

AUTOFLAME[®]

燃烧控制管理系统



**MK8 EGA EVO
MM82004/E
Setup Guide**

**MK8 烟气分析仪 EVO
MM82004/E
安装指南**

2022.04.29



燃 烧 控 制 管 理 系 统

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Technical Manual 技术手册

Mk8 EGA EVO Setup Guide Mk8 烟气分析仪 EVO 安装指南

Part No. MM82004/E

2022.04.29

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CONTENTS 目录

1 INSTALLATION AND WIRING

安装和接线.....	1
1.1 Mk8 EGA MK8 烟气分析仪.....	1
1.1.1 Inside View 内视图.....	2
1.2 Fixing Holes and Dimensions 固定孔和尺寸.....	3
1.3 Technical Specifications 技术规范.....	4
1.4 Standards 标准.....	5
1.5 Flying Lead Wiring 连接线.....	6
1.5.1 EGA Connections 烟气分析仪连接.....	6
1.5.2 Flying Leads 接线.....	7
1.6 Installing Sampling Probe and EGA 安装采样探头和烟气分析仪.....	8
1.6.1 Sampling Probe Dimensions 采样探头尺寸.....	8
1.6.2 Sampling Probe – Internal Layout 采样探头内部结构.....	10
1.6.3 Assembly of Dry Filter 干滤器的组装.....	11
1.6.4 Sampling Probe Installation 采样探头的安装.....	12
1.6.5 EGA Installation 烟气分析仪的安装.....	15
1.6.6 Cable Specification 电缆规范.....	16
1.7 Wiring Schematics 接线示意图.....	18
1.7.1 Connection between EGA and Mk8 MM 烟气分析仪和 Mk8 控制模块的连接.....	18
1.7.2 Connection between EGA, MM and DTI 烟气分析仪、控制模块和数据传输接口的连接.....	19
1.7.3 Connection between EGA and DTI 烟气分析仪和数据传输接口的连接.....	20
1.8 Ancillary Parts 辅助部件.....	21
1.8.1 Air Inlet Filter 进气过滤器.....	21
1.8.2 External Particulate Filter 外部微粒过滤器.....	22
1.8.3 Chilled Environmental Enclosure 冷冻环境保护柜.....	23
1.8.4 Pre-Heated Air Sensor 预热空气传感器.....	26
2 COMMISSIONING EGA 调试烟气分析仪.....	27

2.1	Operating Modes	
	运行模式	27
2.1.1	EGA through MM	
	通过控制模块连接烟气分析仪	27
2.1.2	Standalone EGA	
	单机运行烟气分析仪	30
2.2	EGA Settings	
	烟气分析仪的设置	31
2.2.1	Commission Mode Settings	
	调试模式设置	34
2.2.2	Fuel Setup Settings	
	燃料设置	35
2.2.3	Analogue Setup Settings	
	模拟量设置	44
2.3	Commissioning MM with EGA	
	使用 EGA 烟气分析仪调试 MM 控制模块	57
2.4	Calibration Schedule	
	校准计划	59
2.5	Resetting Data	
	重置数据	62
2.5.1	Reset Cells to Factory Calibration	
	重置传感器至出厂设置	62
2.5.2	Reset Run Times	
	重置运行时间	62
2.5.3	Reset Other Data	
	重置其它数据	63
3	SYSTEM CONFIGURATION	
	系统设置	64
3.1	Language	
	语言	64
3.2	Set Clock	
	设置时钟	65
3.3	Online Changes	
	在线修改	66
3.3.1	Settings	
	设置	66
3.3.2	Fuel Setup	
	燃料设置	66
3.3.3	Calibration Schedule	
	校准计划	67
3.4	Run Times	
	运行时间	68
3.5	Diagnostics	
	故障诊断	69
3.6	System Log	
	系统日志	70
3.7	Manual	
	用户手册	71
3.8	Cell Information	
	传感器信息	72
3.8.1	O ₂ Cell Characteristics	
	氧气传感器特点	73

3.8.2	CO, NO, NO ₂ and SO ₂ Cell Characteristics CO, NO, NO ₂ 和 SO ₂ 传感器特点	74
3.8.3	CO ₂ Sensor CO ₂ 传感器	75
3.9	Calibrate Now 立即校准	75
4	EGA OPERATION	
	烟气分析仪操作	76
4.1	Sampling Screen Icons 采样屏幕图标	76
4.1.1	Temperature 温度	77
4.1.2	Emissions 排放	78
4.1.3	Pressure 压力	79
4.1.4	Fuel Flow 燃料流量	80
4.1.5	Faults 故障	81
4.2	EGA Overview 烟气分析仪概述	82
4.2.1	Features and Benefits	82
	特点和优点	82
4.2.2	System Operation 系统运行	82
4.2.3	Overview of 3-Parameter Trim 3 参数微调概述	83
4.3	EGA Trim Function 烟气分析仪微调功能	85
4.3.1	Trim Operation 微调操作	85
4.3.2	Importance of Measuring 3-Parameters 测量 3 参数的重要性	85
4.3.3	Trim Correction Calculation 微调校正值的计算	88
4.3.4	Trim Timing Operation 微调时序操作	91
4.3.5	Channel 5 Trim (Mk8 MM Only) 通道 5 的微调 (仅用于 Mk8 控制模块)	92
4.3.6	Trim Delay 微调延迟	92
4.4	Combustion Efficiency Calculations 燃烧效率的计算	93
4.5	Combustion Limits 燃烧限值	94
4.5.1	O ₂ Combustion Limits 氧气燃烧限值	95
4.5.2	NO Combustion Limits 一氧化氮燃烧限值	96
4.5.3	CO Combustion Limits 一氧化碳燃烧限值	97
4.5.4	Temperature Limits 温度限值	98
4.6	Emission Gases Data Logging Units 烟气排放数据日志单元	99

4.7	Downloading EGA Long Term Logs 下载烟气分析仪长期日志	99
5	REMOTE MONITORING	
	远程监控	101
5.1	Overview 概述	101
5.2	Wiring 接线	101
5.3	Direct Modbus Settings Modbus 设置	102
5.4	Modbus Addresses Modbus 地址	103
6	SERVICING AND TROUBLESHOOTING	
	维护和故障排除	105
6.1	Servicing 维护	105
6.1.1	Sampling Probe Maintenance 采样探头的维护	105
6.1.2	Servicing EGA Sampling Probe 烟气分析仪采样探头的维护	106
6.2	Shipping 运输	107
6.3	Fault Codes 故障代码	108
6.3.1	General Troubleshooting 一般故障排除	112
6.3.2	Faults on MM 控制模块故障	112

1 **INSTALLATION AND WIRING**

安装和接线

1.1 **Mk8 EGA**

MK8 烟气分析仪



1.1.1 Inside View
内视图

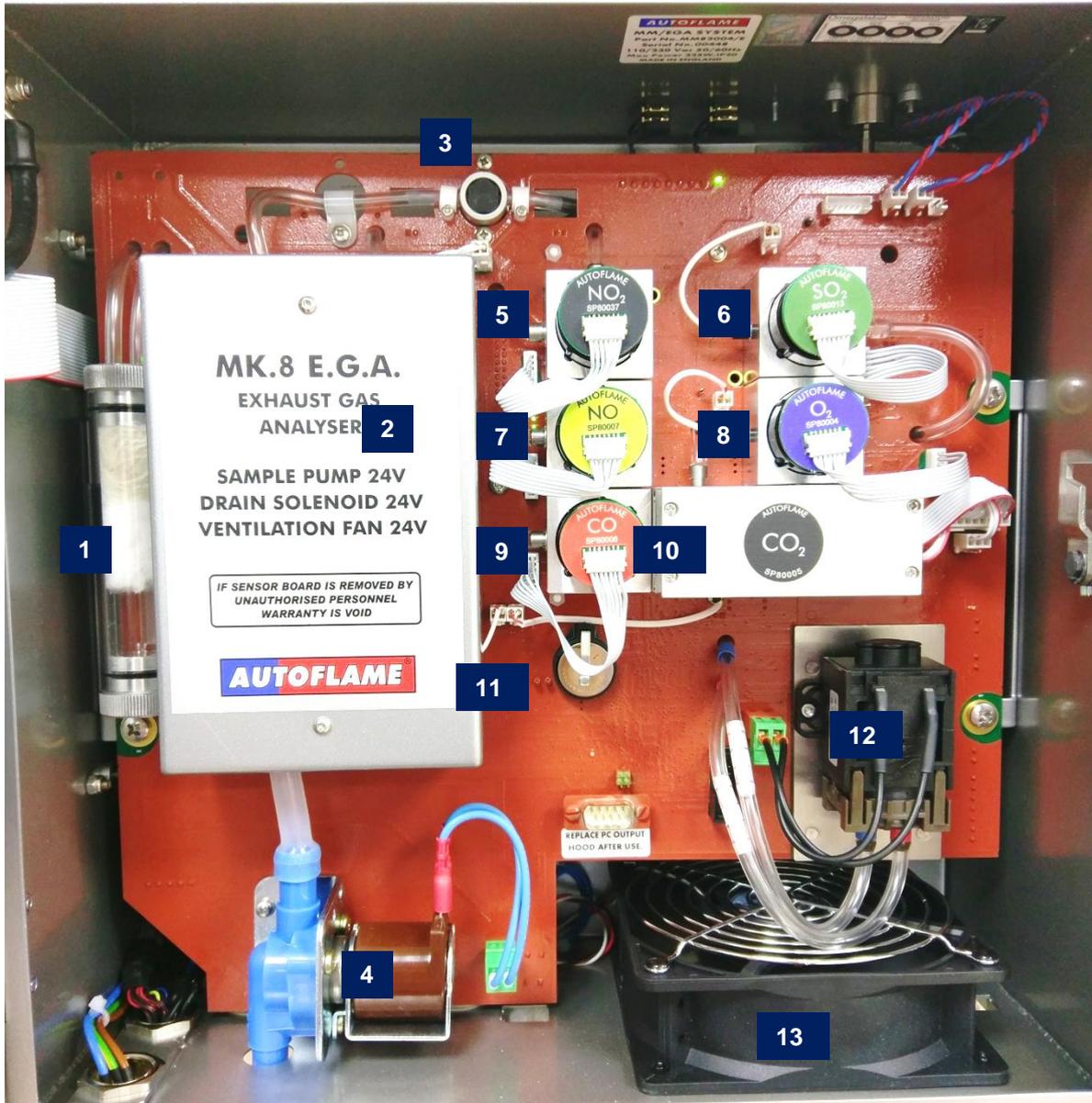
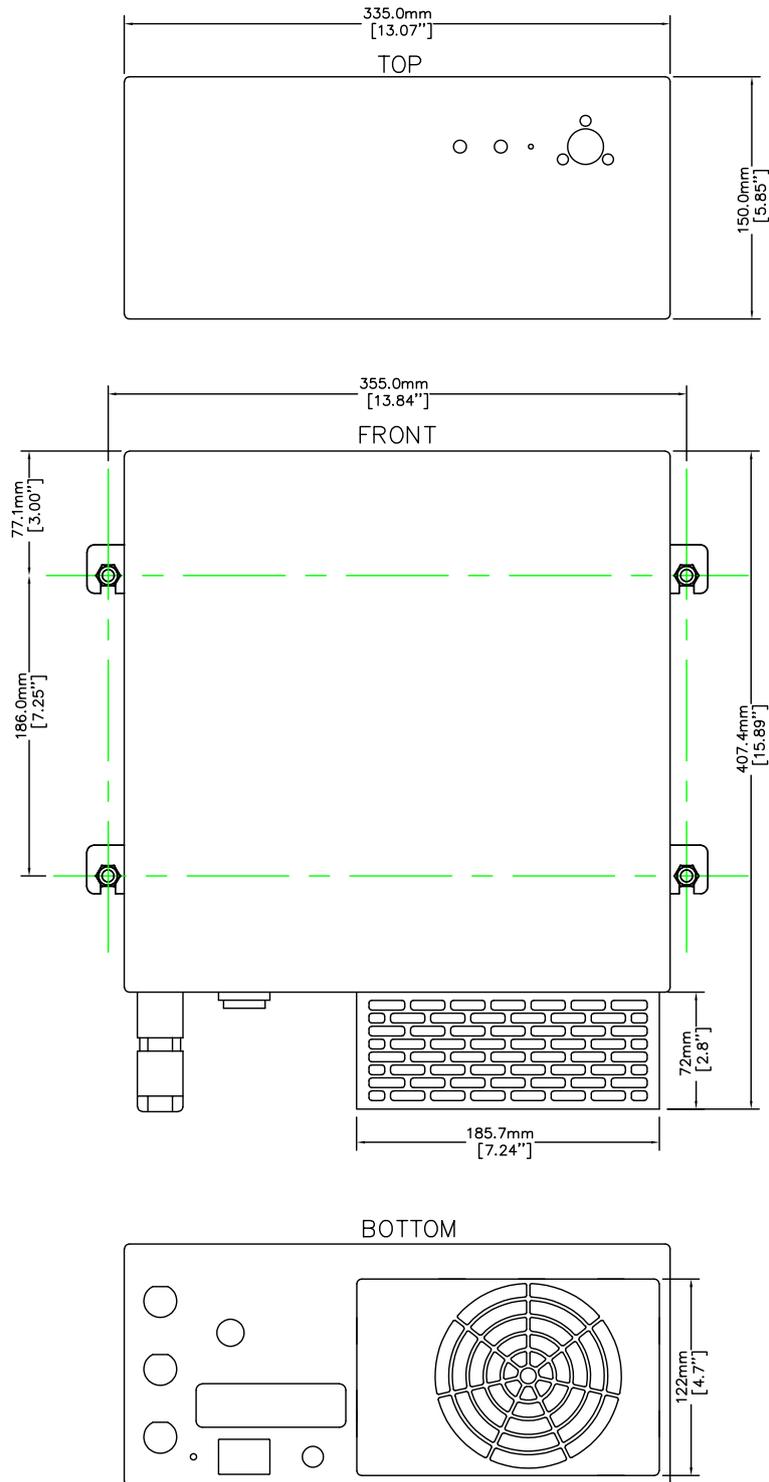


Figure 1.1.1.i Inside view of the EGA 烟气分析仪内视图

- | | |
|------------------------------------|--------------------------|
| 1. Dry filter | 干滤器 |
| 2. Chiller block | 冷却器组 |
| 3. Pinch valve | 夹管阀 |
| 4. Drain solenoid | 排水电磁阀 |
| 5. NO ₂ cell (optional) | NO ₂ 传感器 (可选) |
| 6. SO ₂ cell (optional) | SO ₂ 传感器 (可选) |
| 7. NO cell | NO 传感器 |
| 8. O ₂ cell | O ₂ 传感器 |
| 9. CO cell | CO 传感器 |
| 10. CO ₂ cell | CO ₂ 传感器 |
| 11. Battery | 纽扣电池 |
| 12. Pump | 抽气泵 |
| 13. Fan | 风扇 |

1.2 Fixing Holes and Dimensions 固定孔和尺寸



100mm CLEARANCE IN THE TOP TO INSERT SAMPLING TUBE
 100mm CLEARANCE IN THE RIGHT SIDE TO INSERT KEY
 200mm CLEARANCE IN THE BOTTOM

上方留空 10 厘米空间安装样气管线；右侧留空 10 厘米空间开锁，下方底部留空 20 厘米空间

Drawing No. 7976 图纸编号：7976

1.3 Technical Specifications 技术规范

Electrical Supply 电源	230/110V (minimum 100V, maximum 240V) 50/60 Hz
Power Rating 功率额定值	160W
Max Power Consumption 最大功率消耗	225W
Fuse Rating 保险丝额定值	4A
Environmental Rating 环境级别	IP20, NEMA 1
Internal Temperature 内部温度	5 – 40°C (40 – 104°F)
K Type Thermocouple K 型热电偶	0 – 400°C (32 – 752°F)
Sampling Tubing Environment Temperature 采样管环境温度	Maximum 60°C (140°F) 最大 60°C (140°F)
Pump Flow 泵流量	600ml/min
Heating Sampling Line 加热采样线	Requires separate power supply. 需要独立电源 Power consumption will depend on application and length. 功率消耗取决于应用场所和持续时间 Fuse rating on EGA for HSL is 20A. 用于加热采样线的烟气分析仪保险丝额定值是 20A

1.4 Standards 标准

The Mk8 EGA EVO conforms to the following legislations, standards and technical specifications:

Mk8 EGA EVO 符合以下法规、标准和技术规格：

- Low Voltage Directive: 2014/35/EU
低电压指令：2014/35/EU
- EMC Directive: 2014/30/EU
EMC 电磁兼容指令：2014/30/EU
- Safety requirements for electrical equipment for measurement standard: BS EN 61010-1:2010
电气设备的安全要求和测量标准：BS EN 61010-1:2010
- Industrial, scientific and medical equipment standard: BS EN 55011:2016+A1:2017
工业、科学和医疗设备标准：BS EN 55011:2016+A1:2017
- Electromagnetic compatibility (EMC) standards: BS EN 61000-4-2:2009, BS EN 61000-4-3:2006 +A1:2008 +A2:2010, BS EN 61000-4-4:2012, BS EN 61000-4-5:2014, BS EN 61000-4-6:2014, BS EN 61000-4-8:2010, BS EN 61000-3-2:2014, BS EN 61000-3-3:2013
电磁兼容（EMC）标准：BS EN 61000-4-2:2009, BS EN 61000-4-3:2006 +A1:2008 +A2:2010, BS EN 61000-4-4:2012, BS EN 61000-4-5:2014, BS EN 61000-4-6:2014, BS EN 61000-4-8:2010, BS EN 61000-3-2:2014, BS EN 61000-3-3:2013
- Canadian Standard for Temperature-Indicating and –Regulating Equipment: CSA C22.2
加拿大温度指示和规定设备标准：CSA C22.2
- US Standard for Limit Controls: UL 353
美国限值控制标准：UL 353
- US Combustion Safeguards and Flame Sensing Systems: FM 7610 1997
美国燃烧保护和火焰感应系统：FM 7610 1997
- US Low Water Level Limit Controls for Boilers: FM 7710 2003
美国锅炉低水位限值控制：FM 7710 2003

The Mk8 EGA EVO is Manufactured and calibrated in compliance with the requirements of ISO 9001:2015 Quality Management System.

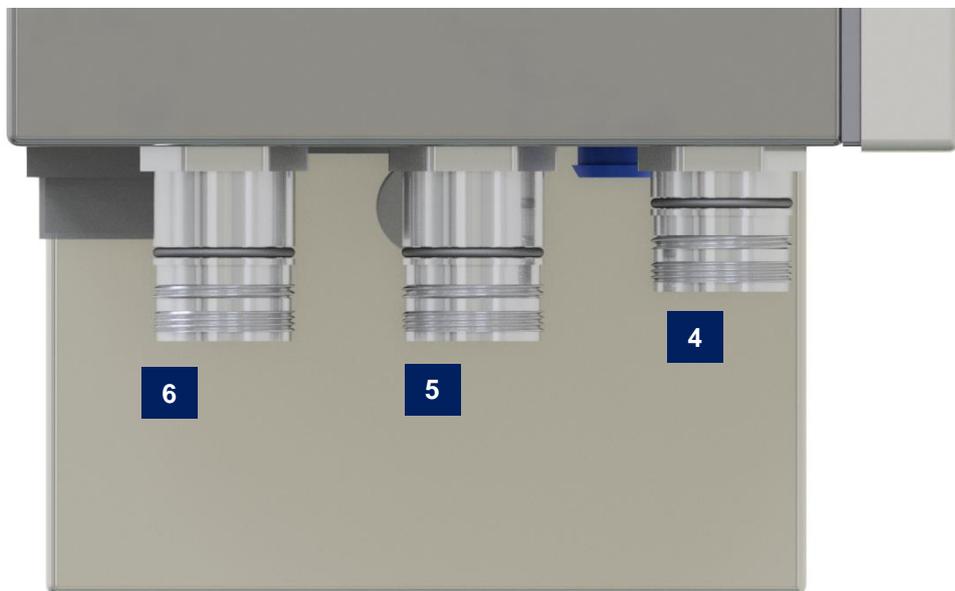
Mk8 EGA EVO 制造和校准符合 ISO9001:2015 质量管理体系的要求

1.5 Flying Lead Wiring 连接线

1.5.1 EGA Connections 烟气分析仪连接



1. Pre-heated air sensor connection 预热空气传感器连接
2. Exhaust temperature thermocouple connection 排气温度热电偶连接
3. Sampling line connection 采样管线连接



4. Mains flying leading connection 电源线连接
5. Data flying leading connection 数据线连接
6. Auxiliary flying lead connection 辅助线连接

1.5.2 Flying Leads 接线

Mains Flying Lead 电源接线	Pin 针号	Description 说明
	1	Live 火线
	2	Live for HSL* 加热采样线火线
	3	Earth for HSL 加热采样线地线
	4	Neutral for HSL 加热采样线零线
	5	Neutral 零线
	6	Earth 地线

*Note: If a Heated Sample Line (HSL) is fitted, then a separate power supply is required.

*注: 如已安装加热采样线, 则需要一个独立电源。

图: 1.5.2.i 电源(插针匹配图)

Data Flying Lead 数据接线	Pin 针号	Description 说明
	1	4-20mA 通道 1 输出 (+)
	2	4-20mA 通道 2 输出 (+)
	3	4-20mA 通道 3 输出 (+)
	4	4-20mA 通道 4 输出 (+)
	5	4-20mA 通道 5 输出 (+)
	6	4-20mA 通道 6 输出 (+)
	7	4-20mA 输出公共端 (-)
	8	燃料 1 选择输出 (+)
	9	燃料 2 选择输出 (+)
	10	燃料 3 选择输出 (+)
	11	燃料 4 选择输出 (+)
	12	燃料选择输入公共端 (-)
	13	MM 控制模块通信 (-)
	14	MM 控制模块通信 (+)
	15	DTI 数据传输接口通信 (-)
	16	DTI 数据传输接口通信 (+)
	17	4-20mA 燃料流量输入公共端 (-)
	18	4-20mA 燃料流量输入 (+)
	19	未使用

Figure 1.5.2.ii Data
(Insert Pin Mating View)

图 1.5.2.ii 数据接线

注: 在单机模式下, 燃料选择线必须连接到针 12 燃料选择输入公共端。

Auxiliary Flying Lead 辅助接线	Pin 针号	Description 说明
	1	外部排水 (0V) *
	2	未使用
	3	未使用
	4	未使用
	5	外部排水 (24V)
	6	未使用

*Note: If an external particulate filter is fitted, then the 24V DC power supply required for the external drain, comes from the EGA.

注意: 如果安装了外部微粒过滤器, 则外部排放所需的 24V DC 电源来自烟分仪。

图 1.5.2.iii 辅助接线 (插针匹配图)

1.6 Installing Sampling Probe and EGA 安装采样探头和烟气分析仪

The sampling probe must be purchased separately to the EGA and is supplied with the sampling tube for the exhaust gases and the thermocouple. The sampling tube and thermocouple is available in the below standard lengths, however if a different length is required, please contact Autoflame.

采样探头必须和烟气分析仪分开购买，采样探头配备了用于烟气采样的采样管和热电偶。采样管和热电偶的标准长度见下表，如需不同长度，请联系 Autoflame。

Sampling Probe 采样探头	Sampling Tube and Thermocouple Length 采样管和热电偶线长度
MM10033	3m (10ft)
MM10033/5	5m (16ft)
MM10033/10	10m (33ft)

The EGA should be checked before installing it on site. It is advisory that EGA 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 EGA.

