将要求输入数据的最大值，输入方法与输入最小值相同。

5. Repeat steps 1 to 4 for each output as desired.
重复步骤 1 至 4 完成各项输出。

Note: All changes will be stored with immediate effect.

注：所有更改都将立即保存并生效。

3.1.7 Operating Mode Set-up 运行模式设置

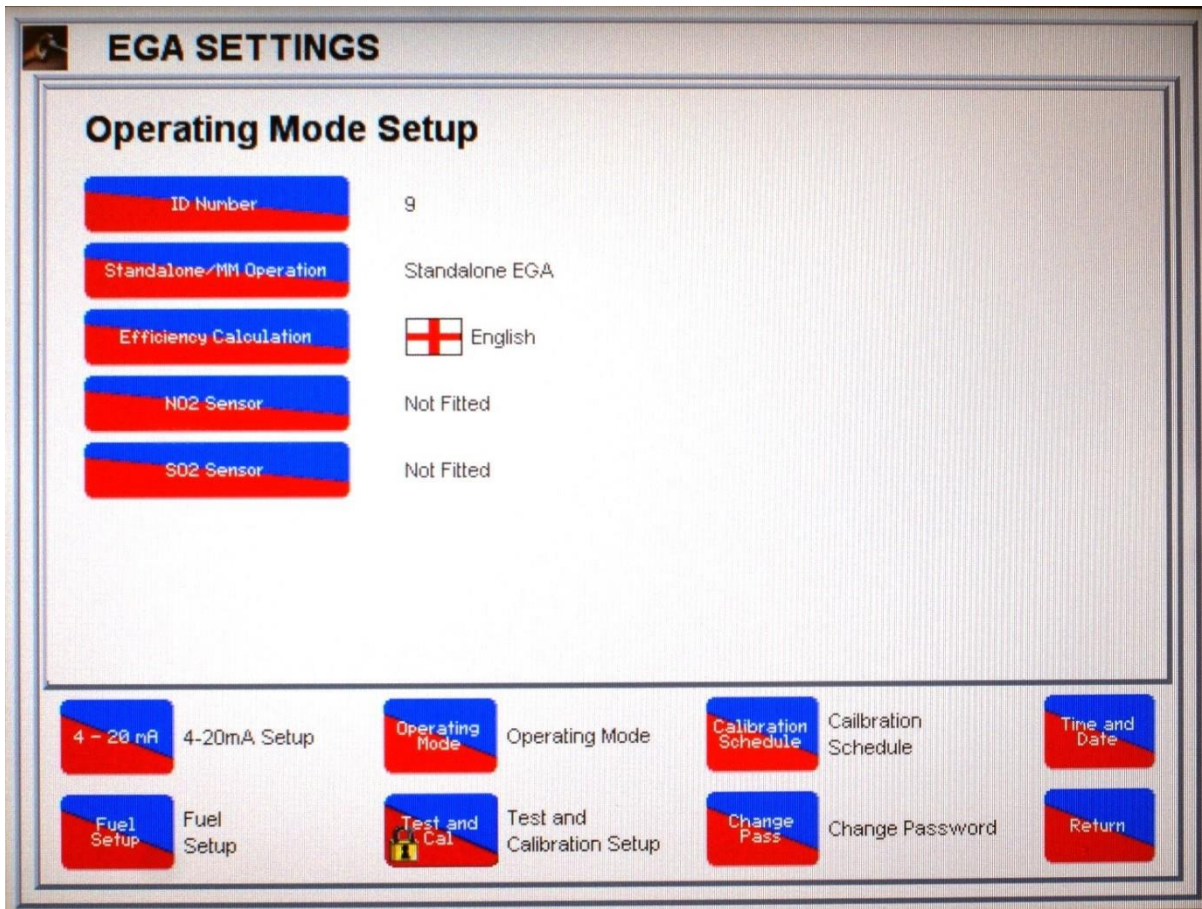

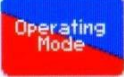


Figure 3.1.7.i Operating Mode Set-up Screen

图 3.1.7.i 运行模式设置屏幕

Pressing the  mode button will display the above screen. The Operating Mode screen is used to setup the E.G.A. The following settings can be changed on this screen:

按下  模式按钮将显示以上屏幕。运行模式屏幕用于设置尾气分析仪。在屏幕上可以更改以下设置：

1. ID number (1-10). If using an E.G.A. in standalone mode with a D.T.I. it is necessary to give each E.G.A. a different ID number.
ID 号（1-10）。如果尾气分析仪处于单机模式且连接数据传输接口，则需要为每个尾气分析仪分配一个不同的 ID 号。
2. Mode of operation (E.G.A. with MM, E.G.A. selects fuel).
运行模式（带控制模块的尾气分析仪，EGA 选择燃料）。
3. Efficiency calculation (European, English).
效率计算（欧洲、英语）
4. Presence of NO₂ and SO₂ cells (Fitted, Not Fitted).
出现 NO₂ 和 SO₂ 感应器（已安装、未安装）。

To change any of the settings above, press the corresponding button and select from the available options.

要改变以上设置请按下对应的按钮，然后从出现的选项中选择。

If setting the E.G.A. for standalone operation, the operation mode should be selected as 'E.G.A. selects fuel.' Please see section 2.1 for information on standalone fuel selection.

如果尾气分析仪处于单机模式，运行模式应选为'EGA 选择燃料'。关于单机燃料选择的更多信息请见 2.1 章节。

3.1.8 Time and Date 时间和日期

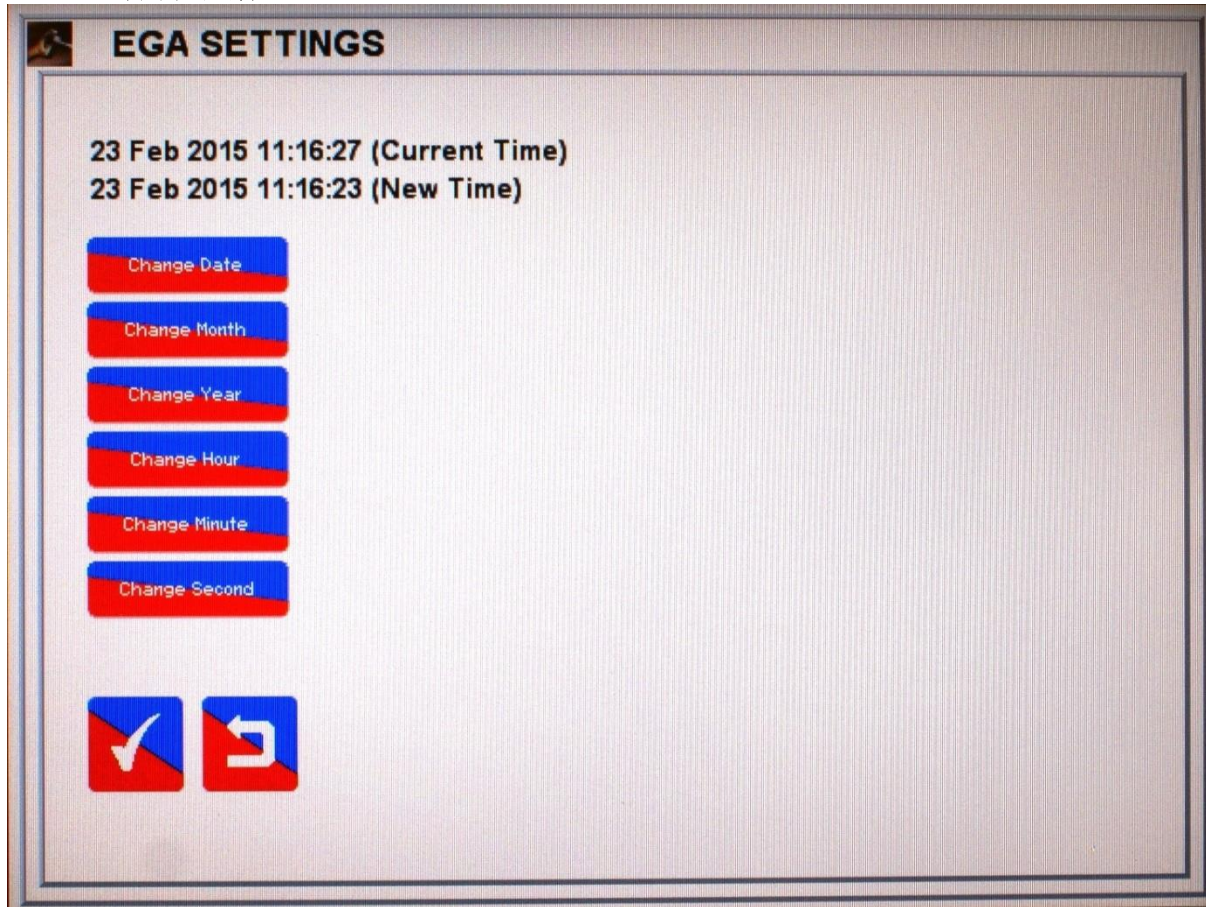




Figure 3.1.8.i Time and Date Screen

图 3.1.8.i 时间和日期屏幕

Pressing the  button will display the screen above, where it is possible to change the time and date. The screen displays the following:

按下  按钮将显示以上屏幕，在屏幕上可以更改时间和日期。屏幕将显示以下信息：

1. The currently set time. 设定的当前时间
2. The currently set date. 设定的当前日期
3. The new time and date to be set. 将要设定的新时间和日期
4. Buttons to set a new date. 设定新日期的按钮
5. Buttons to set a new time. 设定新时间的按钮

To change the time or date press the relevant button to what you want to change. Enter the required value into the keypad that appears. Each button has the following ranges:

要更改时间或日期时请按下相应的按钮，然后在出现的小键盘上输入所需的数值，每个按钮都有以下范围：

3 Set-Up 设置



Range: 1 – 31 范围 1-31

Choose from the available options. 从可用选项中选择

Range: 0 – 99 (20## is automatically appended upon entering the value).
范围: 0-99 (20##在输入数值时自动附加)

Range: 0 – 24. 范围: 0-24

Range: 0 – 59. 范围: 0-59

Range: 0 - 59.范围: 0-59

3.1.9 Change Password 更改密码

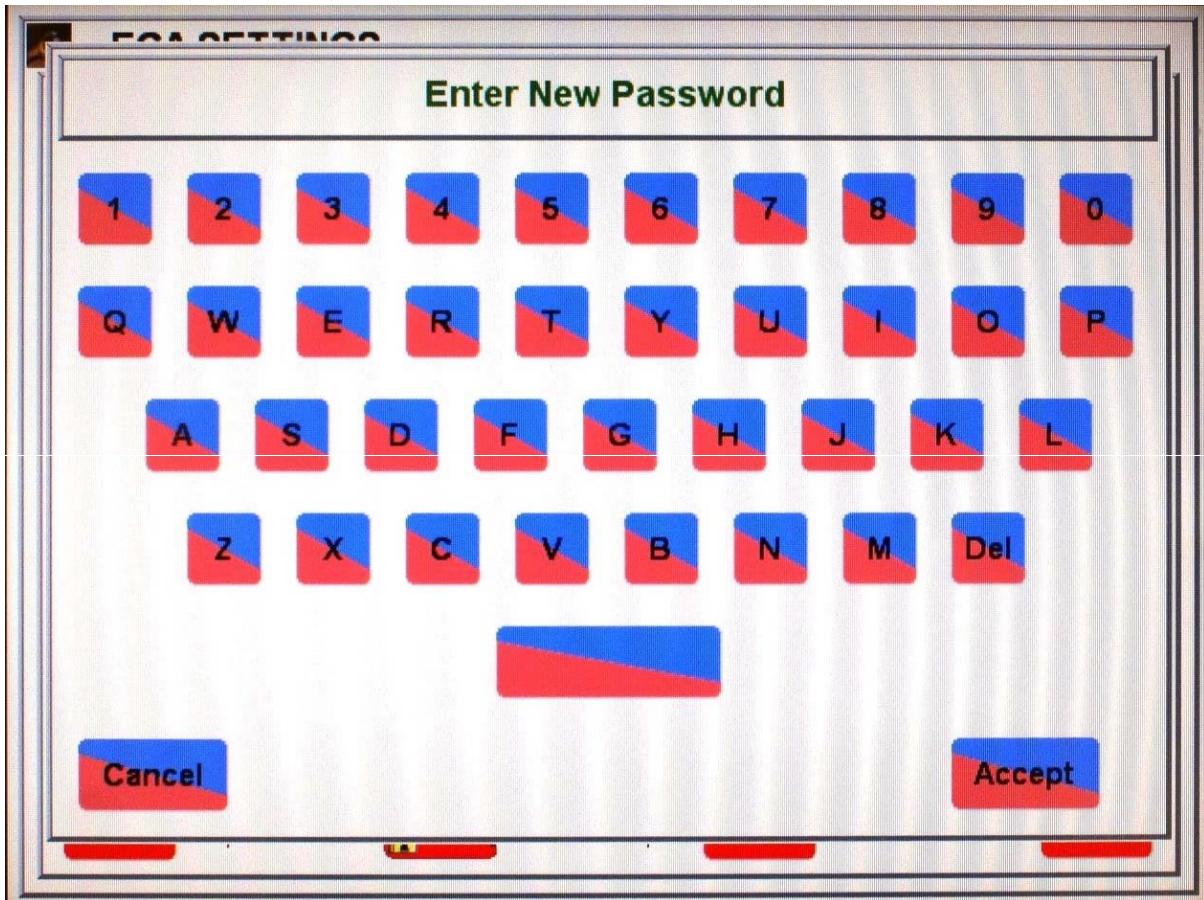


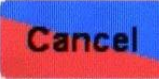


Figure 3.1.9.i Change Password Screen


图 3.1.9.i 更改密码屏幕

It is possible to change the password from its default by pressing the  button. To exit this

screen without changing the password press the  button at any time. To proceed with changing the password:

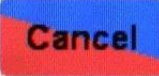
按下  按钮可以更改默认密码。按下  按钮可以退出屏幕而不更改密码。更改密码的步骤:

1. Enter the new desired password using the keyboard. Note this password down for future reference.
用小键盘输入新密码并记下该密码。
2. Press  . 按下  按钮。
3. A prompt stating "Retype New Password" will appear. Re-enter the password entered in 1 and press .

此时将出现‘重新输入新密码’提示框，重新输入密码后按下  按钮。

3 Set-Up 设置

If the passwords entered in steps 1 and 3 are identical a box will appear stating "Password Changed".

Should the passwords not match or if the  button is pressed a box will appear stating "Password Not Changed".


如果在步骤 1 和步骤 3 输入的密码相同，则会出现‘更改密码’提示框。


如果密码不匹配或按下  按钮将会出现‘密码未更改’提示框。

3.2 CEMS Set-Up CEMS 设置

3.2.1 Fuel Selection 燃料选择

To access the fuel setup screens, press the 'Setup' button at the top left of the E.G.A. screen, go to the

'Factory Settings'; you will be required to enter the password. Press on the  button in the bottom left corner of the screen.

要进入燃料设置屏幕请按下 EGA 屏幕左上方的'设置'按钮进入'出厂设置'屏幕。您将被提示输入密码，然后按下屏幕左下角的  按钮。

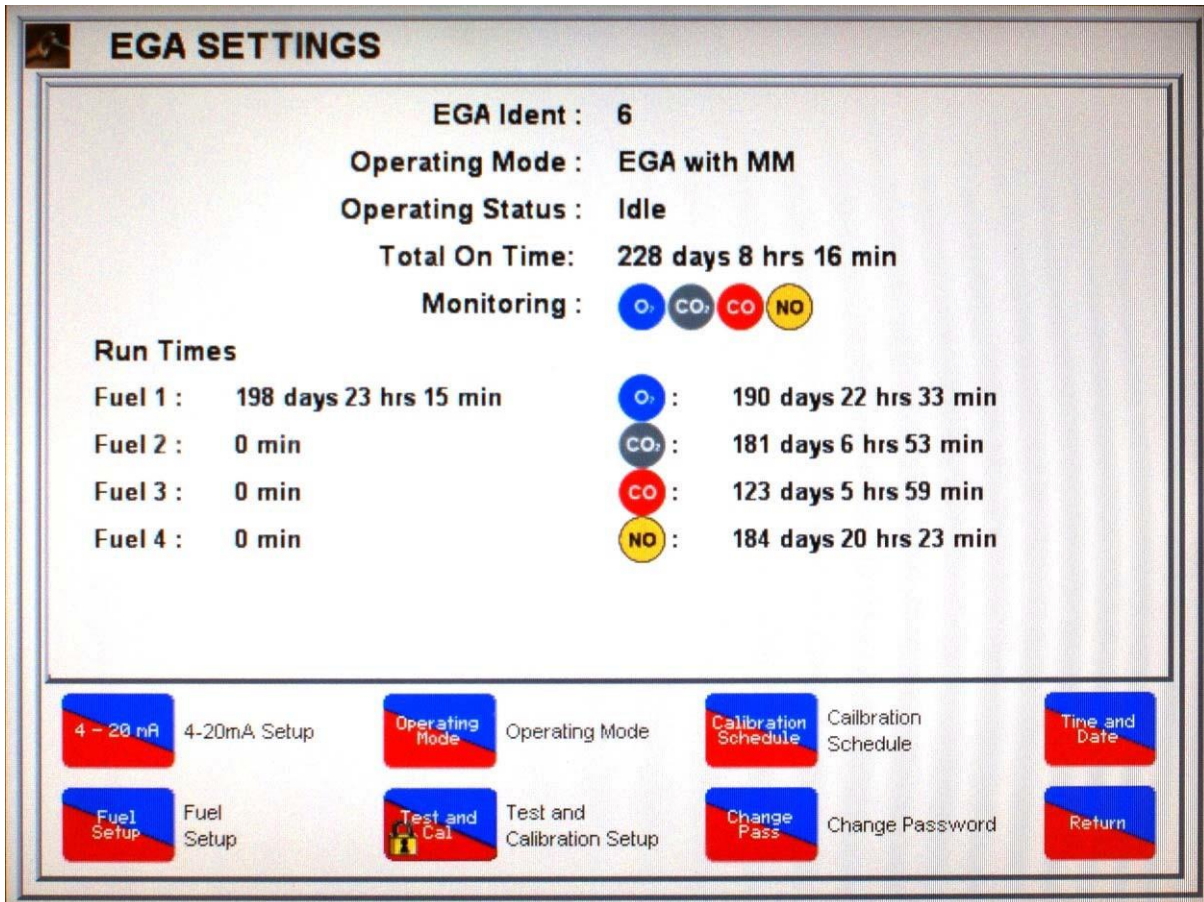
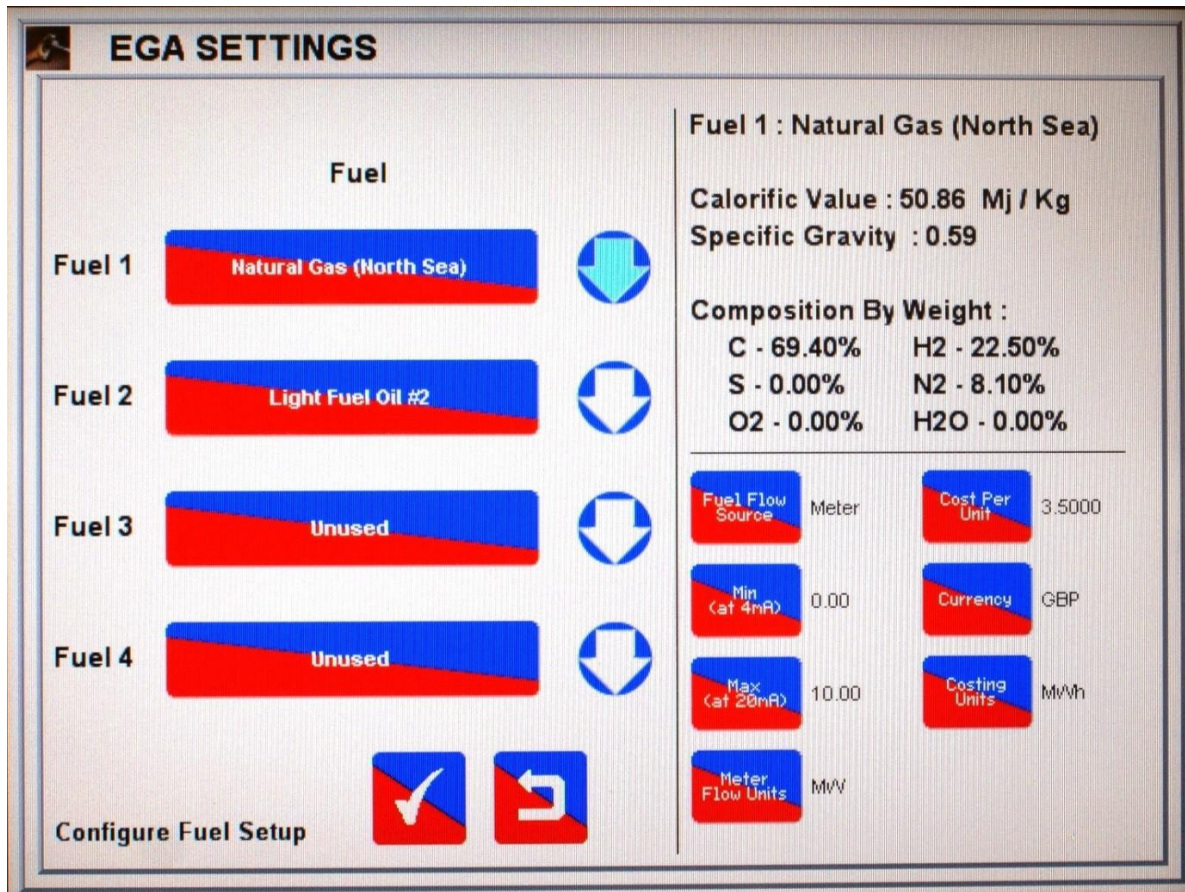


Figure 3.2.1.i EGA Settings – CEMS E.G.A.
图 3.2.1.i 尾气分析仪设置-CEMS 尾气分析仪

Note: Fuel setup is required for CEMS recording on the EGA and DTI.






注：CEMS 在尾气分析仪和数据传输接口上进行记录需要进行燃料设置。






3.2.1.ii Fuel Set-up
图3.2.1.ii 燃料设置

CEMS fuel data can be entered for up to 4 fuels. There are several pre-set fuels that can be used for each. The calorific values for each are not configurable. If a fuel cannot be found that has similar properties to what is required for accurate CEMS data analysis, please contact Autoflame Technical Support.

CEMS 燃料数据可以输入 4 种燃料，可以使用其中几个预先设定的燃料，每种燃料的热值无法配置。如果没有和需要的燃料有相同属性的燃料进行 CEMS 数据分析，请联系 Autoflame 技术支持。

For each fuel used in that burner application, the fuel flow source , meter units , cost per unit , currency  and costing units  must be set.

至于燃烧器使用的各种燃料，必须设置燃料流量源、计量单位 、每单位成本 、货币  和成本单位。

3.2.2 Fuel Flow Source
燃料流量源

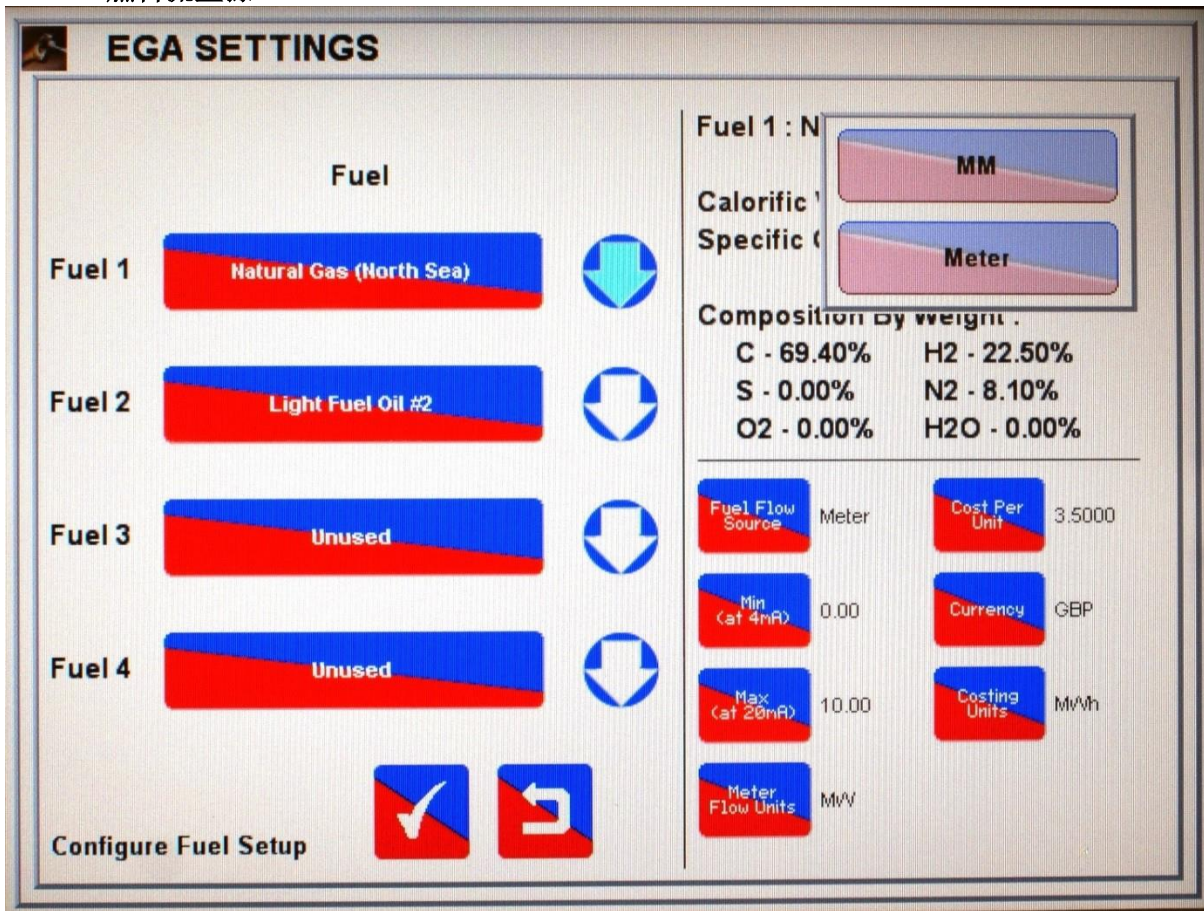







Figure 3.2.2.i Fuel Flow Source

图 3.2.2.i 燃料源

Press  to enter whether the fuel flow metering data is taken from the M.M. or a fuel flow meter. If the Mk8 CEMS E.G.A. is being used in conjunction with an M.M., then the fuel consumption can be determined based on the M.M. fuel flow metering which is entered through option 57 on the M.M. For the M.M. fuel flow metering based audits, press the 'Fuel Flow Source' button and select M.M.