安装烟气分析仪前必须对其进行检查。在测试和检查期间建议使烟气分析仪保持直立状态，随后应将烟气分析仪关闭一段时间（数小时），然后再次开启使其排出内部剩余的水分。

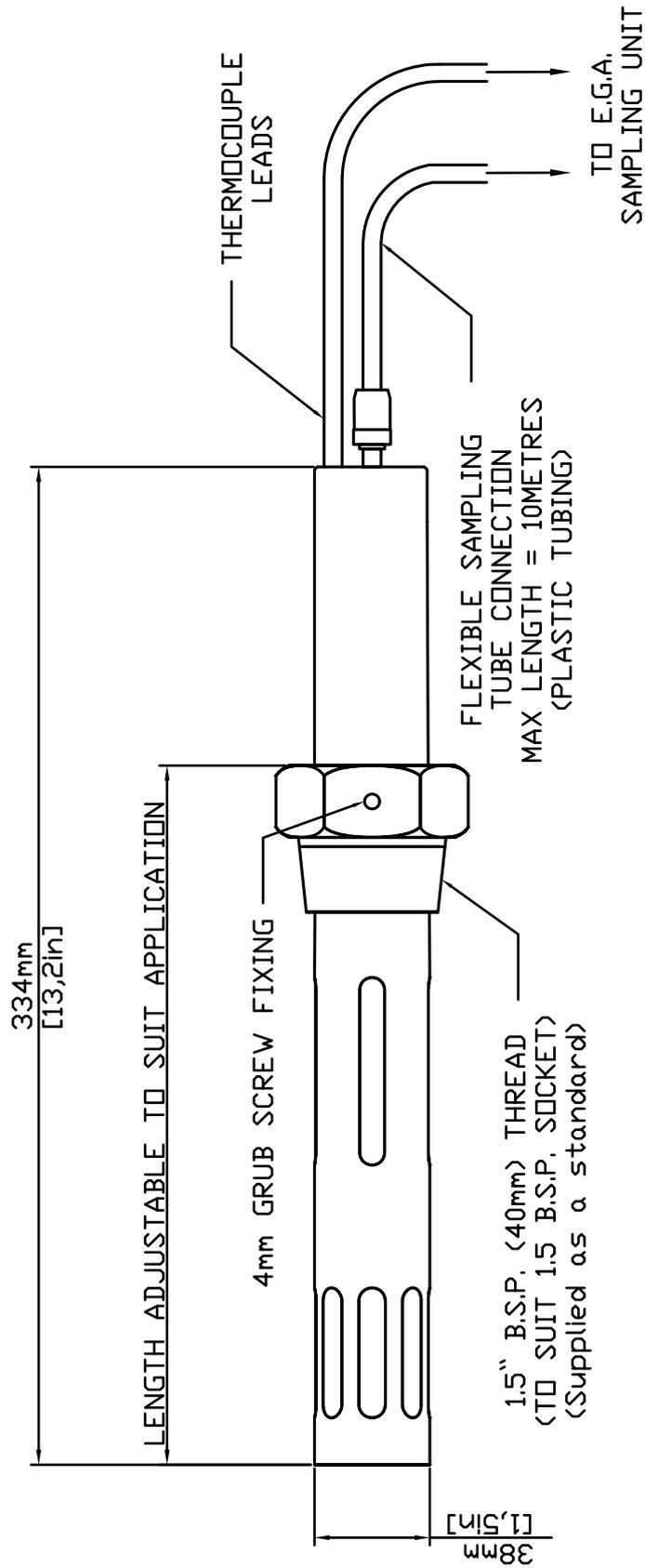
1.6.1 Sampling Probe Dimensions 采样探头尺寸



Drawing No. 9058
图纸编号：9058

1. Internal filter / 内部过滤器
2. Set screw 2mm (5/64") / 固定螺丝 2mm (5/64")
3. Threaded probe socket 1.5" BSP/ NPT / 螺纹探头插座 1.5" BSP/ NPT
4. Exhaust temperature thermocouple slot / 烟气温度热电偶安装孔
5. Set screw 2mm (5/64") 固定螺丝 2mm (5/64")
6. Sampling line hole 采样线插口

Figure 1.6.1.i Sampling Probe Assembly
图 1.5.1.i 采样探头总成



Drawing No. 7978
图纸编号 No. 7978

图 1.6.1.ii 采样探头尺寸

1.6.2 Sampling Probe – Internal Layout 采样探头内部结构

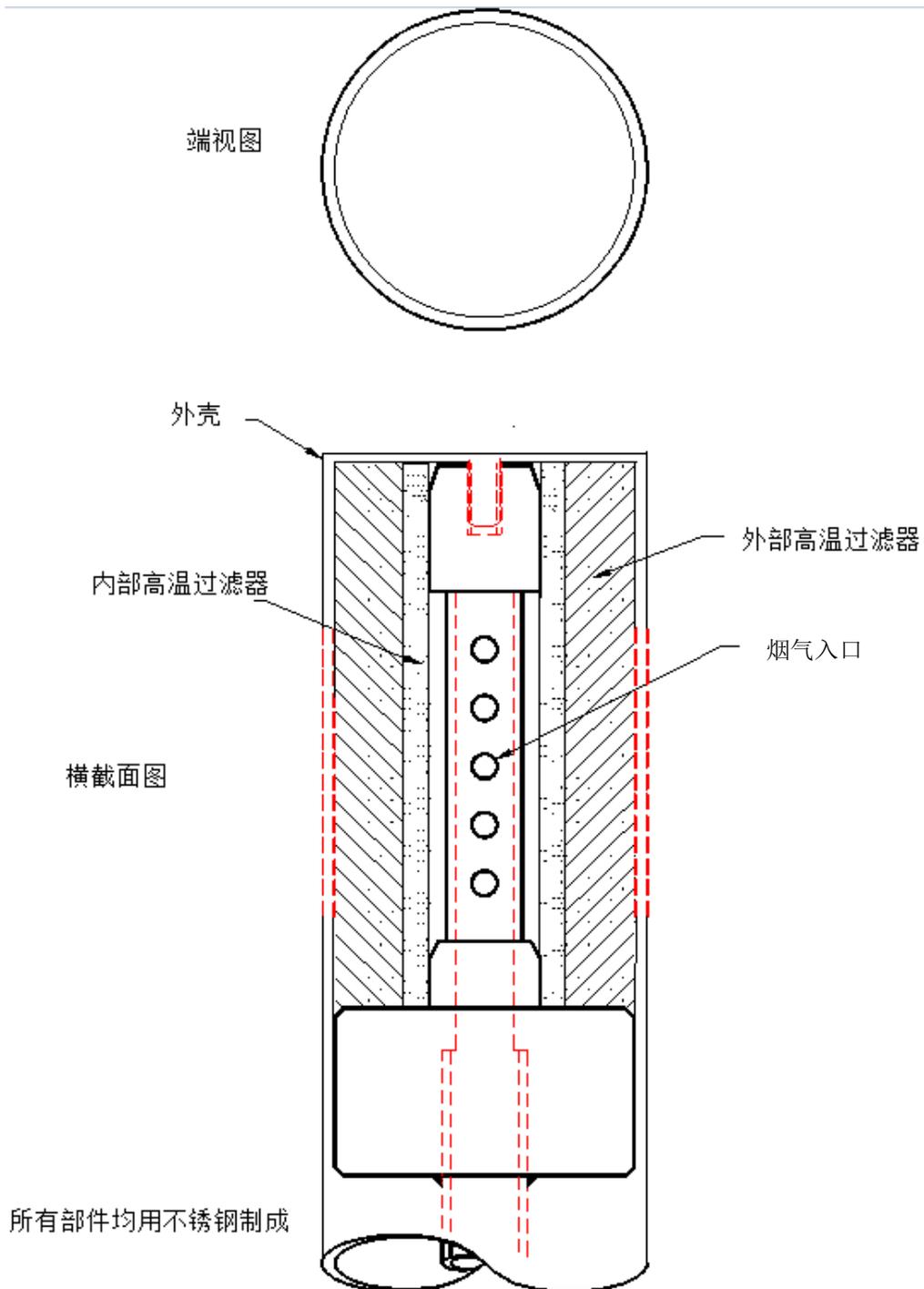


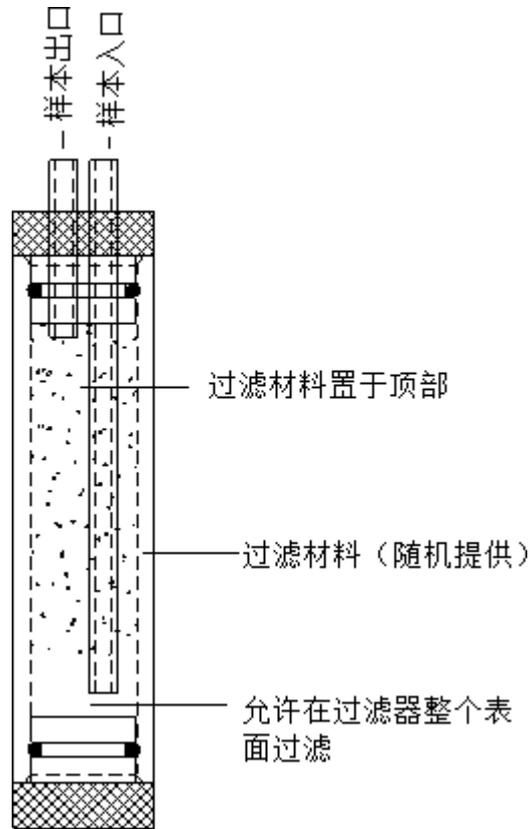
Figure 1.6.2.i Sampling Probe Internal Layout
图 1.6.2.i 采样探头内部结构

1.6.3 Assembly of Dry Filter

干滤器的组装

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

如果烟气分析仪的泵发生故障，他们建议检查烟气分析仪内的干滤器以及是否堵塞，确保过滤材料未饱和。



**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 and 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 EGA and contact Autoflame Technical Support.

该过滤器专门用作干滤器，用于在干燃气进入传感器前清除灰尘微粒。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，请隔离烟气分析仪并联系 Autoflame 技术支持。

1.6.4 Sampling Probe Installation 采样探头的安装

The sampling probe must be installed as per the below guide to prevent any blockages in the line and incorrect operation.

采样探头必须根据以下规定安装，以防采样线内堵塞和错误运行。

1. Install a 1.5" BSP socket on the flue where the sampling probe is to be positioned.
在烟道内安装一个 1.5" BSP 插座使采样探头定位。
 - a. If using the Autoflame draft control system, the sampling probe should be positioned after the stack damper and air pressure sensor.
如使用 Autoflame 烟道背压控制系统，则采样探头应在固定在背压挡板和空气压力传感器后。
 - b. If using a single EGA on a twin furnace, the sampling probe should be positioned after the individual flues are combined into one stack.
如在一个双炉堂上使用一个烟气分析仪，则采样探头应在总烟道连接排气管位置。
 - c. If an economiser is fitted to the flue, the sampling probe should be positioned before the economiser.
如在烟道内安装节能器，则采样探头应在固定节能器前安装。
2. Mount the sampling probe at an angle of approximately 45° into the stack. This will allow any condensate in the sample to flow down to the EGA rather causing blockages in the sampling line. A build-up of condensation in the EGA could result in a pump failure.
将采样探头按 45 度角安装在排气管中。这样样本中的冷凝水将通过烟分析仪排掉而不会导致采样线堵塞，累积在烟气分析仪内的冷凝水可导致泵故障。
3. Mount the main body of the sampling 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.
采样探头主体应该安装在尽可能往里面的位置，松开探头固定底座上的固定螺丝可以进行调节。

Notes 备注

- Keep the thermocouple and blue sampling tube away from hot surfaces.
使热电偶和蓝色采样管远离热表面。
- The thermocouple should be positioned away from high voltage cabling.
使热电偶远离高压线。
- Ensure that the thermocouple and sampling tube run from the sampling probe to the EGA with no coils or loops.
确保热电偶和采样管从采样探头至烟气分析仪之间没有盘绕或卷线现象。
- The sampling probe must be positioned without air leaks as this will result in incorrect readings on all cells.
采样探头必须正确定位而无空气泄露，因为这将导致所有传感器读数不准确。
- If the thermocouple is run in conduit from the sampling probe to the EGA, this must be earthed.
如果热电偶在从采样探头到 EGA 的线槽中走线，该导管必须接地。

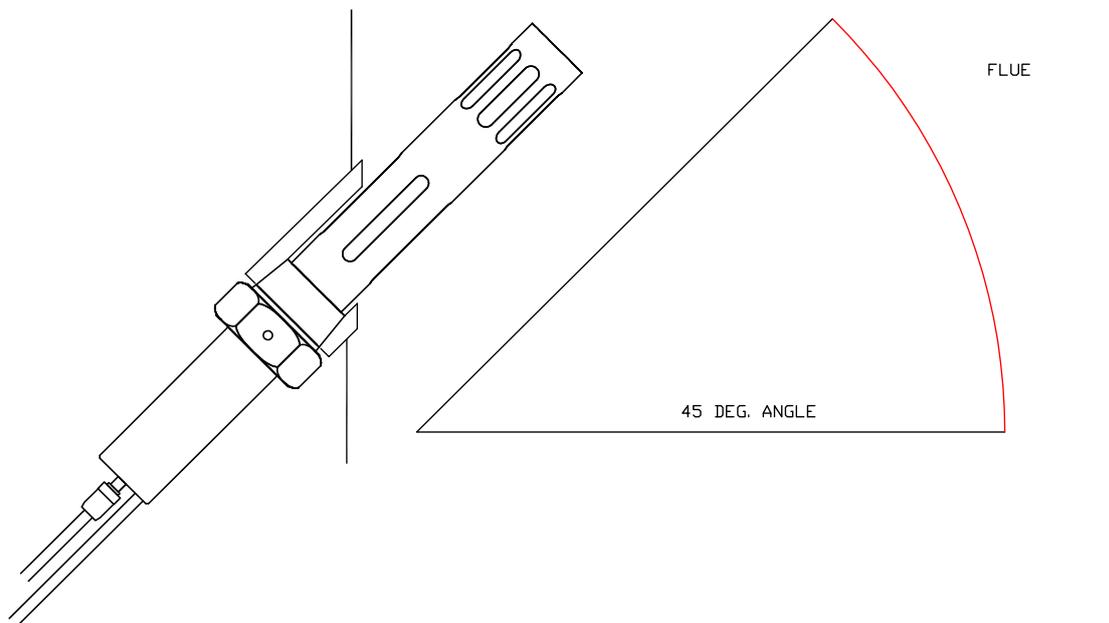


Figure 1.6.4.i EGA Probe 45° In Flue
图: 1.6.4.i 烟道内呈 45 度角的烟气分析仪探头

Drawing No. 7978
图纸编号: 7978



Figure 1.6.4.ii Incorrect installation of the sampling probe: a gully is formed in the sampling line will cause blockage
图 1.6.4.ii 不正确的采样探头的安装：采样线的冲沟形成会引起堵塞



Figure 1.6.4.iii Correct installation of the sampling probe: the sample can flow down the sampling line with no restriction.

图 1.6.4.iii 正确的采样探头的安装：采样可以无限制流入采样线

1.6.5 EGA Installation

烟气分析仪的安装

Once the sampling probe has been positioned and installed into the stack as per the guidelines in section 1.6.4, it can be connected to the EGA following the guidelines below.

采样探头定位并根据第 1.6.4 节所述安装在排气管内后，可以按以下步骤连接烟气分析仪。

1. Push the sampling line into the inlet tube.
将采样管插头插到输入管道插座上
2. Plug the thermocouple connector into the socket and tighten the screw.
将热电偶连接器插入插座并拧紧螺丝

Notes 注:

- If the unit is started up for the first time, it may take some time for the chiller to cool down.
首次启动冷却器组时可能需要一段时间冷却。
- 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. If the ambient temperature is greater than 40°C (104°F), a chilled environmental enclosure is required, see section 1.8.3.
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。如环境温度高于 40°C (104°F)，则需要安装冷冻环境保护柜子，请见第 1.8.3 节。
- For environments with high humidity, a chilled environmental enclosure is recommended to avoid corrosion on the electronics board, see section 1.8.3.
在高湿环境下我们同样建议使用冷冻环境保护柜子，以避免电路板腐蚀，请见第 1.8.3 节。
- If the EGA is placed in an enclosure or cabinet, to avoid the EGA being recalibrated on contaminated gases, ensure that the drain solenoid is taking in fresh air during calibration.
如烟气分析仪安装在机壳或机柜内，请避免烟气分析仪使用污染的烟气进行空气校准，确保排水电磁阀在校准期间吸入新鲜空气。
- Ensure that the air flow to the intake in the bottom of the EGA unit is not impeded and the air temperature is less than 40°C (104°F). If the burner air temperature is greater than 40°C (104°F), then a pre-heated air sensor is required, see section 1.8.4.
确保空气可以从烟气分析仪底部的进气口顺利流入，且空气温度小于 40°C (104°F)。如燃烧器的空气温度高于 40°C (104°F)，则需要安装预热空气传感器，请见第 1.8.4 节。
- Position the sample tube so that the sample slopes down to the EGA unit at all times. The EGA unit must always be mounted lower than the EGA probe. This helps drain excessive condensate from the flue gases, which may cause blockages in the sample tube.
将采样管固定，使样本始终向下倾斜对准烟气分析仪。烟气分析仪必须安装在低于烟气分析仪探头的位置，这样有助于排出烟气中过多的冷凝水，否则可能会堵塞采样管线。
- If extension tubing is attached to the drain solenoid, check that the end of the tubing is clear of any obstructions or contaminants. When the EGA performs an air calibration, the air is sucked into the EGA through the solenoid.
如在排水电磁阀上连接加长管，请确保管端无任何妨碍物或污染物。烟气分析仪进行空气校准时，空气将通过电磁阀被吸入烟气分析仪。
- Condensate in the EGA could also occur from the load demand not being so high at certain times, resulting in the back end temperature of the boiler being low and not warm enough to evaporate the condensation quick enough. This will cause a large build-up of moisture in the EGA, and so the time period between drains may need to be shortened in Commission Mode settings 43 and 44.
烟气分析仪中的冷凝水可能为特定时间内锅炉负载要求不高所致，从而导致锅炉的后端温度较低，没有足够热量快速蒸发冷凝水。这将导致烟气分析仪中积聚大量湿气，因此在调试模式设置 43 和 44 中需要将排水时间间隔设的较短。
- Do not mount the units where excessive vibration occurs.
切勿将设备安装在有过度振动的位置。
- The EGA should be positioned away from high voltage cabling.

烟气分析仪应远离高压线。

- The EGA O₂, CO, NO, SO₂ and NO₂ cells have a 6 month shelf-life. If ordering an EGA for project that will be installed later we would advise to purchase an EGA without these cells, and then purchase the cells when they are due to be installed. This EGA 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.

烟气分析仪的 O₂、CO、NO、SO₂ 和 NO₂ 传感器有 6 个月的保质期。如果订购一个烟气分析仪并在后期再进行安装时，我们建议先购买不带传感器的烟气分析仪，然后在安装时再购买传感器。烟气分析仪仅标配二氧化碳感应器（产品号：MM72004/NC），因为传感器只可在 Autoflame 工厂进行安装，我们建议使用燃气燃烧时每隔 12 至 18 个月更换一次传感器，在使用重油燃烧时每隔 6 至 12 个月更换一次。

1.6.6 Cable Specification 电缆规范

Low Voltage 低压

The screened cable used for low voltage wiring from the EGA for the fuel flow 4-20mA input, and channels 1 to 6 4-20mA outputs must conform to the following specification:

烟气分析仪低压线路使用的屏蔽电缆用于 4-20mA 燃料流量输入，4-20mA 通道 1 至 6 输出，且必须符合以下规范：

16/0.2mm PVC insulated overall braid, screened, PVC sheathed.

16/0.2mm 聚氯乙烯护套编织屏蔽电缆。

- Sixteen wires per core
每芯 16 丝线。
- Diameter of wires in each core 0.2mm
芯内电线直径0.2mm。
- Rated at 440V AC rms at 1600Hz
1600Hz 时额定有效值：440V AC。
- DEF 61-12 current rating per core 2.5A
每芯 DEF 61-12 电流额定值：2.5A。
- Maximum operating temperature 70°C (158°F)
最大运行温度：70°C (158°F)
- Nominal conductor area 0.5sq mm per core
每芯标称导体截面积：0.5mm²
- Nominal insulation radial thickness on core 0.45mm
每芯标称绝缘径向厚度：0.45mm
- Nominal conductor diameter per core 0.93mm
每芯标称导体外径：0.93mm
- Nominal core resistance at 20°C. 40.1Ω/1000m
20°C 时标称线芯电阻：40.1Ω/1000m
- Nominal overall diameter per core 1.83mm
每芯公称外径：1.83mm
- Fill factor of braid screen 0.7
编制屏蔽填充因数：0.7
- Equivalent imperial conductor sizes 14/0.0076
等效导体尺寸：14/0.0076

Use the number of cores suitable for the application. A universal part numbering system appears to have been adopted for this type of cable as follows:

请根据应用场合选择合适的线芯数量。此类电缆可以参考以下通用零件编号系统：

16-2-2C 2 Core / 2 芯
16-2-3C 3 Core / 3 芯
16-2-4C 4 Core / 4 芯
16-2-6C 6 Core / 6 芯
16-2-8C 8 Core / 8 芯

(5 Core not readily available)
(不提供 5 芯电缆)

Note: If using 4 Core cable and interference is detected, use 2 sets of 2 Core.

注：使用 4 芯电缆时如检测到干扰，请使用两套两芯的电缆。

Data Cable 数据电缆

Data cable must be used for communication connections between MMs for sequencing applications as well as between MMs to EGAs, MMs to a DTI and DTI to BMS systems.

数据电缆必须用于控制模块的智能群控应用，以及在烟气分析仪，控制模块，数字传输接口与楼宇管理系统之间的通信。

Communication cable should not exceed 1km.

通信电缆长度不得超过 1km。

Types of data cable that can be used:

使用的数据电缆类型：

- 1 Belden 9501 for 2-core shielded cable (1 twisted pair)
Belden 9501 两芯屏蔽电缆（1 对双绞线）
- 2 Belden 9502 for 4-core shielded cable (2 twisted pairs)
Belden 9502 四芯屏蔽电缆（2 对双绞线）
- 3 STC OS1P24

Samples are available upon request. Low voltage and data cable can be ordered directly from Autoflame Engineering, please contact Autoflame Sales.

可以根据要求提供样品。低压电缆和数据电缆可以直接从 Autoflame 订购，请联系 Autoflame 销售部。

1.7 Wiring Schematics

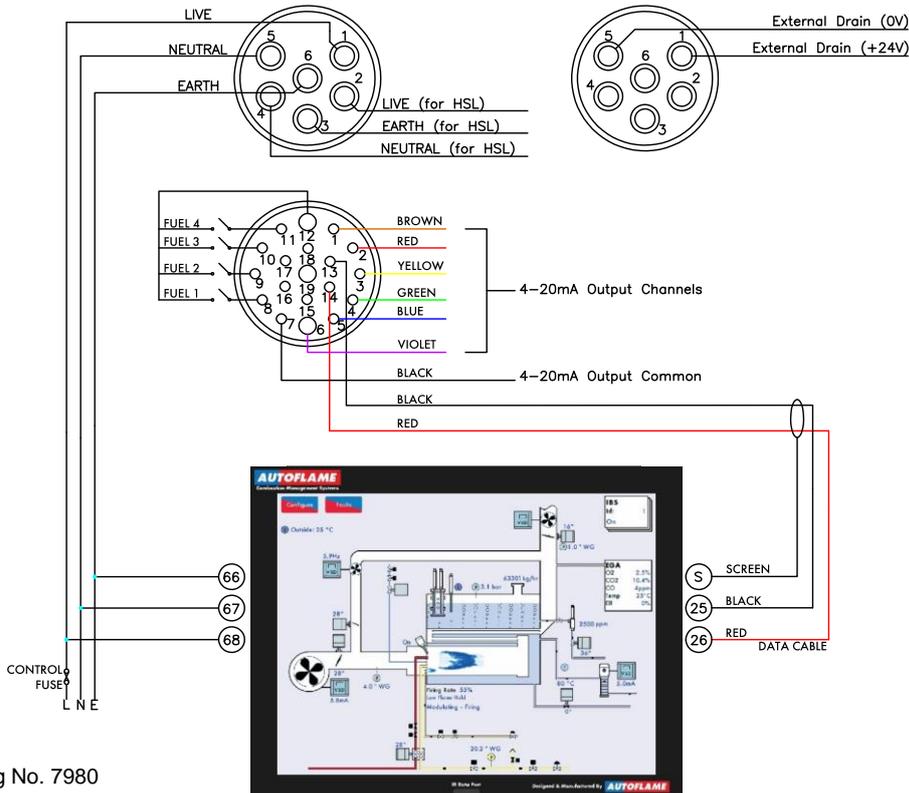
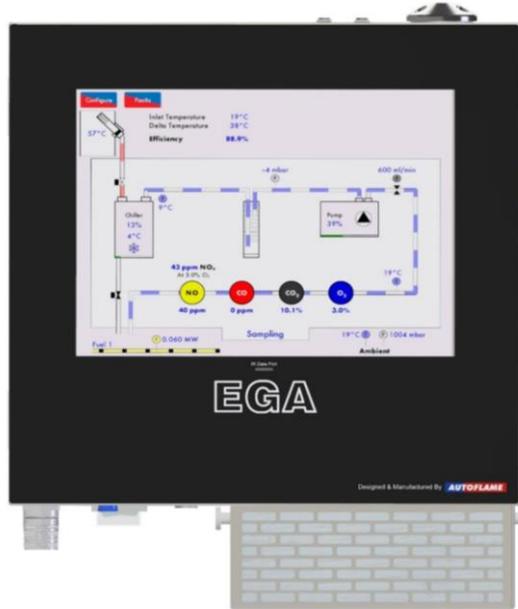
接线示意图

1.7.1 Connection between EGA and Mk8 MM

烟气分析仪和 Mk8 控制模块的连接

The data cable should be screened at the MM end and connected all the way to the EGA plug; the screen from the flying lead provided should be connected to the data cables that connect to the MM.