按下  按钮可以输入从控制模块或燃料流量表中获得的燃料流量计量数据。如果

Mk8CEMS 尾气分析仪与控制模块一起使用，则燃料消耗可以根据控制模块燃料流量计量数进行确定，该计量数可以通过控制模块上选项 57 输入。至于控制模块燃料流量计量审查，请按下‘燃料流量源’按钮并选择控制模块。

A fuel flow meter can also be used to calculate the fuel consumption. This is done via a fuel flow meter connected to the 4-20mA analogue signals, the minimum flow at 4mA  and maximum 20mA . Units for the flow meter can be changed using the flow units button .

也可以用燃料流量表计算燃料消耗，计算可以通过连接 4-20mA 模拟信号的燃料流量表完成，模拟信号显示 4mA 时的最小流量和 20mA 时的最大流量。流量表的单位可以通过流量单位按钮进行更改。

3.2.3 Unit Measurement 设备测量

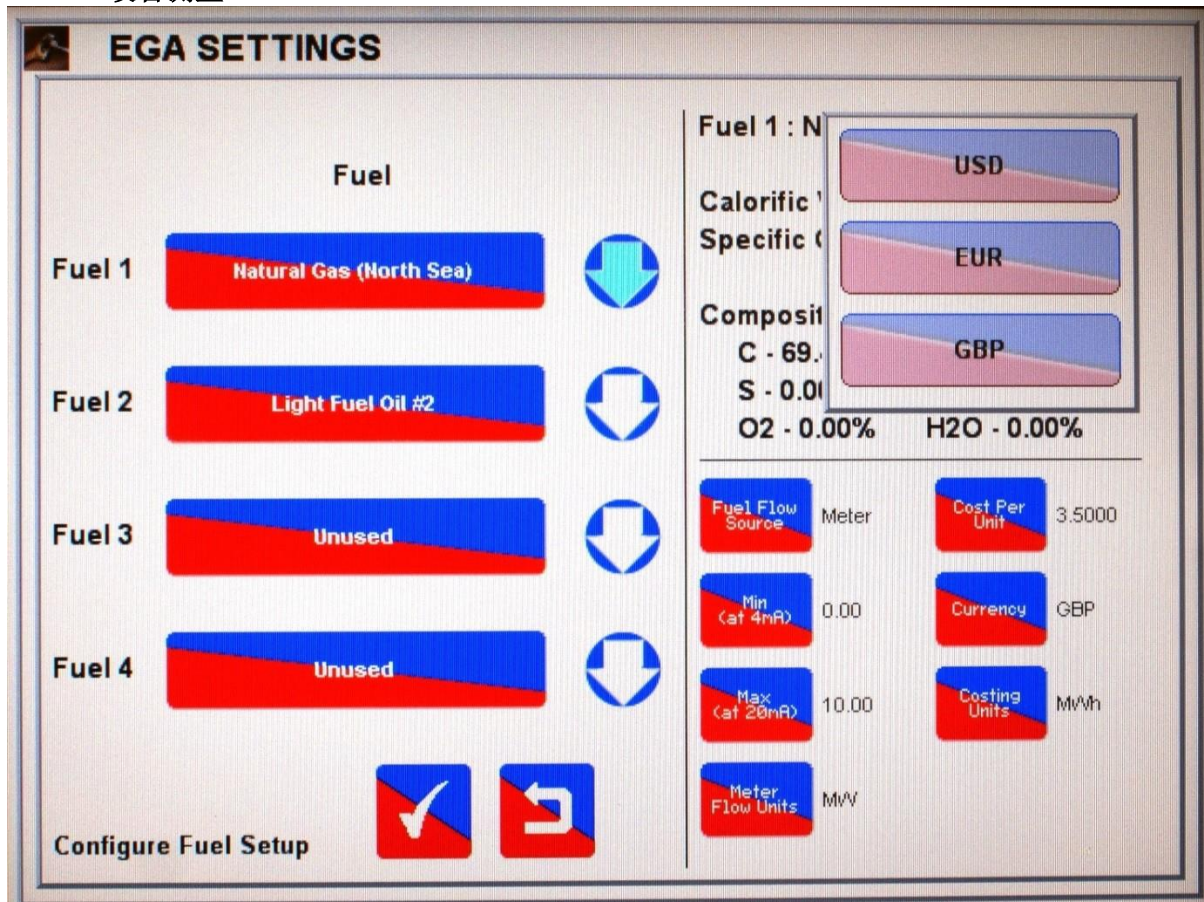


Figure 3.2.3.i Unit Measurement

图 3.2.3.i 设备测量

Press ,  and  to enter the details for the fuel cost and currency.

按下 ,  和  按钮进入燃料成本和货币信息屏幕。

Once a fuel has been set, accurate CEMS data can be obtained by entering an accurate cost per unit of fuel fired. This is done using the 'Cost per Unit', 'Currency' and 'Costing Units' buttons on the right hand side of the Fuel Set-up screen. If further currencies or unit measurements are required, please contact Autoflame Technical Support.

燃料设置后可以通过输入每单位燃料的准确成本获得准确的 CEMS 数据。按下燃料设置屏幕右侧的'每单位成本'、'货币和成本单位'按钮可以完成上述设置。如果需要更多的货币或单位，请联系 Autoflame 技术支持。

3.3 CEMS Data Screens CEMS 数据屏幕

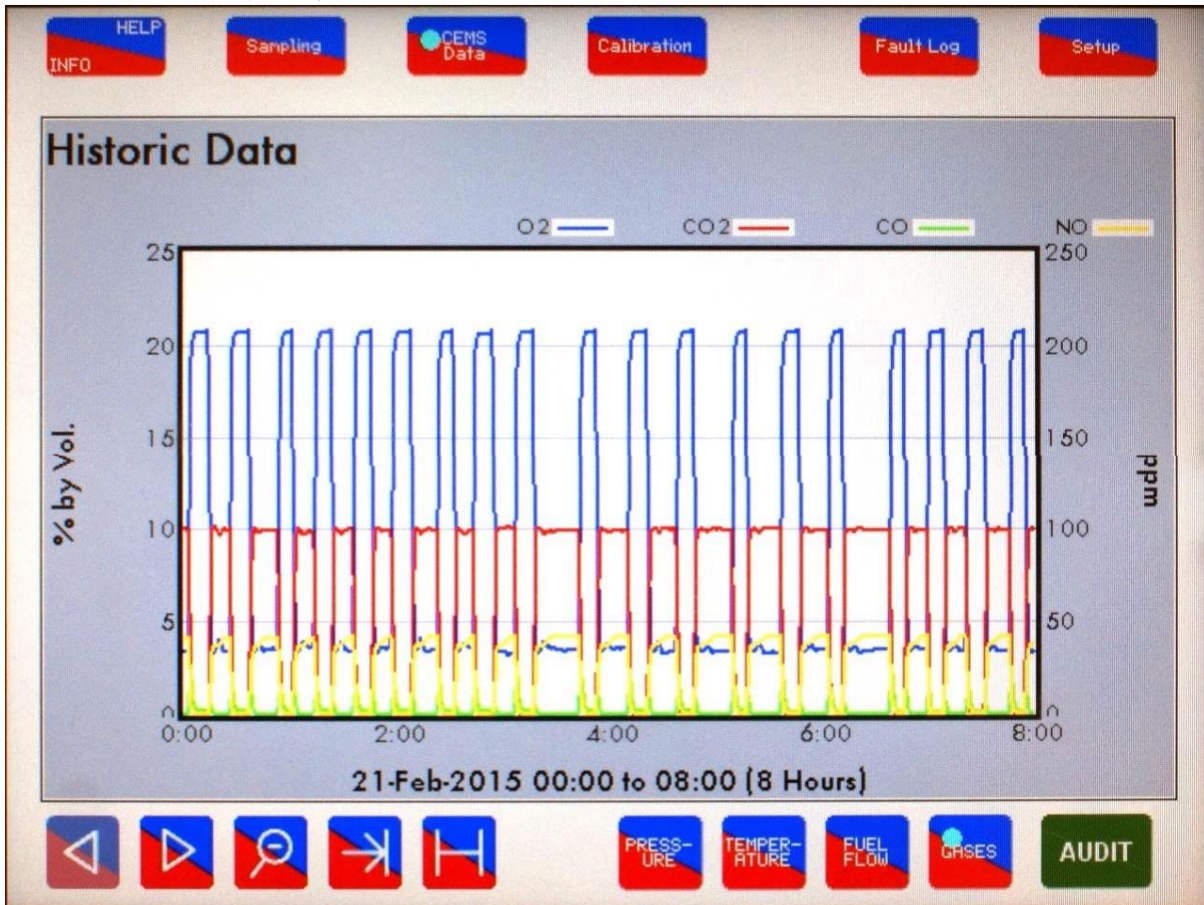






Figure 3.3.i Gas History
图 3.3.i 燃气历史

Press the  button to view the emissions data logging for up to 2 years.

按下  按钮可以查看记录的两年排放数据。

Press  to view the gas history. The graph can be zoomed in by pressing 2 points on the axis. To view one gas at a time, deselect the other gases above the graph.

按下  按钮可以查看燃气历史。按下坐标轴的两点可以放大图表。要每次查看一种燃气时请取消上图中其他燃气选项。

3 Set-Up 设置

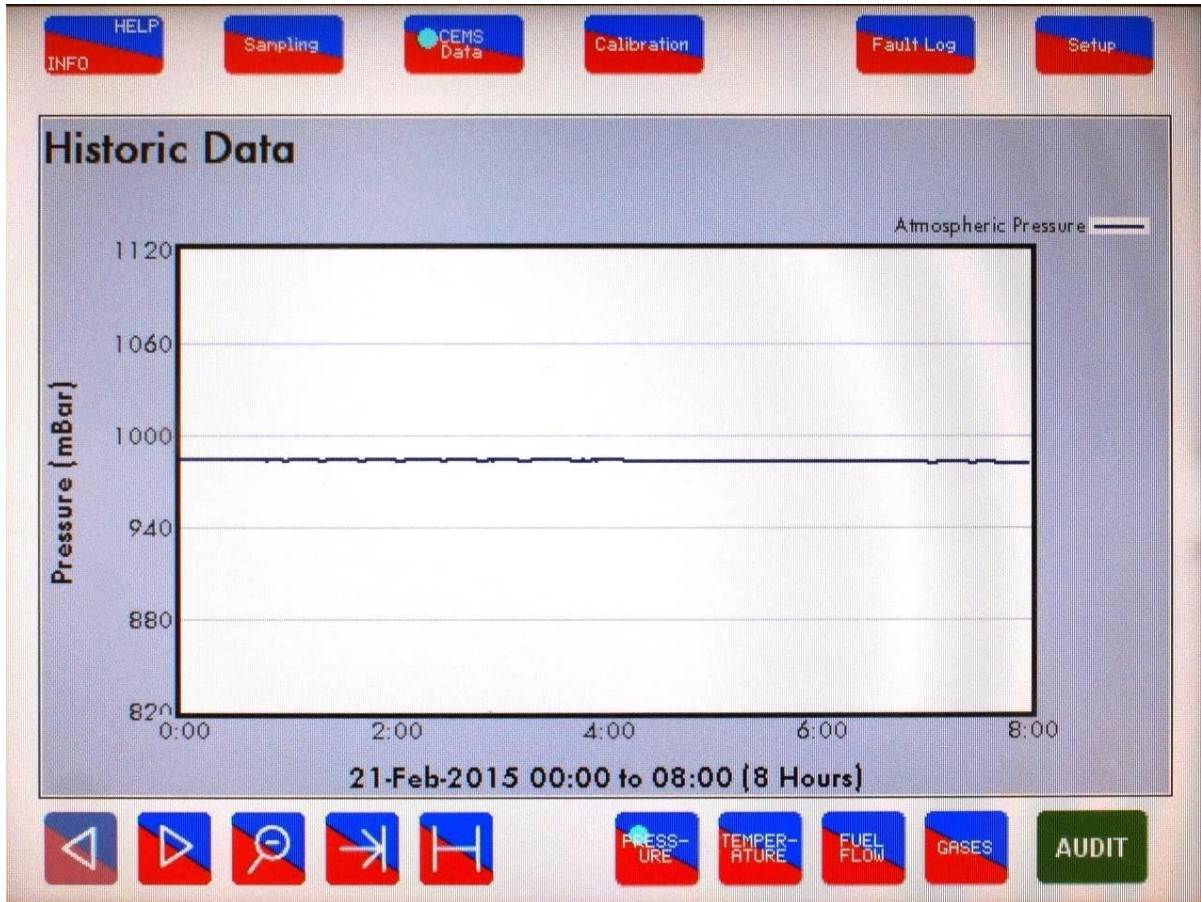




Figure 3.3.ii Pressure History

图3.3. ii 压力历史

Press  to view the atmospheric (ambient) pressure history for up to 2 years. The graph can be zoomed by pressing 2 points on the axis.

按下  按钮可以查看两年的大气（环境）压力历史。按下坐标轴的两点可以放大图表。

3 Set-Up 设置

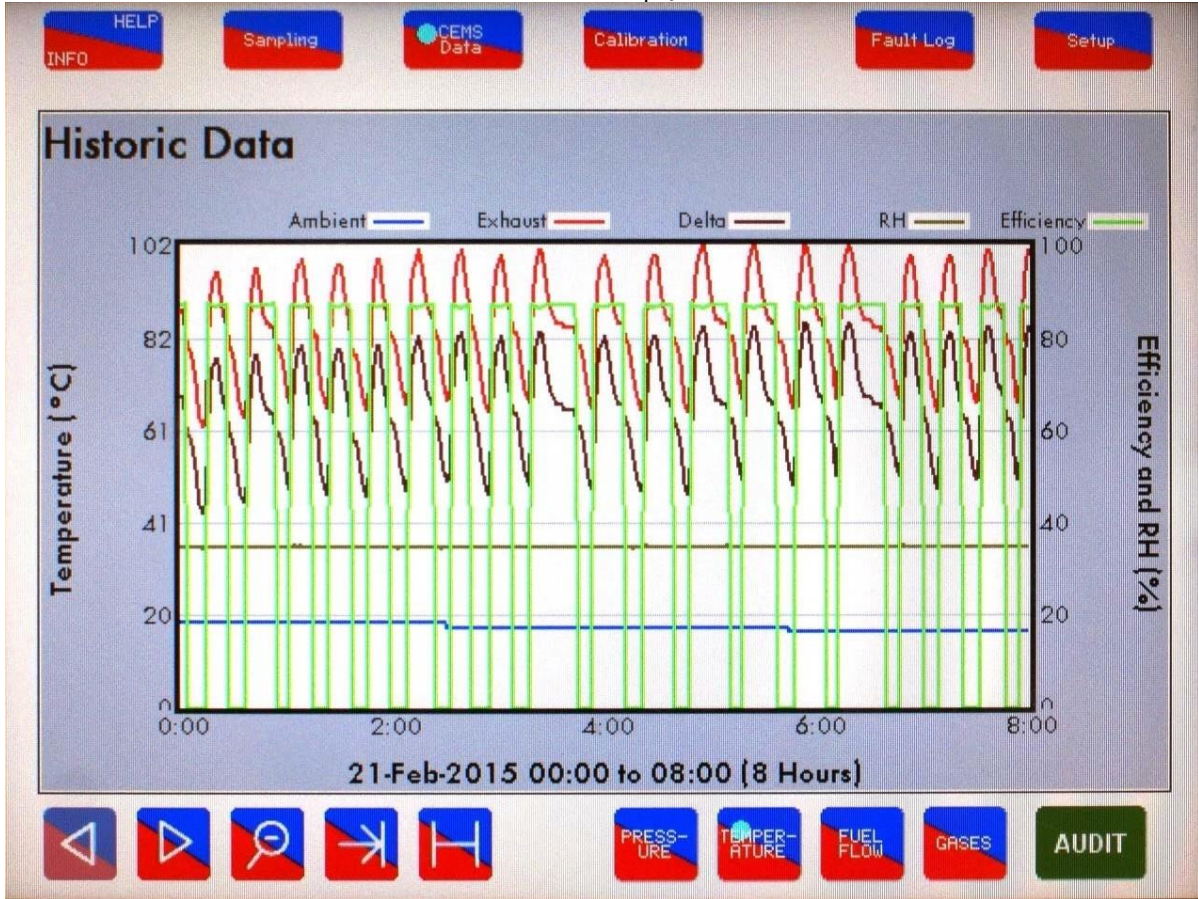




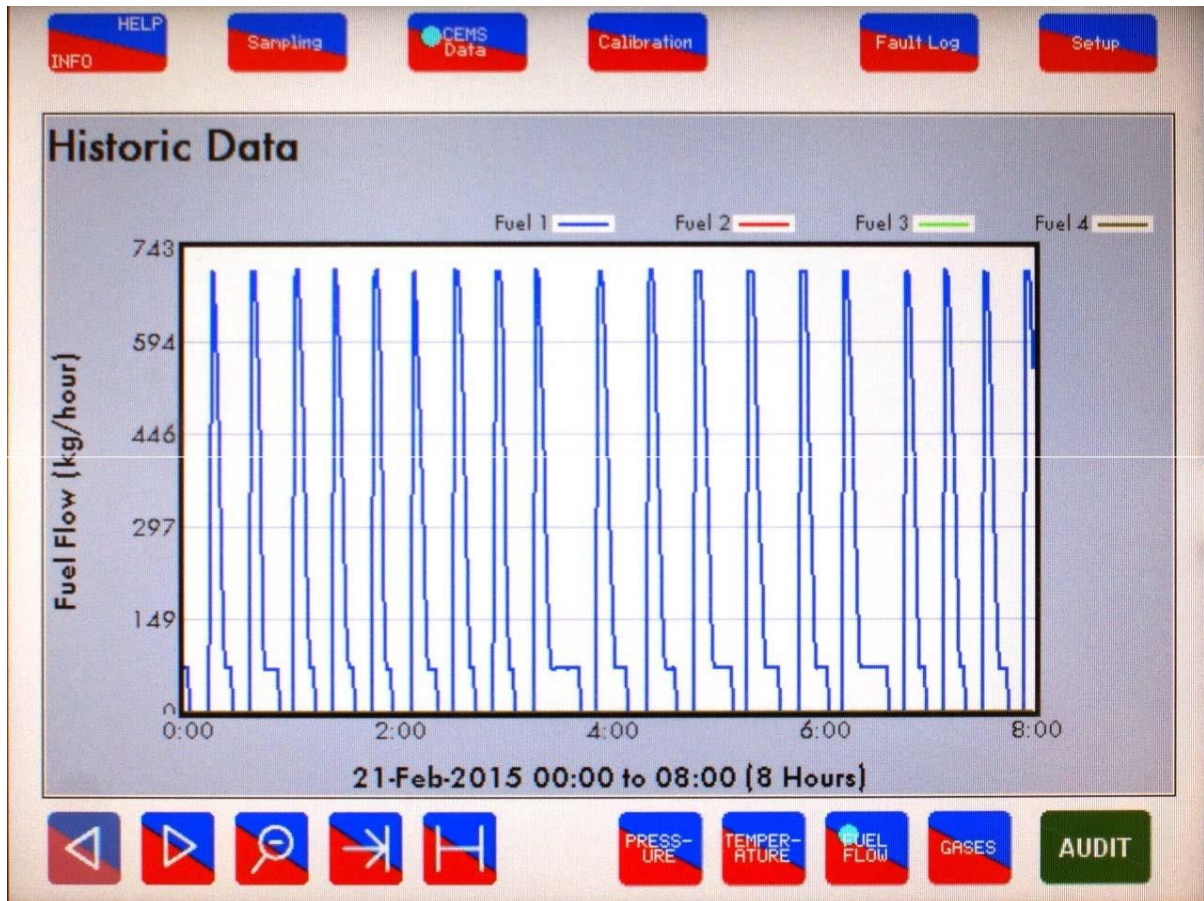
Figure 3.3.iii Temperature History

图 3.3.iii 温度历史

Press  to view the temperature history for up to 2 years, for the ambient temperature, exhaust temperature, delta temperature, relative humidity percentage and efficiency percentage. The graph can be zoomed in by pressing 2 points on the axis. To view one temperature graph at a time, deselect the other temperatures above the graph.


按下  按钮可以查看两年的温度历史，包括环境温度、排气温度、delta 温度、相对湿度百分比和效率百分比。按下坐标轴的两点可以放大图表。要每次查看一个温度图表时请取消上图中其他温度选项。


3 Set-Up 设置







3.3.iv Fuel Flow History


图3.3.i 燃料流量历史


Press  to view fuel flow history. The fuel flow data is taken from the M.M.'s fuel flow metering or from a 4-20mA analogue signal. The graph can be zoomed in by pressing 2 points on the axis. To view one fuel graph at a time, deselect the other fuels above the graph.

按下  按钮可以查看燃料流量历史。燃料流量数据来自控制模块的燃料流量计量数据或来自 4-20mA 模拟信号。按下坐标轴的两点可以放大图表。每次查看一个燃料图表时请取消上图中其他燃料选项。


The left  and right  arrows are used to change the data range (hours, days, months) to the next available one.

左箭头  和右箭头  用于更改数据范围（时、日、月）至下一个可用数据。


The zoom out button  is used to go back to the next available data range, i.e. from hourly data to daily data.


缩小按钮  用于返回下一个可用数据范围如从小时数据返回至每天数据。

3 Set-Up 设置

To view the last available data press .

按下  按钮可以查看最后一个可用数据

The full range of data can be seen by pressing .

按下  按钮可以查看全部的数据范围。

To view overnight data, a two day view is required (e.g. From 20:00 on day 1 to 08:00 on day 2).
查看隔夜数据时需要查看两天（例如：从第一天的 20:00 至第二天的 08:00）

The hourly data for each day is displayed from 00:00 to 24:00.
每天的小时数据显示时间是 00:00 至 24:00。

3.4 CEMS Energy Audits CEMS 能源检查

Once the fuel set-ups have been entered, it is possible on the Mk8 E.G.A. to take fuel consumption audits. Select a time period using the arrow section on the CEMS data for which the fuel consumption will be calculated for.

输入燃料设置值后可以在 Mk8 尾气分析仪上进行燃料消耗检查。利用 CEMS 数据上的箭头选择一个时间范围可以计算相应的燃料消耗。

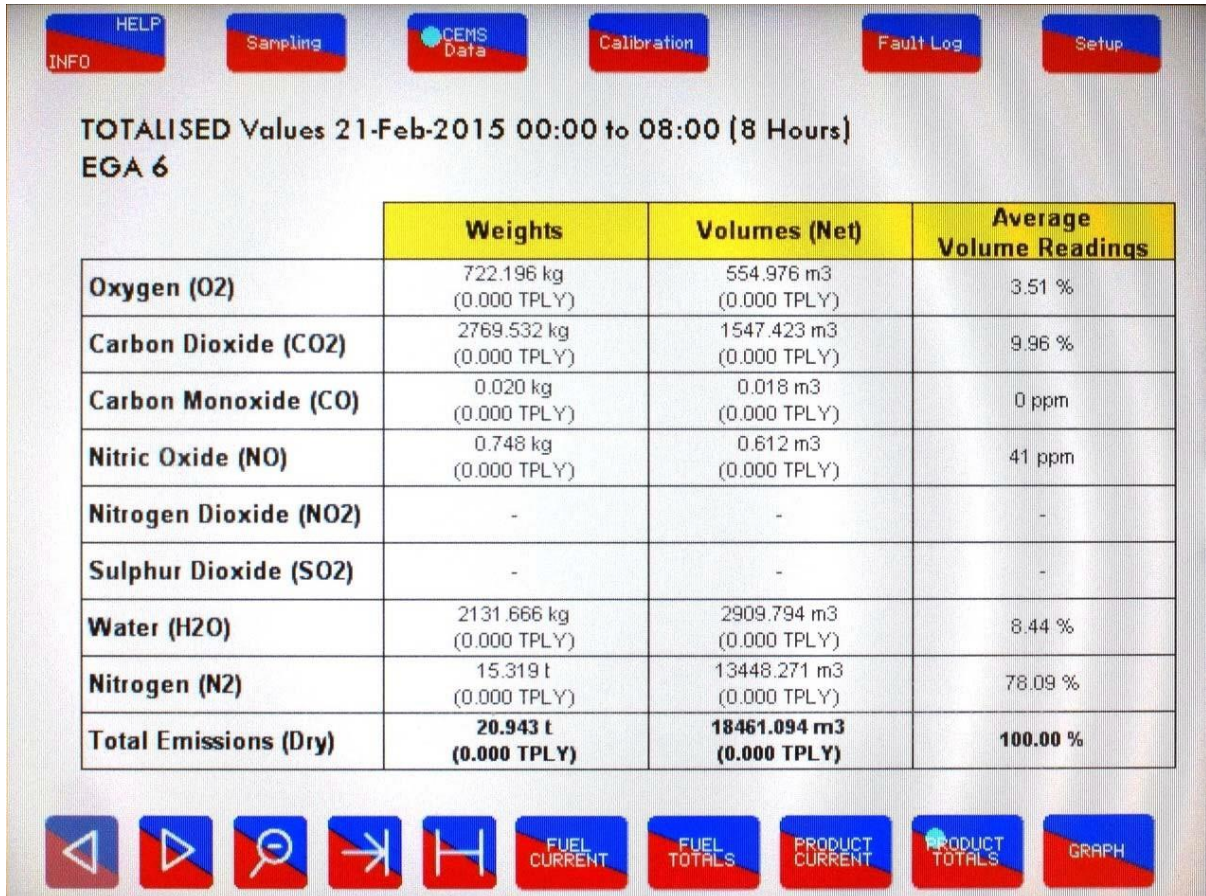







Figure 3.4.i Product Totals

图3.4.i 产品总计

Press  to view the product and fuel totals. The  and  buttons allow you to view the consumption at present.

按下  按钮可以查看产品总计和燃料总计数。按下  和  按钮允许操作员查看当前的燃料消耗。

Press  to view information on the exhaust gas weights, volumes and average volume readings for that time period.

按下  按钮可以查看选定时间段的废气重量、体积和平均体积读数等信息。

3 Set-Up 设置

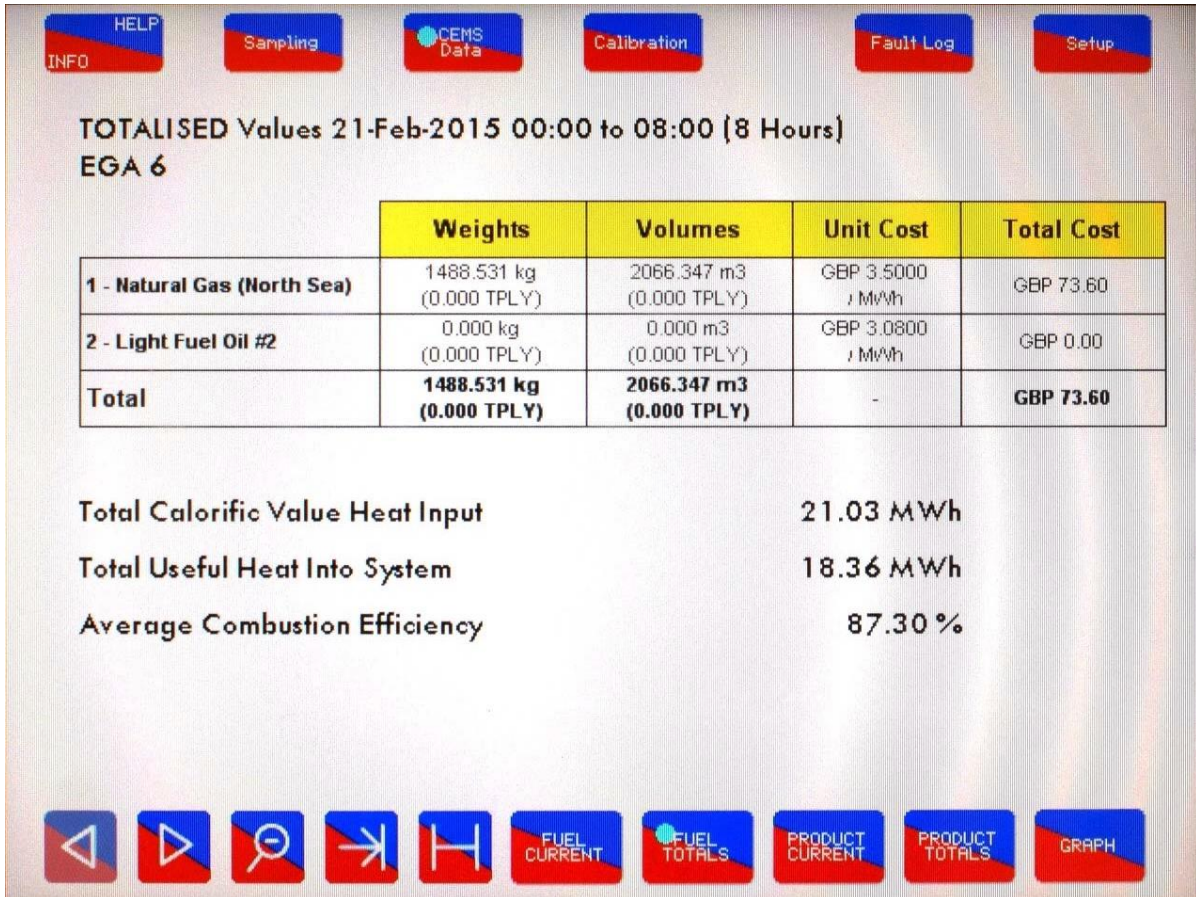




Figure 3.4.ii Fuel Totals
 图3.4.ii 燃料总计

Press  to view information on the fuel weights, volumes and total costs, as well as the total calorific value heat input, total useful heat into the system and the average combustion efficiency.

按下  按钮可以查看燃料重量、体积和总费用以及总热值热输入、进入系统的总可用热和平均燃烧效率。

As detailed in this section 3.3 the totalised values can be viewed for a particular time period if required.

如 3.3 节所述，需要时可以查看特点时间的总数值。

3.5 Trim Settings 调节设置

3.5.1 Relevant Mk7 M.M. Options Mk7 控制模块相关选项

The following table gives all the options in the M.M. which are relevant to the E.G.A. settings. When changing the options for the E.G.A. such as the alarm operation, trim threshold and trim delay, it is good practice to adjust one and check the effects on the trim operation before adjusting another.

下表给出了与尾气分析仪设置相关的控制模块所有选项。更改尾气分析仪相关的选项时如警报操作、调节阈值和调节延迟，最好的方式是一次调节一个，然后在调节另一个前检查调节操作的效果。

3 Set-Up 设置

	Option No. 选项号	Factory Setting 出厂设置	Option Value 选项值	Description 说明
12	0			<p>E.G.A. Options: If this option has a setting of 1 - 9, then the E.G.A. will trim and the burner must be commissioned with the E.G.A. operational. The trim is applied to channel 2 or 5, dependent on how option 76 is set.</p> <p>尾气分析仪选项：如本选项设为 1-9，则尾气分析仪将进行调节，燃烧器必须与尾气分析仪一起进行调试。调节根据选项 76 的设置适用通道 2 或 5。</p> <p>0 E.G.A. not optioned 未选择尾气分析仪。</p> <p>1 If an E.G.A. error occurs, then the burner will continue to fire. The servomotors will return to the original commissioned fuel/air ratio and the trim function will not be operational until the E.G.A. error is reset. No combustion/single point changes can be made whilst the E.G.A. is in an error condition.</p> <p>如果尾气分析仪出现错误，则燃烧器将继续燃烧。伺服电机将返回至原始的调试燃料空气比，此时将无法操作调节功能直至尾气分析仪错误复位。尾气分析仪在错误条件下无法对燃烧点和单个点进行更改。</p> <p>2 Terminal 79 is not energised in the event of an E.G.A. error. 尾气分析仪出现错误时终端 79 无法上电。</p> <p>If an E.G.A. error occurs, then the burner will stop firing. The burner will not start until the E.G.A. error has been cleared and the E.G.A. is inside its operating temperature range. Terminal 79 is not energised in the event of an E.G.A. error.</p> <p>如果尾气分析仪出现错误，燃烧器将停止燃烧。燃烧器直至尾气分析仪错误被清除以及尾气分析仪处于工作稳定范围内时才能启动。尾气分析仪出现错误时终端 79 无法上电。</p> <p>3 Same as 1, except terminal 79 is energised in the event of an E.G.A. error.</p> <p>与 1 情况相同，但终端 79 在尾气分析仪出现错误时可以上电。</p> <p>4 Same as 2, except terminal 79 is energised in the event of an E.G.A. error</p> <p>与 2 情况相同，但终端 79 在尾气分析仪出现错误时可以上电。</p> <p>5 Same as 1, plus the combustion limits are also tested (Options 19 - 27)</p> <p>与 1 情况相同，此外燃烧限制也可以进行测试（选项 19-27）</p> <p>6 Same as 2, plus the combustion limits are also tested (Options 19 - 27)</p> <p>与 2 情况相同，此外燃烧限制也可以进行测试（选项 19-27）</p> <p>7 System commissioned on M.M. Only - E.G.A. used only for monitoring and display purposes.</p> <p>系统在控制模块上调试时仅有尾气分析仪用于监控和显示。</p> <p>8 Same as 5, except terminal 79 is energised in the event of an E.G.A. error.</p> <p>与 5 情况相同，但终端 79 在尾气分析仪出现错误时可以上电</p> <p>9 Same as 6, except terminal 79 is energised in the event of an E.G.A. error.</p> <p>与 6 情况相同，但终端 79 在尾气分析仪出现错误时可以上电</p>
17	0			<p>NO & CO Displayed when running on oil: If fuels 2 or 3 are selected, then the displaying of CO & NO can be on or off. This option is only relevant if an E.G.A. is operational on the system.</p> <p>燃油燃烧情况下显示 NO 和 CO：如果选择燃料 2 或 3，CO 和 NO 的显示可以是开启或关闭。本选项仅在尾气分析仪在系统中运行时可以选择。</p> <p>0 NO & CO not displayed NO 和 CO 未显示。</p> <p>1 NO & CO is displayed normally. NO 和 CO 正常显示。</p>
18	1			<p>Carry Forward of Trim: When the system modulates, the correction that may exist on the air damper position can be carried forward. This option is only relevant if an E.G.A. is operational on the system.</p> <p>调节值的延续：当系统进行调节时，可以对空气挡板位置进行修正。该选项只有尾气分析仪在系统中运行时才有效。</p> <p>0 No carry forward of trim.</p> <p>1 未进行调节。</p> <p>1 Trim carried forward.</p> <p>进行调节。</p>
19	0.0			<p>Upper Offset Limit % O₂: This is an offset limit from the commissioned values.</p> <p>上限补偿值 % O₂：该值是调试值的一种补偿限值。</p> <p>E.G.A. Limits: Options 19 - 27 are only relevant if an E.G.A. is operational on the system. Option 12 must be set to 5,6, 8 or 9 for combustion limits to be set.</p> <p>尾气分析仪限值：选项 19-27 仅在尾气分析仪在系统中运行时可以选择。设置燃烧限值时选项 12 必须设为 5、6、8 或 9。</p>

0 - 100 % O₂ 氧气百分比

3 Set-Up 设置

- 20 0.0** **Upper Offset Limit % CO₂:** This is an offset limit from the commissioned values.
上限补偿值%CO₂:该值是调试值的一种补偿限值。
0 - 100 % CO₂ 二氧化碳百分比
- 21 0** **Upper Offset Limit ppm CO:** This is an offset limit from the commissioned values.
上限补偿值 ppm CO: 该值是调试值的一种补偿限值
0 - 200 ppm CO 一氧化碳百万分率
- 22 0.0** **Lower Offset Limit % O₂:** This is an offset limit from the commissioned values.
下限补偿值% O₂: 该值是调试值的一种补偿限值
0 - 100 % O₂ 氧气百分比
- 23 0.0** **Lower Offset Limit % CO₂:** This is an offset limit from the commissioned values.
下限补偿值%CO₂:该值是调试值的一种补偿限值
0 - 100 % CO₂ 二氧化碳百分比
- 25 0.0** **Absolute Value % O₂:** System checks for O₂ values lower than the value specified in this option regardless of the commissioned values.
绝对值% O₂: 系统检查氧气数值是否低于本选项数值，该值与调试值无关。
0 - 200 % O₂ 氧气百分比
- 26 0.0** **Absolute Value % CO₂:** System checks for CO₂ values higher than the value specified in this option regardless of the commissioned values.
绝对值% CO₂: 系统检查二氧化碳数值是否高于本选项数值，该值与调试值无关。
0 - 200 % CO₂ 二氧化碳百分比
- 27 0** **Absolute Value ppm CO:** System checks for CO readings higher than value specified in this option regardless of the commissioned values.
绝对值 ppm CO: 系统检查一氧化碳数值是否高于本选项数值，该值与调试值无关。
0 - 200 ppm CO 一氧化碳百万分率

3 Set-Up 设置

	Option No. 选项号	Factory Setting 出厂设置	Option Value 选项值	Description 说明
28	20		0 - 50 0 - 5.0	<p>Trim Threshold: This option is only relevant if an E.G.A. is operational on the system. The value set in this option is subtracted from the required setpoint. If the actual value is below this offset, then the E.G.A. will not trim. If the trim is to be effective at all times, then set this value to zero. This Option must also be set to zero for the E.G.A. to operate when external modulation is optioned.</p> <p>调试阈值: 本选项只在尾气分析仪运行时有效。设定点将减去本选项数值。如果实际数值低于补偿值, 尾气分析仪将不执行调节。如果本选项为 0, 尾气分析仪将始终进行调节。当系统采用外部调节时本选项数值必须为 0 来保证尾气分析仪始终执行调节。</p> <p>If Centigrade, Fahrenheit or PSI units effective. 使用单位是摄氏度、华氏度或 PSI。 If Bar units effective. 使用单位是巴。</p> <p>Note: No single point changes can be made if the actual value is below the offset value. 注: 如果实际值小于补偿值, 则不可更改单个点。</p>
32	20		0 - 250	<p>Trim Delay: After ignition, the E.G.A. does not sample for the period of time set in this option (only relevant if E.G.A. is operational on system). This allows for the combustion to stabilise before sampling commences. The timing starts at the ignition point.</p> <p>调节延迟: 尾气分析仪在点火后在本选项设定的一段时间内无法采样(仅在尾气分析仪在系统中运行时可以选择)。这允许在采样开始前使燃烧稳定, 时间从点火点开始计算。</p> <p>Period (seconds) after ignition no sampling takes place. 点火期间(秒)不进行采样。</p>
56	1			<p>Operation of alarm output for all M.M. and E.G.A. errors/lockouts on Terminal 79: 所有控制模块的警报输出操作和尾气分析仪在终端 79 上的错误/锁定:</p> <p>1 Relay normally off, on when alarm. 继电器常闭, 继电器打开时输出警报。 2 Relay normally on, off when alarm. 继电器常开, 继电器关闭时输出警报。</p> <p>Note: This is a switched neutral and not an output terminal. 注: 切换至中性位, 而不是输出端。</p>
76	0		0 1	<p>Trim channel: If an E.G.A. is optioned, the trim can be applied to either Channel 2 (servomotor) or channel 5 (VSD). If trim on channel 5 is used, Options 91 to 97 must be entered correctly.</p> <p>调节通道: 如果选择尾气分析仪, 则调节适用通道 2 (伺服电机) 或通道 5 (VSD)。如果使用通道 5 上调节, 选项 91 至 97 必须正确输入。</p> <p>0 Trim on channel 2. 通道 2 上调节。 1 Trim on channel 5. 通道 5 上调节。</p>

3.5.2 Relevant Mk7 M.M. Parameters Mk7 控制模块相关参数

The following table shows the relevant parameters for the E.G.A. operation on the M.M. It is important to remember that changing these parameters will dramatically change the trim operation. The majority of these parameters can be left with the default settings in most applications; any adjustments to these parameters should be made one at a time.

下表显示了尾气分析仪在控制模块上运行的相关参数。重要的是牢记更改这些参数将会改变调节操作。在多数应用场合中大部分参数可以保持默认设置。调节时一次只能改变一个参数。

3 Set-Up 设置

Parameter No. 参数号	Factory Setting 出厂设置	Parameter Value 参数值	Description 说明
4	45	5 - 100	<p>E.G.A. - Number of seconds 'ENTER' button is disabled after 'E.G.A.' button is pressed during commissioning and single point change. 尾气分析仪-在调试和单点改变期间按下'尾气分析仪 EGA'按钮将禁用秒数 'ENTER 输入'按钮。</p> <p>Seconds. 秒</p>
8	30	5 - 240	<p>E.G.A. - Delay after draining before trim cycle starts (washout period). When the E.G.A. drainings and the cells are cleaned with air this value maintains the E.G.A. readings from before the drain period for 'n' seconds to allow the air to clear from the E.G.A.</p> <p>尾气分析仪-在完成冷凝水排放后，尾气分析仪要等待一段时间（清洗期）然后进入调节周期。在排放冷凝水和清洁感应器（用空气清洁）之后的“n”秒时间内，系统将维持冷凝水排放之前的 EGA 读数。这是为了让空气全部从尾气分析仪中排出。</p> <p>Seconds.秒。</p>
9	60	5 - 240	<p>E.G.A. - Auto commission time (seconds). How long the air rich and fuel rich positions are held during commissioning.</p> <p>尾气分析仪-自动调试（秒）。调试期间保持富氧和富油位置的时间。</p> <p>Seconds. 秒</p>
10	1	0 1 2	<p>E.G.A. - Version 尾气分析仪-版本</p> <p>0 Mk6 E.G.A. Mk6 尾气分析仪</p> <p>1 Mk7 E.G.A. Mk7 尾气分析仪</p> <p>2 Mk8 E.G.A. Mk8 尾气分析仪</p>
11	15	5 - 60	<p>E.G.A. - Air flush time, the flush out period between going air rich and fuel rich during commissioning.</p> <p>尾气分析仪-空气清洗时间，调试期间富氧和富油间的冲洗周期。</p> <p>Seconds. 秒</p>
12	0	0 1	<p>E.G.A. - CO included in trim calculation on fuel 2 & 3 (see option 17). Required when using natural gas on fuel 2 & 3.</p> <p>尾气分析仪-燃料 2 和 3（见选项 17）在调节计算中包括一氧化碳，在燃料 2 和 3 中使用天然气时需要一氧化碳。</p> <p>0 No. 否</p> <p>1 Yes. 是</p>
13	20	5 - 30	<p>E.G.A. - $\div 4 = \%$ of air damper movement. Amount of auto commission trim. Applies only to fuel rich cycle.</p> <p>尾气分析仪--4 = 空气挡板移动百分比。自动调试数量。仅适用于富油循环。</p> <p>Degrees. 角度</p>
14	20	1 - 200	<p>E.G.A. - Number of degrees the fuel valve moves before fuel rich trim is reset.</p> <p>尾气分析仪-重置富油调节前燃料阀移动的角度数。</p> <p>Degrees 角度</p>
17	3	0 - 10	<p>E.G.A. - Number of trims before an E.G.A. error is flagged when combustion limits are exceeded. Each trim is equal to Parameter 25 (seconds).</p> <p>尾气分析仪-超过燃烧限值时尾气分析仪错误标志前的调节数。每次调节都等于参数 25（秒）。</p> <p>Number of trims. 调节数。</p>
18	20	5 - 60	<p>E.G.A. - $\div 2 = \%$ of trim, trim amount during run. This value cannot be set above 20 (10%) or an error 25 occurs</p> <p>尾气分析仪--$\div 2 =$调节百分比，运行时的调节数。本数值不得设为大于 20 (10%)或发生错误 25。</p> <p>Amount of trim. 调节数。</p>
19	5.00		<p>E.G.A. - $\div 4 = \%$ of air damper movement. Amount of auto commission trim. Applies only to air rich cycle.</p>

3 Set-Up 设置

尾气分析仪-- ÷4 =空气挡板移动百分比。自动调试数量。仅适用于富油循环。

- 0 - 20 Air damper movement. (20 = 5.00%)空气挡板移动。(20 = 5.00%)
- 23 0** **E.G.A.** - Trim to add air when CO is present. When trim is taking place, if the O₂ and CO₂ appear on the air rich side but the CO appears on the fuel rich side then the air damper will open further to remove CO.
尾气分析仪-当存在 CO 时添加空气。在尾气分析仪调节期间如果富氧时存在 O₂ 和 CO₂ 并且富油时存在 CO，那么要进一步打开空气挡板去除 CO。
- 0 Enabled.
启用
- 1 Disabled.
禁用
- 25 30** **E.G.A.** - Time between each sample (trim). **尾气分析仪**-各样本（调节）间的时间。
5 - 100 Seconds. 秒
- 26 8** **E.G.A.** - Number of samples (trims) between each trim cycle. **尾气分析仪**-各调节周期期间的样本数（调节）。
1 - 50 Number of trims. 调节数。
- 27 25** **E.G.A.** - Minimum operating temperature (÷5 = degC) **尾气分析仪**-最小工作温度（÷5 =摄氏度）
0 - 255 Temperature 温度
- 28 200** **E.G.A.** - Maximum operating temperature (÷5 = degC) **尾气分析仪**--最大工作温度（÷5 =摄氏度）
0 - 255

3 Set-Up 设置

Parameter No. 参数号	Factory Setting 出厂设置	Parameter Value 参数值	Description 说明
35	2	0 - 10 %	O2 change to detect residence time: Default is set at 2 for 0.2% O2 change to detect residence time. O2 变化至检测停留时间: 0.2% O2 变化检测停留时间的默认设置为 2。
44	4	0 - 40 %	O2 window inside which no trim takes place: ÷10 = O2% O2 内部无调节发生÷10 =氧气百分比
45	2	0 - 20 %	CO2 window inside which no trim takes place: ÷10 = CO2 % CO2 内部无调节发生÷10 =二氧化碳百分比
58	0	0 1	E.G.A. - Air Calibrations 尾气分析仪-空气校准 0 Enabled 启用 1 Disabled 禁用
60	0	0 1	E.G.A. or O2 trim interface module 尾气分析仪或氧气调节接口模块 0 Normal E.G.A. operation. 尾气分析仪运行正常。 1 O2 trim interface module operation. 氧气调节接口模块运行。
74	0	0 1	Trim method: Changes the method of trim from the normal angular degrees trim to area trim, where the trim works on the area that is open on the damper blades to allow the air through。 调节方法- 从正常角度调节至区域调节需改变调节方法，区域调节发生在阻尼器叶片上，使空气可以通过。 0 Angular degrees trim. 角度调节。 1 Area trim (quick commission). 区域调节（快速调节）。
79	0		E.G.A. Splitter for twin burner application: When using twin burners its is possible to use the E.G.A. data from the master M.M. module for the slave M.M. module, so only one E.G.A. is required. Set parameter 79 to 1 on the slave and parameter 79 to 0 on the master. 尾气分析仪双燃烧器应用分离器: 使用双燃烧器时可以使用尾气分析仪。主控制模块至向从控制模块传输数据，因此至需要一个尾气分析仪。从控制模块参数从 79 设为 1，主控制模块参数从 79 设为 0.
94	0	0 - 999	Upper offset limit ppm NO: This is an offset limit from the commissioned values. 上限补偿值 ppm NO: 该值是调试值的一种补偿限值 ppm No 一氧化氮百万分率
96	0	0 - 999	Upper offset limit exhaust temperature: This is an offset limit from the commissioned values. 上限补偿值排气温度: 该值是调试值的一种补偿限值。 deg C/ deg F 摄氏度/华氏度
97	0	0 - 999	Absolute limit exhaust temperature: System checks for exhaust temperature readings higher than this value. 绝对限值排气温度: 系统检查高于该值的排气温度读数。 deg C/ deg F 摄氏度/华氏度

3.5.3 Relevant Mini Mk8 M.M. Options

Mk8 微型控制模块相关选项

The following table gives all the options in the M.M. which are relevant to the E.G.A. settings. When changing the options for the E.G.A. such as the alarm operation, trim threshold and trim delay, it is good practice to adjust one and check the effects on the trim operation before adjusting another.