数据电缆应在控制模块末端屏蔽并连接到烟气分析仪的插头上。提供的屏蔽接线应与连接控制模块的数据电缆相连。

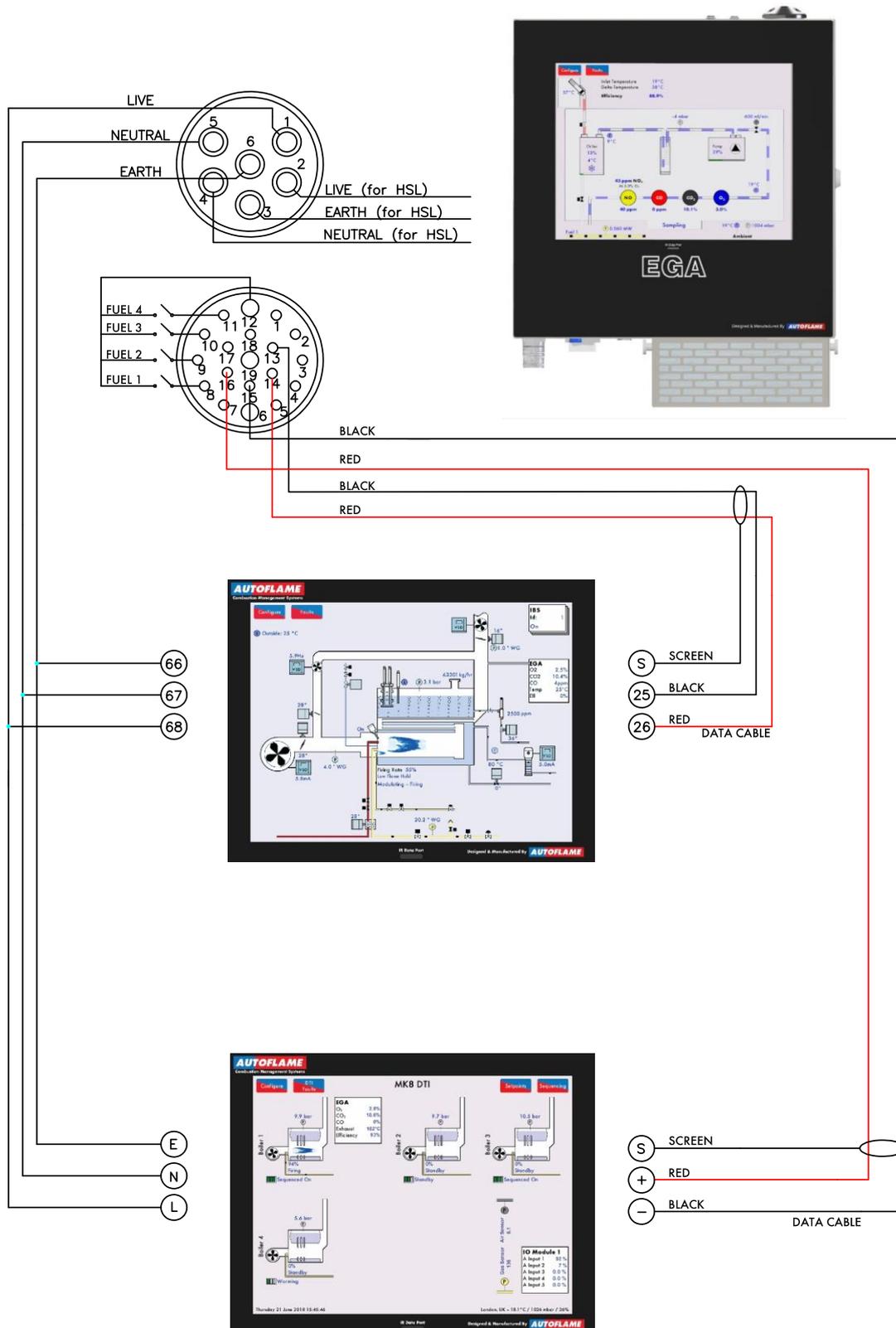


Drawing No. 7980

1.7.2 Connection between EGA, MM and DTI

烟气分析仪、控制模块和数据传输接口的连接

The data cable should be screened at the MM and DTI end and connected all the way to the EGA plug; the screen from the flying lead provided should be connected to the data cables that connect to the MM and DTI. 数据电缆应在控制模块和数据传输接口末端进行屏蔽并连接到烟气分析仪的插头上。提供的屏蔽线应与已连接控制模块和数据传输接口的数据电缆相连。



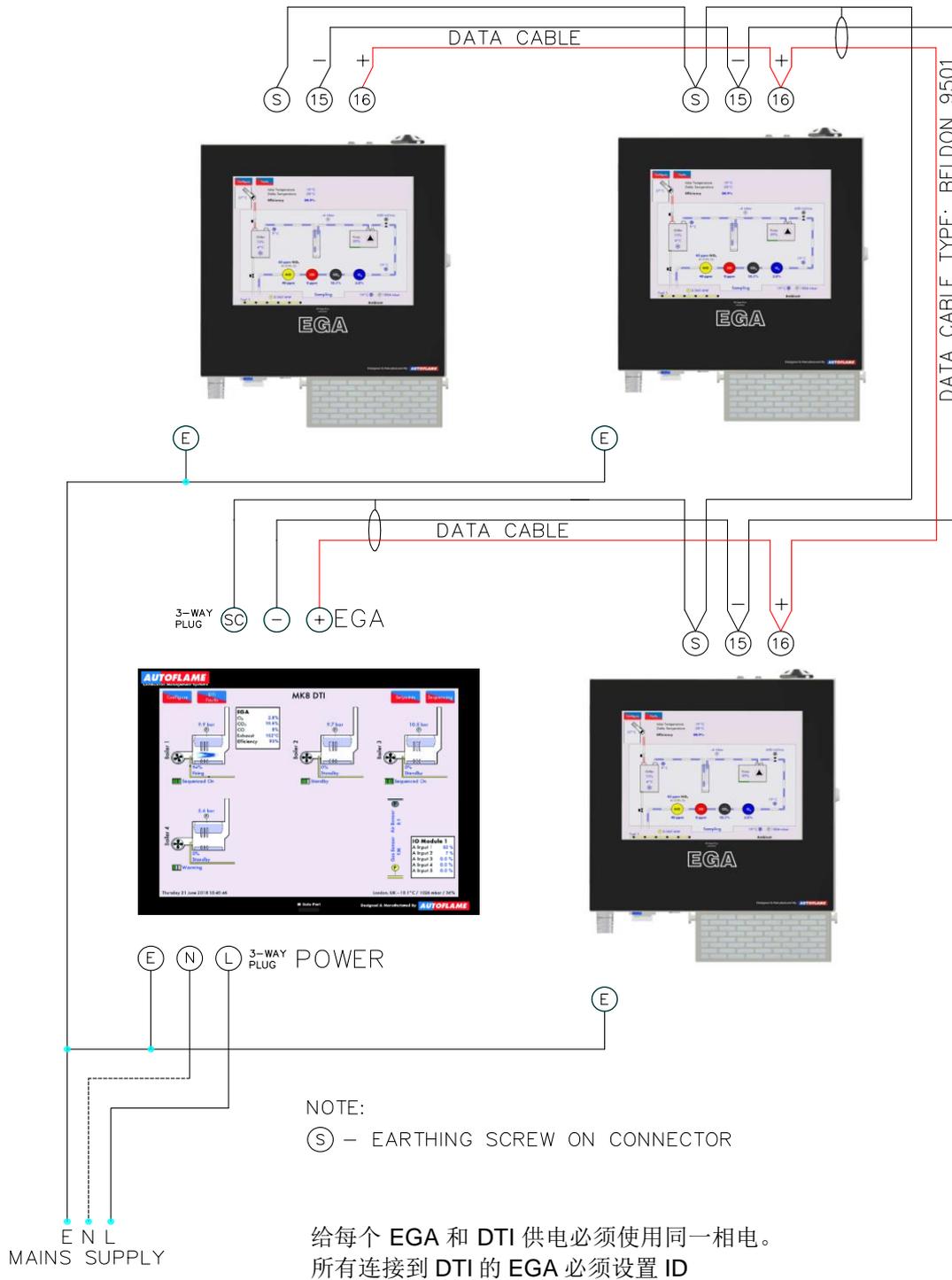
1.7.3 Connection between EGA and DTI

烟气分析仪和数据传输接口的连接

The data cable should be screened at the DTI end and connected all the way to the EGA plug; the screen from the flying lead provided should be connected to the data cables that connect to the DTI.

数据电缆应在数据传输接口末端屏蔽并连接到烟气分析仪的插头上。提供的屏蔽线应与已连接数据传输接口的数据电缆相连。

单独运行的 EGA 跟 DTI 之间的连接



Drawing No. 7979 编号: 7979

1.8 Ancillary Parts 辅助部件

1.8.1 Air Inlet Filter 进气过滤器

The air inlet filter is designed to protect the EGA from dust and other particles that may cause damage or reduce the performance of the EGA over time. The air inlet filter will fit over the fan that cools the EGA and stop dust and particles from getting inside the EGA. 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.

进气过滤器设计用于保护烟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烟气分析仪或降低其性能。进气过滤器将配备一个用于冷却烟气分析仪的风扇，阻止灰尘和微粒进入烟气分析仪。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 1.8.1.i Air Inlet Filter
图 1.8.1.i 进气过滤器

While the EGA 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.

燃烧重油时烟气分析仪可以用于成功地测量燃烧烟气，重要的是需要保持燃料含有恒定、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 EGA. 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。燃烧不完全将导致烟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 EGA is used on a dual fuel application where natural gas is the primary fuel and HFO is the secondary fuel, the EGA should not be monitoring the HFO exhaust. This can be achieved by simply isolating the EGA when the HFO fuel is selected to be fired.

烟气分析仪使用双燃料时，如果主燃料使用天然气，辅燃料使用重燃油，烟气分析仪不应监测重燃油的排放。当选择重燃油燃烧时，可以通过隔离烟气分析仪实现。

1.8.2 External Particulate Filter 外部微粒过滤器

The external particulate filter 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 EGA. The external particulate filter stops excessive moisture from getting into the EGA 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 EGA.

外部微粒过滤器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会损坏烟气分析仪。外部微粒过滤器可以阻止过多的水分进入烟气分析仪，因为过滤器中配备了排水电磁阀，用于清除过多的水分。排水与烟气分析仪上正常排水电磁阀同步工作。

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. The external particulate filter can be ordered with a new EGA or it can be ordered separately and fitted on site onto an existing Mk8 EGA Evo.

外部微粒过滤器自身也配有过滤芯，可以过滤烟道中的过多微粒。我们建议在使用重燃油时使用外部微粒过滤器。外部微粒过滤器可以与当前新款的烟气分析仪一同订购，也可以单独订购，现场安装到现有 Mk8 EGA EVO 上。



Figure 1.8.2.i External Particulate Filter
图 1.8.2.i 外部颗粒过滤器

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

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烟气分析仪中。

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 year or as little as once every 6 months, once the 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需要及时更换，时间可以是一年或每隔 6 个月更换一次，即过滤器开始变色时就更换。更换过滤器时可以用 5 级格林曼黑度计进行检查。

The filter material is fluorocarbon resin bonded, borosilicate glass micro-fibre 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 1.8.2.i 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 EGA.

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集液体颗粒。内层是主过滤层，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 1.8.2.i 所示方式固定，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，即在过多水分到达烟气分析仪前就将其从烟气中排出。

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.

烟气入口连接过滤器顶部的水平部分，垂直部分直接连接烟气分析仪入口。

External particulate filters should be used for applications firing on heavy or dirty oil, environments with dust and particulate, extremely cold or high humidity conditions.

外部颗粒过滤器应用于使用重燃油或脏油的场所、或用于含较多灰尘和颗粒的环境以及过冷或高湿环境。

1.8.3 Chilled Environmental Enclosure **冷冻环境保护柜**

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

烟气分析仪排出烟气到大气中。排气管位于紧邻排水电磁阀出口的烟气分析仪外壳外侧。确保烟气排入大气非常重要，因此请勿将烟气分析仪安装在密闭的箱体内部，否则可能使烟气分析仪用污染的烟气进行校准。烟气分析仪每隔 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 EGA module. This protects the EGA from dust and ensures that the EGA is well protected. Using the enclosures allows the EGA to operate under optimal operating conditions.

在极端环境条件或过热环境下有必要在烟气分析仪模块上使用环境柜子。这样可以防止灰尘进入烟气分析仪，保护烟气分析仪。使用外壳后，烟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 EGA 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 EGA. Autoflame also manufacture a heated enclosure for low temperature and for anti-condensing sites.

Autoflame 生产一种冷却环境柜子，配备了冷却器模块和柜门，目的是使安装在冷却柜子内的烟气分析仪始终保持在预设温度下，以防止烟气分析仪过热。用户可以用温控器设置预设温度，通常设为 35° C (95° F)，这样可以确保烟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柜子，可以用于防止冷凝的场合。

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。

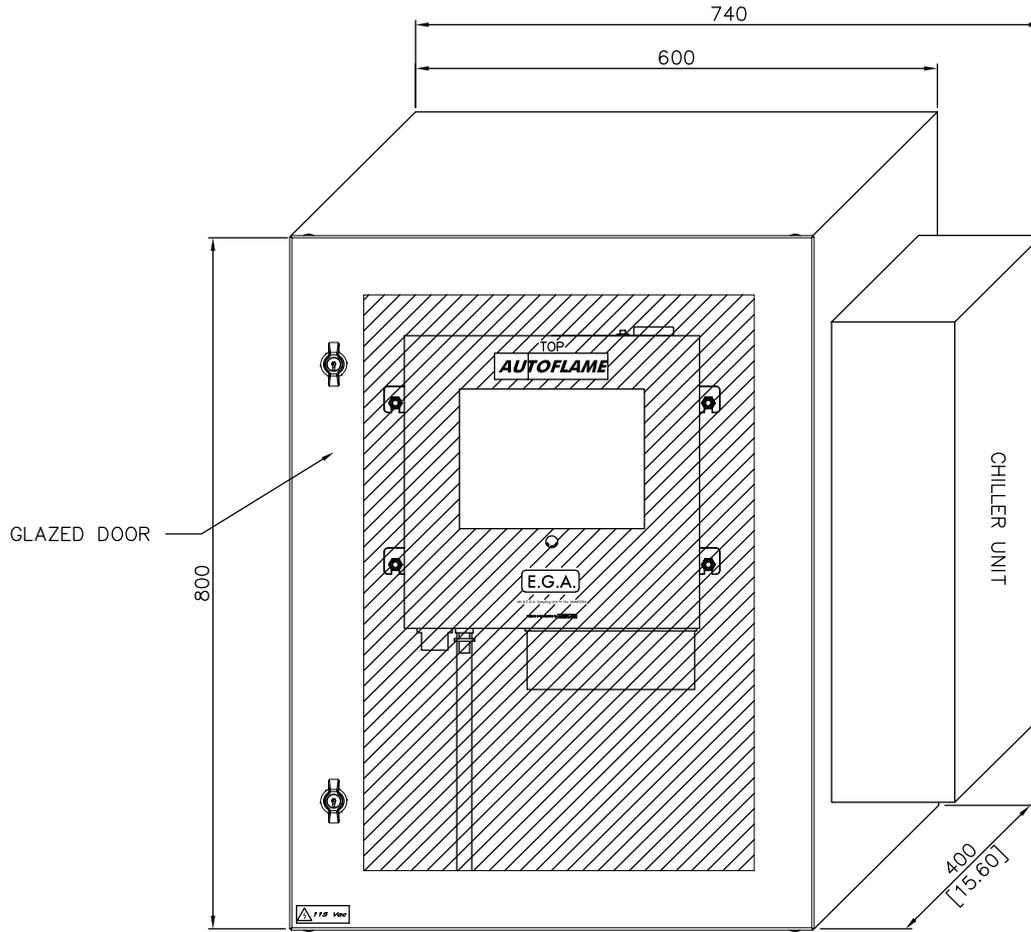


Figure 1.8.3.i Schematic of EGA Chilled Environmental Enclosure
图 1.8.3.i 冷冻环境柜子示意图



Figure 1.8.3.ii EGA Chilled Environmental Enclosure
图 1.8.3.ii 烟气分析仪冷冻环境柜子示意图

1.8.4 Pre-Heated Air Sensor

预热空气传感器

A pre-heated air sensor can be connected to the EGA to ensure an accurate combustion efficiency calculation when using pre-heated air to the burner. If the temperature of the air going into the burner is more than 40°C (104°F), a preheated air sensor is required.

预热空气传感器可以连接烟气分析仪，当燃烧器使用预热空气时可以确保准确计算燃烧效率。如进入燃烧器的空气温度高于 40°C (104°F)，则需要安装预热空气传感器。

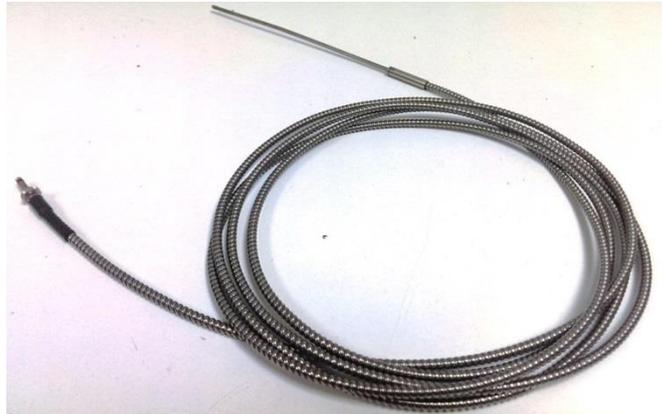


Figure 1.8.4.i Pre-Heat Air Sensor 预热空气传感器

The pre-heated air sensor uses a K-type thermocouple and the working temperature range is 0 – 400°C (32 – 752°F). The pre-heated air sensor will need to be enabled in Commission Mode setting 41, see section 2.2.1.

预热空气传感器使用 K 型热电偶，工作温度范围是 0 - 400° C (32 - 752° F)。预热空气传感器需要在调试模式设置 41 中启用，请见第 2.2.1 节。

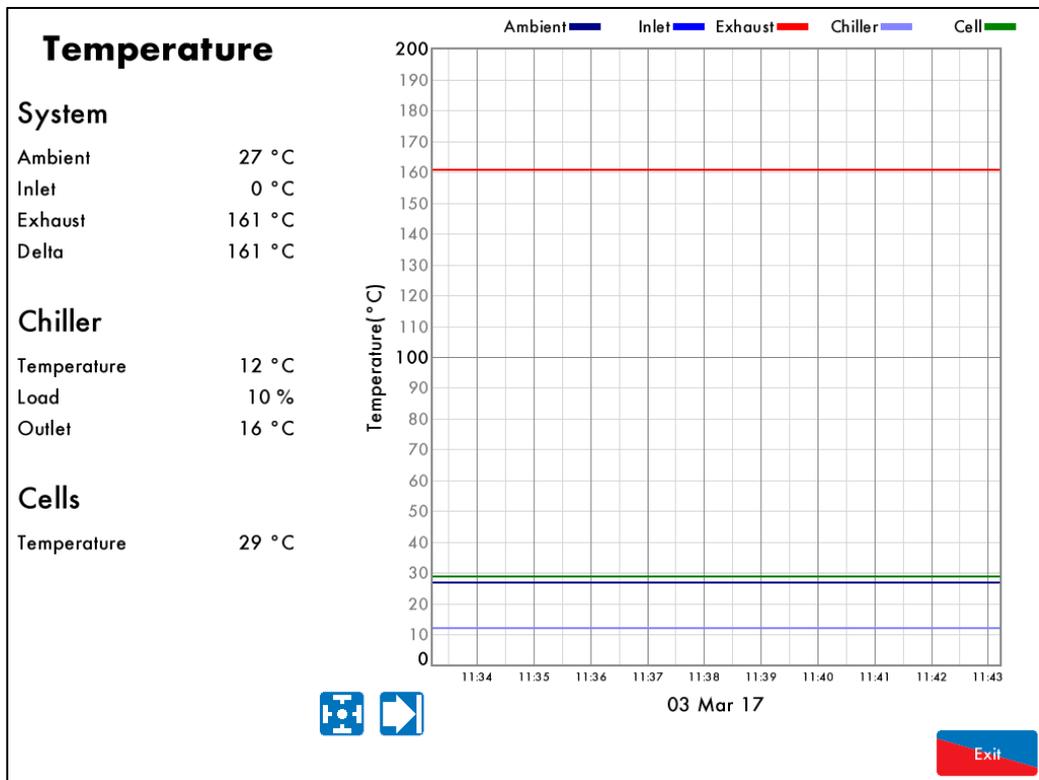


Figure 1.8.4.ii Temperature Screen with Pre-Heated Air Sensor Enabled 启用了预热空气传感器的温度界面

The EGA will separate the ambient temperature from the pre-heated air (inlet) temperature. 烟气分析仪将区分环境温度和预热空气（进气口）温度。

2 COMMISSIONING EGA

调试烟气分析仪

2.1 Operating Modes

运行模式

2.1.1 EGA through MM

通过控制模块连接烟气分析仪

When using an EGA with an MM, the EGA can be connected to the MM following the wiring schematic in section 1.7.1. The EGA must also be enabled in the MM settings. If the EGA is to be connected to a DTI as well, then the boilers on the DTI will need to set up with 'EGA fitted,' and modules connected following the wiring schematic in section 1.7.2.

当烟气分析仪与控制模块一起使用时，请按第 1.7.1 节所示的接线示意图连接烟气分析仪和控制模块。烟气分析仪必须在控制模块设置中设为启用。如烟气分析仪还连接了数据传输接口，则连接数据传输接口上的锅炉需要设为“EGA fitted/已安装烟气分析仪”，控制模块的连接请参考第 1.7.2 节所示的接线示意图。

When used with an MM, the EGA can be set to monitoring only, 3-parameter trim, or 3-parameter with combustion limits through option 12. If an EGA fault occurs, the burner can either shutdown or continue running depending on option 13. The table below shows the relevant options and parameters for on the MM for the EGA.

当烟气分析仪和控制模块一起使用时，烟气分析仪可以通过选项 12 设为仅监控、3 参数微调或带燃烧限值的 3 参数。如果烟气分析仪出现故障，燃烧器则根据选项 13 的设置进行停机或继续运行。下表显示了控制模块的关于烟气分析仪的选项和参数。

Options 选项	Description 说明
12	EGA Functionality 烟气分析仪功能
13	EGA Fault Response 烟气分析仪错误响应
18	Carry Forward of Trim 微调延续
19	O ₂ Upper Limit Offset 氧气上限补偿值
20	CO ₂ Upper Limit Offset 二氧化碳上限补偿值
21	CO Upper Limit Offset 一氧化碳上限补偿值
22	O ₂ Lower Limit Offset 氧气下限补偿值
23	CO ₂ Lower Limit Offset 二氧化碳下限补偿值
25	O ₂ Absolute Limit 氧气绝对限值
26	CO ₂ Absolute Limit 二氧化碳绝对限值
27	CO Absolute Limit 一氧化氮绝对限值
28	Trim Threshold 微调阈值
32	Trim Delay 微调延迟
76	Trim Channel 微调通道 (仅限 MK8 MM)

Parameters 参数	Description 说明
4	Delay before EGA Commission Can Be Stored 存储烟气分析仪调试值前延迟
8	Trim Delay After Drain 排水后微调延迟
10	EGA Version 烟气分析仪版本
12	CO Used for Trim On Oil 用于燃油微调的一氧化碳
13	Commission Fuel-Rich Trim 调试富油微调
14	Trim Reset Angular Rate 微调重置角速率
17	Number of Trims Before Limits Error Generated 产生限值错误前的微调次数
18	Maximum Trim During Run 运行时的最大微调幅度

19	Commission Air-Rich Trim 调试富氧微调
23	Add Air when CO Present 一氧化碳出现时添加空气
26	Trim Samples Per Cycle 单个周期内微调样本数量
94	NO Upper Limit Offset 一氧化氮上限补偿值
96	Exhaust Temperature Upper Limit Offset 排气温度上限补偿值
97	Exhaust Temperature Absolute Limit 排气温度绝对限值

Please refer to the MM Installation and Commissioning Guides for full description of these settings.
关于设置的具体说明请参考控制模块安装和调试指南。

Please refer to section 4.3 for the 3-parameter trim function and section 4.5 for combustion limits.
关于 3 参数微调功能请参考第 4.3 节，燃烧限值请参考 4.5 节。

When setting up a Mk8 EGA EVO with an MM, it must be ensured that both EGA and MM are setup with the same type of communication via Setting 40 on the EGA and Parameter 10 on the MM.
当 Mk8 EGA EVO 与控制模块一起安装时，必须确保烟气分析仪和控制模块安装同类型的通讯，通过烟气分析仪的设置 40，控制模块的参数 10。

To set up communications between a Mk8 EGA EVO and a Mk8 or Mini Mk8 MM, Setting 40 on the EGA should be set to **0. Mk8 Protocol (RS485)** and Parameter 10 on the MM should be set to **2. Mk8 Protocol (RS485)**.