下表给出了与尾气分析仪设置相关的所有控制模块选项。更改尾气分析仪相关选项时如警报操作、调节阈值和调节延迟，最好的方式是一次调节一个，然后在调节另一个前检查调节操作的效果。

3 Set-Up 设置

Option No. 选项号	Factory Setting 出厂设置	Option Value 选项值	Description 说明
12	0		<p>E.G.A. Functionality: If this option has a setting of 2 or 3, then the E.G.A. will trim once this has been added. The trim is applied to channel 2 air damper.</p> <p>尾气分析仪功能: 该选项值为 2 或 3 时, 尾气分析仪在安装好后就开始调节, 调节对象是通道 2 空气挡板。</p> <p>0 Not optioned. 未选择。</p> <p>1 Monitoring only - no E.G.A. errors will be generated regardless of option 13. 仅监视-无论选项 13 数值是多少均不生成尾气分析仪错误。</p> <p>2 Applies trim. 执行调节。</p> <p>3 Applies trim, combustion limits tested. 执行调节, 测试燃烧极限。</p> <p>Note: If option 12 is set to 0 or 1, then the M.M. is commissioned without trim, however trim can be added at a later date by changing option 12 to 2 or 3 in online changes, and then going through single point change to add the trim data for each fuel-air position.</p> <p>注: 如果选项 12 的值是 0 或 1, 控制模块只做燃烧器控制但不做 EGA 调节。操作员以后仍然可以在线上将选项 12 更改成 2 或 3, 然后在线单点更改和添加各个燃料-空气位的调节数据。</p>
13	0		<p>E.G.A. Error Response: This sets the M.M. operation on terminal 79 for when an E.G.A. error occurs.</p> <p>尾气分析仪错误响应: 该选项控制终端 79 在发生尾气分析仪错误时的运行。</p> <p>0 On error burner stops, alarm active. 发生尾气分析仪错误时, 燃烧器停止, 警报响起。</p> <p>1 On error burner runs, alarm not active. 发生尾气分析仪错误时, 燃烧器运行, 警报不响起。</p> <p>2 On error burners runs, alarm active. 发生尾气分析仪错误时, 燃烧器运行, 警报响起。</p>
18	1		<p>Carry Forward of Trim: When the system modulates, the correction that may already exist on the air damper position can be carried forward. This option is only relevant if an E.G.A. is operational on the system. Trim will be reset if the rate of change of the fuel valve angle is greater than that set in parameter 14.</p> <p>调节值的延续: 当系统进行控制时, 已有的空气挡板调节值将得以延续。该选项只在尾气分析仪运行时才有效。当燃料阀门角度变化速率大于参数 14 的数值时, 空气挡板调节值将被重置。</p> <p>0 Disabled. 禁用</p> <p>1 Enabled. 启用</p>
19	0		<p>O₂ Upper Limit Offset: This is an offset limit from the commissioned values. Options 19 - 27 are only relevant if an E.G.A. is operational on the system. Option 12 must be set to 3.</p> <p>氧气上限补偿值: 该值调试值的补偿限值。选项 19 - 27 只在尾气分析仪运行时才有效。选项 12 的数值必须设为 3。</p> <p>0 Disabled. 禁用</p> <p>0.1 - 10.0 % O₂ 氧气百分比</p>
20	0		<p>CO₂ Upper Limit Offset: This is an offset limit from the commissioned values.</p> <p>二氧化碳上限补偿值: 该值是调试值的一种补偿限值。</p> <p>0 Disabled. 禁用</p> <p>0.1 - 10.0 % CO₂ 二氧化碳百分比</p>
21	0		<p>CO Upper Limit Offset: This is an offset limit from the commissioned values.</p> <p>一氧化碳上限补偿值: 该值是调试值的一种补偿限值。</p> <p>0 Disabled. 禁用</p> <p>1 - 200 ppm CO 一氧化碳百万分率</p>
22	0		<p>O₂ Lower Limit Offset: This is an offset limit from the commissioned values.</p> <p>氧气下限补偿值: 该值是调试值的一种补偿限值。</p> <p>0 Disabled. 禁用</p> <p>0.1 - 10.0 % O₂ 氧气百分比</p>
23	0		<p>CO₂ Lower Limit Offset: This is an offset limit from the commissioned values.</p> <p>二氧化碳下限补偿值: 该值是调试值的一种补偿限值。</p> <p>0 Disabled. 禁用</p> <p>0.1 - 10.0 % CO₂ 二氧化碳百分比</p>
25	0		<p>O₂ Absolute Limit: System checks for O₂ values lower than the value specified in this option</p>

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regardless of the commissioned values.

氧气绝对值: 系统检查氧气数值是否低于本选项数值。该值与调试值无关。

0 Disabled.禁用

0.1 - 20.0 % O₂ 氧气百分比

26 0.0

CO₂ Absolute Limit: System checks for CO₂ values higher than the value specified in this option regardless of the commissioned values.

二氧化碳绝对值: 系统检查二氧化碳数值是否高于本选项数值。该值与调试值无关。

0 Disabled.禁用

0.1 - 20.0 % CO₂ 二氧化碳百分比

27 0

CO Absolute Limit: System checks for CO readings higher than value specified in this option regardless of the commissioned values.

一氧化碳绝对值: 系统检查一氧化碳数值是否高于本选项数值。该值与调试值无关。

0 Disabled.禁用

1 - 200 ppm CO 一氧化碳百万分率

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Option No. 选项号	Factory Setting 工厂设置	Option Value 选项值	Description 说明
28	20	0 - 50 0 - 5.0	<p>Trim Threshold: This option is only relevant if an E.G.A. is operational on the system. The value set in this option is subtracted from the required setpoint. If the actual value is below this offset, then the E.G.A. will not trim. If the trim is to be effective at all times, then set this value to zero. This Option must also be set to zero for the E.G.A. to operate when external modulation is optioned.</p> <p>尾气分析仪调节阈值: 本选项只在尾气分析仪运行时有效。设定点将减去本选项数值。如果实际数值低于补偿值, 尾气分析仪将不执行调节。如果本选项为 0, 尾气分析仪将始终进行调节。当系统采用外部调节时本选项数值必须为 0 来保证尾气分析仪始终执行调节。</p> <p>If Centigrade, Fahrenheit or PSI units effective. 使用单位是摄氏度、华氏度或 PSI。 If Bar units effective. 使用单位是巴。</p>
32	20	0 - 250	<p>Trim Delay: After ignition, the E.G.A. does not sample for the period of time set in this option (only relevant if E.G.A. is operational on system). This allows for the combustion to stabilise before sampling commences. The timing starts at the ignition point.</p> <p>调节延时: 点火后尾气分析仪在本选项时长内不执行采样 (仅在尾气分析仪运行时有效)。这是为了获得稳定的燃烧状态样本。计时始于点燃点。</p> <p>Period (seconds) after ignition where no sampling takes place. 时取样的时间段 (秒)。</p>
56	0	0 1	<p>Alarm Output Operation (Terminal #79) 警报输出操作 (终端号 79)</p> <p>0 Relay normally off, on when alarm. 继电器常闭, 继电器打开时输出警报。 1 Relay normally on, off when alarm. 继电器常开, 继电器关闭时输出警报。</p>

Note: This is a switched neutral output terminal.
注: 这是一个切换的中性位输出终端。

3.5.4 Relevant Mini Mk8 M.M. Parameters Mk8 微型控制模块相关参数

The following table shows the relevant parameters for the E.G.A. operation on the M.M. It is important to remember that changing these parameters will dramatically change the trim operation. The majority of these parameters can be left with the default settings in most applications; any adjustments to these parameters should be made one at a time.

下表显示了尾气分析仪在控制模块上运行的相关参数。重要的是牢记更改这些参数将会改变调节操作。在多数应用场合中大部分参数可以保持默认设置。调节时一次只能改变一个参数。

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Parameter No. 参数号	Factory Setting 工厂设置	Parameter Value 参数值	Description 说明
4	45	10 - 120	<p>Delay Before E.G.A. Commission Can Be Stored: During commissioning and single point change, the E.G.A. there is delay before the E.G.A. values are stored. This allows some time for the E.G.A. values to stabilise. 存储尾气分析仪调试值的延时：在调试时和单点变更时，存储尾气分析仪数值前将有一个延时。这是为了获得稳定的尾气分析仪数值。</p> <p>Seconds. 秒</p>
8	30	5 - 240	<p>Trim Delay After Drain: This is the delay after draining before trim cycle starts (washout period). When the E.G.A. drainings and the cells are cleaned with air this value maintains the E.G.A. readings from before the drain period for 'n' seconds to allow the air to clear from the E.G.A. 排出冷凝水后的尾气分析仪调节延时：在完成冷凝水排放后，尾气分析仪要等待一段时间（清洗期）然后进入调节周期。在排放冷凝水和清洁感应器（用空气清洁）之后的“n”秒时间内，系统将维持冷凝水排放之前的尾气分析仪读数。这是为了让空气全部从尾气分析仪排出。</p> <p>Seconds. 秒</p>
10	2	0 2	<p>E.G.A. Version: 尾气分析仪版本</p> <p>0 Mk7 E.G.A. Mk7 尾气分析仪</p> <p>2 Mk8 E.G.A. Mk8 尾气分析仪</p>
12	0	0 1	<p>CO Used for Trim on Oil: CO included in trim calculation when firing oil for fuels 2, this is also required when using natural gas on fuel 2. 烧油锅炉调节时的 CO 使用： 当锅炉燃料 2 为燃油时，调节计算应包括一氧化碳；当锅炉燃料 2 为天然气时，调节计算也应包括一氧化碳。</p> <p>0 Disabled. 禁用</p> <p>1 Enabled. 启用</p>
13	50	20 - 75	<p>Commission Fuel-Rich Trim: The % of air damper movement, when commissioning the fuel rich cycle trim. 调试富油调节： 当调试富油调节时风门挡板角度的百分比。</p> <p>Value 50 = 5.0% degrees 数值 50 = 5.0%角度</p>
14	50	0 - 900	<p>Negative Trim Reset Angle: This is the change in fuel angle per minute that will reset trim. 负值调节重置角度：这是执行重置调节时每分钟燃料阀角度的变化。</p> <p>Note: This also applies to positive trim if option 18 is set to no carry forward of trim. 注：这也适用于 EGA 正值调节，如果选项 18 被设定为“不延续调节值”。</p> <p>Value 50 = 5.0° 数值 50 = 5.0°</p>
17	3	0 - 10	<p>Number of Trims Before Limits Error Generated: Number of trims before an E.G.A. error is flagged when the combustion limits are exceeded. 发出极限值错误信息前的调节次数： 当超出燃烧极限值时，发出尾气分析仪错误提示之前的调节次数。</p> <p>Number of trims. 调试数。</p>
18	100	20 - 100	<p>Maximum Trim During Run: The % of trim amount during run. 运行时的最大调节幅度： 运行时的调节幅度百分比。</p> <p>Value 100 = 10.0%. 数值 100 = 10.0%.</p>
19	50	20 - 75	<p>Commission Air-Rich Trim: The % of air damper movement, when commissioning the air rich cycle trim. 调试富氧调节： 调试富氧调节操作时的风门开度百分比。</p> <p>Value 50 = 50.0%. 数值 50 = 50.0%.</p>
23	0		<p>Add Air When CO Present: Trim to add air when CO is present. When trim is taking place, if the O2 and CO2 appear on air richbut the CO appears on fuel rich then the air damper will open further to remove CO. 存在一氧化碳时添加空气：当存在一氧化碳时添加空气。在尾气分析仪调节期间如果富氧时存在氧气和二氧化碳并且富油时存在一氧化碳，那么要进一步打开空气挡板来去除一氧化碳。</p>

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	0	Disabled. 禁用
	1	Enabled. 启用
26	8	Trim Samples per Cycle: 单个调节周期内的调节样本
	1 - 50	Number of trims. 调节数。
94	0	NO Upper Limit Offset: This is an offset limit from the commissioned values, if the NO is above this limit an alarm will occur. 一氧化氮上限补偿值: 该值是调试值的一种补偿限值, 一氧化氮高于限值时将报警。
	0	Disabled. 禁用
	1 - 200	ppm
96	0	Exhaust Temperature Upper Limit Offset: This is an offset limit from the commissioned values. 排气温度上限补偿值: 该值是调试值的一种补偿限值。
	0	Disabled. 禁用
	1 - 999	deg C/ deg F 华氏度/摄氏度
97	0	Exhaust Temperature Absolute Limit: System checks for exhaust temperatures higher than this value. 排气温度绝对值: 系统将检查排气温度是否大于该值。
	0	Disabled. 禁用
	1 - 999	deg C/ deg F 华氏度/摄氏度

3.5.5 Commissioning Procedure 调试流程

Commissioning with the E.G.A. is an extension to commissioning with the M.M. and is required if the trim function is to be used. The factory trained technician must be completely familiar with the commissioning of the M.M. unit before commissioning with the E.G.A. For the full commissioning procedure, please refer to the M.M. Installation and Commissioning Guide.

利用尾气分析仪进行调试是利用控制模块进行调节的一种补充方式，使用调节功能时则需要进行此类调节。工厂经培训的技术人员在利用尾气分析仪进行调试前必须完全熟悉控制模块的调试。关于完整的调试流程，请参考控制模块安装和调试指南。

The commissioning procedure as described must be strictly adhered to. Anybody commissioning an M.M./E.G.A. system must have an adequate understanding of combustion plants and be officially certified by Autoflame Engineering.

操作员必须严格遵守所述的调试流程。调试控制模块和尾气分析仪系统的任何人都必须完全了解燃烧设备的运行，并获得 Autoflame Engineering 认证。

In the wrong hands, hazardous conditions could be made to exist that could lead to product damage, critical injury or death.

未经培训的人员进行调节时可能会发生危险，导致产品损坏和伤亡。

The fundamental idea of the system is to set a fuel valve position and then set a corresponding air valve position. Care must be taken when adjusting the fuel and air positions so as not to create any unstable or dangerous combustion conditions, e.g. moving the fuel valve to the open position without increasing the air valve correspondingly.

控制系统的理论基础是设置一个燃料阀门位置和一个对应的空气挡板位置。应仔细调节燃料和空气位置并且保证不造成任何不稳定或者危险的燃烧条件，比如：把燃气阀门调节到开启位的时候未相应增大空气挡板的开度。

Commissioning a system with an E.G.A. does not require a combustion monitor as the E.G.A. performs all normal exhaust gas measurements. When burning oil, a smoke detection device is required to check that the smoke generated is within government guidelines.

利用尾气分析仪调试系统不需要燃烧监视器，因为尾气分析仪可以进行所有正常的废气测量。使用燃油时需要烟气检测设备对产生的烟气进行检测。

Ideally, to implement commissioning as quickly as possible arrange for a substantial load on the boiler. The commissioning procedure can be interrupted due to excess temperature or pressure, causing the burner to turn off. In these instances the commissioning data accumulated so far is not lost. When the burner is called back on, the system starts up automatically and commissioning can proceed from where it left off.

为了尽快完成调试，锅炉的运行要带有相当的荷载量。过高的温度/压力会中断调试过程并且造成燃烧器关闭。当发生此类情况时，已有的调试数据不会丢失。当燃烧器恢复运行后，系统将自动启动并且从上次中止处继续进行调试。

Once the burner has been fired the maximum fuel position is entered first then descending fuel positions are entered consecutively until finally a minimum fuel position is entered. The CH1 and CH2 positions must always be less than the ones previously entered. However with the remaining channels it is possible to move the position above or below the previously entered points. This is important if these channels are used to control FGR (Flue Gas Recirculation) or atomisation of oil.

燃烧器燃烧时将燃料首先进行最大燃料位置，然后是下行燃料位置直至完全进入最小燃料位置。CH1 和 CH2 位置必须小于上次进入的数量。在剩余通道中操作员可以根据先前进入点上下移动位置。这些通道可以用于控制燃气再循环或燃油离子化。

On a newly installed system the following procedures should be carried out as listed:

在新安装的系统中必须执行以下流程：

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1. Check all interconnecting wiring between the M.M. and external components are correct.
检查控制模块和外部组件间的所有接线是否正确。
2. Set the Options and Parameters required (Sections 3.5.1 and 3.5.2 for Mk7 M.M., and Sections 3.5.3 and 3.5.4 for Mini Mk8 M.M.).
设置所需选项和参数（Mk7 控制模块请参考 3.5.1 和 3.5.2 节，Mk8 微型控制模块请参考 3.5.3 和 3.5.4 节）。
3. Set up positioning motors.
设置定位电机。
4. Programme fuel/air positions.
确定燃料/空气位置。

Note: For the safety and operational checks, and the full commissioning procedure of the Mk7 M.M. Installation and Commissioning Guide or the Mini Mk8 M.M. Installation and Commissioning Guide.

注：关于安全检查和运行检查，请参考 **Mk7 控制模块**或 **Mk8 微型控制模块**安装和调试指南中的调试流程。

3.6 Mk8 E.G.A. Trim Mk8 尾气分析仪的调节

3.6.1 Trim Operation 调节操作

With the E.G.A. trim facility it is possible to expand the M.M. so it will measure and display O₂, CO, CO₂ and exhaust gas temperature, together with boiler temperature or pressure. It is also possible to use these O₂, CO and CO₂ values for 3 parameter trim in order to optimise the burner combustion throughout the firing range of the burner in a safe manner. This means that the safety is never compromised by efficiency, but the best burner/boiler efficiency is maintained. Correct set-up of the 3 parameter trim will maintain optimum combustion efficiency, whilst never compromising safety.

在尾气分析仪调节设施中可以扩展控制模块，使其测量并显示氧气、一氧化碳、二氧化碳和废气温度以及锅炉温度或压力。也可以使用氧气、一氧化碳和二氧化碳数值用于 3 参数调节，以安全的方式在燃烧器燃烧范围内优化燃烧器燃烧。这意味着既高效又安全，同时可以保持最佳的燃烧器/锅炉效率。正确设置 3 参数有助于保持最佳的燃烧效率，保证安全。

During commissioning, for every paired value of fuel and air, the corresponding values of O₂, CO and CO₂ are stored. The system will then automatically induce an 'autotrim' cycle in which the air damper will close 5% (parameter 13) of the entered air damper position and then hold its position for 60 seconds (parameter 9). This is known as the fuel rich part of the autotrim cycle. After 60 seconds the values of O₂, CO, and CO₂ are stored. The 60 seconds allows the combustion gases to move through the E.G.A. in order to obtain new combustion values.

在调试期间，燃料和空气数值以及对应的氧气、一氧化碳和二氧化碳值都将被保存。系统将自动匹配自动调节周期，空气挡板将关闭 5%（参数 13）的进气挡板位置，然后保持该位置 60 秒（参数 9）。这就是所谓的自动调节周期中的富油步骤。60 秒后将保存氧气、一氧化碳和二氧化碳值。在 60 秒内允许燃烧气体通过尾气分析仪，从而获得最新的燃烧数值。

After these values have been stored then the E.G.A. will stop sampling from the stack for 15 (parameter 11) seconds and sample from atmosphere (through the solenoid valve) in order to clear any CO residue that may have been produced during this fuel rich autotrim. During this time the air damper will now open 5% of (parameter 5) the commissioned air damper position and following the air flush time the air damper will be held in this position for 60 seconds (parameter 9). This is known as the air rich part of the autotrim cycle. After the 60 seconds the values of O₂, CO, and CO₂ are stored. It is now possible to move to the next position in the fuel and air curve to be entered. This same process will occur for every fuel and air position entered. This builds up a complete map of the burner's combustion performances (see graphs in Section 3.6.2).

在保存上述数值后，尾气分析仪将同时停止从设备中采样 15 秒（参数 11）和从大气中采样（通过电磁阀），以便清除在富油自动调节期间可能产生的一氧化碳残留。在此时间段，空气挡板将打开 5%（参数 5）的调试空气档位位置，然后进行空气吹扫，此时空气挡板将保持打开位置 60 秒（参数 9）。这就是所谓的自动调节周期中的富氧步骤。60 秒后将保存氧气、一氧化碳和二氧化碳数值。然后移动至下一位置输入燃料和空气曲线，每个燃料和空气位置都采用相同的步骤。这就是燃烧器燃烧性能的完整步骤（见 3.6.2 节的图表）。

During the normal run mode, the on-line sample at any position within the burner's firing rate is compared to the commissioned values. There are 3 individually sampled parameters (O₂, CO, CO₂) in order to verify the combustion performance either side of the commissioned value. The software within the M.M. unit will inflict minute corrections to the channel 2 air damper positions or the channel 5 variable speed drive in order to maintain the commissioned values. These small changes ensure that the originally entered commissioning data is adhered to, irrespective of variations in stack pressure, ambient temperature/pressure fluctuations, barometric conditions or fuel pressure changes.

在正常运行模式中对任何位置的燃烧器燃烧率在线样本与调试值进行比较。有 3 个单独的采样参数（氧气、一氧化碳和二氧化碳）可以证明调试值任一侧的燃烧性能。控制模块设备软件将对通道 2 空气挡板位置或通道 5 变速驱动器进行修正，从而保证符合调试值。这些小更改可以

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确保符合最初输入的调试数据，无论设备压力、缓解温度/压力波动、气压条件或燃油压力如何变化。

The system trim function is achieved by every paired value for air and fuel having stored values for O₂, CO₂, and CO at the commissioned value. Deviations from these ideal values are held and accessible via the Combustion Map button the Mk7 M.M. This data shows the commissioned values of the emissions, the current values of the emissions and the amount of trim that is being used.

系统调节功能通过保存的每对空气和燃料值和氧气、一氧化碳和二氧化碳调试值实现。可以通过 Mk7 控制模块燃烧图按钮查看这些数值的偏差。这些数值显示了尾气的调试值、尾气的当前值和使用的调节量。

Importance of Measuring 3 Parameters

测量 3 参数的重要性

The Autoflame system trims on O₂, CO₂ and CO, and so is not simply an O₂ trim system. If only O₂ is measured and trimmed on then there is no cross reference to CO, CO₂ or NO_x. Therefore, even if the O₂ readings are correct, changes in ambient conditions can cause the CO to rise significantly (>>100ppm). Another, more dangerous problem that can occur is oxygen being induced into the boiler through gaskets and small gaps in the boiler flue ways. As the flue gas is measured at the exit of the boiler, this could lead to higher O₂ readings even if the combustion is good, i.e. high CO levels (>>100ppm), low O₂ levels. With a simple O₂ trim system, this potentially dangerous problem would not be accounted for. With the Autoflame E.G.A., O₂, CO₂ and CO are constantly measured and any changes to these 3 parameters, will result in a trim taking place on the air damper to return the combustion level back to the original commissioned values. Therefore, even if both the O₂ and CO₂ are reading correctly the system will still trim due to changes in the amount of CO produced.

Autoflame 系统对氧气、二氧化碳和一氧化碳进行调节，而并非简单的氧气调节系统。如果仅测量和调节氧气，则没有对一氧化碳、二氧化碳或氮氧化物的对照参考。因此，即使氧气读数正确，环境条件的改变也可能导致一氧化碳大幅升高 (>>100ppm)。此外，可能出现的更危险问题是氧气会通过锅炉烟道的垫片和小缝隙进入锅炉。由于烟道中的烟气在锅炉出口处测量，这可能导致氧气读数升高，即使在燃烧正常的情况下，即高一氧化碳值 (>>100ppm)，低氧气值。利用 Autoflame 尾气分析仪可以对氧气、二氧化碳和一氧化碳进行不断测量，这 3 个参数的任何变化都将对空气挡板进行调节，使燃烧值符合起始的调试值。因此，即使氧气和二氧化碳的读数正确，系统也将根据一氧化碳的变化进行调节。

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The following table shows a potential problem with using the O₂ analyser.

下表显示了使用氧气分析仪的潜在问题。

	O ₂ Analyser 氧气分析仪		3 Parameter Trim (Autoflame) 3 参数调节 (Autoflame)			
State 状态	O ₂	CO	O ₂	CO ₂	CO	
1	3	0	3	10	0	Commissioned 已调试
2	4	0	4	10	0	Trim 调节
3	4.5	100	4.5	10.5	100	Increased Trim 增加调节
4	5	200	5	10.5	100	No trim 未调节
5	4	500	5.5	10	0	Commission position 调试位置
6	3	1000+	5.5	10.5	50	Trim 调节

Values in red are ones that are not viewable using an O₂ trim system.

使用氧气调节系统无法查看红色数值。

State 1 – The burner is operating under normal conditions.

状态 1-燃烧器在正常条件下运行。

State 2 – Over a period of time, boilers are susceptible to leaks occurring. One of the most likely places that this will occur is on the stack, near to the point where the analyser is measuring the exhaust gases. As a leak occurs at this point, the analyser is not measuring solely the exhaust gases, but is in fact contaminated with 20.9% O₂ from atmosphere. Therefore, the oxygen reading starts to increase.

状态 2-在一段时间内，锅炉容易发生泄漏。最长出现的位置是在排气管靠近分析仪测量废气的位置。出现泄漏时，分析仪将不仅仅是测量废气，而是包括大气中受 20.9%的氧气。因此，氧气读数将开始增加。

State 3 – As the amount of oxygen increases so too does the reading. At this point the controller closes the air damper in order to react to the increase in oxygen. The CO begins to rise since the combustion is now not correct.

状态 3-氧气增加时读数也相应增加。此时，随着氧气的增加控制器将关闭空气挡板。由于燃烧不正确，因此一氧化碳将开始增加。

State 4 – Both analysers still see an increase in the oxygen reading. The O₂ analyser continues to close the air damper in order to reduce the excess air through the system, and so producing CO. The Autoflame analyser measures the increasing CO value and ensures that the air damper does not continue to close.

状态 4-分析仪也可以检测到氧气读数的增加。氧气分析仪继续关闭空气挡板以便减少通过系统的过多空气，从而产生一氧化碳。Autoflame 分析仪测量增加的一氧化碳值，确保空气挡板不会继续关闭。

State 5 – The O₂ analyser continues to trim based on the oxygen readings and so excess CO is produced. The Autoflame analyser has seen this ambiguous case and returns the air damper back to the commissioned value in order to ensure that the O₂, CO₂ and CO levels are returned to the commissioned values (or close to) before further trimming occurs. This, potentially dangerous anomaly has been corrected for.

状态 5-氧气分析仪继续根据氧气读数进行调节，而言产生过多的一氧化碳。Autoflame 分析仪检测到此种情况并将空气挡板返回至调试值，从而确保在调试前氧气、二氧化碳和一氧化碳数

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值返回至调试值（或接近）。这样可以减少潜在危险。

State 6 – Dangerous combustion occurs on the O₂ analyser, whereas the Autoflame E.G.A. system has taken this ambiguous case into account.

状态 6-氧气分析仪发生危险燃烧，Autoflame 尾气分析仪系统将检测此种情况。

3.6.2 Quick Commission Mk7 M.M. 快速调试 Mk7 控制模块

Quick Commission allows the engineer to commission the burner separately to add the trim values later. This allows the engineer to enter a full combustion curve in situations where there is a low demand for heat or steam. Entering the fuel rich and air rich data for the combustion map can sometimes take too long. Single point change can be accessed at a later time at load to add the trim curve. (See Mk7 Manual: M.M. Installation and Commissioning Guide).