要在 Mk8 EGA EVO 和 Mk8/微型 Mk8 MM 之间安装通讯，烟气分析仪的设置 40 就应该更改为 0。Mk8 协议（RS485）和控制模块的参数 10 应该更改为 2。Mk8 协议（RS485）。

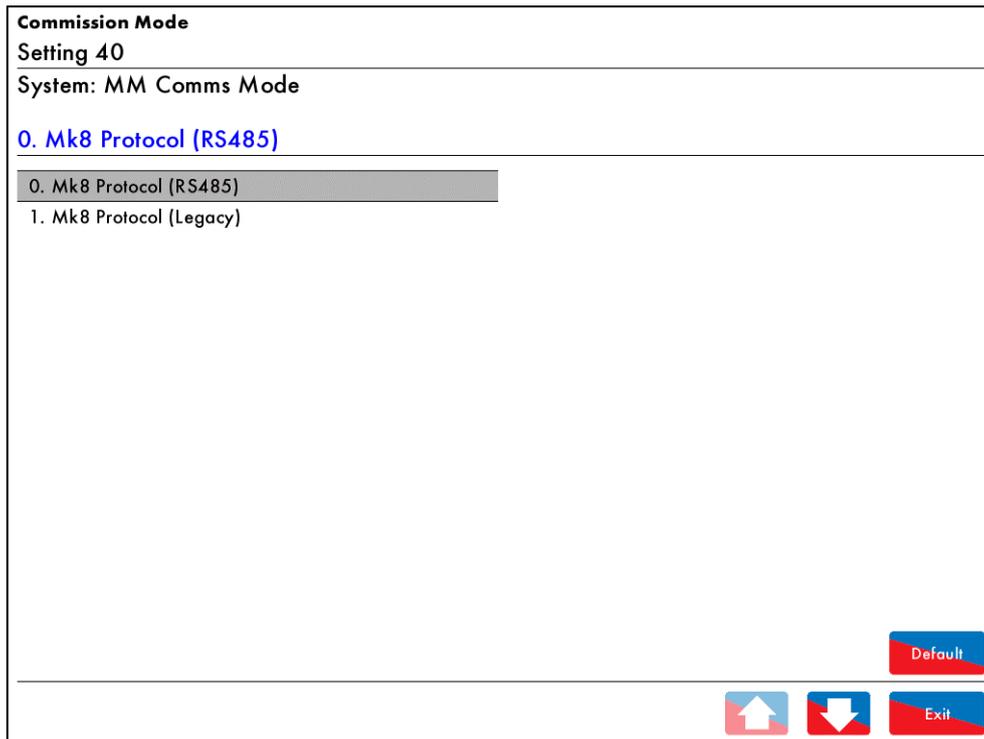


Figure 2.1.1.i: Setting 40 on the EGA

图 2.1.1.i: 烟气分析仪的设置 40

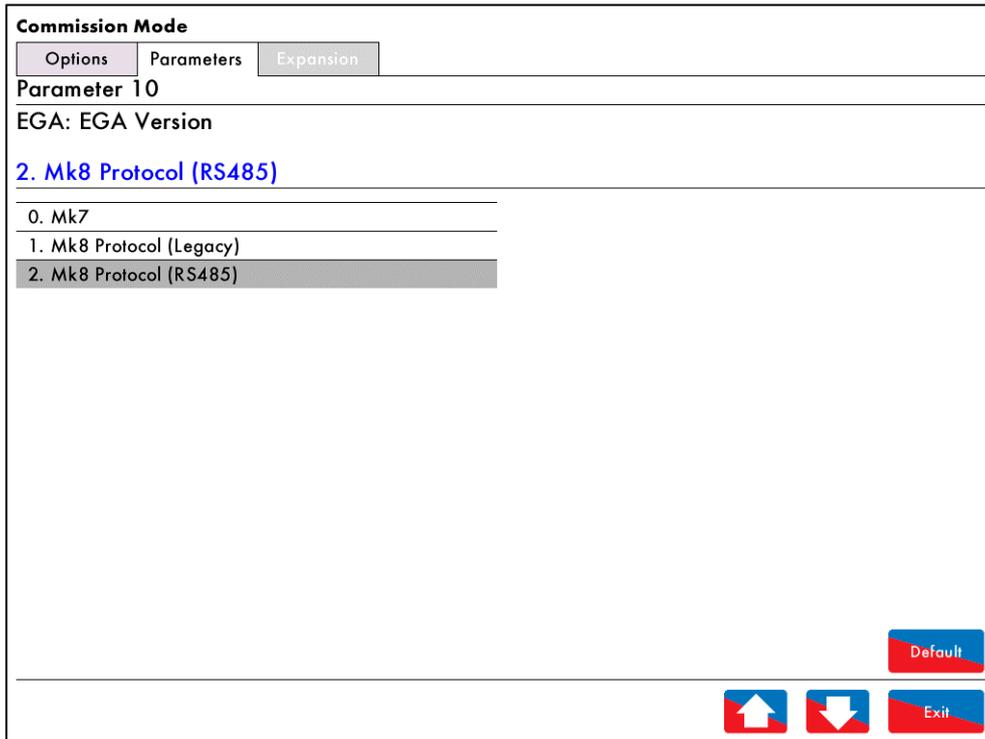


Figure 2.1.1 ii: Parameter 10 on the Mk8 or Mini Mk8 MM
图 2.1.1 ii: Mk8 或微型 Mk8 MM 上的参数 10

2.1.2 Standalone EGA 单机运行烟气分析仪

If using the EGA as a standalone module, with or without a DTI, a fuel select input must be given to the EGA. This is done by connecting a link between the chosen fuel select input and the fuel input common. The EGA must also be set to standalone mode in setting 1, see section 2.3 for EGA Settings.

如将烟气分析仪作为单机模块使用，无论有没有 DTI 数据传输接口，燃料选择输入信号都必须给烟气分析仪。需要将选定的燃料选择输入(+)和燃料输入公共端(-)连接在一起即可。烟气分析仪还必须在设置 1 中设为单机模式，请见第 2.3 节烟气分析仪的设置。

Fuel Select 燃料选择	Data Flying Lead Wiring 数据线的连接
1	Pin 8 to pin 12 第 8 针连接第 12 针
2	Pin 9 to pin 12 第 9 针连接第 12 针
3	Pin 10 to pin 12 第 10 针连接第 12 针
4	Pin 11 to pin 12 第 11 针连接第 12 针

Note: When using an EGA in standalone mode, there is no 3-parameter trim function or combustion limits, this can only be set on the MM.

注：在单机模式下使用烟气分析仪时没有参数微调功能或燃烧限值，它们只可在控制模块上设置。

The standalone EGA will also require fuel flow input on pins 17 and 18 in the data flying lead, see section 2.2.2 for setting up the 4-20mA fuel flow inputs.

单机模式下的烟气分析仪还需要在数据线第 17 和 18 针上有燃料流量输入，关于如何设置 4-20mA 燃料流量输入，请见第 2.2.2 节。

Up to 10 EGAs can be connected to the DTI to monitor the emissions remotely, without an MM. The EGAs will need to be connected to the DTI following the wiring schematic in section 1.6.3.

最多 10 个烟气分析仪可以连接到 DTI 数据传输接口，用于远程监控排放，而无需使用控制模块。烟气分析仪应按第 1.6.3 节所示的接线示意图连接数据传输接口。

When adding boilers on the DTI, they should be set up to 'MM not fitted' and 'EGA fitted' on the DTI.

在数据传输接口上添加锅炉时，锅炉应设为“未安装控制模块”和“已安装烟气分析仪”。

Please refer to the DTI Setup Guide for more information on adding EGAs to the DTI.

关于如何在数据传输界面中添加烟气分析仪，请参考数据传输接口设置指南。

2.2 EGA Settings 烟气分析仪的设置

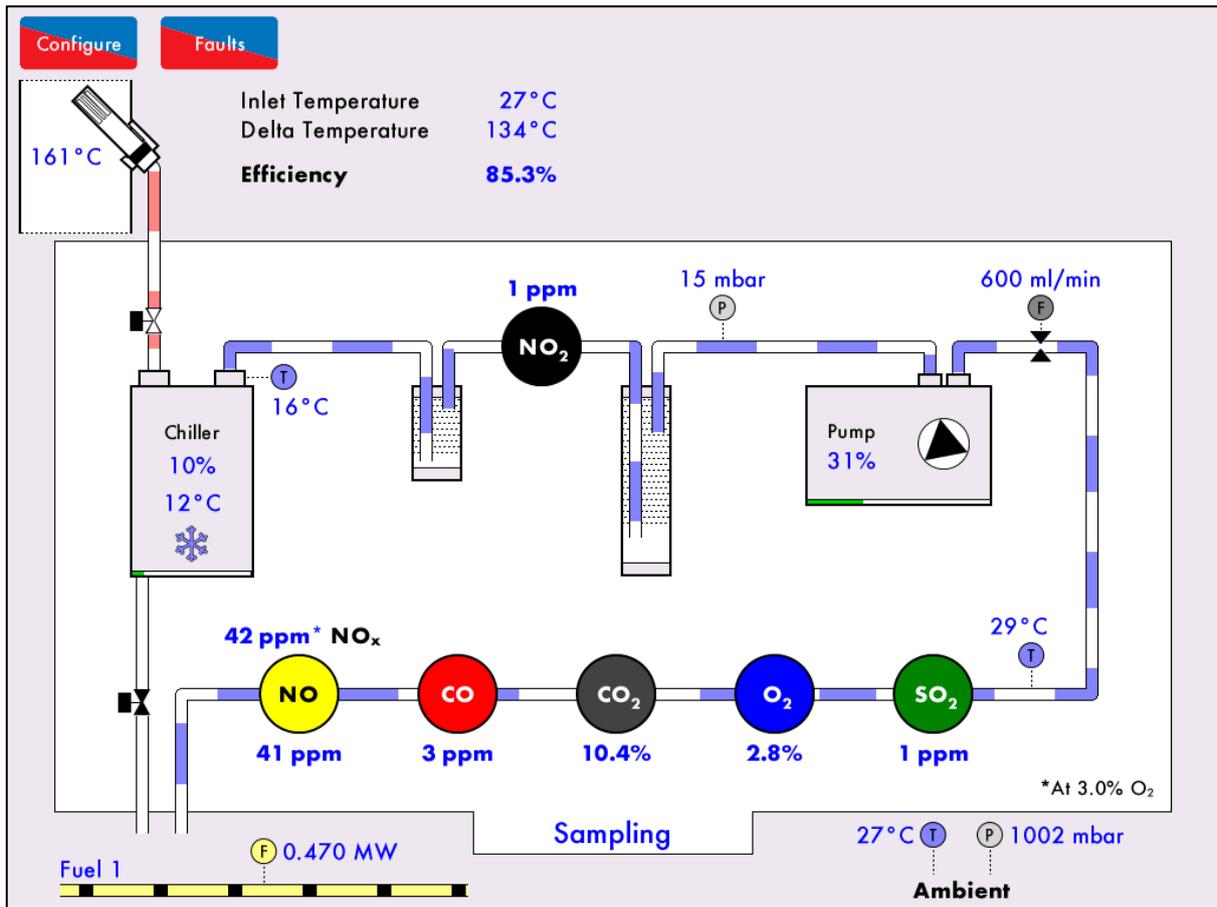


Figure 2.2.i Sampling Screen
图 2.2.i 采样屏幕

When the EGA is first powered up and has loaded the data, the Sampling screen will appear. Press on  to access the System Configuration screen.

首次启动烟气分析仪并加载数据后将显示采样屏幕。按下  设置按钮可以访问系统设置屏幕。

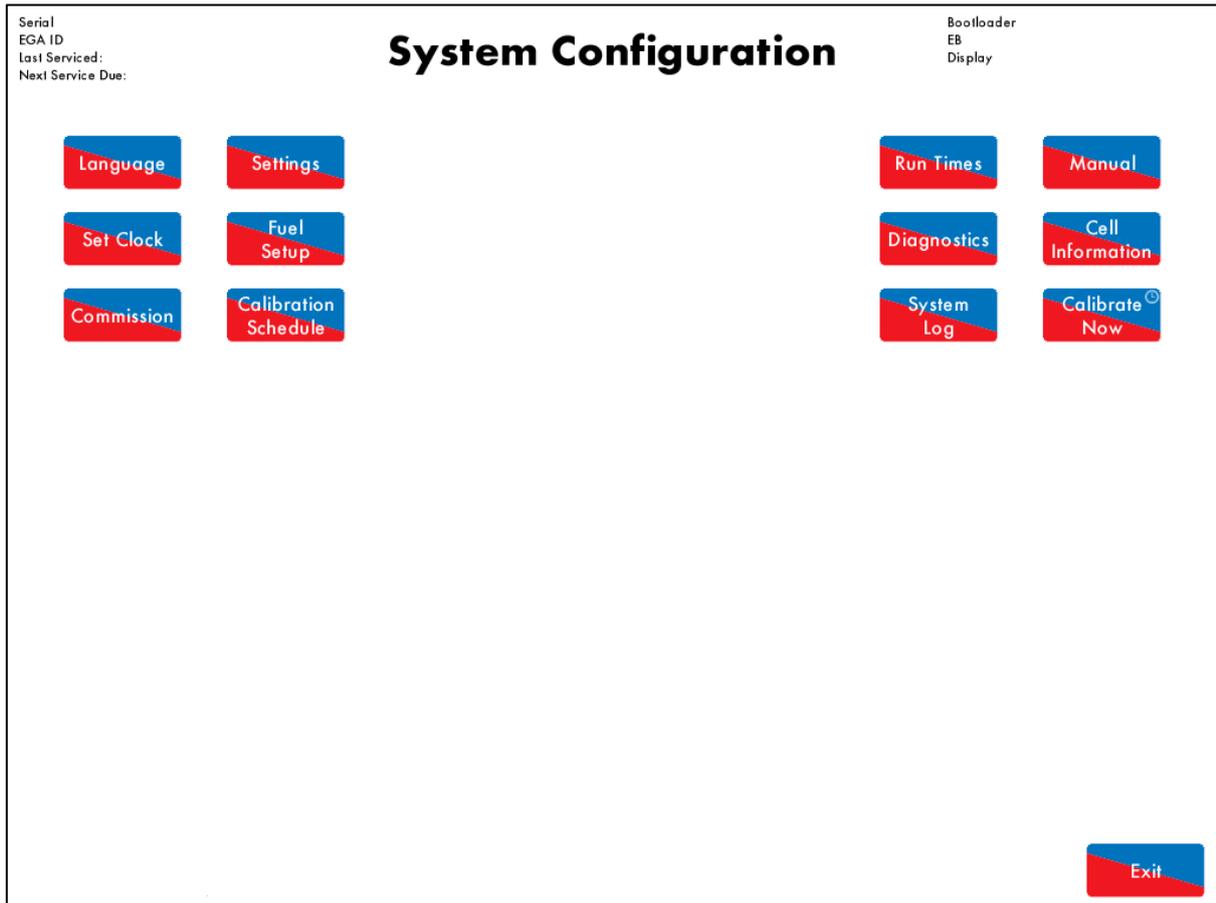


Figure 2.2.ii System Configuration Screen

图 2.2.ii 系统设置屏幕

Press  to access the Commissioning mode of the EGA. You will be prompted to enter the password.

按下  调试按钮可以访问烟气分析仪的调试模式，但需要输入密码。

The System Configuration provides information on:

系统设置将提供以下信息：

- EGA Serial number 烟气分析仪的序列号
- EGA ID number (set in Commission Mode setting 2) 烟气分析仪的 ID 号（在调试模式设置 2 中设置）
- Date of last service 最后一次保养日期
- Date of next service 下次保养日期
- Bootloader software version / Bootloader 软件版本
- EB software version / EB 软件版本
- Display software version / 显示软件版本

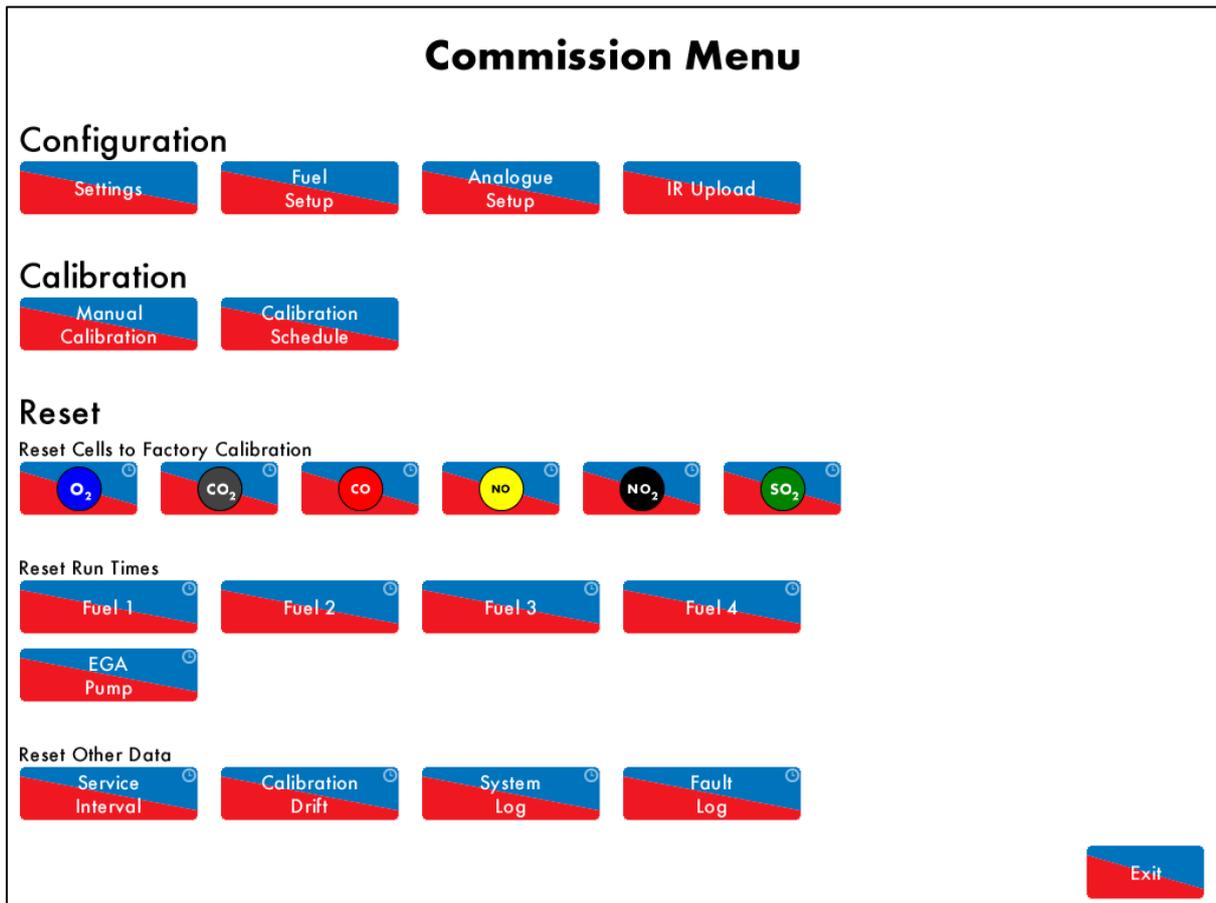


Figure 2.2.iii Commission Menu
图 2.2.iii 调试菜单

In the Commission menu, the following can be changed according to the application requirements:
在调试菜单中可以根据应用要求更改以下内容:

- EGA operational settings
烟气分析仪的操作设置
- Fuel type, units and cost
燃料类型、单位和费用
- Analogue 4-20mA outputs
4-20mA 模拟量输出
- Upload EGA settings to the unit
向设备上传烟气分析仪设置
- Calibration schedule
校准计划
- Reset cells to factory calibration
重置传感器至出厂校准值
- Reset fuel run times, pump history, service interval period, calibration drift
重置燃料运行时间、泵使用记录、维护间隔时间和校准偏差值。
- Reset system log and fault log
重置系统日志和故障日志

2.2.1 Commission Mode Settings 调试模式设置

Commission Mode		
#	Description	Value
1	Base: Control Mode	Controlled by MM
2	Base: Communications Id	1
3	Base: Display Units	Metric
4	Base: Efficiency Calculation Method	English
5	Base: Currency Units	GBP
6	Base: Backlight On Time	600 seconds
7	Base: Logo Display Timer	600 seconds
8	Base: Show Advanced Values	Disabled
9	Base: Pollutant Concentration Units	ppm
10	Cells: CO Poison Detection	Enabled
11	Cells: CO Poison Limit	600 ppm
12	Cells: CO Poison Return	200 ppm
13	Cells: SO2 Correction	100%
14	Cells: Minimum NO2 Fraction of NOx (if NO2 cell fitted)	0%
15	Cells: Reference O2 Concentration	3.0% O2
16	Cells: NO Fraction of NOx (if NO2 cell not fitted)	94.0%
17	Cells: Standard Temperature	298.0 °K
18	Cells: Standard Pressure	1013.2 mbar (406.8 inWG)
19	Unused: Unused	0

All
Base
Cells
Calibration
Back box
System
Vendor





Figure 2.2.1.i Commission Mode 调试模式

Press  in the Commission Menu to access the Commission Mode settings. The settings are grouped together in tabs: Base, Cells, Calibration, Back Box, System and Vendor.

按下调试菜单中的  设置按钮可以访问调试模式设置屏幕。设置内容被归类在基本设置、传感器、校准、背箱、系统和供应商等选项卡中。

Once settings have been changed, press  to return to the Commission Menu screen.

更改设置后按下  退出按钮可以返回调试菜单屏幕。

The below table shows the Commission Mode settings, range and their default values; these settings should be adjusted by factory trained technicians.

下表显示了调试模式设置、范围和默认值，这些设置应由经工厂培训的技术人员进行调整。

Setting 设置	Default 默认值	Range 范围	Description 说明
63			<u>Vendor Details Line 4</u> 供应商详细信息行 4
64	-	-	Enter Contact Details (Phone /Email Address) 输入联系人详细信息（电话/电子邮件） Unused 未使用
65	-	-	Unused 未使用
66	-	-	Unused 未使用
67	-	-	Unused 未使用
68	-	-	Unused 未使用
69	-	-	Unused 未使用
70	0		<u>Factory Restore</u> 恢复出厂设置
		0 – 100	Setting 5 will reset all settings to factory default. 设置 5 将恢复所有设置至出厂设置

2.2.2 Fuel Setup Settings

燃料设置

The fuel flow for the EGA can be taken from the MM (if connected) or by a 4-20mA fuel flow input on pins 17 and 18. The fuel type and cost can also be set on the EGA for CEMS analysis.

烟气分析仪的燃料流量可以在控制模块（如已连接）上设置或通过第 17 和 18 针上的 4-20mA 燃料流量输入设置。燃料类型和成本可以在烟气分析仪上设置，用于烟气连续排放监测系统（CEMS）分析。

If the fuel flow input is used, then the 4-20mA input must be configured.

如使用燃料流量输入，则必须设置 4-20mA 输入。

Fuel Setup		
#	Description	Value
1	Fuel 1: Fuel Type	Natural Gas (Birmingham, AL)
2	Fuel 1: Costing Units	1000 ft ³
3	Fuel 1: Cost Per Unit	10.00 GBP/1000 ft ³
4	Fuel 1: Fuel Flow Source	MM
5	Fuel 1: Fuel Flow Meter Units	MW
6	Fuel 1: Fuel Flow Meter Min At 4mA	0.00 MW
7	Fuel 1: Fuel Flow Meter Max At 20mA	0.00 MW
8	Unused: Unused	0
9	Unused: Unused	0
10	Unused: Unused	0
11	Fuel 2: Fuel Type	Natural Gas (Birmingham, AL)
12	Fuel 2: Costing Units	1000 ft ³
13	Fuel 2: Cost Per Unit	10.00 GBP/1000 ft ³
14	Fuel 2: Fuel Flow Source	MM
15	Fuel 2: Fuel Flow Meter Units	MW
16	Fuel 2: Fuel Flow Meter Min At 4mA	0.00 MW
17	Fuel 2: Fuel Flow Meter Max At 20mA	0.00 MW
18	Unused: Unused	0
19	Unused: Unused	0
20	Unused: Unused	0

All Fuel 1 Fuel 2 Fuel 3 Fuel 4





Figure 2.2.2.i

Press  in the Commission Menu screen to access the Fuel Setup settings. The settings are grouped together in tabs by fuel 1, fuel 2, fuel 3 and fuel 4.

在调试菜单屏幕上按下  燃料设置按钮可以访问燃料设置。设置内容被归类在燃料 1、燃料 2、燃料 3 和燃料 4 等四个选项卡中。

Once settings have been changed, press  to return to the Commission Menu screen.

更改设置后，按下  退出按钮可以返回调试菜单屏幕。

The below table shows the Fuel Setup settings, range and their default values.
下表显示了燃料设定值、范围和默认值。

Setting 设置	Default 默认值	Range 范围	Description 说明
1	0		Fuel 1: Fuel Type 燃料 1: 燃料类型
		0	Natural Gas (Birmingham, AL) 天然气(伯明翰)
		1	Natural Gas (North Sea) 天然气(北海)
		2	Natural Gas (Pittsburgh, PA) 天然气(宾夕法尼亚州匹兹堡)
		3	Butane 丁烷
		4	Digester Gas 沼气
		5	Heavy Fuel Oil #6 6号重燃油
		6	Light Fuel Oil #2 2号轻燃油
		7	Propane 丙烷
			(More information on fuels can be found in at the end of this table.) (关于燃料的更多信息请见本表末尾处)
2	0		Fuel 1: Costing Units 燃料 1: 成本单位
		0	1000 ft ³ 千立方尺
		1	MMBtu 百万英国热量单位
		2	MWh 兆瓦时
		3	m ³ 立方米
		4	US gallons 美国加仑
		5	Litres 升
3	1000		Fuel 1: Cost Per Unit 燃料 1: 单位成本
		0 – 65535	The currency units is set in Commission Mode setting 5, see section 2.2.1. 货币单位在调试模式设置 5 中设置, 请见第 2.2.1 节。 0.00 – 655.35 currency per costing unit 0.00 – 655.35 货币/成本单位 The default value is 10.00 GBP /1000 ft ³ 默认值是 10.00 GBP /1000 ft ³
4	0		Fuel 1: Fuel Flow Source 燃料 1: 燃料流量源
		0	For setting 0, the EGA is connected to an MM and the fuel flow rate is received from the MM's fuel flow rate based on fuel flow metering. For setting 1, a fuel flow meter is connected to the EGA via a 4-20mA input on pins 17 and 18 in the data flying lead. 设置为 0 时, 烟气分析仪与控制模块相连, 控制模块接收的燃料流率是根据燃料流量计计算。设置为 1 时, 燃料流量计通过数据线第 17 和 18 针上的 4-20mA 输入连接烟气分析仪。 MM 控制模块
		1	Fuel Flow Meter 燃料流量计量

Setting 设置	Default 默认值	Range 范围	Description 说明
5	0		Fuel 1: Fuel Flow Meter Units 燃料 1: 燃料流量计量单位
			Setting 5 must be set if setting 4 is set to fuel flow meter. 如设置 4 用于设置燃料流量计，则必须设定设置 5。
		0	MW
		1	MMBtu/h
		2	ft ³ /h
		3	m ³ /h
		4	lb/h
		5	kg/h
		6	litres/h
		7	US gallons/h
6	0		Fuel 1: Fuel Flow Meter Min at 4mA 燃料 1: 4mA 时燃料流量计最小值
		0 – 65535	0.00 – 655.35 fuel flow meter units set in setting 5 0.00 – 655.35 燃料流量计单位在设置 5 中设定
7	0		Fuel 1: Fuel Flow Meter Max at 20mA 燃料 1: 20mA 时燃料流量计最大值
		0 – 65535	0.00 – 655.35 fuel flow meter units set in setting 5 0.00 – 655.35 燃料流量计单位在设置 5 中设定
8	-	-	Unused / 未使用
9	-	-	Unused / 未使用
10	-	-	Unused / 未使用
11	0		Fuel 2: Fuel Type 燃料 2: 燃料类型
		0	Natural Gas (Birmingham, AL) 天然气(伯明翰)
		1	Natural Gas (North Sea) 天然气(北海)
		2	Natural Gas (Pittsburgh, PA) 天然气(宾夕法尼亚州匹兹堡)
		3	Butane 丁烷
		4	Digester Gas 沼气
		5	Heavy Fuel Oil #6 6号重燃油
		6	Light Fuel Oil #2 2号轻燃油
		7	Propane 丙烷
			(More information on fuels can be found in at the end of this table.) (关于燃料的更多信息请见本表末尾处)
12	0		Fuel 2: Costing Units 燃料 2: 成本单位
		0	1000 ft ³
		1	MMBtu
		2	MWh
		3	m ³
		4	US gallons
		5	Litres

Setting 设置	Default 默认值	Range 范围	Description 说明
13	1000		Fuel 2: Cost Per Unit 燃料 2: 单位成本
		0 – 65535	The currency units is set in Commission Mode setting 5, see section 2.2.1. 货币单位在调试模式设置 5 中设置，请见第 2.2.1 节。 0.00 – 655.35 currency per costing unit 0.00 - 655.35 货币单位成本 The default value is 10.00 GBP /1000 ft ³ 默认值是 10.00 英镑/ 1000 英尺 ³
14	0		Fuel 2: Fuel Flow Source 燃料 2: 燃料流量源
		0	For setting 0, the EGA is connected to an MM and the fuel flow rate is received from the MM's fuel flow rate based on fuel flow metering. For setting 1, a fuel flow meter is connected to the EGA via a 4-20mA input on pins 17 and 18 in the data flying lead. 设置为 0 时，烟气分析仪与控制模块相连，控制模块接收的燃料流率是根据燃料流量计计算。设置为 1 时，燃料流量计通过数据接线第 17 和 18 针上的 4-20mA 输入连接烟气分析仪。 MM 控制模块
		1	Fuel Flow Meter 燃料流量计量
15	0		Fuel 2: Fuel Flow Meter Units 燃料 2: 燃料流量计量单位
		0	Setting 15 must be set if setting 14 is set to fuel flow meter. 如设置 14 用于设置燃料流量计，则必须设定设置 15。 MW
		1	MMBtu/h
		2	ft ³ /h
		3	m ³ /h
		4	lb/h
		5	kg/h
		6	litres/h
		7	US gallons/h
16	0		Fuel 2: Fuel Flow Meter Min at 4mA 燃料 2: 4mA 时燃料流量计最小值
		0 – 65535	0.00 – 655.35 fuel flow meter units set in setting 15 0.00 - 655.35 燃料流量计单位在设置 15 中设定。
17	0		Fuel 2: Fuel Flow Meter Max at 20mA 燃料 2: 20mA 时燃料流量计最大值
		0 – 65535	0.00 – 655.35 fuel flow meter units set in setting 15 0.00 - 655.35 燃料流量计单位在设置 15 中设定。
18	-	-	Unused / 未使用
19	-	-	Unused / 未使用
20	-	-	Unused / 未使用

Setting 设置	Default 默认值	Range 范围	Description 说明
21	0		Fuel 3: Fuel Type 燃料 3: 燃料类型
		0	Natural Gas (Birmingham, AL) 天然气(伯明翰)
		1	Natural Gas (North Sea) 天然气(北海)
		2	Natural Gas (Pittsburgh, PA) 天然气(宾夕法尼亚州匹兹堡)
		3	Butane 丁烷
		4	Digester Gas 沼气
		5	Heavy Fuel Oil #6 6号重燃油
		6	Light Fuel Oil #2 2号轻燃油
		7	Propane 丙烷
			(More information on fuels can be found in at the end of this table.) (关于燃料的更多信息请见本表末尾处)
22	0		Fuel 3: Costing Units 燃料 3: 成本单位
		0	1000 ft ³
		1	MMBtu
		2	MWh
		3	m ³
		4	US gallons
		5	Litres
23	1000		Fuel 3: Cost Per Unit 燃料 3: 每单位成本
		0 – 65535	The currency units is set in Commission Mode setting 5, see section 2.2.1. 货币单位在调试模式设置 5 中设置，请见第 2.2.1 节。 0.00 – 655.35 currency per costing unit 0.0 – 655.35 货币/成本单位 The default value is 10.00 GBP /1000 ft ³ 默认值是 10.00 GBP /1000 ft ³ 。
24	0		Fuel 3: Fuel Flow Source 燃料 3: 燃料流量源
			For setting 0, the EGA is connected to an MM and the fuel flow rate is received from the MM's fuel flow rate based on fuel flow metering. For setting 1, a fuel flow meter is connected to the EGA via a 4-20mA input on pins 17 and 18 in the data flying lead. 设置为 0 时，烟气分析仪与控制模块相连，控制模块接收的燃料流率是根据燃料流量计计算。设置为 1 时，燃料流量计通过数据接线第 17 和 18 针上的 4-20mA 输入连接烟气分析仪。
		0	MM 控制模块
		1	Fuel Flow Meter 燃料流量计量

Setting 设置	Default 默认值	Range 范围	Description 说明
25	0		Fuel 3: Fuel Flow Meter Units 燃料 3: 燃料流量计量单位
			Setting 25 must be set if setting 24 is set to fuel flow meter. 如设置 4 用于设置燃料流量计量, 则必须设定设置 25。
		0	MW
		1	MMBtu/h
		2	ft ³ /h
		3	m ³ /h
		4	lb/h
		5	kg/h
		6	litres/h
		7	US gallons/h
26	0		Fuel 3: Fuel Flow Meter Min at 4mA 燃料 3: 4mA 时燃料流量计最小值
		0 – 65535	0.00 – 655.35 fuel flow meter units set in setting 25 0.00 – 655.35 燃料流量计单位在设置 25 中设定
27	0		Fuel 3: Fuel Flow Meter Max at 20mA 燃料 3: 20mA 时燃料流量计最大值
		0 – 65535	0.00 – 655.35 fuel flow meter units set in setting 25 0.00 – 655.35 燃料流量计单位在设置 25 中设定
28	-	-	Unused 未使用
29	-	-	Unused 未使用
30	-	-	Unused 未使用
31	0		Fuel 4: Fuel Type 燃料 4: 燃料类型
		0	Natural Gas (Birmingham, AL) 天然气(伯明翰)
		1	Natural Gas (North Sea) 天然气(北海)
		2	Natural Gas (Pittsburgh, PA) 天然气(宾夕法尼亚州匹兹堡)
		3	Butane 丁烷
		4	Digester Gas 沼气
		5	Heavy Fuel Oil #6 6号重燃油
		6	Light Fuel Oil #2 2号轻燃油
		7	Propane 丙烷
			(More information on fuels can be found in at the end of this table.) (关于燃料的更多信息请见本表末尾处)
32	0		Fuel 4: Costing Units 燃料 4: 成本单位
		0	1000 ft ³
		1	MMBtu
		2	MWh
		3	m ³
		4	US gallons
		5	Litres

Setting 设置	Default 默认值	Range 范围	Description 说明
33	1000		Fuel 4: Cost Per Unit 燃料 4: 每单位成本
		0 – 65535	The currency units is set in Commission Mode setting 5, see section 2.2.1. 货币单位在调试模式设置 5 中设置，请见第 2.2.1 节。 0.00 – 655.35 currency per costing unit 0.00 – 655.35 货币/成本单位 The default value is 10.00 GBP /1000 ft ³ 默认值是 10.00 GBP /1000 ft ³
34	0		Fuel 4: Fuel Flow Source 燃料 4: 燃料流量源
		0	For setting 0, the EGA is connected to an MM and the fuel flow rate is received from the MM's fuel flow rate based on fuel flow metering. For setting 1, a fuel flow meter is connected to the EGA via a 4-20mA input on pins 17 and 18 in the data flying lead. 设置为 0 时，烟气分析仪与控制模块相连，控制模块接收的燃料流率是根据燃料流量计计算。设置为 1 时，燃料流量计通过数据接线第 17 和 18 针上的 4-20mA 输入连接烟气分析仪。 MM 控制模块
		1	Fuel Flow Meter 燃料流量计量
35	0		Fuel 4: Fuel Flow Meter Units 燃料 4: 燃料流量计量单位
		0	Setting 35 must be set if setting 34 is set to fuel flow meter. 如设置 34 用于设置燃料流量计量，则必须设定设置 35。 MW
		1	MMBtu/h
		2	ft ³ /h
		3	m ³ /h
		4	lb/h
		5	kg/h
		6	litres/h
		7	US gallons/h
36	0		Fuel 4: Fuel Flow Meter Min at 4mA 燃料 4: 4mA 时燃料流量计最小值
		0 – 65535	0.00– 655.35 fuel flow meter units set in setting 35 0.00 – 655.35 燃料流量计单位在设置 35 中设定
37	0		Fuel 4: Fuel Flow Meter Max at 20mA 燃料 4: 20mA 时燃料流量计最大值
		0 – 65535	0.00 – 655.35 fuel flow meter units set in setting 35 0.00 – 655.35 燃料流量计单位在设置 35 中设定
38	-	-	Unused 未使用
39	-	-	Unused 未使用
40	-	-	Unused 未使用

The below table shows information on the fuel type set in Fuel Setup settings 1, 11, 21 and 31, for fuels 1, 2, 3 and 4, respectively.

下表显示了燃料设置 1、11、21 和 31 中关于燃料 1、燃料 2、燃料 3 和燃料 4 中设置的燃料类信息。

Fuel Type 燃料类型	Calorific Value (MJ/kg) 热值 (MJ/kg)	Specific Gravity 比重	Composition by weight 成分重量		
			C %	H ₂ %	S %
Natural Gas (Birmingham, AL) 天然气(伯明翰)	50.90	0.60	71.70	23.30	0.00
Natural Gas (North Sea) 天然气(北海)	50.86	0.59	69.40	22.50	0.00
Natural Gas (Pittsburgh, PA) 天然气(宾夕法尼亚州匹兹堡)	50.13	0.63	75.70	23.50	0.00
Butane 丁烷	48.49	2.02	83.50	16.50	0.00
Digester Gas 沼气	19.09	0.80	60.41	13.40	0.00
Heavy Fuel Oil #6 6号重燃油	42.23	0.96	88.30	9.30	0.85
Light Fuel Oil #2 2号轻燃油	44.25	0.83	87.30	12.50	0.20
Propane 丙烷	50.27	1.52	81.60	18.40	0.00

2.2.3 Analogue Setup Settings 模拟量设置

Analogue Setup		Value
#	Description	
1	Output 1: Data Source	Oxygen Concentration
2	Output 1: 4mA Corresponds To	0.0% O2
3	Output 1: 20mA Corresponds To	0.0% O2
4	Unused: Unused	0
5	Unused: Unused	0
6	Output 2: Data Source	Oxygen Concentration
7	Output 2: 4mA Corresponds To	0.0% O2
8	Output 2: 20mA Corresponds To	0.0% O2
9	Unused: Unused	0
10	Unused: Unused	0
11	Output 3: Data Source	Oxygen Concentration
12	Output 3: 4mA Corresponds To	0.0% O2
13	Output 3: 20mA Corresponds To	0.0% O2
14	Unused: Unused	0
15	Unused: Unused	0
16	Output 4: Data Source	Oxygen Concentration
17	Output 4: 4mA Corresponds To	0.0% O2
18	Output 4: 20mA Corresponds To	0.0% O2
19	Unused: Unused	0
20	Unused: Unused	0





Figure 2.2.3.i Analogue Setup Screen
图 2.2.3.i 模拟量设置屏幕

Press  in the Commission Menu screen to access the Analogue Setup screen. There are 6 analogue outputs available on the EGA, which can be configured to send data as 4-20mA from the EGA. The Analogue Setup settings are grouped together in tabs as Output 1, Output 2, Output 3, Output 4, Output 5 and Output 6.

在调试菜单屏幕上按下  **模拟量设置** 按钮可以访问模拟量设置屏幕。烟气分析仪上有 6 个模拟量输出，可以设置从烟气分析仪上发送 4-20mA 数据。模拟设置被归类在输出 1、输出 2、输出 3、输出 4、输出 5 和输出 6 等六个选项卡中。

Once settings have been changed, press  to return to the Commission Menu screen.

更改设置后，按下  **退出** 按钮可以返回调试菜单屏幕。

The table below shows the settings, range and default values for the Analogue Setup settings.
下表显示了模拟量设置的设定值、范围和默认值。

Setting 设置	Default 默认值	Range 范围	Description 说明
1	0		<u>Output 1: Data Source</u> <u>输出 1: 数据源</u>
		0	Oxygen Concentration 氧气浓度
		1	Carbon Dioxide Concentration 二氧化碳浓度
		2	Carbon Monoxide Concentration 一氧化碳浓度
		3	Nitric Oxide Concentration 一氧化氮浓度
		4	Nitrogen Dioxide Concentration 二氧化氮浓度
		5	Sulphur Dioxide Concentration 二氧化硫浓度
		6	Ambient Temperature 环境温度
		7	Exhaust Temperature 排气温度
		8	Efficiency 效率
		9	EGA Status 烟气分析仪状态
2	0		<u>Output 1: 4mA Corresponds To</u> <u>输出 1: 4mA 对应的输出</u>
			For this setting, the units will depend on the data source in setting 1. 本设置中的单位取决于设置 1 中设定的数据源。
		0 – 1000	0.0 – 100.0 % O ₂
		0 – 1000	0.0 – 100.0 % CO ₂
		0 - 10000	0 – 10000 ppm CO
		0 - 10000	0 – 10000 ppm NO
		0 - 10000	0 – 10000 ppm NO ₂
		0 - 10000	0 – 10000 ppm SO ₂
		0 – 10000	0.0 – 1000.0 °C Temperature 摄氏度
		0 – 10000	0.0 – 1000.0 °F Temperature 华氏度
		0 – 1000	0.0 – 100.0 % Efficiency 效率百分比
		0 – 1	0 = Off – 1 = On EGA Status 0 = 关闭 1 = 启动 烟气分析仪状态

Setting 设置	Default 默认值	Range 范围	Description 说明
3	0		<p><u>Output 1: 20mA Corresponds To</u> 输出 1:20mA 对应的输出</p> <p>For this setting, the units will depend on the data source in setting 1. 本设置中的单位取决于设置 1 中设定的数据源。</p> <p>0 – 1000 0.0 – 100.0 % O₂</p> <p>0 – 1000 0.0 – 100.0 % CO₂</p> <p>0 - 10000 0 – 10000 ppm CO</p> <p>0 - 10000 0 – 10000 ppm NO</p> <p>0 - 10000 0 – 10000 ppm NO₂</p> <p>0 - 10000 0 – 10000 ppm SO₂</p> <p>0 – 10000 0.0 – 1000.0 °C Temperature 摄氏度</p> <p>0 – 10000 0.0 – 1000.0 °F Temperature 华氏度</p> <p>0 – 1000 0.0 – 100.0 % Efficiency 效率百分比</p> <p>0 – 1 0 = Off – 1 = On EGA Status 0 = 关闭 1= 启动 烟气分析仪状态</p>
4	-	-	Unused 未使用
5	-	-	Unused 未使用

Setting 设置	Default 默认值	Range 范围	Description 说明
6	0		<u>Output 2: Data Source</u> <u>输出 2: 数据源</u>
		0	Oxygen Concentration 氧气浓度
		1	Carbon Dioxide Concentration 二氧化碳浓度
		2	Carbon Monoxide Concentration 一氧化碳浓度
		3	Nitric Oxide Concentration 一氧化氮浓度
		4	Nitrogen Dioxide Concentration 二氧化氮浓度
		5	Sulphur Dioxide Concentration 二氧化硫浓度
		6	Ambient Temperature 环境温度
		7	Exhaust Temperature 排气温度
		8	Efficiency 效率
		9	EGA Status 烟气分析仪状态
7	0		<u>Output 2: 4mA Corresponds To</u> <u>输出 2: 4mA 对应的输出</u>
			For this setting, the units will depend on the data source in setting 6. 本设置中的单位取决于设置 6 中设定的数据源。
		0 – 1000	0.0 – 100.0 % O ₂
		0 – 1000	0.0 – 100.0 % CO ₂
		0 - 10000	0 – 10000 ppm CO
		0 - 10000	0 – 10000 ppm NO
		0 - 10000	0 – 10000 ppm NO ₂
		0 - 10000	0 – 10000 ppm SO ₂
		0 – 10000	0.0 – 1000.0 °C Temperature 摄氏度
		0 – 10000	0.0 – 1000.0 °F Temperature 华氏度
		0 – 1000	0.0 – 100.0 % Efficiency 效率百分比
		0 – 1	0 = Off – 1 = On EGA Status 0 = 关闭 1 = 启动 烟气分析仪状态
8	0		<u>Output 2: 20mA Corresponds To</u> <u>输出 2: 20mA 对应的输出</u>
			For this setting, the units will depend on the data source in setting 6. 本设置中的单位取决于设置 6 中设定的数据源。
		0 – 1000	0.0 – 100.0 % O ₂
		0 – 1000	0.0 – 100.0 % CO ₂
		0 - 10000	0 – 10000 ppm CO
		0 - 10000	0 – 10000 ppm NO
		0 - 10000	0 – 10000 ppm NO ₂

		0 - 10000	0 – 10000	ppm SO ₂
		0 – 10000	0.0 – 1000.0	°C Temperature 摄氏度
		0 – 10000	0.0 – 1000.0	°F Temperature 华氏度
		0 – 1000	0.0 – 100.0	% Efficiency 效率百分比
		0 – 1	0 = Off – 1 = On	EGA Status
9	-	-	Unused	
10	-	-	Unused	
			未使用	
			未使用	

Setting 设置	Default 默认值	Range 范围	Description 说明
11	0		<u>Output 3: Data Source</u> <u>输出 3: 数据源</u>
		0	Oxygen Concentration 氧气浓度
		1	Carbon Dioxide Concentration 二氧化碳浓度
		2	Carbon Monoxide Concentration 一氧化碳浓度
		3	Nitric Oxide Concentration 一氧化氮浓度
		4	Nitrogen Dioxide Concentration 二氧化氮浓度
		5	Sulphur Dioxide Concentration 二氧化硫浓度
		6	Ambient Temperature 环境温度
		7	Exhaust Temperature 排气温度
		8	Efficiency 效率
		9	EGA Status 烟气分析仪状态
12	0		<u>Output 3: 4mA Corresponds To</u> <u>输出 3: 4mA 对应的输出</u>
			For this setting, the units will depend on the data source in setting 11. 本设置中的单位取决于设置 11 中设定的数据源。
		0 – 1000	0.0 – 100.0 % O ₂
		0 – 1000	0.0 – 100.0 % CO ₂
		0 - 10000	0 – 10000 ppm CO
		0 - 10000	0 – 10000 ppm NO
		0 - 10000	0 – 10000 ppm NO ₂
		0 - 10000	0 – 10000 ppm SO ₂
		0 – 10000	0.0 – 1000.0 °C Temperature 摄氏度
		0 – 10000	0.0 – 1000.0 °F Temperature 华氏度
		0 – 1000	0.0 – 100.0 % Efficiency 效率百分比
		0 – 1	0 = Off – 1 = On EGA Status 0 = 关闭 1 = 启动 烟气分析仪状态
13	0		<u>Output 3: 20mA Corresponds To</u> <u>输出 3: 20mA 对应的输出</u>
			For this setting, the units will depend on the data source in setting 11. 本设置中的单位取决于设置 11 中设定的数据源。
		0 – 1000	0.0 – 100.0 % O ₂
		0 – 1000	0.0 – 100.0 % CO ₂
		0 - 10000	0 – 10000 ppm CO
		0 - 10000	0 – 10000 ppm NO

		0 - 10000	0 – 10000	ppm NO ₂
		0 - 10000	0 – 10000	ppm SO ₂
		0 – 10000	0.0 – 1000.0	°C Temperature 摄氏度
		0 – 10000	0.0 – 1000.0	°F Temperature 华氏度
		0 – 1000	0.0 – 100.0	% Efficiency 效率百分比
		0 – 1	0 = Off – 1 = On	EGA Status
14	-	-	Unused	
15	-	-	Unused	
			未使用	
			未使用	