快速调试允许工程师单独调试燃烧器并随后添加调试值。工程师需要输入一个完整的燃烧曲线，条件是对热量或蒸汽有较低的需求。为燃烧图输入富氧和富油数据可能需要较长的时间。随后查看单点变化以添加调节曲线（见 Mk7 手册：控制模块安装和调试指南）。

The amount of trim is proportional to the area that the damper is open. During normal commissioning with E.G.A., the air damper is opened and closed (during air rich and fuel rich) based on 5% of the angular position. With quick trim it is based on 5% (parameter 13) of the dampers open area, allowing for more precise trimming.

调节量和空气挡板打开的区域成正比。用尾气分析仪进行正常调试期间，空气挡板根据角度位置打开或关闭 5%（富氧和富油期间）。快速调节根据 5%（参数 13）挡板打开区域进行，可以实现更准确的调节。

During normal commissioning with E.G.A. the 'auto commission time' is set to 60 seconds (parameter 9). This is the time at which the air damper is held at the air rich or fuel rich phase of commissioning. With quick commission the commission time is based on the residence time of the combustion gas. This is the time from the time the gas leaves the burner, to the time it exits the boiler into the flue. This time will vary depending on how the burner is firing and the burner turn down ratios. The residence time is measured by looking for a change in the O₂ reading from when the air damper is moved, to a change in combustion of >0.2% O₂. This residence time is displayed in the combustion map screen. The residence time is typically longer at low fire that at high fire due to the volume of the gases passing through the boiler.

用尾气分析仪进行正常调试期间，自动调试时间设为 60 秒（参数 9）。在此时间内，空气挡板在调试富氧或富油阶段保持不变。在快速调试中，调试时间取决于燃烧气体的剩余时间。在此期间，燃气离开燃烧器，进入锅炉的烟道。该时间根据燃烧器的燃烧情况和燃烧器的调节比会有不同。剩余时间可以通过查看氧气读数进行测量，此时空气挡板将移动，燃烧变化 >0.2% 氧气。剩余时间在燃烧图屏幕上显示，通常剩余时间在低火焰时的时间较长，在高火焰时取决于通过锅炉的燃气量。

When selecting a line of combustion in the combustion map screen, the trim values for the air rich and the fuel rich will be displayed below the main table to indicate the trim either side of the commissioned combustion curve.

在燃烧图屏幕中选择一个燃烧曲线，富氧和富油调试值将在主表下方显示，表明在调试燃烧曲线的任一侧进行调节。

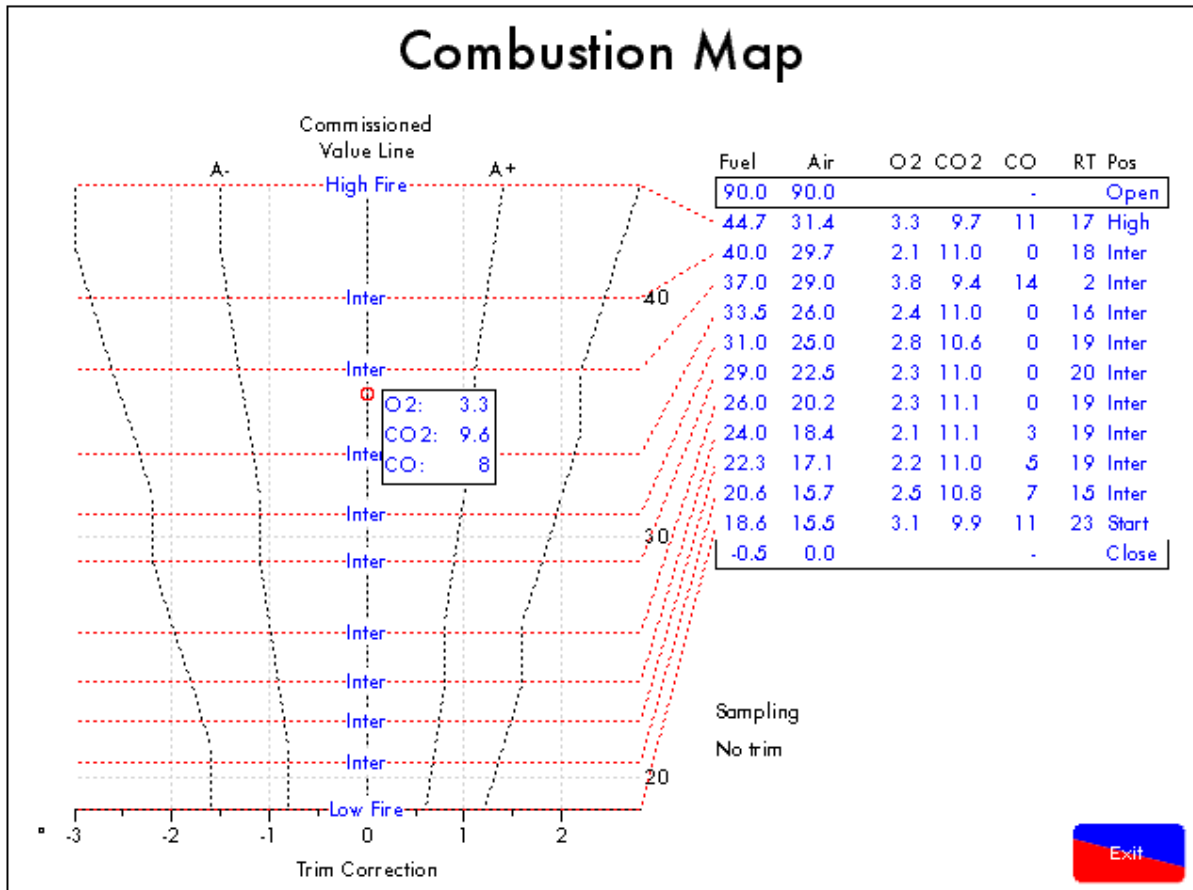


Figure 3.6.2.i Combustion Map Screen

图 3.6.2.i 燃烧图屏幕

The combustion map screen is enabled by setting Parameter 74 to 1 prior to commissioning the Mk7 M.M. and also requires an E.G.A. to be optioned.

调试 Mk7 控制模块前将参数 74 设为 1 可以启用燃烧图屏幕，同时需要选定一个尾气分析仪。

The combustion map (see Figure 3.6.2.i) shows how the trim function works on the system. The combustion map screen can be accessed by pressing the 'combustion map' button on the M.M. home screen. The combustion map clearly shows the commissioned E.G.A. values for O₂, CO₂ and CO. The graph on the left of the screen shows the amount of trim being added by the M.M. to control these emissions values so that they are as close to their commissioned values as possible. The red circle indicates the current position of the trim being applied and the current combustion values are displayed at this point as well.

燃烧图（见图 3.6.2.i）显示了调节功能如何在系统中工作。操作员也可以按下控制模块主屏幕上的‘燃烧图’按钮进入燃烧图屏幕。燃烧图清楚地显示了氧气、二氧化碳和一氧化碳的调试尾气分析仪数值。屏幕左侧图表显示了控制模块添加的调节，用于控制这些排放数值，使数值接近其调试值。红色圆圈表明当前的调节位置和当前显示的燃烧值。

3.6.3 Quick Commission Mini Mk8 M.M. 快速调试 Mk8 微型控制模块

Before commissioning, the EGA must be set to monitoring only (option12) in order to activate the quick commission process. Parameter 74 no longer exists in the Mini Mk8. During commissioning the same process will occur where the MM will not perform the air and fuel rich trim limits. Once commissioning is complete and all points are entered, the trim is then set in Single Point Change. Ensure that option 12 is now set to trim. Once in single point change you will then be able to activate the trim by pressing the 'trim' button when on a particular point.

调试前尾气分析仪必须设为仅监视（选项 12）以便激活快速调试流程。参数 74 不再存在于 Mk8 微型控制模块中。调试期间的流程相同，但控制模块将不再执行空气和燃料调节限值。调试完成后以及各点均输入后，则将调节设为单点改变。确保选项 12 设为调节。单点改变设好后，您可以在某点上按下‘调节’按钮激活调节功能。

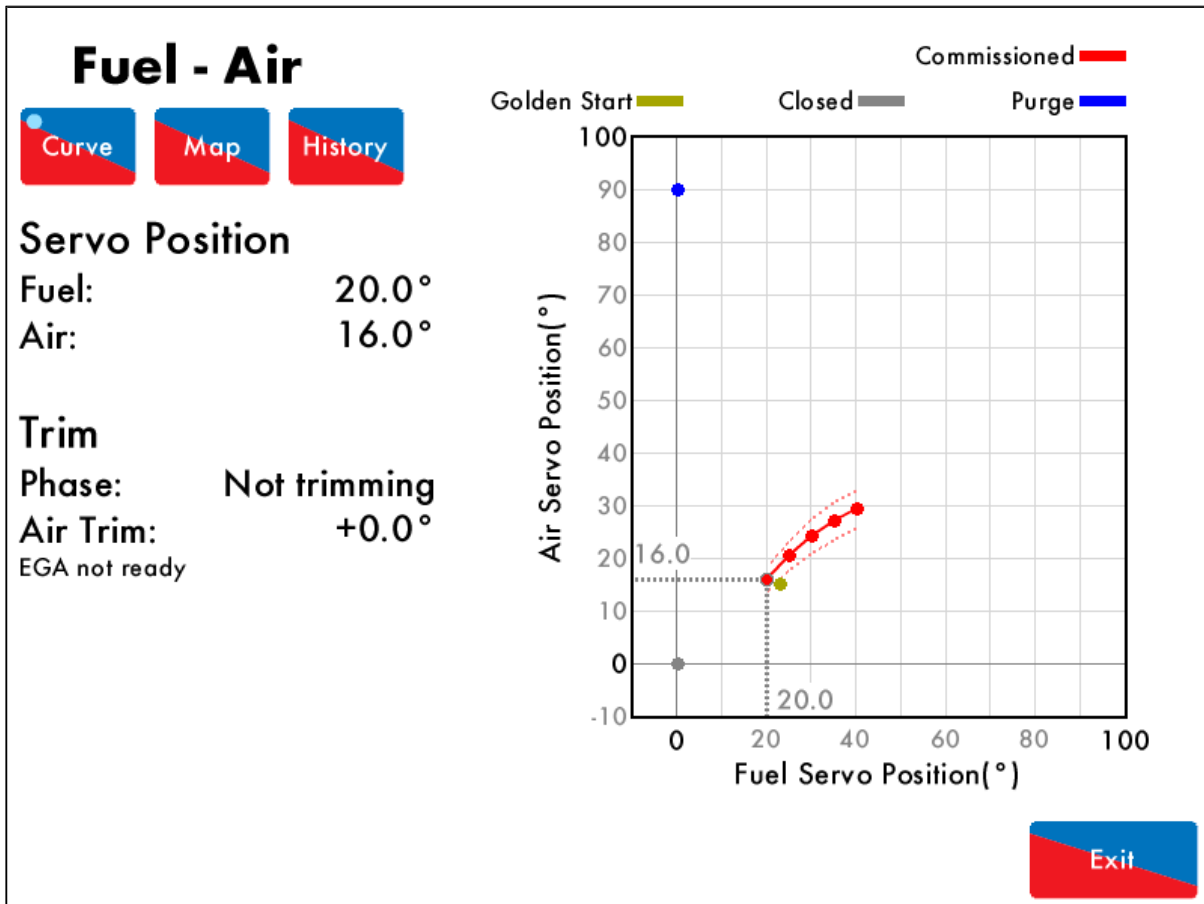


Figure 3.6.3.i Trim Indication

图 3.6.3.i 调节指示

3.6.4 Trim Timing Operation 调节定时操作

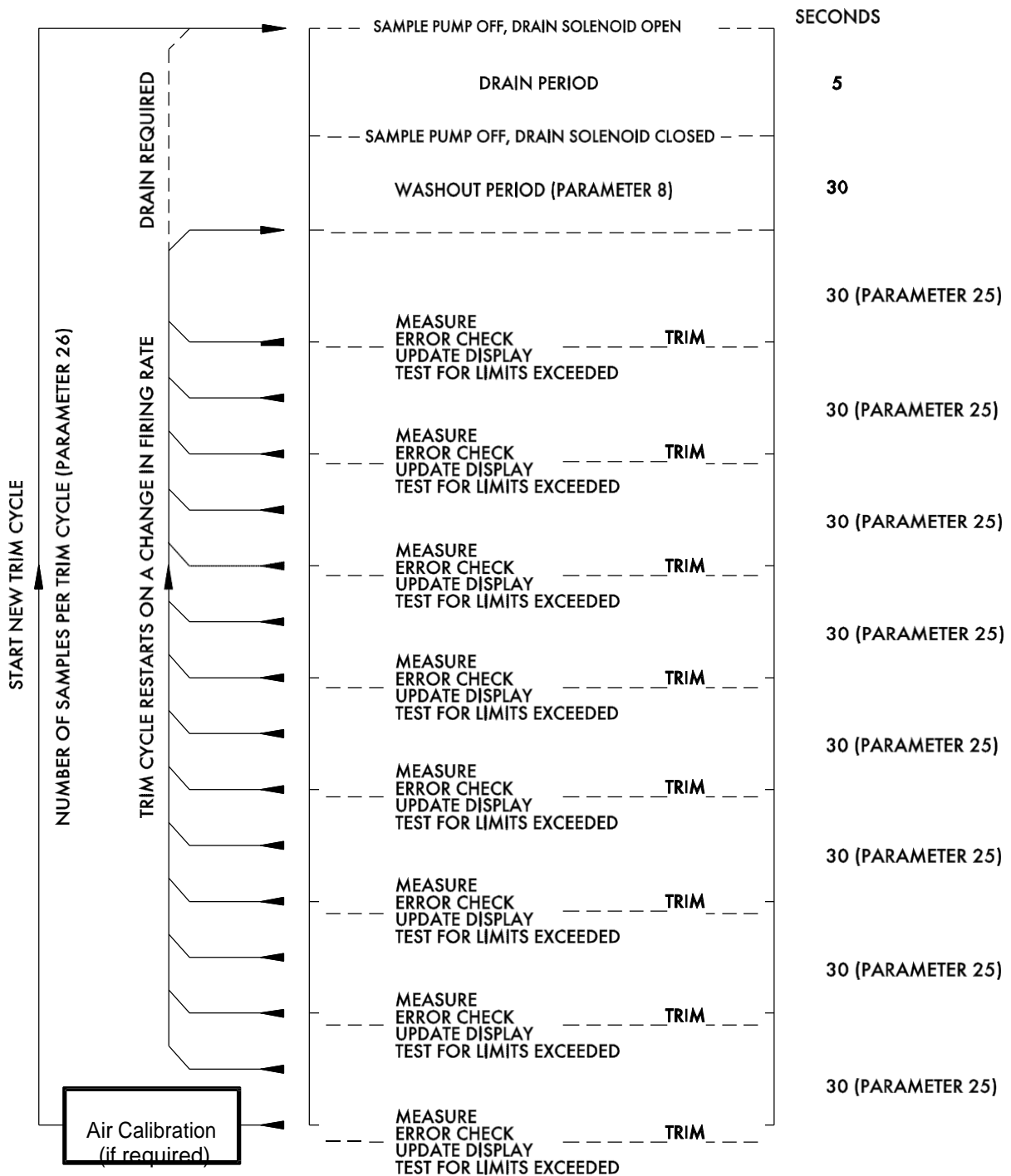


Figure 3.6.4.i Trim Timing Operation

图 3.6.4.i 调节定时操作

If an air calibration is due during the trim cycle, the M.M. will delay the calibration until the cycle has completed.

在调节周期需要空气校准时，控制模块将延迟校准直至完成调节。

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3.6.5 Graphical Trim Operation 图形调节操作

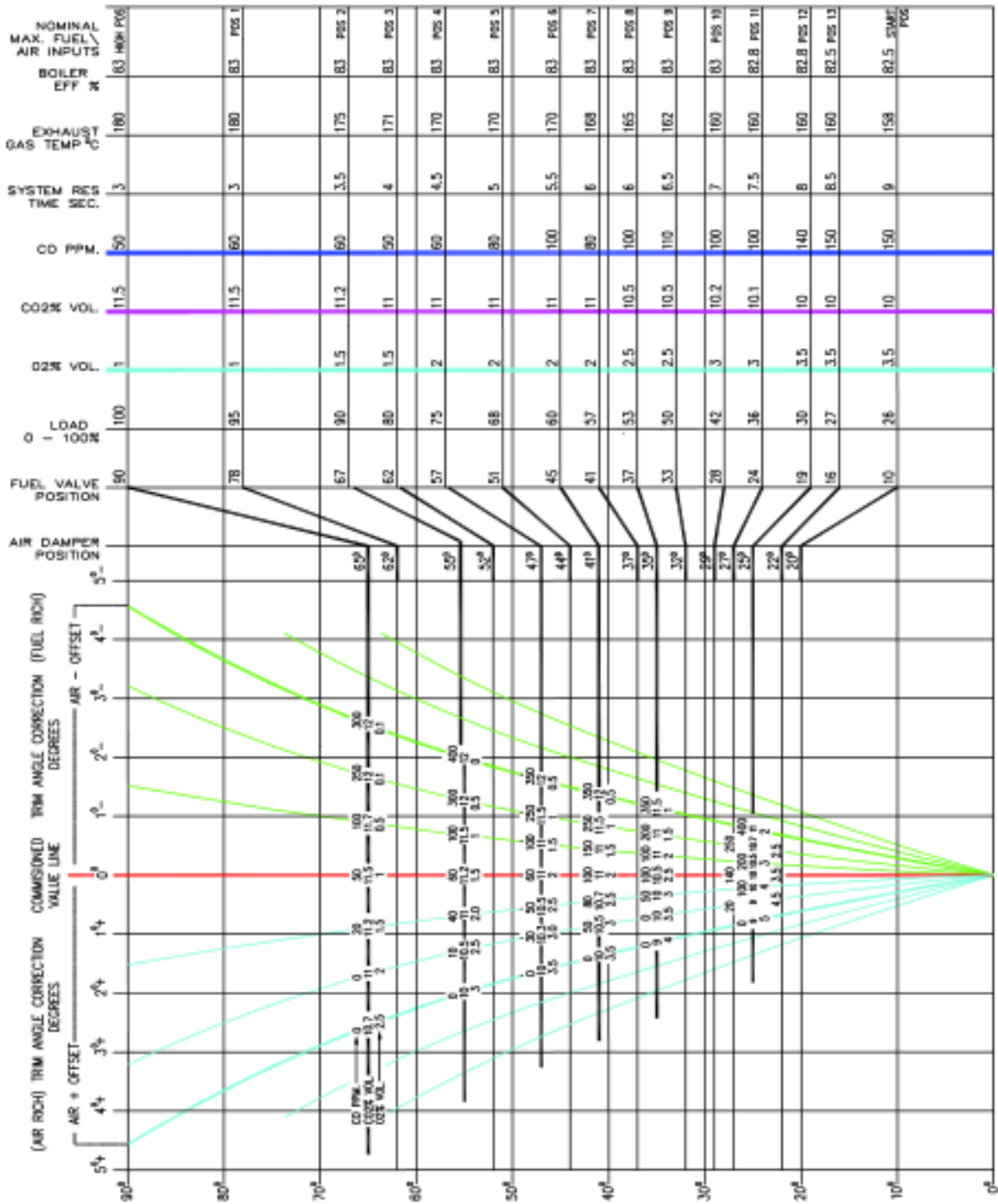


Figure 3.6.5.i Graphical Trim Operation

图 3.6.5.i 图形调节操作

3.6.6 Channel 5 Trim 通道 5 的调节

When trim is set on channel 5, changing the M.M. options will make a difference between errors occurring or not. For the purposes of trim, the Mk7 M.M. needs to know how the VSD will behave, in terms of a change in the VSD input and its effect on the feedback (output) signal, which is why the VSD Options (90 – 97) must be set exactly – i.e. input/output voltage/current ranges and input/output min/max Hertz. If the system is already commissioned and if any of the VSD drive input/output voltage/current ranges or input/output min/max Hertz are altered then re-commissioning will be necessary as the stored feedback values for each M.M. entered point will now be incorrect. These stored feedback values are used by the M.M. as the starting point for working out the expected feedback signal – whether trim on channel 5 is optioned or not.

当设置通道 5 调节时，更改控制模块选项将有助于控制错误的发生。调节时 Mk7 控制模块需要知道 VSD 怎样工作，包括 VSD 输入的改变和反馈（输出）信号的作用，这就是为什么 VSD 选项（90-97）必须准确设置的原因，即输入输出电压/电流范围和输入输出最小/最大功率。如果系统已经调试以及 VSD 驱动输入输出电压/电流范围或输入输出最小/最大功率已经改变，则需要重新调试，因为各控制模块输入点保存的反馈数值将不正确。控制模块将这些保存的反馈值用作反馈信号的起始点，而无论是否已选择通道 5 调节。

3.6.7 Combustion Efficiency Calculations 燃烧效率的计算

Based on dry gas.

根据干燃气

English Calculation:

英国计算方式:

% combustion Efficiency=100-(sensible heat loss + hydrogen and moisture loss)

燃烧效率百分比=100-（显热损失+氢和水损失）

$$\% \text{combustion Efficiency} = 100 - \left(\frac{K1(TG - TA)}{\%CO_2} + (K2(1121.4 + (TG - TA))) \right)$$

$$\text{燃烧效率百分比} = 100 - \left(\frac{K1(TG - TA)}{\%CO_2} + (K2(1121.4 + (TG - TA))) \right)$$

K1= 0.38 Natural Gas (F1/F4) 天然气 (F1/F4)

K1= 0.56 Fuel Oil (F2/F3) 燃油 (F2/F3)

K2= 0.0083 Natural Gas (F1/F4) 天然气 (F1/F4)

K2= 0.0051 Fuel Oil (F2/F3) 燃油 (F2/F3)

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- TG Flue Gas Temperature 燃气温度
- TA Ambient Air Temperature in Boiler House 锅炉房内环境空气温度

Note: To use these equations temperatures must be converted to °C.

注：使用上述公式时温度必须转换为摄氏度。

European Calculation: 欧洲计算方法

% combustion Efficiency=100-sensible heat loss

燃烧效率百分比=100-显热损失

$$\% \text{Combustion Efficiency} = 100 - ((\text{TG} - \text{TA}) \times \frac{\text{A}}{20.9\% - \text{O}_2\%}) + \text{B}$$

燃烧效率百分比

A= 0.66 Natural Gas (F1/F4) 燃气 (F1/F4)

A= 0.68 Fuel Oil (F2/F3) 燃油(F2/F3)

B=0.009 Natural Gas (F1/F4) 天然气 (F1/F4)

B=0.007 Fuel Oil (F2/F3) 燃油(F2/F3)

3.7 Combustion Limits

燃烧限值

3.7.1 Overview of Combustion Limits

燃烧限值概述

The combustion limits are only available when the E.G.A. system is used in conjunction with a M.M. control module. The system will have improved safety from using the combustion limits, as these ensure that the combustion exhaust gases do not reach dangerous levels for health and safety, and also environmental regulations. The engineer can set limits as an offset value of the commissioned exhaust gases value, or as an absolute value. These can be upper or lower limits, depending on the exhaust gas variable and the application; the combustion limits can be set on 5 combustion variables: O₂, CO₂, CO, NO and exhaust gas temperature.

燃烧限值仅在尾气分析仪和控制模块一起使用时有效。使用燃烧限值时系统将大大提高安全性，因为这样可以确保燃烧废气不会达到危害健康和安全的程度，同时还符合环境法规。工程师可以将限值设为调试废气值的一种补偿值或设为一种绝对值。根据废气变量和应用条件就会有上限值和下限值，燃烧限值可以在氧气、二氧化碳、一氧化碳、一氧化氮和废气温度等 5 个燃烧参数上设置。

The limits of combustion can be adjusted through options 19 – 27 and parameters 94 – 97 on the M.M. module. Before the burner is commissioned, option 12 must be set correctly so that the limits of combustion are checked.

燃烧限值可以通过在控制模块上调整选项 19-27 和参数 94-97 进行调节。在调节燃烧器前，选项 12 必须正确设置并检查燃烧限值。

3.7.2 Standard Limits

标准限值

Standard (offset) limits are a set percentage volume above and below for O₂ and CO₂, ppm above for CO and NO, and temperature above for exhaust gas temperature, for all the commissioned values. If the online exhaust gas values go above this offset of the commissioned value for that point in the firing curve, the burner will lockout or an error will be displayed, depending on how option 12 has been set on the M.M. These are values are entered after the commissioning of the E.G.A. system has been completed throughout the firing range of the burner, according to health and safety requirements or environmental regulations.

标准（补偿）限值是关于所有调试值的一种百分比量，大于或小于氧气和二氧化碳，ppm 大于一氧化碳和一氧化氮，温度大于废气温度。如果在线废气值大于燃烧曲线中调试的补偿值，燃烧器将锁定或显示错误，这取决于如何在控制模块上设置选项 12。根据健康和 safety 要求或环境法，这些数值在整个燃烧范围内完成尾气分析仪系统调试后输入。

3.7.3 Absolute Limits

绝对限值

Absolute limits are a specific percentage volume, ppm or temperature. In this form only an ultimate low value may be put on O₂ and exhaust gas temperature in percentage volume and temperature respectively. In the case of CO₂ only an ultimate high value may be entered in percentage volume. For CO and NO an ultimate high in ppm may be entered. These values are entered when commissioning of the E.G.A. system has been completed throughout the load index of the burner to avoid the burner locking out when commissioning.

绝对限值是一种特定的百分比量、ppm 或稳定。在这种形式下，氧气可能被设为低值，废气温度和温度设为百分比。在仅有二氧化碳的情况下，高值可以按百分比输入。至于一氧化碳和一氧化氮，可以输入 ppm 高值。这些数值在尾气分析仪系统根据燃烧器负荷指数完成调试后输入，以防止在调试中燃烧器锁定。

3.7.4 Combustion Limits Control Functions

燃烧限值控制功能

Using Option 12 on the M.M. module it is possible to have two distinct control functions on how the system will react when the limits of combustion are exceeded.