Setting 设置	Default 默认值	Range 范围	Description 说明
16	0		<u>Output 4: Data Source</u> <u>输出 4: 数据源</u>
		0	Oxygen Concentration 氧气浓度
		1	Carbon Dioxide Concentration 二氧化碳浓度
		2	Carbon Monoxide Concentration 一氧化碳浓度
		3	Nitric Oxide Concentration 一氧化氮浓度
		4	Nitrogen Dioxide Concentration 二氧化氮浓度
		5	Sulphur Dioxide Concentration 二氧化硫浓度
		6	Ambient Temperature 环境温度
		7	Exhaust Temperature 排气温度
		8	Efficiency 效率
		9	EGA Status 烟气分析仪状态
17	0		<u>Output 4: 4mA Corresponds To</u> <u>输出 4: 4mA 对应的输出</u>
			For this setting, the units will depend on the data source in setting 16. 本设置中的单位取决于设置 16 中设定的数据源。
		0 – 1000	0.0 – 100.0 % O ₂
		0 – 1000	0.0 – 100.0 % CO ₂
		0 - 10000	0 – 10000 ppm CO
		0 - 10000	0 – 10000 ppm NO
		0 - 10000	0 – 10000 ppm NO ₂
		0 - 10000	0 – 10000 ppm SO ₂
		0 – 10000	0.0 – 1000.0 °C Temperature 摄氏度
		0 – 10000	0.0 – 1000.0 °F Temperature 华氏度
		0 – 1000	0.0 – 100.0 % Efficiency 效率百分比
		0 – 1	0 = Off – 1 = On EGA Status 0 = 关闭 1 = 启动 烟气分析仪状态
18	0		<u>Output 4: 20mA Corresponds To</u> <u>输出 4: 20mA 对应的输出</u>
			For this setting, the units will depend on the data source in setting 16. 本设置中的单位取决于设置 16 中设定的数据源。
		0 – 1000	0.0 – 100.0 % O ₂
		0 – 1000	0.0 – 100.0 % CO ₂
		0 - 10000	0 – 10000 ppm CO
		0 - 10000	0 – 10000 ppm NO

		0 - 10000	0 – 10000	ppm NO ₂
		0 - 10000	0 – 10000	ppm SO ₂
		0 – 10000	0.0 – 1000.0	°C Temperature 摄氏度
		0 – 10000	0.0 – 1000.0	°F Temperature 华氏度
		0 – 1000	0.0 – 100.0	% Efficiency 效率百分比
		0 – 1	0 = Off – 1 = On	EGA Status
19	-	-	Unused	
20	-	-	Unused	
			未使用	
			未使用	

Setting 设置	Default 默认值	Range 范围	Description 说明
21	0		<u>Output 5: Data Source</u> <u>输出 5: 数据源</u>
		0	Oxygen Concentration 氧气浓度
		1	Carbon Dioxide Concentration 二氧化碳浓度
		2	Carbon Monoxide Concentration 一氧化碳浓度
		3	Nitric Oxide Concentration 一氧化氮浓度
		4	Nitrogen Dioxide Concentration 二氧化氮浓度
		5	Sulphur Dioxide Concentration 二氧化硫浓度
		6	Ambient Temperature 环境温度
		7	Exhaust Temperature 排气温度
		8	Efficiency 效率
		9	EGA Status 烟气分析仪状态
22	0		<u>Output 5: 4mA Corresponds To</u> <u>输出 5: 4mA 对应的输出</u>
			For this setting, the units will depend on the data source in setting 21. 本设置中的单位取决于设置 21 中设定的数据源。
		0 – 1000	0.0 – 100.0 % O ₂
		0 – 1000	0.0 – 100.0 % CO ₂
		0 - 10000	0 – 10000 ppm CO
		0 - 10000	0 – 10000 ppm NO
		0 - 10000	0 – 10000 ppm NO ₂
		0 - 10000	0 – 10000 ppm SO ₂
		0 – 10000	0.0 – 1000.0 °C Temperature 摄氏度
		0 – 10000	0.0 – 1000.0 °F Temperature 华氏度
		0 – 1000	0.0 – 100.0 % Efficiency 效率百分比
		0 – 1	0 = Off – 1 = On EGA Status 0 = 关闭 1 = 启动 烟气分析仪状态
23	0		<u>Output 5: 20mA Corresponds To</u> <u>输出 5: 20mA 对应的输出</u>
			For this setting, the units will depend on the data source in setting 21. 本设置中的单位取决于设置 21 中设定的数据源。
		0 – 1000	0.0 – 100.0 % O ₂
		0 – 1000	0.0 – 100.0 % CO ₂
		0 - 10000	0 – 10000 ppm CO
		0 - 10000	0 – 10000 ppm NO

		0 - 10000	0 - 10000	ppm NO ₂
		0 - 10000	0 - 10000	ppm SO ₂
		0 - 10000	0.0 - 1000.0	°C Temperature 摄氏度
		0 - 10000	0.0 - 1000.0	°F Temperature 华氏度
		0 - 1000	0.0 - 100.0	% Efficiency 效率百分比
		0 - 1	0 = Off - 1 = On	EGA Status
24	-	-	Unused	
25	-	-	Unused	
			未使用	
			未使用	

Setting 设置	Default 默认值	Range 范围	Description 说明
26	0		<u>Output 6: Data Source</u> <u>输出 6: 数据源</u>
		0	Oxygen Concentration 氧气浓度
		1	Carbon Dioxide Concentration 二氧化碳浓度
		2	Carbon Monoxide Concentration 一氧化碳浓度
		3	Nitric Oxide Concentration 一氧化氮浓度
		4	Nitrogen Dioxide Concentration 二氧化氮浓度
		5	Sulphur Dioxide Concentration 二氧化硫浓度
		6	Ambient Temperature 环境温度
		7	Exhaust Temperature 排气温度
		8	Efficiency 效率
		9	EGA Status 烟气分析仪状态
27	0		<u>Output 6: 4mA Corresponds To</u> <u>输出 6: 4mA 对应的输出</u>
			For this setting, the units will depend on the data source in setting 26. 本设置中的单位取决于设置 26 中设定的数据源。
		0 – 1000	0.0 – 100.0 % O ₂
		0 – 1000	0.0 – 100.0 % CO ₂
		0 - 10000	0 – 10000 ppm CO
		0 - 10000	0 – 10000 ppm NO
		0 - 10000	0 – 10000 ppm NO ₂
		0 - 10000	0 – 10000 ppm SO ₂
		0 – 10000	0.0 – 1000.0 °C Temperature 摄氏度
		0 – 10000	0.0 – 1000.0 °F Temperature 华氏度
		0 – 1000	0.0 – 100.0 % Efficiency 效率百分比
		0 – 1	0 = Off – 1 = On EGA Status 0 = 关闭 1 = 启动 烟气分析仪状态
			0.0 – 100.0 % O ₂
28	0		<u>Output 6: 20mA Corresponds To</u> <u>输出 6: 20mA 对应的输出</u>
			For this setting, the units will depend on the data source in setting 26. 本设置中的单位取决于设置 26 中设定的数据源。
		0 – 1000	0.0 – 100.0 % O ₂
		0 – 1000	0.0 – 100.0 % CO ₂
		0 - 10000	0 – 10000 ppm CO
		0 - 10000	0 – 10000 ppm NO

		0 - 10000	0 - 10000	ppm NO ₂
		0 - 10000	0 - 10000	ppm SO ₂
		0 - 10000	0.0 - 1000.0	°C Temperature 摄氏度
		0 - 10000	0.0 - 1000.0	°F Temperature 华氏度
		0 - 1000	0.0 - 100.0	% Efficiency 效率百分比
		0 - 1	0 = Off - 1 = On	EGA Status
29	-	-	Unused	
30	-	-	Unused	
			未使用	
			未使用	

2.3 Commissioning MM with EGA

使用 EGA 烟气分析仪调试 MM 控制模块

Commissioning with the EGA is an extension to commissioning with the MM and is required if the trim function is to be used. The factory trained technician must be completely familiar with the commissioning of the MM unit before commissioning with the EGA. For the full commissioning procedure, please refer to the Mk8 MM Installation and Commissioning Guide and Mini Mk8 MM Installation and Commissioning Guide.

利用烟气分析仪进行调试是使用控制模块进行调试的一种补充方式，使用微调功能时则需要进行此类调试。经工厂培训的技术人员在利用烟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 Mk8 控制模块安装和调试指南以及 Mk8 微型控制模块安装和调试指南。

The commissioning procedure as described must be strictly adhered to. Anybody commissioning an MM/EGA 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。调试控制模块和烟气分析仪系统的所有人员都必须完全了解燃烧设备的运行，并获得 Aotoflame 工程有限公司的正式认证。

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试时可能会发生危险，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位置和一个对应的空气阀位置。调节燃料和空气位置时应特别小心，确保不产生任何不稳定或危险的燃烧状况，例如：把燃气阀调节到开启位置时未相应增大空气阀的开度。

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

利用烟气分析仪调试系统不需要燃烧监测器，因为烟气分析仪可以进行所有烟气的正常测量。使用燃油时需要用烟气检测设备对产生的烟气进行检测，确定产生的烟气符合政府的规定。

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，锅炉运行时应施加相当的荷载量。过高的温度或压力会中断调试过程并造成燃烧器关闭。当此类情况发生时，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.

燃烧器燃烧时燃料先进入最大燃料位置，然后进入燃料递减位置，直至完全进入最小燃料位置。CH1 和 CH2 的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:

请按以下流程安装新系统：

1. Check all interconnecting wiring between the MM 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 MM Settings and EGA Settings, see sections 2.1.1 and 2.2, respectively.
设置控制模块和烟气分析仪（请分别参考第 2.1.1 和 2.2 节）。

3. Set up positioning motors.
设置伺服电机。
4. Programme fuel/air positions.
设置燃料/空气位置。

Note: For the safety and operational checks, and the full commissioning procedure please refer to the Mk8 MM Installation and Commissioning Guide and the Mini Mk8 MM Installation and Commissioning Guide.

注：关于安全检查和运行检查，请参考 **Mk8 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。

On the Mk8 MM and Mini Mk8 MM, it is possible to commission the burner with option 12 set to no EGA or monitoring only, then add EGA trim later by setting option 12 to 2 or 3 and adding the trim positions in single point change. 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.

在 **Mk8 控制模块**和 **Mk8 微型控制模块**上可以调试燃烧器，调试时只需将选项 12 设为“无烟气分析仪”或“仅监控”，然后将选项 12 设为 2 或 3 后再添加烟气分析仪微调，请在单点更改模式上添加微调位置。完成调试并输入所有点后在单点更改上设置微调。此时，请确保选项 12 已设为微调。进入单点更改模式后，您可以在特定点按下“微调”按钮启用微调。

2.4 Calibration Schedule 校准计划

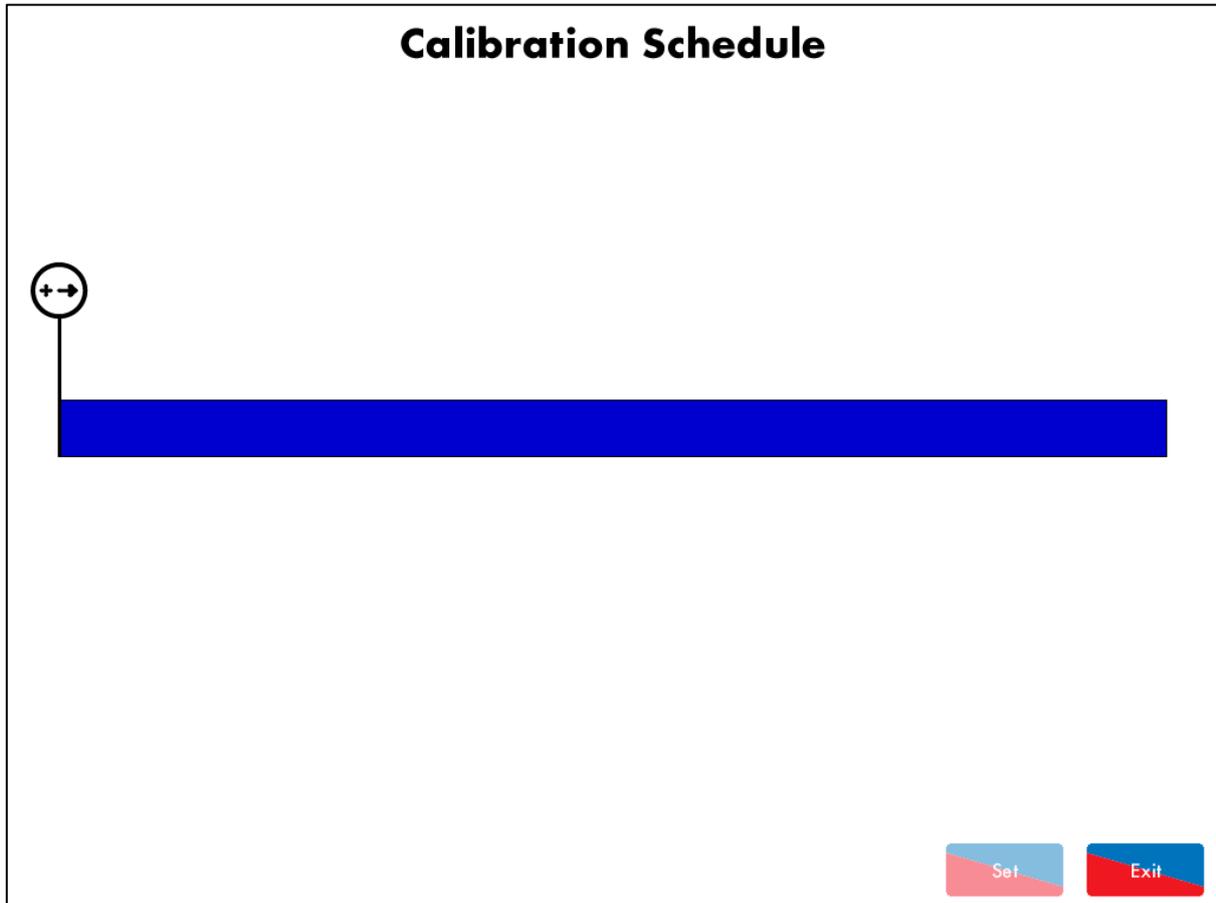


Figure 2.4.i Calibration Schedule (clear)
图 2.4.i 校准计划 (空白)

Press  in the Commission Menu screen shown in Figure 2.2.iii to access the Calibration Schedule screen. Alternatively, press  in the System Configuration screen and enter the Online Changes password.

在图 2.2.iii 所示的调试菜单屏幕上按下  校准计划按钮可以访问校准计划安排屏幕，您也可以
在系统设置屏幕上按下  校准计划按钮，然后输入在线更改密码。

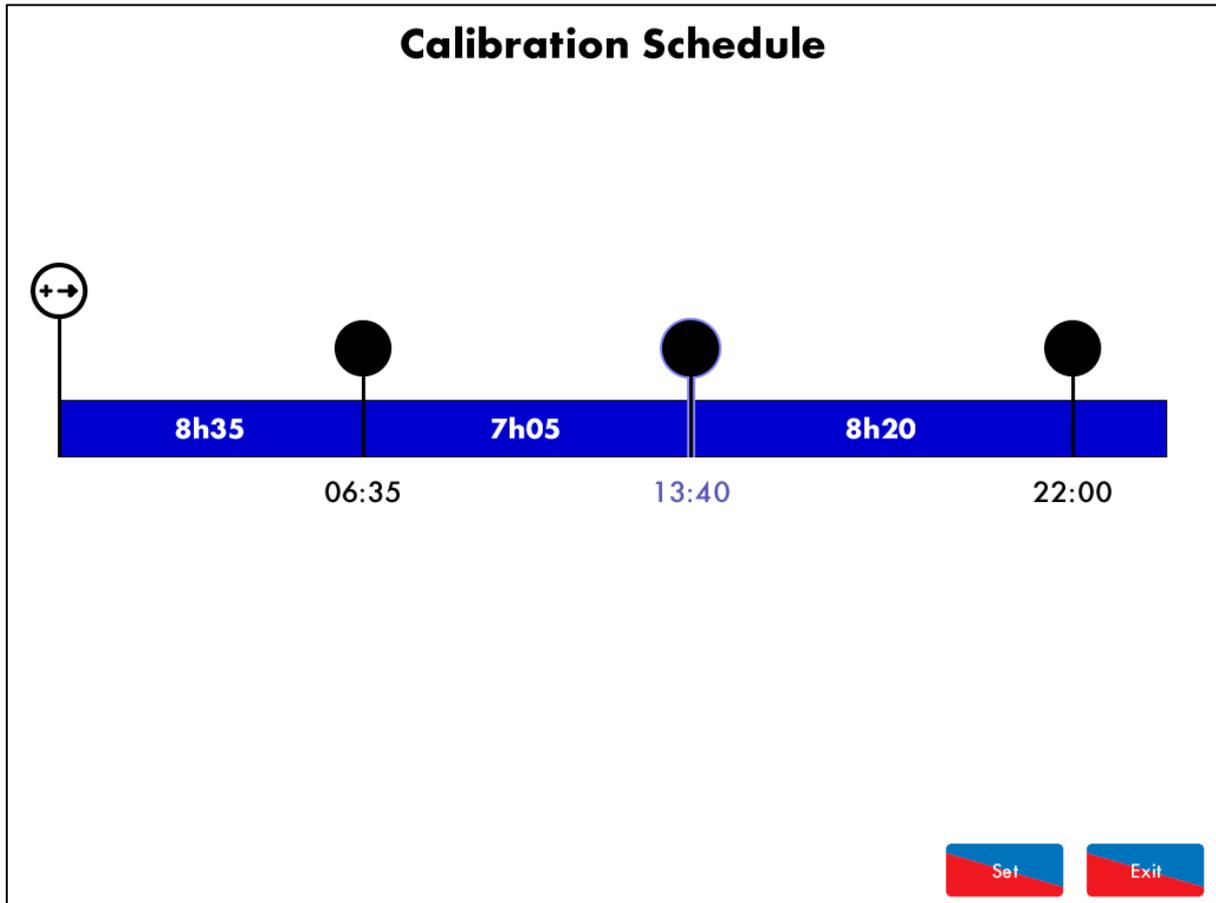


Figure 2.4.ii Calibration Schedule
图 2.4.ii 校准计划

Press on  to add an air calibration time, and drag this circle to the left or right to adjust to the time. The air calibrations can be scheduled at 5 minute intervals, and up to 4 air calibrations can be added over a 24 hour period.

按下  按钮可以添加一个空气校准计划，向左或向右拖动该圆圈可以调节时间。空气校准间隔时间可以设为 5 分钟，24 小时内可以进行 4 次空气校准。

To remove an air calibration press on  and drag the circle up, and then press  to remove this air calibration from the calibration schedule.

如要移除空气校准，请按住  按钮向上拖动，然后按下  按钮从校准计划内移除空气校准。

Once the air calibrations have been set, press  to save the air calibration schedule, and then press  to leave the calibration schedule screen.

完成空气校准设置后，按下  设置按钮可以保存空气校准计划，然后按下  退出按钮可以退出校准计划屏幕。

To force an air calibration, either trigger this on the MM, or in the System Configuration screen, see section 3.9.

如要强制进行空气校准，可以在控制模块屏幕或系统设置屏幕上拖动对应按钮，请见第 3.9 节。

Note: An air calibration schedule must be set for the health life % to display in the Cell Information screen, see section 3.8.

注：空气校准时间必须设为正常运行的百分比并在传感器信息屏幕上显示，请见第 3.8 节。

2.5 Resetting Data 重置数据

In the Commission Menu screen shown in Figure 2.2.iii, it is possible to reset data on the EGA.
在图 2.2.iii 所示的调试菜单屏幕上可以重置烟气分析仪上的数据。

2.5.1 Reset Cells to Factory Calibration 重置传感器至出厂设置

If the cell calibration is not accurate, the cells can be reset to factory calibration.
如传感器校准不准确，则需要将传感器重置为出厂设置。

Press and hold  for 3 seconds to reset the O₂ cell to factory calibration.

按住  按钮 3 秒钟可以将氧气传感器重置为出厂设置。

Press and hold  for 3 seconds to reset the CO₂ cell to factory calibration.

按住  按钮 3 秒钟可以将二氧化碳传感器重置为出厂设置。

Press and hold  for 3 seconds to reset the CO cell to factory calibration.

按住  按钮 3 秒钟可以将一氧化碳传感器重置为出厂设置。

Press and hold  for 3 seconds to reset the NO cell to factory calibration.

按住  按钮 3 秒钟可以将一氧化氮传感器重置为出厂设置。

Press and hold  for 3 seconds to reset the NO₂ cell to factory calibration (if fitted).

按住  按钮 3 秒钟可以将二氧化氮传感器重置为出厂设置。

Press and hold  for 3 seconds to reset the SO₂ cell to factory calibration (if fitted).

按住  按钮 3 秒钟可以将二氧化硫传感器重置为出厂设置。

2.5.2 Reset Run Times 重置运行时间

When a new cell is fitted on the EGA, the run times and data for the previous data should be reset. Similarly, when a new EGA pump is fitted, the pump run times should also be reset for previous pump.
当烟气分析仪上安装了新传感器后，则需要重置以前的运行时间和数据。同样，当安装了新烟气分析仪泵后，也需要重置以前的泵运行时间。

Press and hold  for 3 seconds to reset all the exhaust gas and fuel flow data for fuel 1.

按住  燃料 1 按钮 3 秒钟可以重置燃料 1 的所有烟气和燃料流量数据。

Press and hold  for 3 seconds to reset all the exhaust gas and fuel flow data for fuel 2.

按住  燃料 2 按钮 3 秒钟可以重置燃料 2 的所有烟气和燃料流量数据。

Press and hold  for 3 seconds to reset all the exhaust gas and fuel flow data for fuel 3.

按住  燃料 3 按钮 3 秒钟可以重置燃料 3 的所有烟气和燃料流量数据。

Press and hold  for 3 seconds to reset all the exhaust gas and fuel flow data for fuel 4.

按住  **燃料 4** 按钮 3 秒钟可以重置燃料 4 的所有烟气和燃料流量数据。

Press and hold  for 3 seconds to reset the EGA pump data.

按住  **EGA 泵** 按钮 3 秒钟可以重置烟气分析仪泵的数据。

2.5.3 Reset Other Data 重置其它数据

If the service interval period set in Commission Mode setting 54 has elapsed, and a service has been completed on the EGA, the service interval can be reset.

如在调试模式设置 54 中设置的服务间隔已用完，且烟气分析仪已完成服务，则需要重置服务间隔时间。

Press and hold  for 3 seconds to reset the service interval period.

按住  **服务间隔** 按钮 3 秒钟可以重置服务间隔时间。

If the new calibration drift has been corrected by fitting a new cell or performing an accurate calibration, the calibration drift data can be reset.

如通过安装新传感器纠正校准偏移或执行某个精确校准时，则需要重置校准偏移数据。

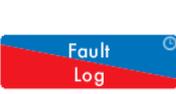
Press and hold  for 3 seconds to reset the calibration drift data.

按住  **校准偏移** 按钮 3 秒钟可以重置校准偏差数据。

Press and hold  for 3 seconds to reset the system log.

按住  **系统日志** 按钮 3 秒钟可以重置系统日志。

Press and hold  for 3 seconds to reset the fault log.

按住  **故障日志** 按钮 3 秒钟可以重置故障日志。

3 SYSTEM CONFIGURATION 系统设置

3.1 Language 语言

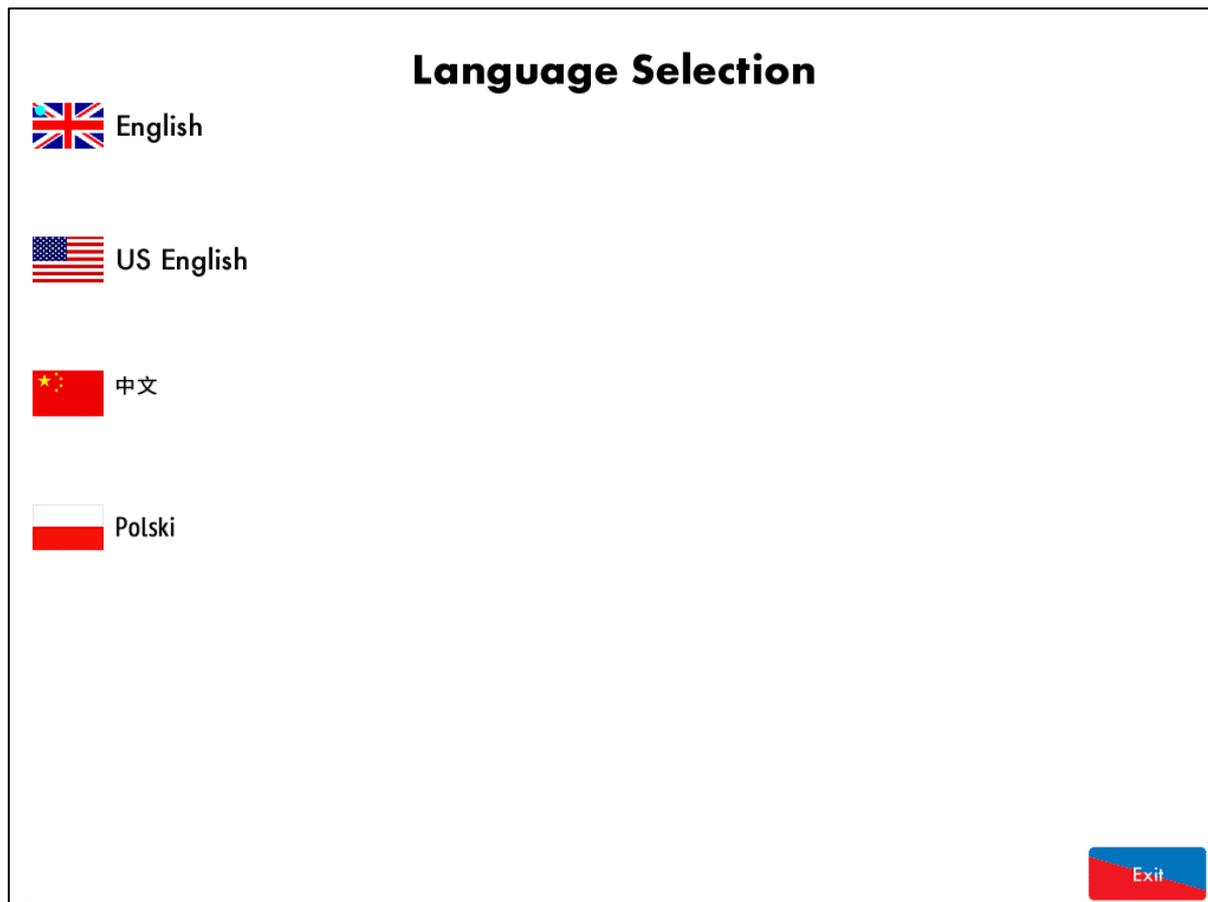


Figure 3.1.i Language Selection
图 3.1.i 语言选择

Press  in the System Configuration. Enter the Online Changes password to access the Language Selection screen. Select the desired language and then press  to save the selection and return to the System Configuration screen.