超过燃烧限值时在控制模块上使用参数 12 在系统如何反应方面可以有两种完全不同的控制功能。

Control Function 1

控制功能 1

Once the combustion limits are exceeded the trim function is disabled automatically and the system runs on the fuel-air ratio positions that the M.M. module was commissioned on. An error will also appear on the M.M. module, and until the error is reset on the M.M., the trim function will remain disabled, even if the combustion limits are no longer exceeded.

仅有当超过控制限值时才会自动禁用调节功能，系统将在燃油空气比位置运行，此位置即是控制模块调试位置。控制模块也会出现错误，直至错误在控制模块上重置，此时控制功能将保持禁用状态，即使不再超过燃烧限值。

Control Function 2

控制功能 2

Once the combustion limits are exceed the M.M. module will lockout the burner. The M.M. module will also display an error message, and until the lockout is reset on the M.M. module, the system will remain in a lockout condition.

仅有当超过燃烧限值时控制模块才会锁定燃烧器。同时控制模块将显示错误消息，直至错误在控制模块上重置，此时系统将保持锁定状态。

The following figures give a graphical presentation of how the standard limits of combustion works.

下图用图形显示了燃烧标准限值的工作情况。

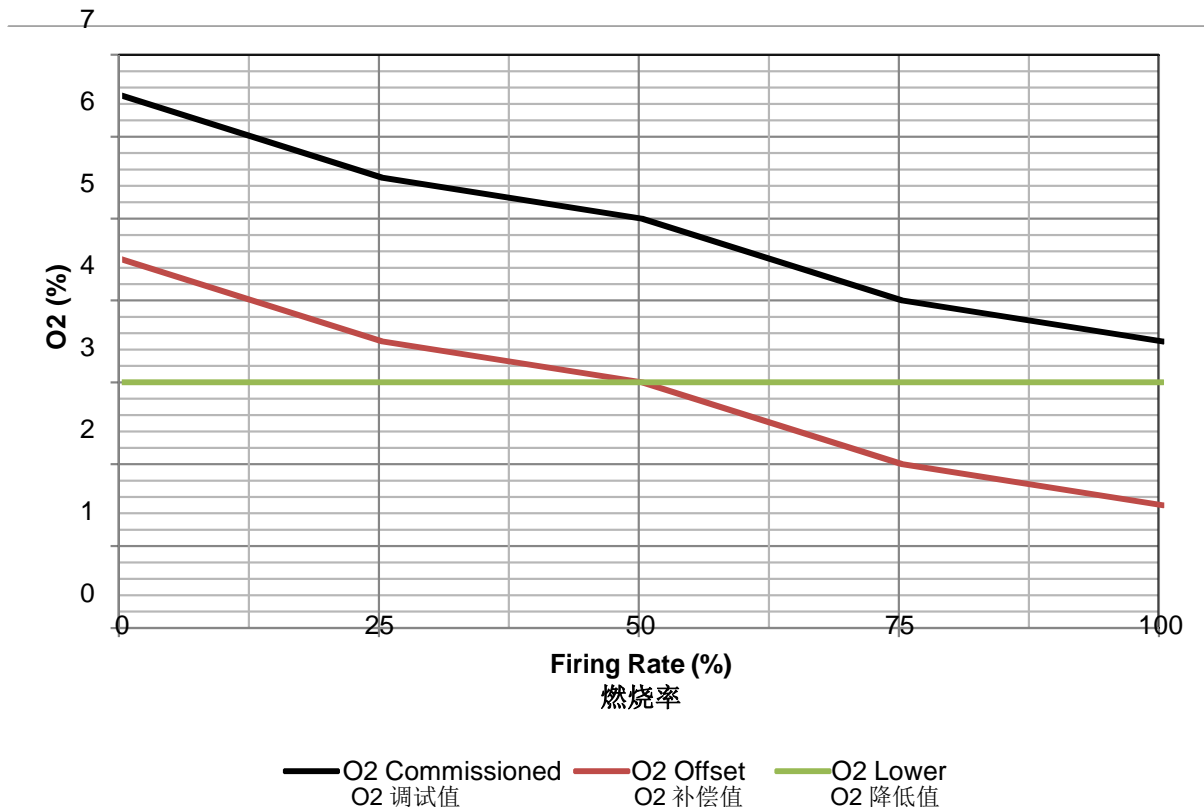
3.7.5 O₂ Limits Example 氧气限值示例

Figure 3.7.5.i O₂ Limits Example
图 3.7.5.i 氧气限值示例

Figure 3.7.5.i shows an example of the O₂ limits. If the offset limit was set to 2%, then the burner would alarm (depending on the terminal 79 operation) when the actual O₂ value dropped below 2% offset from the commissioned value. If the absolute lower limit was set to 3%, the burner would alarm when the actual O₂ value dropped below 3%.

图 3.7.5.i 显示了氧气限值示例。如果补偿限值设为 2%，当氧气值从调试值降低至 2% 补偿值时，燃烧器将发出警报（取决于终端 79 的操作）。如果绝对下限值设为 3%，当实际氧气值降至低于 3% 时燃烧器将发出警报。

3.7.6 NO Limits Example 一氧化氮限值示例

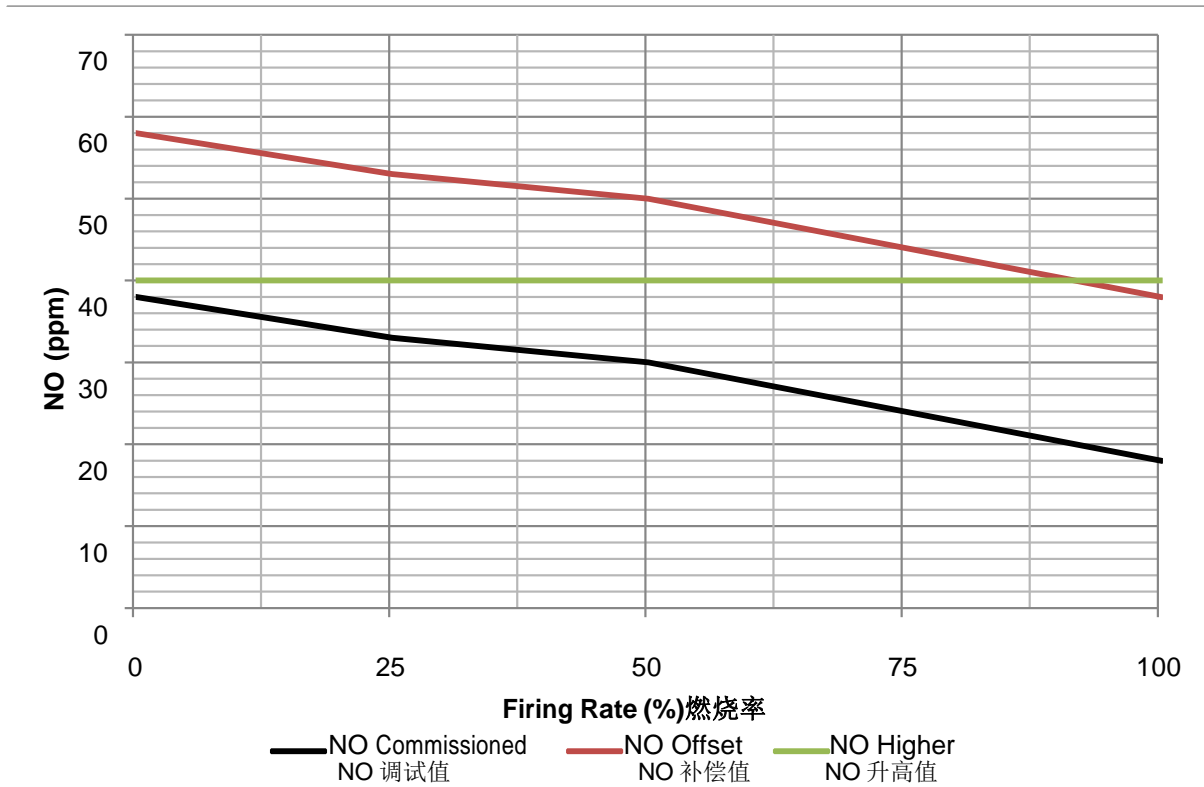


Figure 3.7.6.i NO Limits Example

图 3.7.6.i 一氧化氮限值示例

Figure 3.7.6.i shows an example of the NO limits. If the offset limit was set to 20ppm, then the burner would alarm (depending on the terminal 79 operation) when the actual NO value rose above 20ppm offset from the commissioned value. If the absolute higher limit was set to 40ppm, the burner would alarm when the actual NO value rose above 40ppm.

图 3.7.6.i 显示了一氧化氮限值示例。如果如果补偿限值设为 20ppm，当实际一氧化氮值从调试值升值高于 20ppm 补偿值时，燃烧器将发出警报（取决于终端 79 的操作）。如果绝对上限值设为 40ppm，当实际一氧化氮值升至大于 40ppm 时燃烧器将发出警报。

3.7.7 CO Limit Example 一氧化碳限值示例

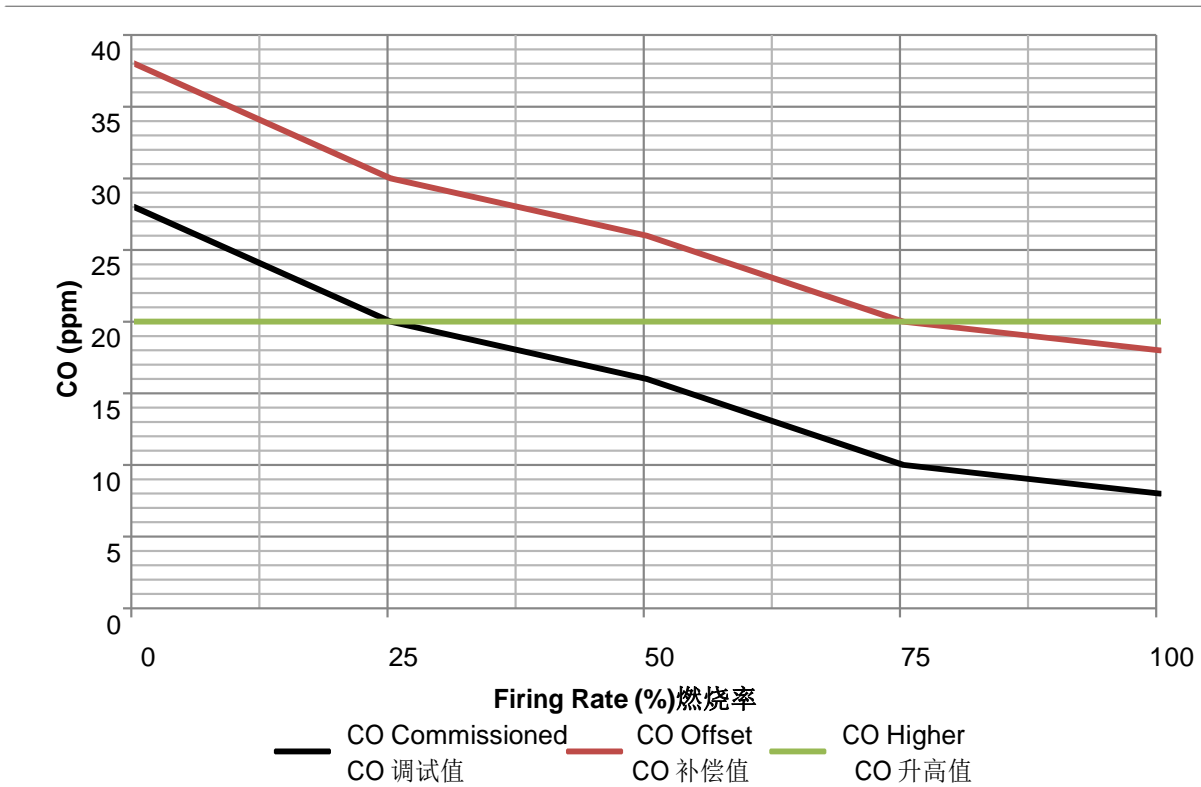


Figure 3.7.7.i CO Limit
图 3.7.7.i 一氧化碳限值示例

Figure 3.7.7.i shows an example of the CO limits. If the offset limit was set to 20ppm, then the burner would alarm (depending on the terminal 79 operation) when the actual CO value rose above 20ppm offset from the commissioned value. If the absolute higher limit was set to 20ppm, the burner would alarm when the actual CO value rose above 20ppm.

图 3.7.7.i 一氧化碳限值示例。如果如果补偿限值设为 20ppm，当实际一氧化碳值从调试值升值高于 20ppm 补偿值时，燃烧器将发出警报（取决于终端 79 的操作）。如果绝对上限值设为 20ppm，当实际一氧化碳值升至大于 20ppm 时燃烧器将发出警报。

3.7.8 Temperature Limits Example 温度限值示例

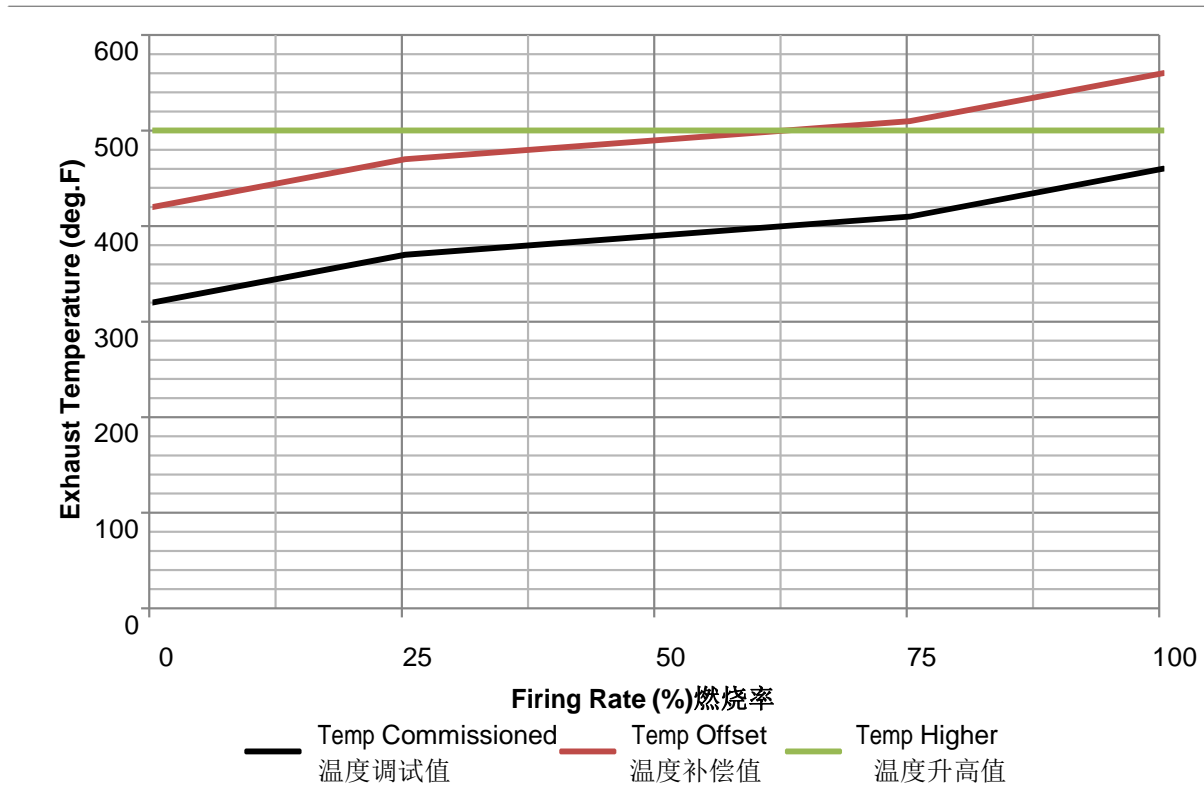


Figure 3.7.8.i Temperature Limits Example

图 3.7.8.i 温度限值示例

Figure 3.7.8.i shows an example of the exhaust temperature limits. If the offset limit was set to 100deg.F, then the burner would alarm (depending on the terminal 79 operation) when the actual exhaust temperature value rose above 100deg.F offset from the commissioned value. If the absolute higher limit was set to 500deg.F, the burner would alarm when the actual exhaust temperature value rose above 500deg.F.

图 3.7.8.i 显示了温度限值示例。如果补偿值设为 100 华氏度，当实际排气温度值升至大于 100 华氏度时，燃烧器将发出警报（取决于终端 79 的操作）。如果绝对上限值设为 500 华氏度，当实际排气温度值升至大于 500 华氏度时燃烧器将发出警报。

4 DIMENSIONS AND EQUIPMENT 尺寸和设备

4.1 Mk8 E.G.A. Dimensions Mk8 尾气分析仪尺寸

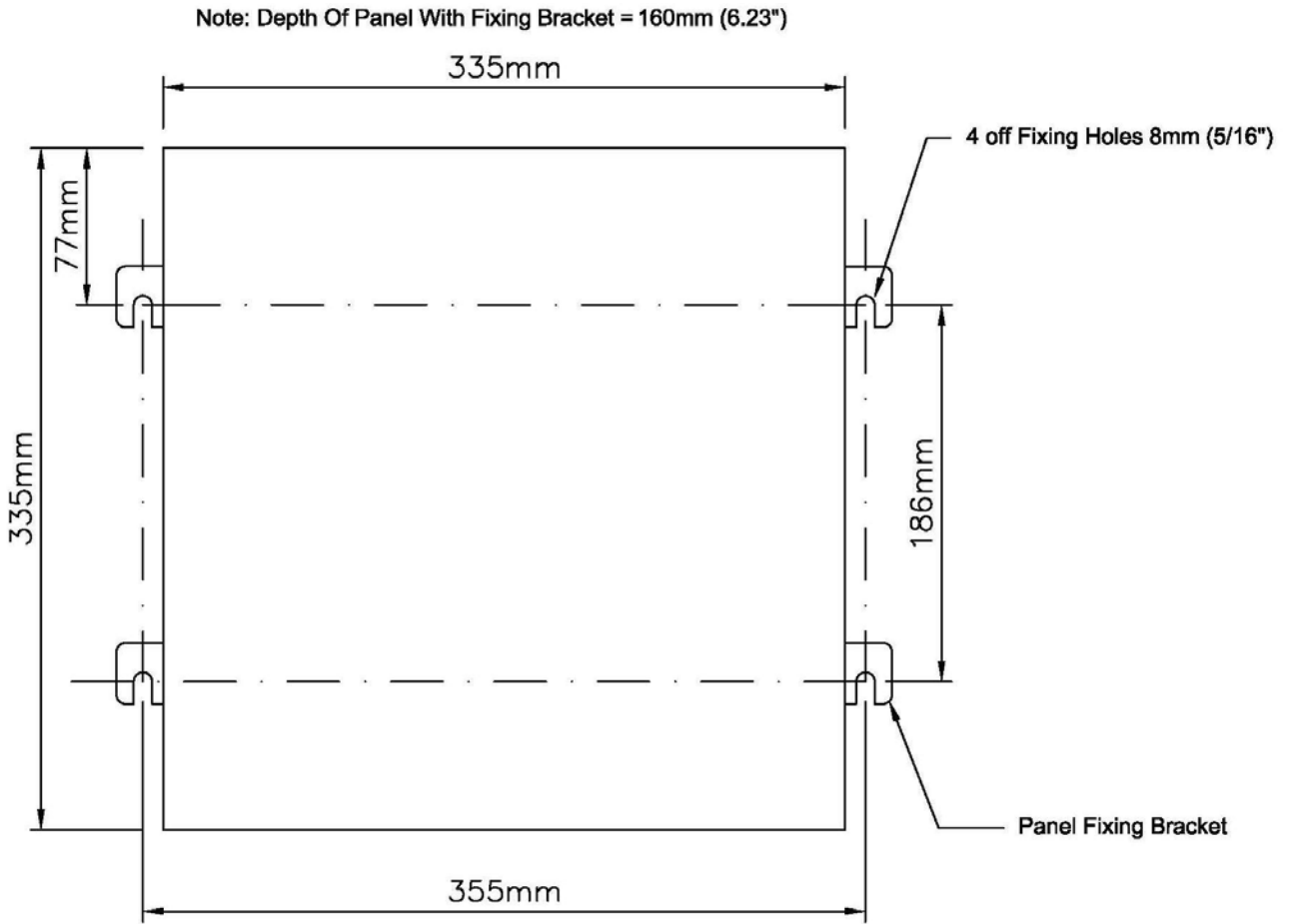


Figure 4.1.i Mk7 E.G.A. Dimensions

图 4.1.i Mk7 尾气分析仪尺寸

4.2 Technical Specifications 技术规范

Electrical 电气设备

Electrical Supply 电源	230/110V 50/60 Hz
Power 功率	160W
Max Power Consumption 最大功率消耗	225W
Fuse Rating 保险丝额定值	4A
Pump Flow 泵流量	110 – 120 mBar 600ml/min
Environmental Rating 环境额定值	IP20
	NEMA 1

Temperature Range 温度范围

E.G.A 尾气分析仪	Min: 5°C (40°F) 最小: 5°C (40°F) Max: 40°C (104°F) 最大: 40°C (104°F)
K Type Thermocouple K 型热电偶	0 - 400°C (32 - 752°F)
Sampling probe tubing 采用探头管	Max: 60°C (140°F) 最大: 60°C (140°F)

4.3 Sampling Probe 采用探头

4.3.1 Installation and Maintenance 安装和维护

E.G.A. Sampling Probe Installation 尾气分析仪采样探头的安装

1. Mount the sampling probe at an angle of approximately 45 degrees into the stack.
在排气管中按 45 度角安装采用探头。
2. Install a 1.5" BSP socket on the flue or other point that the sampling probe is to be positioned.
在烟道或其他位置安装一个 1.5" BSP 插座使采样探头定位。
3. Mount the main body of the probe as far in as possible; adjustment is made by loosening the grub screws in the flats of the 1.5" BSP bush supplied on the probe.
在尽可能远的位置安装探头主体，松开探头上 1.5" BSP 衬套的固定螺丝可以进行调节。
4. Keep the thermocouple cable and sample tube away from hot surfaces.
使热电偶电缆和采样管远离热表面。

Note: For correct E.G.A. operation the probe must be positioned without air leaks as this will give incorrect readings on all sensors.