在系统设置屏幕上按下  语言按钮并输入在线修改密码可以访问语言选择屏幕。选定语言后按下  退出按钮可以保存选择并返回系统设置屏幕。

If the language required is not displayed, please contact your local Autoflame representative or Autoflame Sales.

如未显示选定的语言，请联系当地 Autoflame 代表或销售人员。

3.2 Set Clock 设置时钟

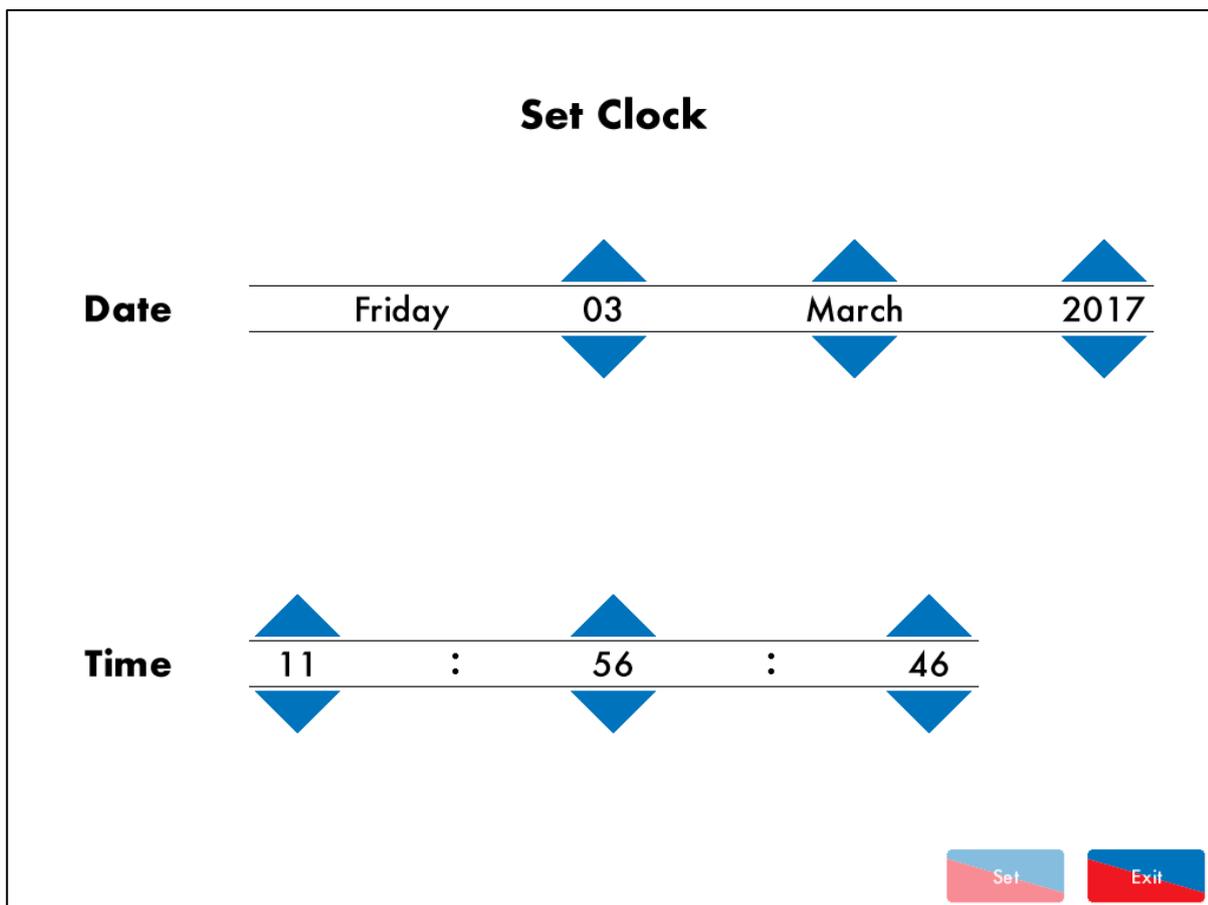


Figure 3.2.i Set Clock
图 3.2.i 设置时钟

Press  in the System Configuration screen. Enter the Set Clock password (10, 10) to access the Set Clock screen.

在系统设置屏幕上按下  **设置时钟** 按钮并输入设置时钟密码（默认 10,10）可以访问设置时钟屏幕。

Adjust the time and date by using the  and  buttons, and then press  to save the time and then  to go back to the System Configuration screen.

利用  和  按钮可以调节时间和日期，按下  **设置** 按钮可以保存时间，按下  **退出** 按钮可以返回系统设置屏幕。

Note: Changing the time and date will affect the logged exhaust and fuel flow data, so it is recommended to set the clock when the EGA is installed and then leave it at that time and date setting.

注：由于更改时间和日期将影响记录的烟气和燃料流量数据，因此建议在安装烟气分析仪时设置时钟，以后则不用更改已设定的时间和日期。

3.3 Online Changes

在线修改

3.3.1 Settings

设置

Online Changes		Value
#	Description	
1	Base: Control Mode	Controlled by MM
2	Base: Communications Id	1
3	Base: Display Units	Metric
4	Base: Efficiency Calculation Method	English
5	Base: Currency Units	GBP
6	Base: Backlight On Time	600 seconds
7	Base: Logo Display Timer	600 seconds
8	Base: Show Advanced Values	Disabled
9	Unused: Unused	0
10	Cells: CO Poison Detection	Enabled
11	Cells: CO Poison Limit	600 ppm
12	Cells: CO Poison Return	200 ppm
13	Cells: SO ₂ Correction	100%
14	Cells: Minimum NO ₂ Fraction of NO _x (if NO ₂ cell fitted)	0%
15	Cells: NO _x Normalised O ₂ Value	3.0% O ₂
16	Cells: NO Fraction of NO _x (if NO ₂ cell not fitted)	94.0%
17	Cells: Standard Temperature	298.0 °K
18	Cells: Standard Pressure	1013.2 mbar (406.8 inWG)
19	Unused: Unused	0

All Base Cells Calibration Back box System Vendor




Figure 3.3.1.i Online Changes – Settings

图 3.3.1.i 在线修改 – 设置

Press on  in the System Configuration screen. Enter the Online Changes password to access the Online Changes screen for the Commission Mode settings, where some of the settings can be adjusted, see section 2.2.1 on Commission Mode settings.

在系统设置屏幕上按下  按钮并输入在线修改密码可以访问在线修改屏幕，进行调试模式设置，其中某些设置可以修改，请见第 2.2.1 节调试模式设置。

3.3.2 Fuel Setup

燃料设置

Press  in the System Configuration screen. Enter the Online Changes password to access the Fuel Setup screen where the settings can be adjusted, see section 2.2.2 on Fuel Setup settings.

在系统设置屏幕上按下  燃料设置按钮并输入在线修改密码可以访问燃料设置屏幕并对设置进行修改，请见第 2.2.2 节燃料设置。

Once the settings have been adjusted as required, press  to save the settings and go back to the System Configuration screen.

按要求修改设置后请按下  **退出**按钮保存设置并返回系统设置屏幕。

3.3.3 Calibration Schedule 校准计划

Press  in the System Configuration screen. Enter the Online Changes password to access the Calibration Schedule screen, see section 2.4.

在系统设置屏幕上按下  **校准计划**按钮并输入在线修改密码可以访问校准计划屏幕，请见第 2.4 节。

3.4 Run Times 运行时间

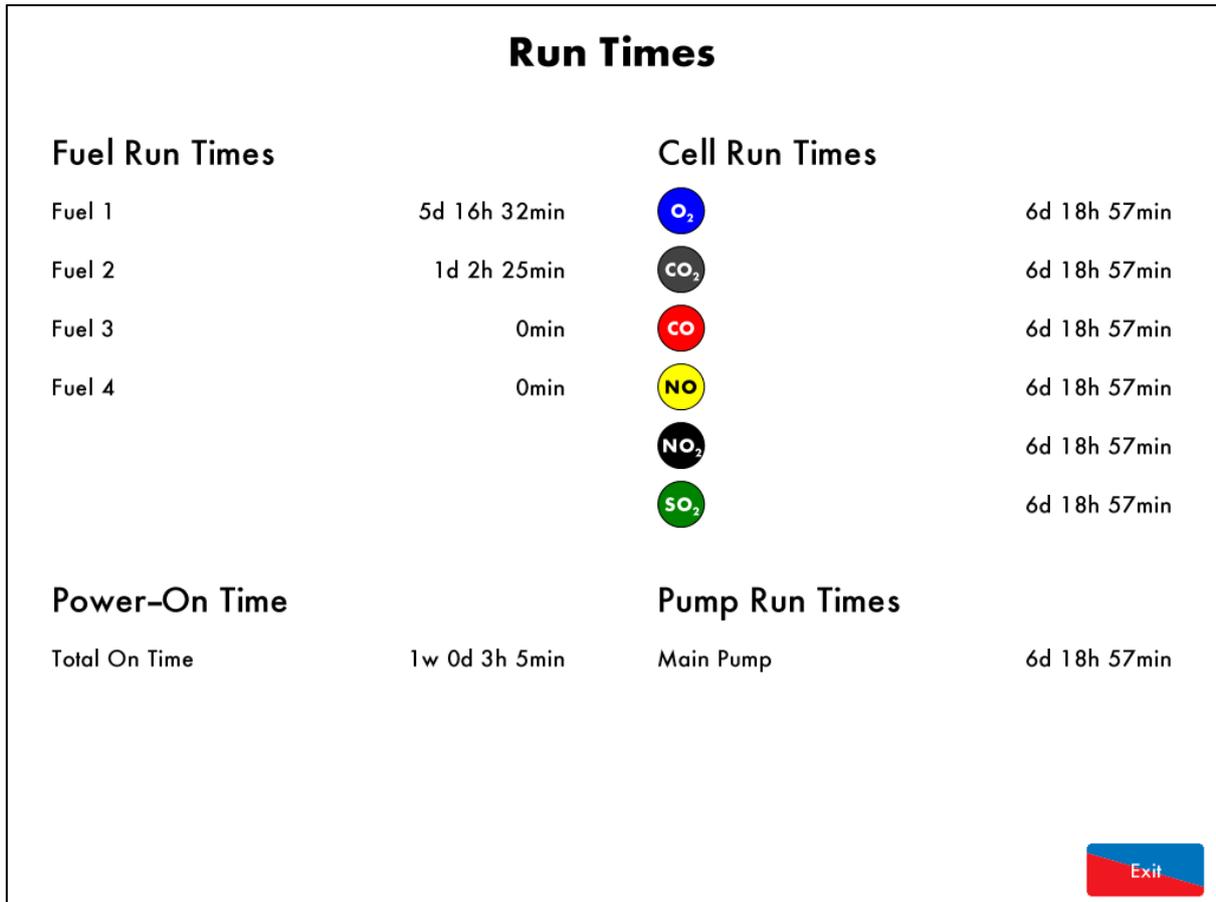


Figure 3.4.i Run Times
图 3.4.i 运行时间

Press  in the System Configuration screen to access the Run Times screen. The Run Times screen provides the following information:

在系统设置屏幕上按下  **运行时间** 按钮可以访问运行时间屏幕，屏幕上将提供以下信息：

- Fuel run times 燃料运行时间
- Power on time 上电时间
- Fitted cell run times 已安装传感器运行时间
- EGA pump run time 烟气分析仪泵运行时间

Press  to go back to the System Configuration screen.

按下  **退出** 按钮可以返回系统设置屏幕。

3.5 Diagnostics 故障诊断

Diagnostics		Value
#	Description	
1	EGA: Processor temperature (Now)	42.9°C
2	EGA: Processor temperature (Min)	(Limit 3.0°C) 27.3°C
3	EGA: Processor temperature (Max)	(Limit 140.0°C) 45.3°C
4	EGA: PCB temperature (Now)	26.3°C
5	EGA: PCB temperature (Min)	(Limit 3.0°C) -4.9°C
6	EGA: PCB temperature (Max)	(Limit 40.0°C) 27.0°C
7	Cells: CO2 cell bulb current (Now)	0.562A
8	Cells: CO2 cell bulb current (Min)	0.000A
9	Cells: CO2 cell bulb current (Max)	0.763A
10	EGA: Chiller Current	0.194A
11	Comms: Messages sent to MM per minute	58
12	Comms: Messages sent to DTI per minute	20
13	Cells: O2 Cell raw reading	-629
14	Cells: CO2 Cell raw reading	8977
15	Cells: CO Cell raw reading	17
16	Cells: NO Cell raw reading	151
17	Cells: NO2 Cell raw reading	-5
18	Cells: SO2 Cell raw reading	103
19	Cells: CO2 Cell temperature	29.9°C
20	EGA: Fan frequency	86.0Hz




Figure 3.5.i Diagnostics

图 3.5.i 故障诊断

Press  in the System Configuration screen to access the Diagnostics screen. The Diagnostics screen shows the real-time values of the EGA's environmental conditions, as well as the minimum and maximum values which have been detected in its entire operating period. Press on the tabs to view the following information:

在系统设置屏幕上按下  **故障诊断** 按钮可以访问故障诊断屏幕，屏幕上将显示烟气分析仪环境条件的实时数据，以及在整个运行期间检测到的最小值和最大值。按下对应选项卡可以查看以下信息：

- Processor temperature 处理器温度
- PCB temperature PCB 温度
- Chiller current 冷却器电流
- Fan frequency 风扇频率
- CO₂ bulb current 二氧化碳灯泡电流
- O₂ cell raw reading 氧气传感器原始读数
- CO₂ cell raw reading 二氧化碳传感器原始读数
- CO cell raw reading 一氧化碳传感器原始读数
- NO cell raw reading 一氧化氮传感器原始读数
- NO₂ cell raw reading 二氧化氮传感器原始读数
- SO₂ cell raw reading 二氧化硫传感器原始读数
- CO₂ cell temperature 二氧化碳传感器温度
- Messages sent to MM per minute 每分钟发送给控制模块的消息数
- Messages sent to DTI per minute 每分钟发送给数据传输接口的消息数

3.6 System Log 系统日志

System Log	Detail	Occurred
1. Fuel Selection	Fuel 1 Selected	15 Feb 17 12:43
2. EGA Started		15 Feb 17 12:43
3. Fuel Selection	Fuel 1 Selected	15 Feb 17 12:30
4. EGA Started		15 Feb 17 12:30
5. Fuel Setup 32 Changed	Costing Units (From 0 To 2)	10 Feb 17 16:54
6. Fuel Setup 31 Changed	Fuel Type (From 0 To 1)	10 Feb 17 16:54
7. Fuel Setup 22 Changed	Costing Units (From 0 To 2)	10 Feb 17 16:54
8. Fuel Setup 21 Changed	Fuel Type (From 0 To 1)	10 Feb 17 16:54
9. Fuel Setup 12 Changed	Costing Units (From 3 To 2)	10 Feb 17 16:54
10. Fuel Setup 11 Changed	Fuel Type (From 6 To 1)	10 Feb 17 16:54
11. Fuel Setup 3 Changed	Cost Per Unit (From 1000 To 1750)	10 Feb 17 16:50
12. Fuel Selection	Fuel 1 Selected	10 Feb 17 14:56
13. EGA Started		10 Feb 17 14:56
14. Fuel Selection	Fuel 1 Selected	7 Feb 17 12:27
15. Fuel Selection	No Fuel Selected	7 Feb 17 12:27
16. Fuel Selection	Fuel 1 Selected	6 Feb 17 10:36
17. EGA Started		6 Feb 17 10:36
18. Fuel Selection	Fuel 1 Selected	2 Feb 17 12:29
19. EGA Started		2 Feb 17 12:29
20. Calibration Schedule Change		2 Feb 17 12:01
21. Setting 21 Changed	Air Calibration Time (From 20 To 360)	31 Jan 17 09:57
22. Setting 40 Changed	MM Comms Mode (From 1 To 0)	31 Jan 17 09:51
All	Faults	Config
	Service	Operation





Figure 3.6.i System Log
图 3.6.i 系统日志

Press  in the System Configuration screen to access the System Log. The System stores 1000 entries of changes or any faults that have occurred, including:

在系统设置屏幕上按下  系统日志按钮可以访问系统日志屏幕，系统将保存 1000 条已经发生的更改数据或故障数据，其中包括：

- Errors and warnings
错误和警告
- Settings which have been changed
已更改的设置
- Service intervals
服务间隔时间
- Fuel selection
燃料选择
- EGA turned on/off
烟气分析仪的启停

3.7 Manual 用户手册

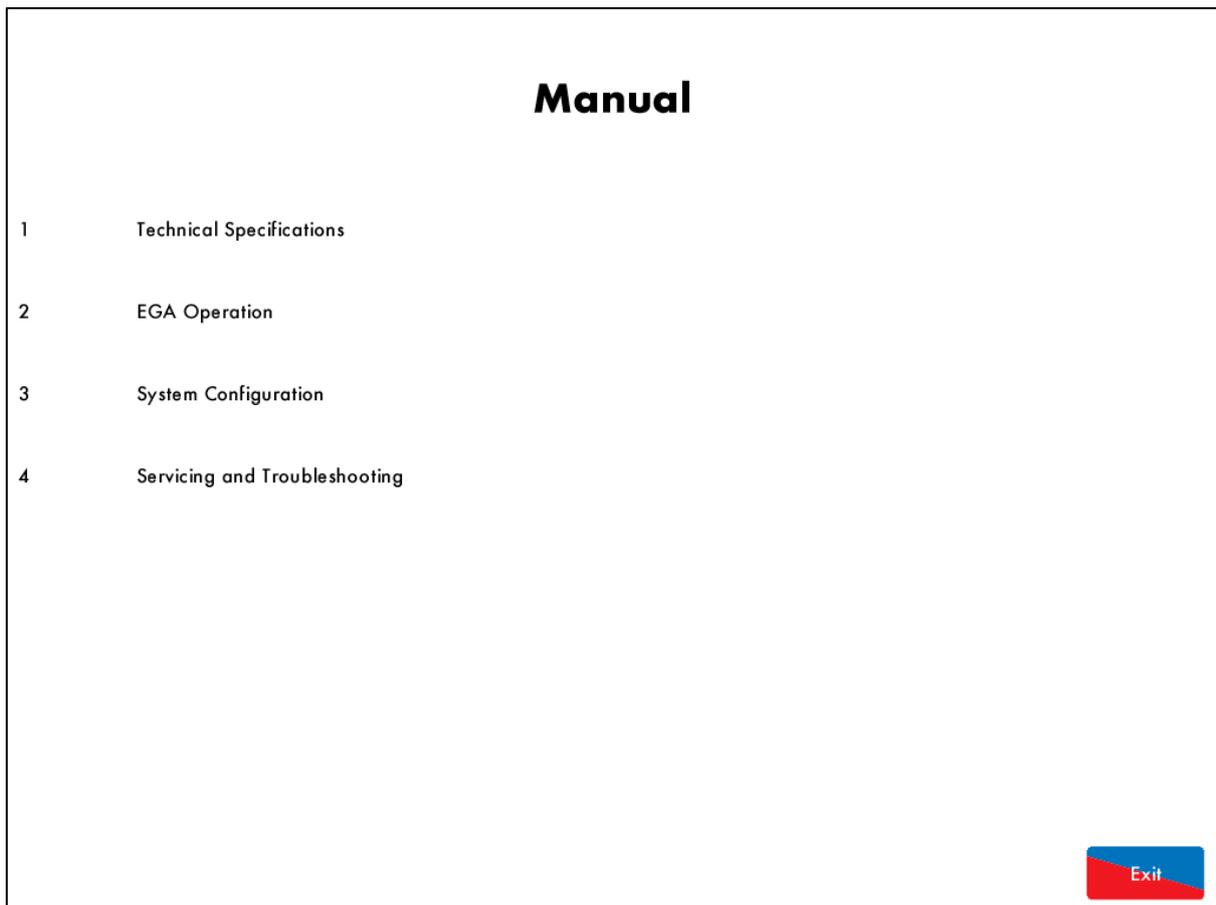


Figure 3.7.i Manual
图 3.7.i 用户手册

Press  in the System Configuration screen to access the Manual screen.

在系统设置屏幕上按下  用户手册按钮可以访问用户手册屏幕。

3.8 Cell Information 传感器信息

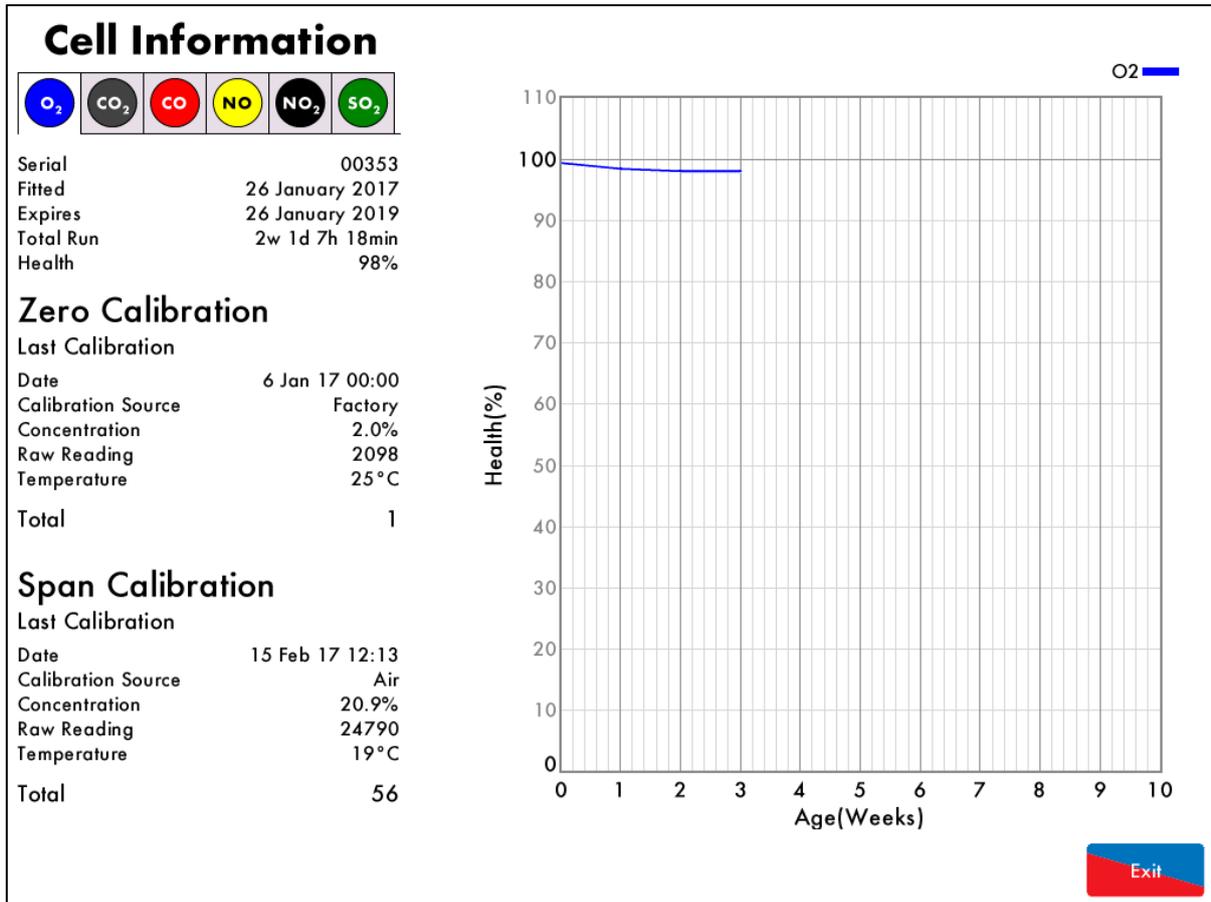


Figure 3.8.i Cell Information Screen

图 3.8.i 传感器信息屏幕

Press **Cell Information** in the System Configuration screen to access the Cell Information screens. Press on the tabs for information on each cell fitted, including:

在系统设置屏幕上按下 **Cell Information** 传感器信息按钮可以访问传感器信息屏幕，按下各传感器对应的选项卡可以查看以下信息：

- Cell serial number 传感器序列号
- Date cell was fitted 传感器安装日期
- Cell expiry date 传感器有效期
- Total run times 总运行时间
- Health 健康度
- Last zero calibration date, source, concentration, raw reading, temperature, and total number of zero calibrations
最后一次零点校准日期、数据源、浓度、原始读数、温度和零点校准总次数。
- Last span calibration date, source, concentration, raw reading, temperature and total number of span calibrations (and pressure of span calibration for CO₂ cell)
最后一次量程校准日期、数据源、浓度、原始读数、温度和范围校准总次数（压力量程校准用于二氧化碳传感器）。

Note: The health % of the cell will only show in the air calibration has been set, see section 2.4.