注：为使尾气分析仪正确运行，探头必须正确定位而无空气泄漏，因为空气泄漏会使所有传感器的读数不准确。

E.G.A. Sampling System Unit Installation 尾气分析仪采样系统组件的安装

1. Push the sample tube onto the inlet tube. Plug the thermocouple connector into the socket and tighten the screw.
将采样管固定在进口管上，插入热电偶连接器并拧紧螺丝。
2. To obtain optimum performance and reliability do not mount the unit in ambient temperatures above 40°C (104°F) or areas of direct heat radiation. Ensure that the air flow to the intake in the bottom of the E.G.A. unit is not impeded and the air temperature is less than 40°C (104°F).
要获得最佳性能和稳定性，请勿将组件安装在环境温度高于 40°C (104°F) 的位置或有直接热辐射的位置。确保空气可以顺利流动至尾气分析仪组件的底部且空气温度小于 40°C (104°F)。
3. Do not mount the units where excessive vibration occurs.
勿将组件安装在有过度振动的位置。
4. Position the sample tube so that the sample slopes down to the E.G.A. unit at all times. The E.G.A. unit must always be mounted lower than the E.G.A. probe. This helps drain excessive condensate from the flue gases, which may cause blockages in the sample tube.
将采样管固定，使样本始终下倾斜至尾气分析仪。尾气分析仪组件必须安装在低于尾气分析仪探头的位置。这样有助于排出烟道气体中过多的冷凝水，否则可能会堵塞采样管。

Figure 4.3.1.i Incorrect and Correct Installation of an E.G.A. Unit.
图 4.3.1.i 尾气分析仪组件错误和正确安装方法

4.3.2 Sampling Probe Assembly 采样探头总成

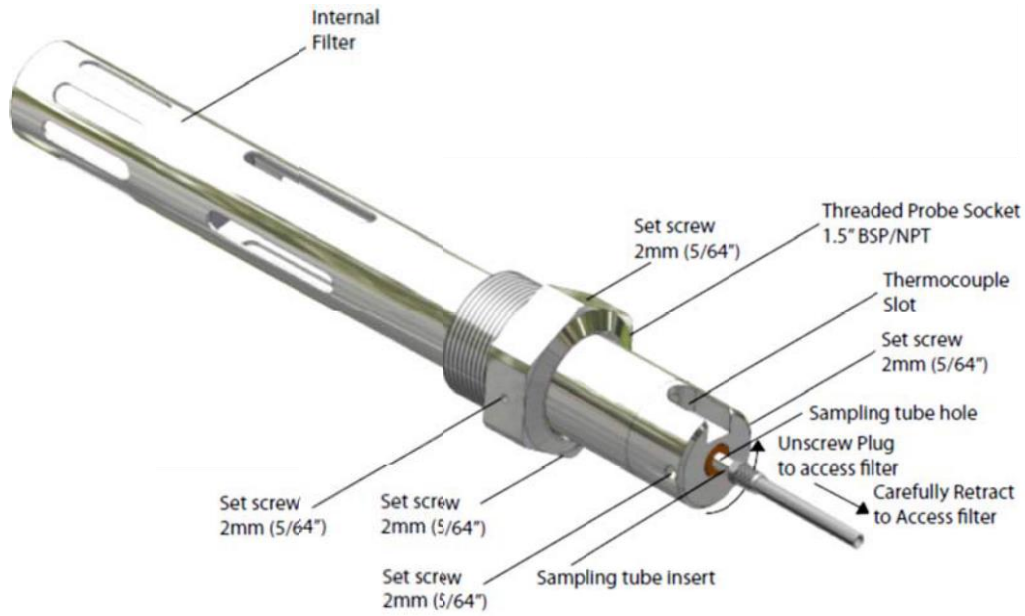
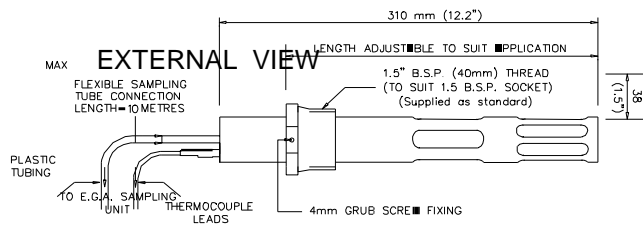
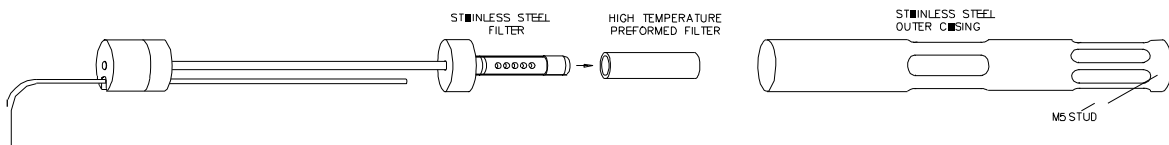


Figure 4.3.2.i Sampling Probe Assembly

图 4.3.2.i 采样探头总成



ASSEMBLY OF E.G.A. PROBE 尾气分析仪探头组装



E.G.A. PROBE 尾气分析仪 POSITIONED IN FLUE 装于烟道内

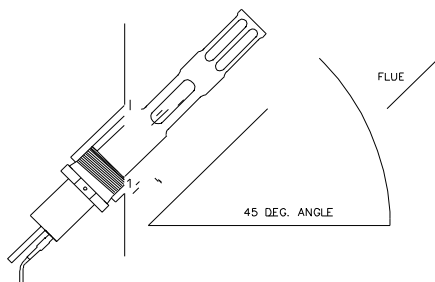
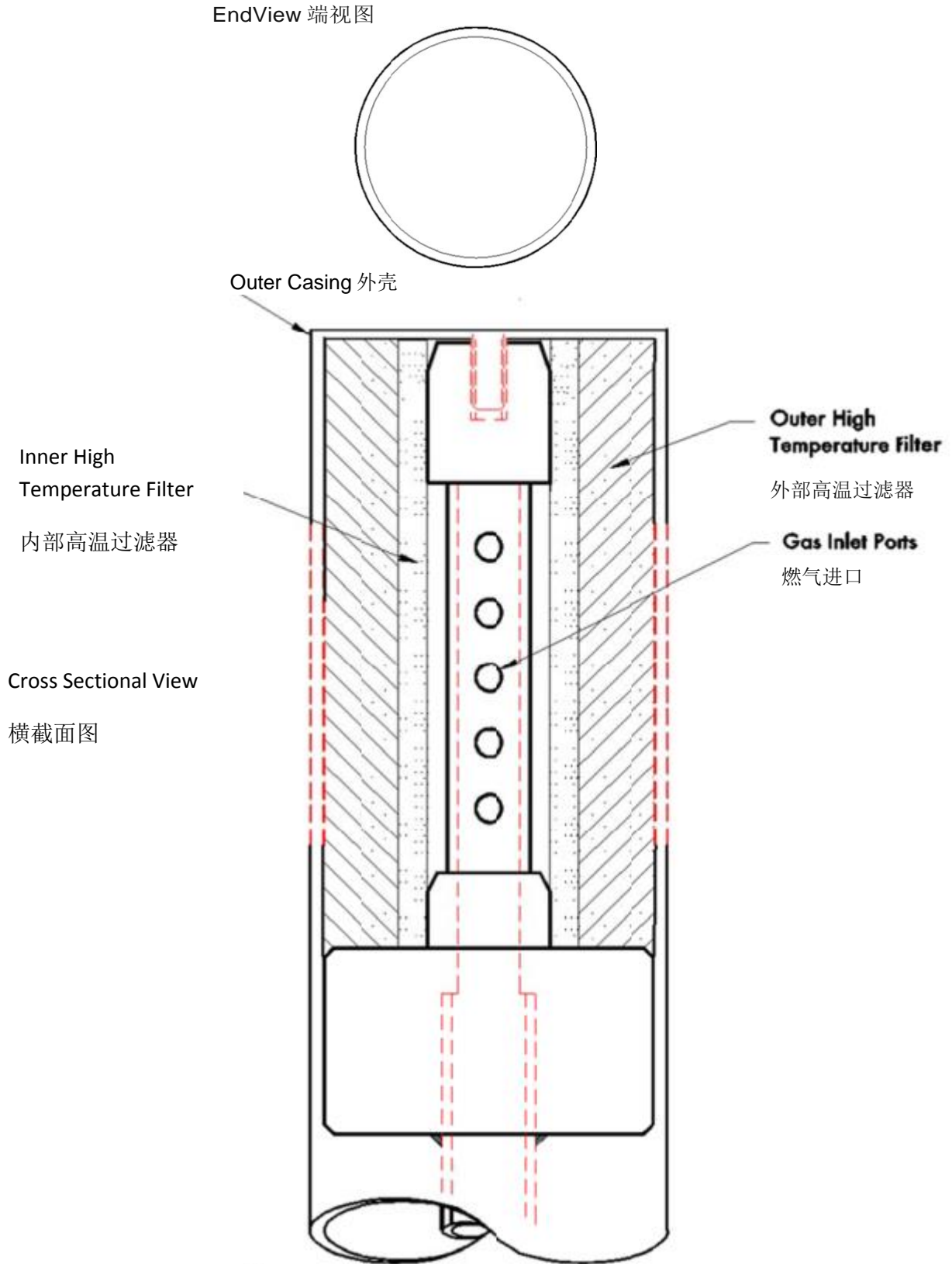


Figure 4.3.2.ii Sampling Probe Dimensions

图 4.3.2.ii 采样探头尺寸

4.3.3 Sampling Probe Internal Filter 采样探头内部过滤器



All Parts Manufactured From Stainless Steel 所有部件均用不锈钢制成

Figure 4.3.3.i Sampling Probe Internal Filter
图 4.3.3.i 采样探头内部过滤器

4.3.4 Sampling Probe Maintenance

采样探头的维护

On gas only applications it is unlikely that there should be continual maintenance required on the stack mounted probe. It is advised that the probe is checked annually on the gas firing applications in order to ensure that the probe is free of any blockages. On heavy or solid fuel applications, deposits may build up in the outlet part of the tube. If a blockage in the tube occurs a 'O₂ pump fault' will appear on the E.G.A. (See Section 5).

在仅使用燃气时，在排气管上安装的探头不可能进行连续不断的维护，我们建议每年对探头检查一次，确保探头没有堵塞。使用重燃料或固体燃料时在管道出口处可能会积累沉淀物，如果管道出现堵塞，尾气分析仪上将显示‘氧气泵故障’（见第 5 章节）。

The deposits can be cleared by running a long drill (7mm/0.275") up into the outlet tube by hand. Twist and withdraw the drill often so as to pull out the deposits, otherwise the deposits will be pushed further into the probe assembly.

用手将长钻头（7mm/0.275"）插入出口管可以清洁沉淀物，旋转钻头可以将沉淀物拉出，否则沉淀物将会被推入探头总成。

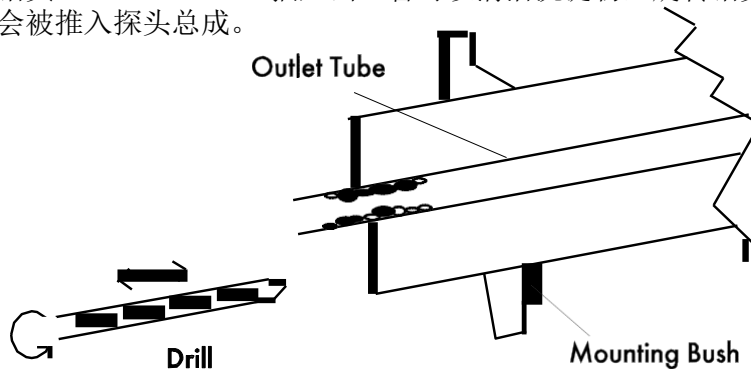


Figure 4.3.4.i Diagram to Show Method of Cleaning a Blocked Outlet Tube

图 4.3.4.i 清洁堵塞出口管方法示意图

4.3.5 Servicing E.G.A. Sampling Probe

尾气分析仪采样探头的维护

If the filter assembly in the E.G.A. sampling probe is blocked then it is necessary to disassemble the probe and fit a new pre-formed fine filter and coarse filter (Part Number SP70012). To check if the probe is blocked connect the probe to the E.G.A. and allow the E.G.A. to sample. If the pump pressure or flow rate drops below 110mBar or 550 ml/min respectively then the filtering material should be replaced.

如果尾气分析仪采样探头的过滤器总成出现堵塞，则有必要拆开探头并安装一个精细过滤器和粗过滤器（零件号 SP70012）。检查探头是否堵塞，将探头连接至尾气分析仪并使其开始采样。如果泵压力或流量分别降低至 110mBar 或 550 ml/分钟，则应该更换过滤材料。

To disassemble the probe, unscrew the casing from the base of the probe. See diagram in section 4.3.2. The whole of the internal assembly can now be withdrawn from the sample connection end.

需要拆开探头时先松开螺丝将外壳从探头底座上取下。见 4.3.2 章节的图示。然后可以从样本连接端将整个内部总成取下。

1. Remove the sampling tube and thermocouple from the E.G.A. and unscrew the end cap.
从尾气分析仪上取下采样管和热电偶并松开端盖。
2. Retract the filter and thermocouple from inside the probe at the same angle.
从探头内部按相同角度将过滤器和热电偶拉出。

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3. Replace the filter on the end of the thermocouple; the thermocouple can also be replaced.
更换热电偶端部过滤器，也可以更换热电偶。
4. Loosen the 2mm set screw located above the cap to extract the thermocouple.
松开固定在端盖的 2mm 固定螺丝将热电偶拉出。
5. Replace the thermocouple and retighten the set screw.
更换热电偶并拧紧固定螺丝。
6. Remove all traces of the filtering materials from the stainless steel filter.
从不锈钢过滤器中取出所有过滤材料。
7. Check that the stainless steel filter and inner sample tube are clear inside.
检查不锈钢过滤器和内部采样管内部是否干净。
8. Very carefully push the delicate pre-formed filter onto the stainless steel filter.
仔细将预装过滤器推入不锈钢过滤器。
9. Slide the inner assembly back into the stainless steel outer casing.
将内部总成滑至不锈钢外壳内。
10. Pack the void between the fine filter and the outer casing with coarse filtering material.
用粗过滤材料封住内部过滤器和外壳缝隙。
11. Use a small rod to pack the material down a little at a time.
用小棍向下推入过滤材料。
12. Reassemble by sliding the assembly into the casing and screw together.
将总成滑动至外壳内部并拧紧螺丝。
13. After reassembly connect the probe to the E.G.A. and check the pump pressure and flow.
重新组装后将探头连接至尾气分析仪并检查泵压力和流量。

4.4 Ancillary Equipment 辅助设备

4.4.1 External Particulate Filter 外部微粒过滤器

The external particulate filter (part no. EGA20103/D) is designed to be used when there is excessive moisture from the flue gases, or if there is excess particulates in the flue gases which may cause damage to the E.G.A. The external particulate filter stops excessive moisture from getting into the E.G.A. as it has its own drain solenoid to remove any excess moisture. This drain occurs at the same time intervals as the normal drain solenoid on the E.G.A. The external particulate filter has its own filter, capable of filtering excess particulates from the flue gases. We recommend that this external particulate filter be used for any heavy oil applications. Due to the nature of this product it can only be installed by Autoflame and cannot be fitted on site.

外部微粒过滤器（零件号 EGA20103/D）设计用于过滤烟道烟气中的水分和过多的微粒，因为过多的微粒可能损坏尾气分析仪。外部微粒过滤器使过多的水分不会进入尾气分析仪，因为过滤器中配备排水电磁阀用于清除过多的水分。排水过程与尾气分析仪上正常排水电磁阀同步工作。外部微粒过滤器配备自身的过滤器，可以过滤烟气中过多的微粒。我们建议在使用重燃油时使用外部微粒过滤器。因为产品比较特殊，因此需要 **Autoflame** 进行安装，过滤器不得在现场安装。

The external particulate filter can be ordered with a new E.G.A. or retrofitted onto an existing E.G.A. at our Autoflame London office.

外部微粒过滤器可以与新尾气分析仪一同订购，或由 **Autoflame** 伦敦办事处改装到现有的尾气分析仪中。



Figure 4.4.1.i External Particulate Filter
图 4.4.1.i 外部微粒过滤器

Note: For applications firing on heavy or dirty oil, an external particulate filter is highly recommended to be fitted with the Mk8 E.G.A.

注：在使用重燃油或脏油时强烈建议将外部微粒过滤器安装在 Mk8 尾气分析仪中。

The external particulate filter will need to be changed depending on the amount of particulate carried over from the combustion process. This could be a month or as little as once every 6 months, once the

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filter starts to discolour. Use the Bacharach scale of 5 as an indication as to when the filters need to be changed.

外部微粒过滤器根据燃烧过程中产生的微粒数量也需要及时更换，时间可能是一个月或每隔 6 个月更换一次，即过滤器开始褪色时。当过滤器需要更换时可以使用 5 级格林曼黑度计进行检查。

The filter material is fluorocarbon resin bonded, borosilicate glass microfibre designed to coalesce liquid particles through a two layer construction. The inner layer forms the main filtration and the coarser layer provides drainage. It is a type MCE 95% 25micron high efficiency filter. The filter should be fitted as in the Figure 4.4.1.ii ensuring that the filter operates correctly. Please note that there may be a discharge of liquid from the filter when in use. This is a design feature to drain any excess moisture from the flue before it reaches the E.G.A.

过滤材料是氟碳树脂和硼硅酸盐玻璃微纤维，设计可以通过两层结构聚结液体颗粒。内层形成主过滤层，粗过滤层用于排水。过滤器是一种 MCE 95% 25 微米高效过滤器。过滤器应按图 4.4.1.ii 所示固定，以确保过滤器正常工作。请注意过滤器在使用时可能会排出液体。这是过滤器的设计特点，当烟气到达尾气分析仪时用于排出烟气中过多的水分。

The inlet from the flue is connected to the horizontal section on the top of the filter. The vertical section is connected directly to the EGA inlet.

烟道入口连接过滤器顶部的水平部分，垂直部分之间连接尾气分析仪入口。

4.4.2 Air Inlet Filter 进气过滤器

The Mk8 E.G.A. air inlet filter (part no. EGA80106) is designed to protect the E.G.A. from dust and other particles that may cause damage or reduce the performance of the E.G.A. over time. The air inlet filter will fit over the fan that cools the E.G.A. and stop dust and particles from getting inside the E.G.A. The air inlet filter is easy to maintain with only the air filter material needing replacing once it has become saturated. The time between each change of air filter will depend on the site conditions.

Mk8 尾气分析仪进气过滤器（零件号 EGA80106）设计用于保护尾气分析仪远离灰尘和其他微粒，因为随着时间的推移灰尘和微粒可能会损坏尾气分析仪或降低其性能。进气过滤器将配备一个风机用于冷却尾气分析仪，阻止灰尘和微粒进入尾气分析仪。进气过滤器非常容易维护，过滤器堵塞时只需更换过滤器材料即可。更换过滤器的时间取决于现场环境。



Figure 4.4.2.i Air Inlet Filter
图 4.4.2.i 进气过滤器

While the E.G.A. can successfully be used to measure combustion exhaust gases when burning HFO, it is very important that the fuel is carefully maintained at a constant and known composition. The fuel temperature and pressure play a major role in the amount of particulate carry-over sampled, before combustion even takes place.

燃烧重燃料油时尾气分析仪可以用于成功地测量燃烧废气，重要的是需要小心地保持燃料含有恒定、已知的成分。在燃烧开始前，燃料温度和压力对采样的微粒量起到重要作用。

The burner must be regularly maintained to ensure complete combustion of the hydrocarbons. Failure to do so will result in premature failure of the E.G.A. Ensure the oil filter is regularly maintained and the oil nozzle is regularly inspected for fatigue.

燃烧器必须定期维护，确保碳氢化合物充分燃烧。如果燃烧不完全将导致尾气分析仪过早出现故障。确保定期维护燃油过滤器，定期检查喷油孔是否老化。

It is recommended that when the E.G.A. is used on a dual fuel application where natural gas is the primary fuel and HFO is the secondary fuel, the E.G.A. should not be monitoring the HFO exhaust. This can be achieved by simply isolating the E.G.A. when the HFO fuel is selected to be fired.

建议尾气分析仪用于双燃料时主燃料使用天然气，辅燃料使用重燃料油。尾气分析仪不会监视重燃料油的排气。当选择重燃料油燃烧时，可以通过隔离尾气分析仪实现监视排气的功能。

4.4.3 Chilled Environmental Enclosure 冷冻环境保护罩

The exhaust gas is vented into the air stream leaving the E.G.A. unit. This is located on the outside of the E.G.A. enclosure next to the drain solenoid outlet. It is extremely important that the exhaust gas is vented into atmosphere; **do not install an E.G.A. within a sealed enclosure**. Installing the E.G.A. in a sealed enclosure will cause the E.G.A. to calibrate on contaminated gases. The E.G.A. will self-calibrate every 12 hours of running or when the burner starts and stops.

废气排入空气流后被排出尾气分析仪，保护罩位于紧邻排水电磁阀出口的尾气分析仪外壳外部。确保废气排入大气非常重要，因此请勿将尾气分析仪安装在密闭的外壳内。将尾气分析仪装于密闭的外壳内可能使尾气分析仪对污染的燃气进行校准。尾气分析仪运行后每隔 12 小时或当燃烧器启动和停止时将自行校准一次。

In areas of harsh ambient conditions, or excessive heat, it is necessary to use an environmental enclosure with the E.G.A. module. This protects the E.G.A. from dust and ensures that the E.G.A. is well protected. Using the enclosures allows the E.G.A. to operate under optimal operating conditions.

在极端环境条件小或过热环境下有必要在尾气分析仪模块使用环境保护罩。这样可以防止灰尘进入尾气分析仪，保护尾气分析仪。使用保护罩后尾气分析仪可以在最佳运行条件下运行。

Autoflame manufacture a chilled environmental enclosure that uses a chiller module and control panel in order to maintain the E.G.A. installed within the enclosure at a set temperature to protect itself from excessive heat. The temperature is user adjustable by means of a thermostat counted on the unit but is nominally set for 35°C (95°F), which ensures ideal operating conditions for the E.G.A. Autoflame also manufacture a heated enclosure for low temperature and for anti-condensing sites.

Autoflame 生产了一种冷冻环境保护罩，配备了冷却器模块和控制面板，目的是使安装在保护罩内的尾气分析仪始终保持在预设温度下，防止尾气分析仪过热。预设温度由用户通过温控器设置，通常设为 35°C (95°F)，这样可以确保尾气分析仪在理想的运行条件下运行。Autoflame 还生产了一种用于低温环境的加热保护罩，可以防止冷凝。

If you require further information please contact Autoflame Technical Support.

如要获得更多信息，请联系 Autoflame 技术支持。

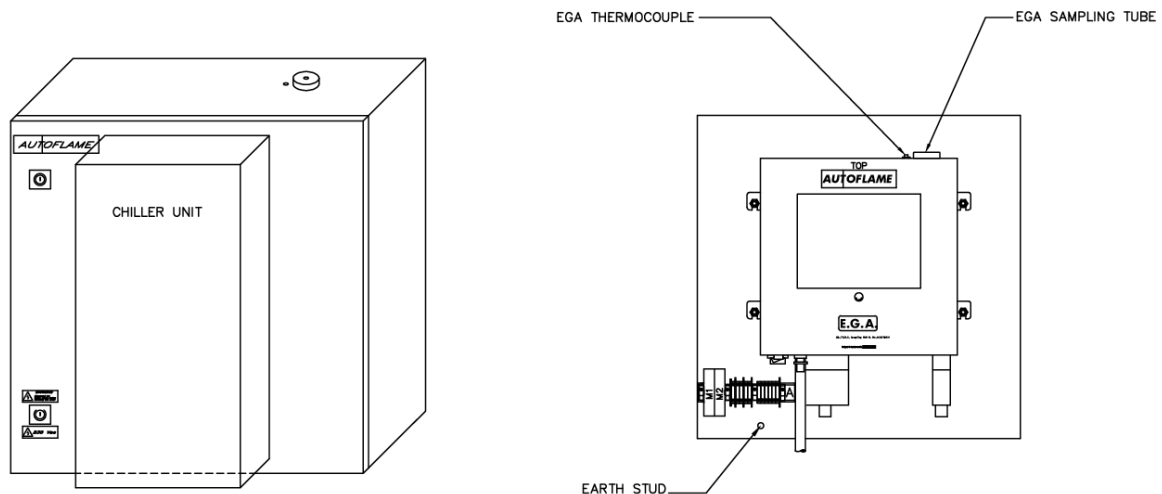
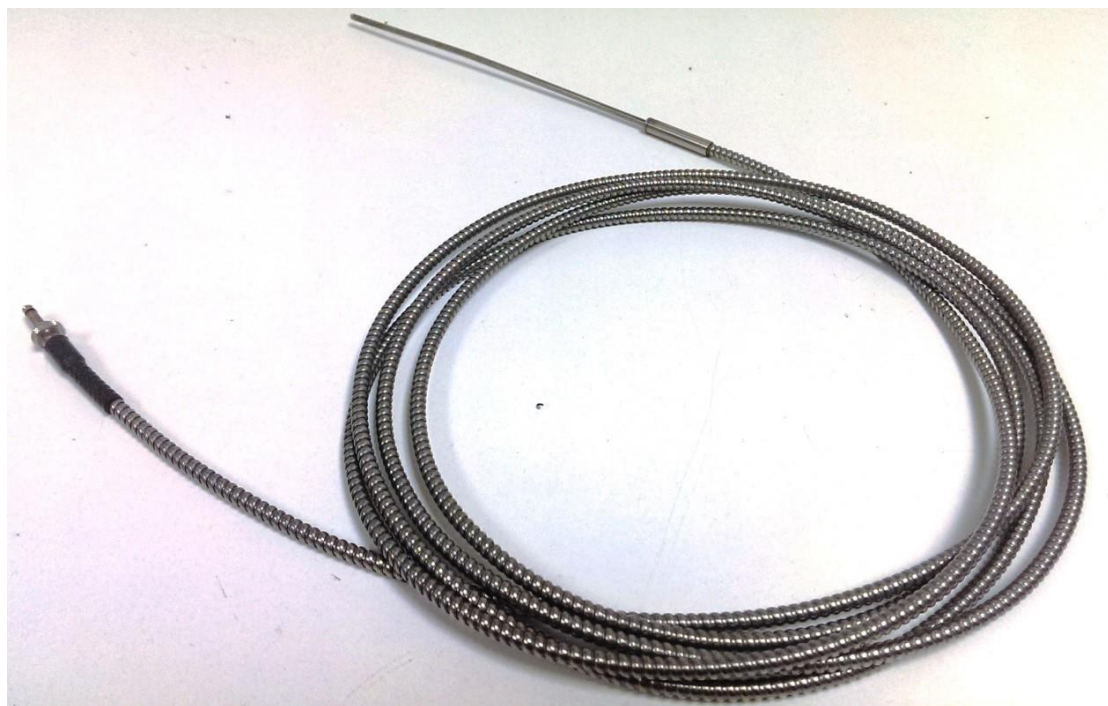


Figure 4.4.3.i Schematic of Chilled Environmental Enclosure

图 4.4.3.i 冷却环境保护罩示意图

4.4.4 Pre-Heat Air Sensor 预热空气传感器



A Pre-Heat Air Sensor has been incorporated into the Mk8 E.G.A. to ensure an accurate efficiency calculation when using pre-heated air. This Pre-Heat sensor uses a K-Type Thermocouple.

Mk8 尾气分析仪配备了预热空气传感器，可以确保在使用预热空气时获得准确的效率计算结果。预热传感器使用了 K 型热电偶。

5 ERROR CHECKING AND SELF-DIAGNOSTICS 错误检查和自诊断

5.1 E.G.A. Faults 尾气分析仪故障

In the event of an E.G.A. failure, an error will appear on the E.G.A. screen of the M.M. The M.M. will show 'See E.G.A. for fault description.' All other screens on the M.M. are still viewable whilst there is an E.G.A. error. The switched neutral alarm output Terminal 79 can be set to become active or remain inactive in the event of an E.G.A. error (see Option 12). The setting of Option 12 will determine how the burner will operate, i.e. continue to run based on the original commissioned values (trim and limits testing disabled) or lockout the burner until the E.G.A. error is reset and becomes fully operational once again.

尾气分析仪发生故障时控制模块的尾气分析仪屏幕上将显示错误消息。控制模块将显示‘查看尾气分析仪故障描述’。尾气分析仪出现错误时仍可以查看控制模块上的其他所有屏幕。中性报警输出终端 79 可以设置为在尾气分析仪出现错误（见选项 12）时启动或保持非活动。选项 12 的设置将决定燃烧器如何运行，即是否根据初始调试值（禁用调节和限值测试）继续运行或锁定燃烧器直至尾气分析仪错误被重置并可以再次开始工作。

Should the fault require the E.G.A. to be returned to Autoflame ensure the E.G.A. sampling system should be carefully packed into the carton in which it was supplied and marked "Fragile – Scientific Instruments" and "Do Not Drop".

出现故障时如果需要将尾气分析仪返回 Autoflame, 请将尾气分析仪采样系统小心地装入纸箱内,

5 Error Checking and Self-Diagnostics 错误检查和自诊断

我们将提供纸箱并标注“易碎-科学仪器”和“小心掉落”字样。

It is possible to remove and re-install the E.G.A. at a later date without the burner needing to be re-commissioning if using the trim function with an MM module. After removing the E.G.A. set Option 12 on the M.M. module to 0. Once the E.G.A. module is ready to be re-installed reset Option 12 back to the required setting, provided the combustion has not been changed either through commissioning mode or single point change the M.M. module will load up as normal and will not be required to be re-commissioned.

使用调节功能和控制模块是可以拆开尾气分析仪并在后期重装而不必对燃烧器进行重新调试。拆开尾气分析仪后请将控制模块上的选项 12 设为 0。尾气分析仪模块准备好重装时请将选项 12 重新设为需要的数值，但条件是燃烧未随着调试模式或单点变化而改变，此时控制模块将正常加载而无需重新调试。

When an error code appears on an M.M. module it is required that the error is reset on the M.M. module as well as the E.G.A. If the error is not reset on the M.M. the E.G.A. and M.M. will not communicate with each other. This will mean the E.G.A. will display “No Fuel Selected” when in run with M.M. mode until the error is reset.

控制模块出现错误代码时需要在控制模块和尾气分析仪上重置错误，如果无法在控制模块上重置错误，尾气分析仪和控制模块将无法互相通信。此时在控制模块模式运行情况下尾气分析仪将显示‘未选择燃料’直至错误被重置。

When first going into commissioning mode, the M.M. invokes an E.G.A. calibration. If an error occurs at this stage it will be necessary to investigate and resolve the error before restarting the commissioning procedure.

首次进入调试模式时，控制模块将调用尾气分析仪校准。如果此时发生错误，则需要在重启调试流程前检查并解决错误。

5.2 Troubleshooting 故障排除

5.2.1 Ambient Conditions 环境条件

1. Ambient Temperature – This will read Ok, High or Low. This must be between 5 – 40C (40 – 140 F) or the settings of Parameters 27/28. The temperature is measured by a sensor on the electronics PCB and is cross referenced with the sensor on the side of the CO₂ cell.
环境温度-环境温度读数包括正常、高或低。温度必须在 5-40°C (40 –140F)间或设置参数 27/28。温度通过电子电路板上的传感器进行测量，也可以使用二氧化碳感应器上的传感器。
2. E.G.A. Trim Threshold – This will be Ok or Low and is looking at the setting of Option 28. This value is an offset from the set point, before which the E.G.A. will not operate. This ensures that the E.G.A. does not pull in high amounts of condensation.
尾气分析仪调节阈值-阈值包括正常或低，取决于选项 28 的设置。该值时设定值的一种补偿值，在设定数值前尾气分析仪不会运行。这样可以确保尾气分析仪不会累积大量的冷凝水。
3. Chiller – This will be Ready or Not Ready. There is a temperature sensor on the chiller unit and this chiller must get down to a set temperature before the pump will start to draw a sample from the stack. If the chiller is not decreasing its temperature then check the operation of the fan. If the ambient air in the boiler house is high, it may be necessary to draw cooler air into the E.G.A. In warm environments, an air conditioned enclosure should be used; in cold environments a heated enclosure should be used.
冷却器-读数包括就绪或未就绪。冷却器上配备了一个温度传感器，冷却器在泵开始从排气管中提取样本前必须处于设定温度范围内。如果冷却器未降低其温度，则需要检查风机是否正常运行。如果锅炉房内的环境温度较高，则必须将冷空气送入尾气分析仪。在温暖的环境中可以使用空调，在寒冷环境中可以使用加热保护罩。
4. Comms – This can read Ok or Not Ok and this is checking for continuity between the E.G.A. and M.M. Check the wiring between the M.M. and E.G.A. modules.
通信-读数包括正常或不正常，用于检查尾气分析仪和控制模块间的连续性。检查控制模块和尾气分析仪模块间的接线。

5.2.2 Fuses 保险丝

If the E.G.A. is mounted in an excessively dusty environment a build-up of particles on the terminals can cause arcing. If the particles are corrosive then any attack to the conformal coating on the printed circuit boards can cause tracks to arc and component failure. Any sign of this activity and the unit should be returned to the supplier.

如果尾气分析仪安装在灰尘较多的环境下，终端上积累微粒后可能导致电弧击穿。如果微粒有腐蚀性，则会腐蚀印刷电路板，导致出现电弧和组件故障。出现上述情况时应将设备返回供应商。

5.2.3 O₂ Reading 氧气读数

If you get a continuous O₂ reading of 20%, this tells you that the Mk8 E.G.A. is sampling fresh air. To troubleshoot this:

5 Error Checking and Self-Diagnostics 错误检查和自诊断

如果您持续获得 20% 的氧气读数，这表明 Mk8 尾气分析仪正采样新鲜空气，请通过以下方法进行检查：

- Check all piping is airtight
- 检查所有管道是否密闭。
- Check sample tube is not blocked
- 检查采样管是否堵塞。
- Check that there are no leaks on the flue
- 检查排气管是否漏气。
- Check the pinch valve tubing for leaks
- 检查夹管阀管道是否泄漏。

5.3 Mk8 E.G.A. Faults Mk8 尾气分析仪故障

Error Code 错误代码	Description 说明	Type 类型	Troubleshooting 故障排除
1	Code Cell Invalid 代码感应器无效	Error – Permanent 错误-永久故障	Cell is invalid, cell not connected or EEPROM not programmed 感应器无效，感应器未连接或 EEPROM 未编程。
2	Cell Data Loaded 加载感应器数据	Warning – User Clear 警告-用户清除	Cell commissioning data re-loaded 重新加载感应器调试数据。
3	Blocked Input 输入阻塞	Error – User Clear 错误-用户清除	Input is blocked, as detected by input pressure reading 输入阻塞，用输入压力读数检测。
4	Blocked Output 输出阻塞	Error – User Clear 错误-用户清除	Output is blocked, as detected by barometric pressure reading 输出阻塞，用气压读数检测。
5	High Humidity 高湿度	Error – Auto Clear 错误-自动清除	Cell Humidity is above 95%, leading to erroneous readings 感应器湿度高于 95%，导致错误读数。
6	Ambient Temperature Low 环境温度低	Error – Auto Clear 错误-自动清除	Ambient Temperature is too low (<3oC) 环境温度过低 (<3℃)
7	Ambient Temperature High 环境温度高	Error – Auto Clear 错误-自动清除	Ambient Temperature is too high (>50oC) 环境温度过高 (>50℃)
8	Chiller Frozen 冷却器被冻住	Error – Auto Clear 错误-自动清除	Chiller Temperature has gone below zero 冷却器温度低于零度。
9	Chiller Temperature High 冷却器温度高	Warning – Auto Clear 警告-自动清除	Chiller cannot maintain required temperature 冷却器无法保持所需温度。
10	Chiller Output 冷却器输出	Error – Auto Clear 错误-自动清除	Chiller current sense is detecting incorrect current 冷却器电流检测到不正确电流。
11	Flow Out of Range 流程超出范围	Error – User/Auto Clear 错误-用户/自动清除	Pump cannot maintain pressure – for self-cal pump, this auto clears so that the calibration process can continue 泵无法保持压力-自校准泵，自动清除后检验步骤可以继续。
12	Self-Cal Low Pressure 自校准低压	Error – User Clear 错误-用户清除	Self-calibration gas supply pressure is too low 自校准燃气供给压力过低。
13	Self-Cal High Pressure 自校准高压	Error – User Clear 错误-用户清除	Self-calibration gas supply pressure is too high 自校准燃气供给压力过高。
14	HSL Out of Range HSL 超出范围	Error – Auto Clear 错误-自动清除	HSL cannot maintain temperature HSL 无法保持温度。
15	Excessive Calibration Drift 校准偏差较大	Error – Permanent Fault 错误-永久故障	Re-calibration resulted in too large value change – only applies to self-cal/MCERTs configured EGAs 再校准导致过大的数值变化-仅使用自校准/MCER 配置的尾气分析仪。
16	Temperature Sensor 温度传感器	Error – User Clear 错误-用户清除	Temperature sensor is faulty – see temperature sensor faults below 温度传感器故障-见以下温度传感器故障章节
17	Pressure Sensor 压力传感器	Error – User Clear 错误-用户清除	Pressure sensor is faulty 温度传感器发生故障。

5 Error Checking and Self-Diagnostics 错误检查和自诊断

Error Code 错误代码	Description 说明	Type 类型	Troubleshooting 故障排除
18	Chemical Sensor 化学传感器	Error – Permanent Fault 错误-永久故障	Chemical sensor is faulty 化学传感器发生故障。
19	Optical Sensor 光学传感器	Error – Permanent Fault 错误-永久故障	Optical sensor is faulty 光学传感器发生故障。
20	Fan Blocked 风机堵塞	Error – Auto Clear 错误-自动清除	Error – Auto Clear 错误-自动清除。
21	EEPROM Write Failed EEPROM 写入失败	Error – Auto Clear 错误-自动清除	EEPROM data could not be written after 10 attempts 10 次尝试后无法写入 EEPROM 数据。
128	Display Communications 显示通信	Error – Auto Clear 错误-自动清除	Communications to the display has been lost 显示的通信丢失。
129	Display CEMS WriteFail 显示 CEMS 写入失败	Error – User Clear 错误-用户清除	Display is unable to write CEMS data to the SD card 显示无法将 CEMS 数据写入 SD 卡。

Temperature Sensor Faults 温度传感器故障

Error Code 错误代码	Description 说明	Type 类型	Troubleshooting 故障排除
0	Temperature Probes 温度探头	Error/ Warning – User Clear 错误/警告-用户清除	Thermocouple sensor in exhaust probe has a fault 热电偶传感器内部排气探头发生故障。
1	Temperature HSL 温度 HSL	Error / Warning – User Clear 错误/警告-用户清除	Thermocouple sensor in HSL jacket has a fault 热电偶传感器内部 HSL 外壳发生故障。
2	Temperature Chiller In 冷却器内部温度	Not Used 未使用	Thermistor sensor for chiller inlet has a fault 冷却器入口热敏电阻传感器发生故障。
3	Temperature Chiller Out 冷却外部温度	Warning – Auto Clear 错误-自动清除	Thermistor sensor for chiller output has a fault 冷却器出口热敏电阻传感器发生故障。
4	Temperature Unused 未使用温度	Not Used 未使用	Thermistor sensor has a fault 热敏电阻传感器发生故障。
5	Temperature Cell 温度传感器	Error – User Clear 错误-用户清除	Thermocouple sensor for pre-heated combustion air temperature has a fault 预热燃烧空气温度热电偶传感器发生故障。
6	Temperature Heat Pre- 预热温度	Error – User Clear 错误-用户清除	Thermocouple sensor for pre-heated combustion air temperature has a fault 预热燃烧空气温度热电偶传感器发生故障。
7	Temperature Ambient 环境温度	Error – User Clear 错误-用户清除	On-board ambient air temperature sensor has a fault 车载环境空气温度传感器发生故障。
8	Temperature Chiller 冷却器温度	Error – User Clear 错误-用户清除	Thermistor sensor in chiller block has a fault 冷却器组热敏电阻传感器发生故障。
9	Temperature CO2 二氧化碳温度	Error – User Clear 错误-用户清除	Thermistor sensor in CO2 block has a fault 二氧化碳热敏电阻传感器发生故障。

5.3.1 Trim Delay 调节延迟

On burner start-up without calibration the E.G.A. performs a drain and starts sampling at 20.9% O₂ (fresh air), which then reduces to the commissioned value. Enough time must be given before the E.G.A. commences trim, to ensure that it is not correcting the air damper at high O₂ values. The total time delay before the E.G.A. starts to trim is based on the boiler's residence time. If the total time delay before trim starts it too short, then a scenario could arise where the E.G.A. reads 5%O₂ and over-trims on air damper, reducing the O₂ too far.

燃烧器启动后未校准时尾气分析仪将开始排水并在 20.9%氧气（新鲜空气）条件下开始采样，这样将降低调试值。因此在尾气分析仪开始调节前必须留出足够的时间，确保在高氧值时不会纠正空气挡板。尾气分析仪开始调节前的总时间延迟取决于锅炉的停留时间。如果调节开始前总时间延迟较短，尾气分析仪将读取 5%氧气并过度调节空气挡板，过度减少氧气。

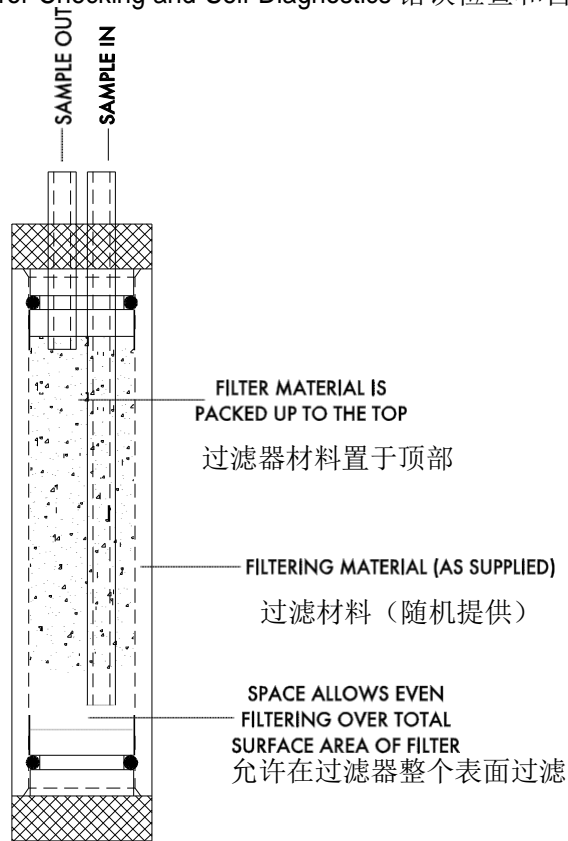
If calibration on start-up is active, option 32 (trim delay) must be greater than the calibration time (parameter 24). A minimum of 40 seconds should be added. Parameter 24 is set as default to 120 seconds, so option 32 should be set to a minimum time of 160 seconds. The total time before trim is applied is 200 seconds (option 32 + parameter 8); this will also depend on the boilers residence time. 如果启动时开始校准，选项 32（调节延迟）必须大于校准时间（参数 24），至少要增加 40 秒。参数 24 设为默认的 120 秒时，选项 32 应设为至少 160 秒。调节前的总时间则为 200 秒（选项 32+参数 8）。这也取决于锅炉的停留时间。

5.3.2 Assembly of Dry Filter 干滤器的组装

If pump faults are occurring on the E.G.A. it is advised to check the dry filter in the E.G.A. and check for any blockages and make sure that the filter material has not become saturated.

如果尾气分析仪上的泵发生故障，我们建议检查尾气分析仪内的干滤器和是否堵塞，确保过滤材料未饱和。

5 Error Checking and Self-Diagnostics 错误检查和自诊断



**N.B. FREE SPACE MUST BE LEFT AT BOTTOM TO STOP ANY PREMATURE BLOCKAGE
THE SAMPLE IN & OUT PIPES MUST BE CONNECTED CORRECTLY OR BLOCKAGE
WILL OCCUR WITHIN A FEW HOURS.**

注意底部必须留有自由空间以防止过早堵塞。必须正确连接样本进出口管，否则在几小时内就会发生堵塞。

This filter is specifically used as a dry filter to remove dust particulate before the dry gas passed into the cells. The filter is carefully packed as a complete replacement part and should be repacked or the filter material changed in the field, as the filter is critically calibrated for a specific pressure drop. The filter should always be dry, if any carryover of liquid or moisture is sent in the filter, please isolate the E.G.A. and contact Autoflame Technical Support.

该过滤器专门用作干滤器，用于在干燃气进入感应器前清除灰尘微粒。干滤器作为完整的替换件经过仔细包装，在现场需要重新包装或更换过滤材料，因为该过滤器是按特定的压降进行校准。干滤器应始终保持干燥，如果过滤器内出现液体或水份，请隔离尾气分析仪并联系 Autoflame 技术支持。

5.4 E.G.A. Best Practice

尾气分析仪的最佳应用

The E.G.A. is a sensitive instrument used to analyse the exhaust gases in the flue, so it needs to be serviced regularly to ensure accurate readings are taken for the trim function to maintain safe operation. The following guidelines should be applied to all E.G.A. applications:

尾气分析仪是一种非常灵敏的仪器，用于分析烟道内的废气，因此需要定期维护，确保通过调节功能获得准确的读数，保证安全运行。以下准则适用所有尾气分析仪应用领域：

- The E.G.A. should be checked before installing it on site. It is advisory that E.G.A. remains upright during any tests and checks. Thereafter the E.G.A should be turned off for a period (couple of hours), and turned back on again to drain out any excess moisture remaining in the E.G.A.

现场安装前应检查尾气分析仪，建议在测试和检查时保持尾气分析仪直立。然后关闭尾气分析仪几小时后再次启动排出内部剩余的过多水分。

- The Autoflame E.G.A. sampling probe thermocouple is rated at a max temperature of 400°C (752°F). We would recommend the E.G.A. to be fitted into a chilled enclosure when being used in high temperature condition. For environments with high humidity, a chilled enclosure is recommended to avoid corrosion on the board.

Autoflame 尾气分析仪采样探头热电偶的额定最大温度是 400°C (752°F)，因此在高温环境下我们建议为尾气分析仪配备一个冷却外壳。在高湿环境下我们同样建议使用冷却外壳以避免电路板发生腐蚀。

- The E.G.A. sample line length is recommended to be 3m.

尾气分析仪采样线的长度推荐为 3m。

- Pump Failure 泵故障

- A build-up of condensation in the E.G.A could result from incorrect installation installed correctly. Make sure the probe is located at 45° to the stack, and the sampling tube is not wound up.

尾气分析仪内积聚冷凝水可能是因为不正确安装所致，请正确安装，确保探头位于排气管 45°位置且采样管上无东西缠绕。

- Condensation could also occur from the load demand not being so high at certain times, so it may mean that the back end temperature of the boiler is not high enough. Therefore it will not be warm enough to evaporate the condensation quick enough, causing a large build-up of moisture.

冷凝水还可能是因为在特定时间段负荷要求不高所致，这表明锅炉的后端温度不够高。因此没有足够热量快速蒸发冷凝水，导致水分积聚。

- Cooler not ready 冷却器未就绪

- There is a temperature sensor in the chiller block and this must read below 12°C(55°F) before the E.G.A, is ready to sample

冷却器组配备了一个温度传感器，尾气分析仪在准备采样前冷却器的温度读数必须低于 12°C(55°F)。

- If the unit is started up for the first time, this could take a while for the unit to cool down.

首次启动冷却器组时可能需要一段时间冷却。

- If the fan is not working, this could cause the problem. The fan may be running slow or the peltier devices may have failed.

风机不工作时可能出现问题。风机运行速度慢或半导体制冷元件出现故障。

- If extension tubing is attached to the drain solenoid, ensure the end of the tubing is clear of any obstructions or contaminants. When the E.G.A. performs an air calibration, the air is sucked into the E.G.A. through the solenoid.

水电磁阀上连接延伸管时请确保管端部无任何障碍物或污染物。尾气分析仪进行空气校准时，空气通过电磁阀被吸入尾气分析仪。

5 Error Checking and Self-Diagnostics 错误检查和自诊断

- If the E.G.A. is placed in an enclosure or cabinet, to avoid the E.G.A. being recalibrated on contaminated gases, ensure that the drain solenoid is taking in fresh air during calibration.
尾气分析仪放置在机壳或机柜内时请避免尾气分析仪对污染的燃气进行重新校准，确保排水电磁阀在校准期间吸入新鲜空气。
- The E.G.A. O₂, CO, NO, SO₂ and NO₂ cells have a 6 month shelf-life. If ordering an E.G.A. for project that will be installed later we would advise to purchase an E.G.A. without these cells, and then purchase the cells when they are due to be installed. This E.G.A. will come with the CO₂ cell only (patent no: MM72004/NC) as this can only be fitted at Autoflame office. We recommend that the cells are replaced 12-18months for gas firing from manufacturing date and 6-12 months for heavy oil firing applications.
尾气分析仪的 O₂、CO、NO、SO₂ 和 NO₂ 感应器有 6 个月的保质期。如果订购一个尾气分析仪并在后期进行安装时，我们建议先购买不带感应器的尾气分析仪，然后在安装时再购买感应器。尾气分析仪仅标配二氧化碳感应器（专利号：MM72004/NC），因为感应器只可在 **Autoflame** 进行安装。我们建议使用燃气燃烧时每隔 12 至 18 个月更换一次感应器，在使用重燃油燃烧时每隔 6 至 12 个月更换一次。
- An external particulate filter should be used for applications:
外部微粒过滤器可以用于：
 - Firing on heavy or dirty oil
重燃油或脏燃油燃烧
 - Environments with dust and particulate
多尘和多微粒的环境
 - Extremely cold conditions
极端寒冷环境。
 - High humidity environments
高湿环境。
- During commissioning and single point change, the E.G.A. must be given enough time to read an accurate sample of the exhaust gases. This set at 45 seconds to default (parameter 4). Also the time for which the fuel rich and air rich positions are held during commissioning should be set correctly so that the E.G.A. has enough time for the readings to stabilise. This is set to 60s as default on the M.M. (Parameter 9).
在调试和单点改变期间，尾气分析仪必须有足够的时间读取废气的准确样本，需要设为默认值为 45 秒（参数 4）。调试期间富油和富氧位置的时间应正确设置，这样尾气分析仪就有足够的时间读取，此时需要在控制模块（参数 9）上设置默认值为 60 秒。

5.4.1 Servicing the E.G.A. 尾气分析仪的维护

Due to the technology used within the Autoflame E.G.A, to ensure accurate and reliable operation the E.G.A. requires annual servicing. Servicing the E.G.A. and sampling probe is crucial to maintaining the correct operation of the E.G.A. must be done regularly. For firing on natural gas, the E.G.A. must be sent back every 12-18 months depending on the boiler room conditions. For firing on oil, this would be shortened to 6-12 months. Failure to send back the E.G.A. when it is due for a service will cause the operation and life of the E.G.A. to deteriorate. The cells will need to be replaced as they are calibrated instruments which lose accuracy over time and use. The probe is constantly sampling the gases and can become easily clogged with debris and dirt picked up from the burner, without a service this can result in incorrect readings which affect the reliability of the E.G.A. Further issues such as pump problems, chiller faults and inaccurate trim operation will occur.

由于 Autoflame 尾气分析仪使用了高科技，因此为确保准确可靠的运行，需要每年对尾气分析仪进行维护。维护尾气分析仪和采样探头对其正确运行至关重要，因此必须定期进行。使用天然气燃烧时，根据锅炉房的环境尾气分析仪必须每隔 12 至 18 个月返还公司进行维护。使用燃油燃烧时，每隔 6 至 12 个月需要返还。尾气分析仪在需要维护时未返还维护将会影响尾气分析仪的运行和寿命。感应器在长期使用后精度会降低，因此也需要进行定期更换。探头因为长期进行采样工作，很容易被积累在燃烧器中的碎屑和灰尘堵塞，如果不及时维护将会导致读数不准确，影响尾气分析仪的可靠性。另外也可能回发生泵故障、冷却器故障和不准确的调节操作。

5.4.2 Shipping the E.G.A. 尾气分析仪的运输

The E.G.A. is a scientific instrument with delicate components. Whenever the E.G.A. is shipped it is essential that the E.G.A. is returned using its original packaging.
尾气分析仪是一种配备精密组件的科学仪器，因此在运输时需要使用原包装。

To avoid any potential damage to the E.G.A. during transit and to stop the PCBs from flexing there are pads between the two PCBs of the Mk8 E.G.A., and the casing of the E.G.A. and the PCBs. This extra support stops flexing of the PCBs during transit. The top of the cells will be covered in bubble wrap to protect them from damage during transit. Before powering up the E.G.A., the bubble wrap must be removed from the E.G.A., however the pads can remain between the PCBs. The pads will affect the operation of the E.G.A. and will help protect the E.G.A. from damage when it is shipped back to Autoflame for its annual service.

为避免在托运时对尾气分析仪造成损坏，使电路板弯曲，在 Mk8 尾气分析仪的两块电路板、尾气分析仪外壳和电路板间都提供了衬垫。这种额外的保护可以防止电路板在运输时发生弯曲。感应器顶部盖有泡沫垫，可以保护感应器在运输时不会损坏。尾气分析仪在上电前必须清除泡沫垫。但衬垫可以保留在电路板间。衬垫将会影响尾气分析仪的运行，将尾气分析仪返还 Autoflame 进行每年维护时衬垫可以保护其不受损坏。

Ensure that couriers treat the package appropriately and labelled as containing a delicate scientific instrument. If the E.G.A. is damaged in transit, repair costs will be incurred.

确保快递员小心的处理包装，在包装上应贴上标签注明是精密的科学仪器。如果尾气分析仪在运输时损坏将会产生维修费用。

Please contact Autoflame or your local Tech Centre to obtain new Autoflame E.G.A. packaging.
请联系 Autoflame 或当地技术中心获取尾气分析仪的新包装。

6 STANDARDS 标准

UL 353

CSA C22.2 No. 24

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