注：传感器的正常运行百分比只在空气校准中显示，请见第 2.4 节。

3.8.1 O₂ Cell Characteristics 氧气传感器特点

This electrochemical cell is used for the detection of oxygen covering a concentration range of 0 to 20.95%. 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.

电化学传感器用于检测浓度范围为 0 至 20.95% 的氧气。传感器结构可以提供长的使用寿命和较高的电阻，即使在使用高硫燃料的情况下。因此该传感器可以在燃烧重燃油或轻燃油上使用。

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.

氧气传感器包括一个带有铅阳极和金阴极的主氧气传感器，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传感器中的氧气分子在金电极处减少。电极间的电流流量与测量的烟气中氧浓度成正比。由于氧气读数不受 CO、H₂、S、NOX 和 SOX 的影响，因此没有横向灵敏度。



Figure 3.8.1.i O₂ Cell
图 3.8.1.i 氧气传感器

Operation Ranges: 运行范围:

Detection Range 检测范围	0 – 23% O ₂
Accuracy 精确度	± 0.3 % Vol O ₂
Operating Temperature 运行温度	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 发货日期算起 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

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 EGA is being installed on site. Depending on the conditions and environment the EGA is in, the cell's life expectancy can go up to 2 years. It is important to replace the cells when the EGA 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 传感器的保质期为 6 个月。最好在烟气分析仪在现场安装后才要求传感器送货。根据烟气分析仪的使用条件和环境，传感器的寿命可长达两年。当屏幕上出现烟气分析仪标记后则需要更换传感器。使用燃气时传感器每隔 9 至 12 个月需要更换一次，使用燃油时每隔 6 至 9 个月需要更换一次。

Please see section 2.5.1 on resetting previous cell run times after changing the cell.

更换传感器后需要重置以前的传感器运行时间，具体请见第 2.5.1 节。

3.8.2 CO, NO, NO₂ and SO₂ Cell Characteristics

CO, NO, NO₂ 和 SO₂ 传感器特点

The CO, NO, NO₂ and SO₂ electromechanical cells which are specifically managed by the calibration philosophy within the Mk8 EGA 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 EGA.

CO、NO、NO₂ 和 SO₂ 电化学传感器在 Mk8 烟气分析仪中根据校准原理进行管理。在浓度为 100ppm 情况下传感器的精度控制在限值的 $\pm 5\%$ 。根据经验表明，传感器每年的偏差为 $\pm 10\text{ppm}$ ，因此无需校准，偏差不会对烟气分析仪的运行或应用造成影响。

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.

传感器的寿命取决于测量的烟气浓度。为了优化 CO 传感器的寿命，电子元件将检测传感器的信号水平是否达到或超过 500ppm，如果达到或超过，传感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，流经这些传感器的样气将被储存。



Figure 3.8.2.i CO, NO, SO₂ and NO₂ Cells
图 3.8.2.i CO, NO, SO₂ 和 NO₂ 传感器

	Gas (range) 燃气烟气 (范围)	Fuel Oil (range) 燃油烟气 (范围)	Resolution at 20°C 解析度 (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	0-500ppm	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

Please see section 2.5.2 on resetting previous cell run times after changing the cell.
更换传感器后需要重置以前的传感器运行时间，具体请见第 2.5.2 节。

Note: The NO₂ and SO₂ values will display on the EGA sampling screen as calculated values if the NO₂ and SO₂ cells are not fitted.

注：如未安装 NO₂ 和 SO₂ 传感器，二氧化氮和二氧化硫数值将作为计算值在烟气分析仪采样屏幕上显示。

3.8.3 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 EGA 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.

二氧化碳传感器是由 Autoflame 生产，使用了非色散红外线技术。该传感器没有移动部件，不是电化学传感器。读数精度为读数的 $\pm 0.3\%$ 。根据烟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。在使用燃气时，其寿命通常不低于两年，在使用燃油时，其寿命取决于燃料中的硫含量。



Figure 3.8.3.i CO₂ Cell
图 3.8.3.i CO₂ 传感器

Measurement Range: 0-20%

测量范围：0-20%

Shelf-Life: 12months from dispatch

质保期：发货起 12 个月

Accuracy of reading: 0.3%

读数精度：0.3%

3.9 Calibrate Now 立即校准

To force the EGA into an air calibration, this can be done by either trigger this action through the EGA screen on the MM, or by pressing and holding  for 3 seconds in the System Configuration screen.

如要强制烟气分析仪进行空气校准，则可以在控制模块上的烟气分析仪屏幕上激活该选项，或在系统设置屏幕

上按住  立即校准按钮 3 秒钟。

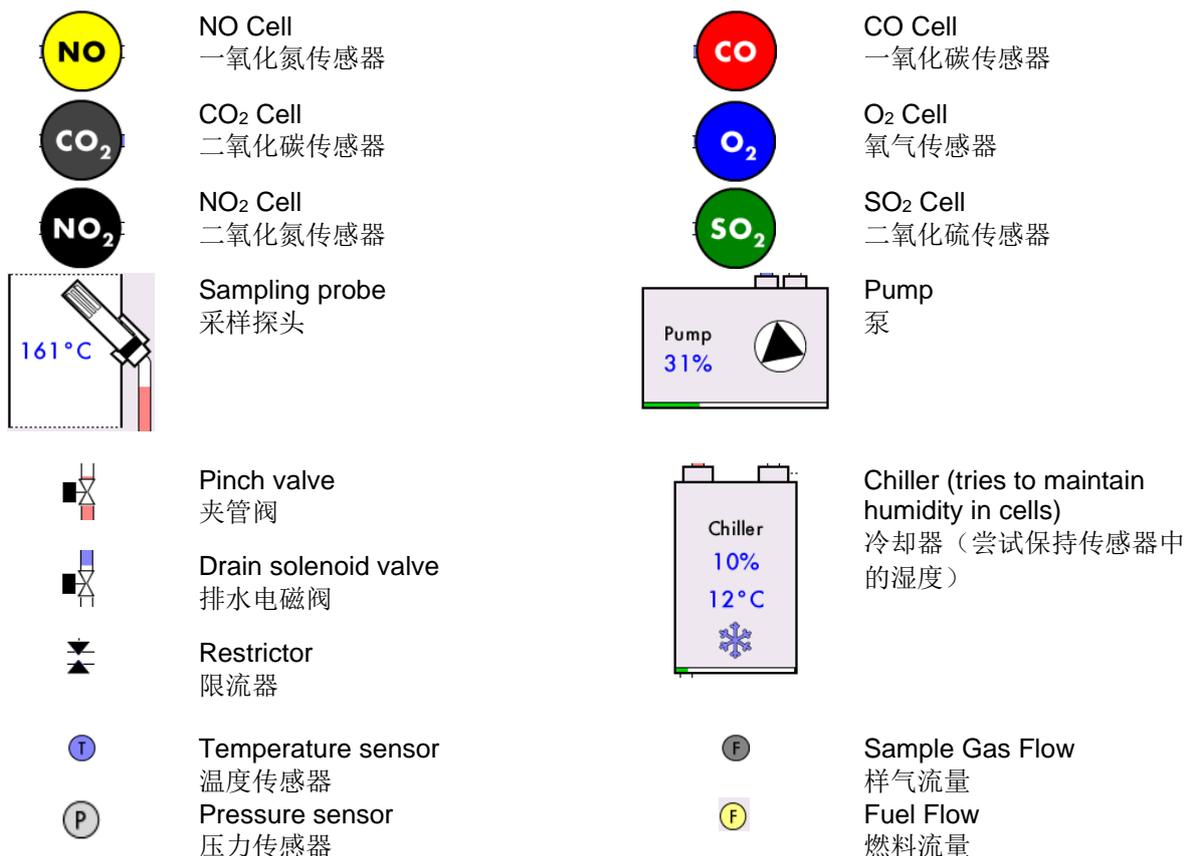
4 EGA OPERATION

烟气分析仪操作

4.1 Sampling Screen Icons 采样屏幕图标

Pressing on the components on the EGA sampling screen will give access to the relevant information screens.

在烟气分析仪采样屏幕上按下对应图标可以访问对应的信息屏幕。



Note: The standard cells that are included in the EGA are NO, CO, CO₂, and O₂. Optional cells are SO₂ and NO₂, and they must be fitted at the factory. If the SO₂ and NO₂ cells are not fitted, then the EGA will calculate these values based on the exhaust gases and fuel composition.

注：烟气分析仪中涉及的标准传感器包括 NO, CO, CO₂ 和 O₂ 传感器，SO₂ 和 NO₂ 传感器是可选件。所有传感器都必须在工厂内安装。如未安装 SO₂ 和 NO₂ 传感器，则烟气分析仪将根据烟气和燃料成分计算这些数值。

4.1.1 Temperature 温度

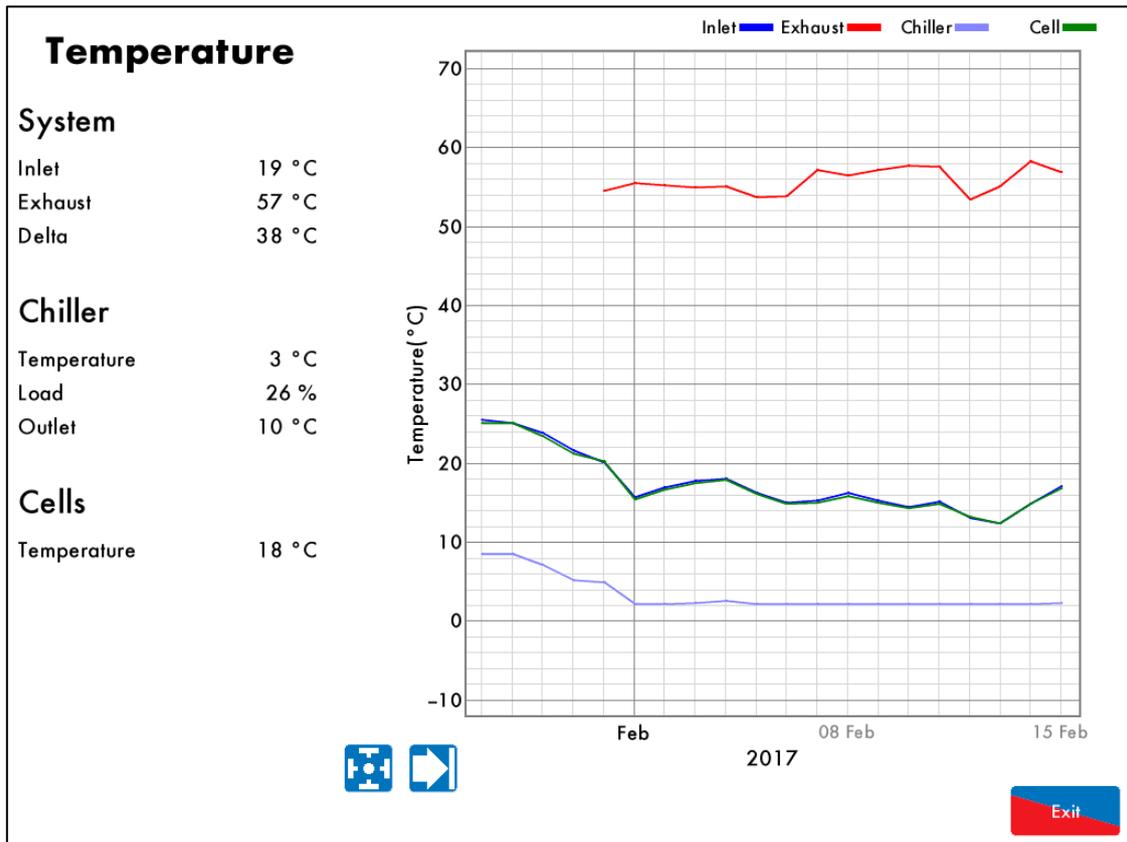


Figure 4.1.1.i Temperature screen on the EGA
图 4.1.1.i 烟气分析仪上的温度屏幕

Press on either the sampling probe, chiller or temperature sensors on the sampling screen to access the Temperature screen which provides information on:

在采样屏幕上按下采样探头、冷却器传感器或温度传感器图标可以访问温度屏幕，屏幕上提供以下信息：

- Current inlet air temperature 当前进气空气温度
- Current exhaust gas temperature 当前烟气温度
- Delta temperature 温度差
- Chiller temperature 冷却器温度
- Chiller load % 冷却器负载百分比
- Chiller outlet temperature 冷却器出口温度
- Cells temperature 传感器温度
- Ambient temperature (it is shown separately from the inlet temperature if a pre-heated sensor is enabled, see section 1.7.4)

环境温度（如启用了预热传感器，则环境温度和进气口温度将分开显示，见第 1.7.4 节）。

This data is logged for 3 years on the EGA. Use the   buttons to change the timescale of the data displayed, and press and drag on the axis to zoom in/out of the graph.

这些数据将在烟气分析仪上保存三年。按下   按钮可以更改数据显示的时间范围，按下并拖动中心轴可以放大或缩小图表。

This data can be downloaded from the EGA and exporting into an Excel spreadsheet, please refer to the PC Software Guide for more information.

数据可以从烟气分析仪上下载并导入 Excel 电子表格中，更多信息请参考计算机软件指南。

4.1.2 Emissions 排放

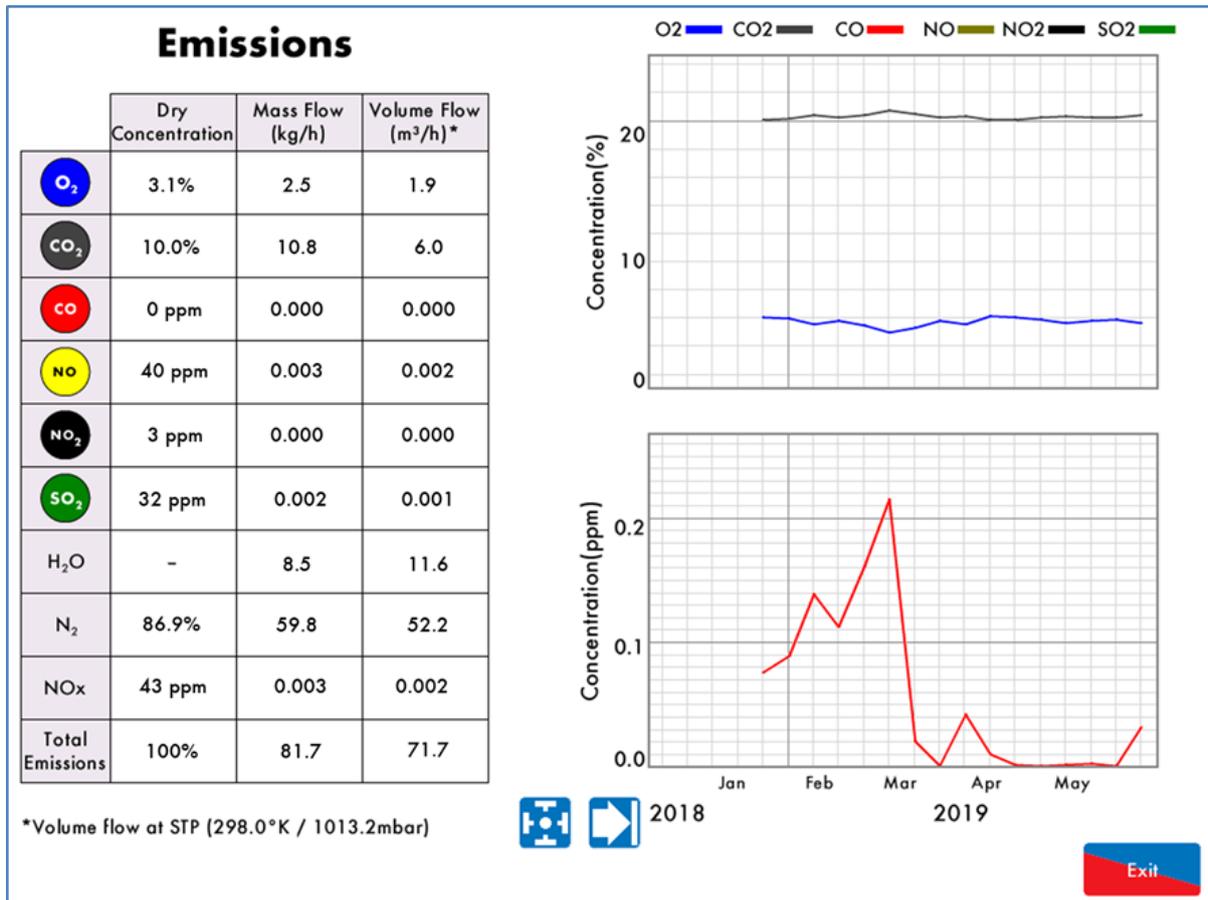


Figure 4.1.2.i Emissions
图 4.1.2.i 排放屏幕

Press on any of the cells in the sampling screen to access the Emissions screen, which provides the dry volume concentration, mass flow and volume flow for the O₂, CO₂, CO, NO, NO₂, SO₂, H₂O, and N₂ emissions in the stack. If NO₂ and SO₂ cells are not fitted, these values are calculated by the EGA. The H₂O is also calculated within the EGA.

在采样屏幕上按下任何一个传感器图标可以访问对应的排放屏幕，屏幕上将提供排气管中排放的 O₂、CO₂、CO、NO、NO₂、SO₂、H₂O 和 N₂ 干体积浓度、质量流量和体积流量。如未安装 NO₂ 和 SO₂ 传感器，则这些数据将由烟气分析仪计算，H₂O 的数据也由烟气分析仪计算。

The volume flow is derived from the mass flow, based on the standard temperature and pressure set in Commission Mode settings 17 and 18.

体积流量来自于质量流量，是根据调试模式设置 17 和 18 中设置的标准温度和压力计算而得。

This data is logged for 3 years on the EGA. Use the   buttons to change the timescale of the data displayed, and press and drag on the axis to zoom in/out of the graph.

这些数据将在烟气分析仪上保存三年。按下   按钮可以更改数据显示的时间范围，按下并拖动中心轴可以放大或缩小图表。

This data can be downloaded from the EGA and exporting into an Excel spreadsheet, please refer to the PC Software Guide for more information.

数据可以从烟气分析仪上下载并导入 Excel 电子表格中，更多信息请参考计算机软件指南。

4.1.3 Pressure

压力

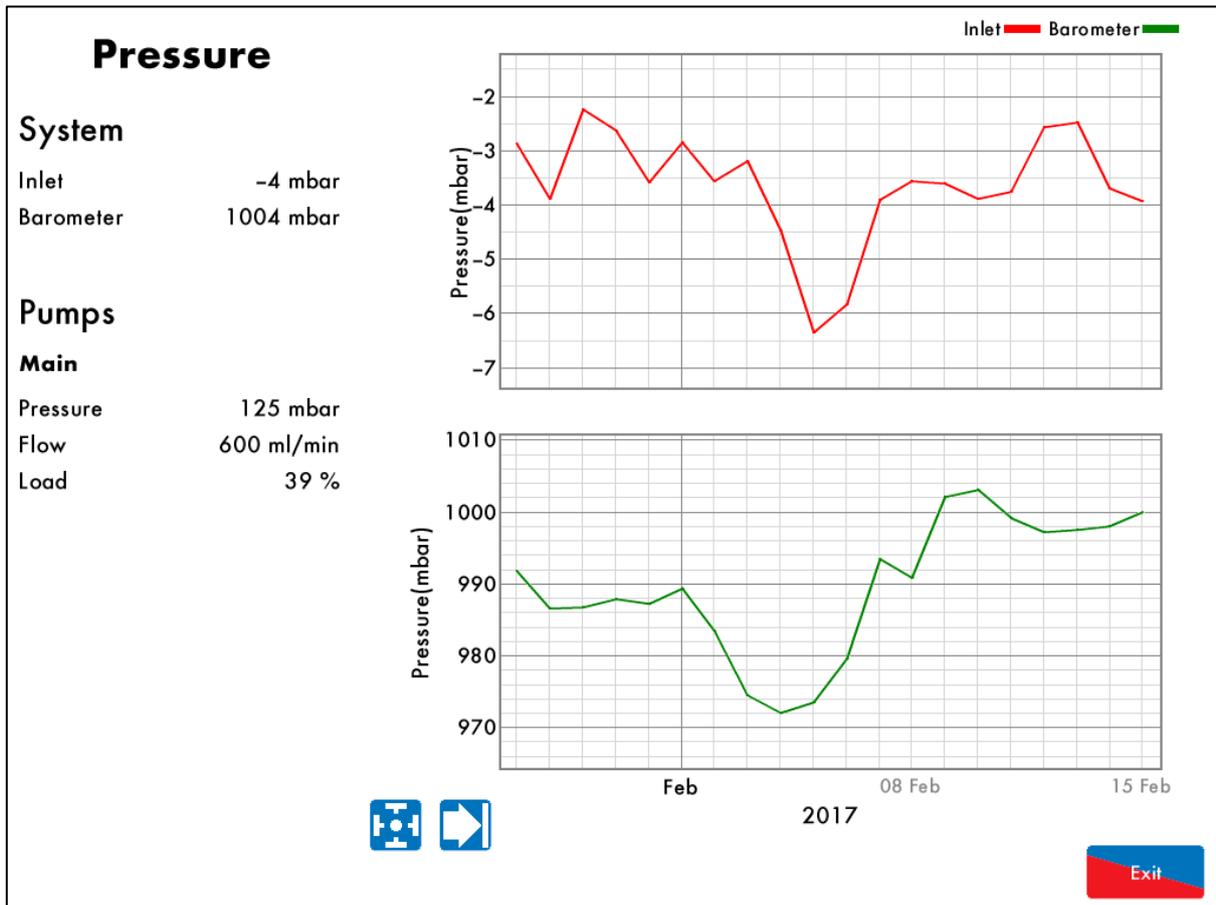


Figure 4.1.3.i Pressure

图 4.1.3.i 压力屏幕

Press on the pump or the pressures sensors in the sampling screen to access the Pressure screen which gives information on:

在采样屏幕上按下泵或压力传感器图标可以访问压力屏幕，屏幕上将提供以下信息：

- Inlet pressure
进气口压力
- Barometric pressure (in sampling line)
气压（采样管）
- Pump pressure
泵压力
- Sample flow
样本流量
- Pump load %
泵负载百分比

This data is logged for 3 years on the EGA. Use the   buttons to change the timescale of the data displayed, and press and drag on the axis to zoom in/out of the graph.

这些数据将在烟气分析仪上保存三年。按下   按钮可以更改数据显示的时间范围，按下并拖动中心轴可以放大或缩小图表。

This data can be downloaded from the EGA and exporting into an Excel spreadsheet, please refer to the PC Software Guide for more information.

数据可以从烟气分析仪上下载并导入 Excel 电子表格中，更多信息请参考计算机软件指南。

4.1.4 Fuel Flow 燃料流量

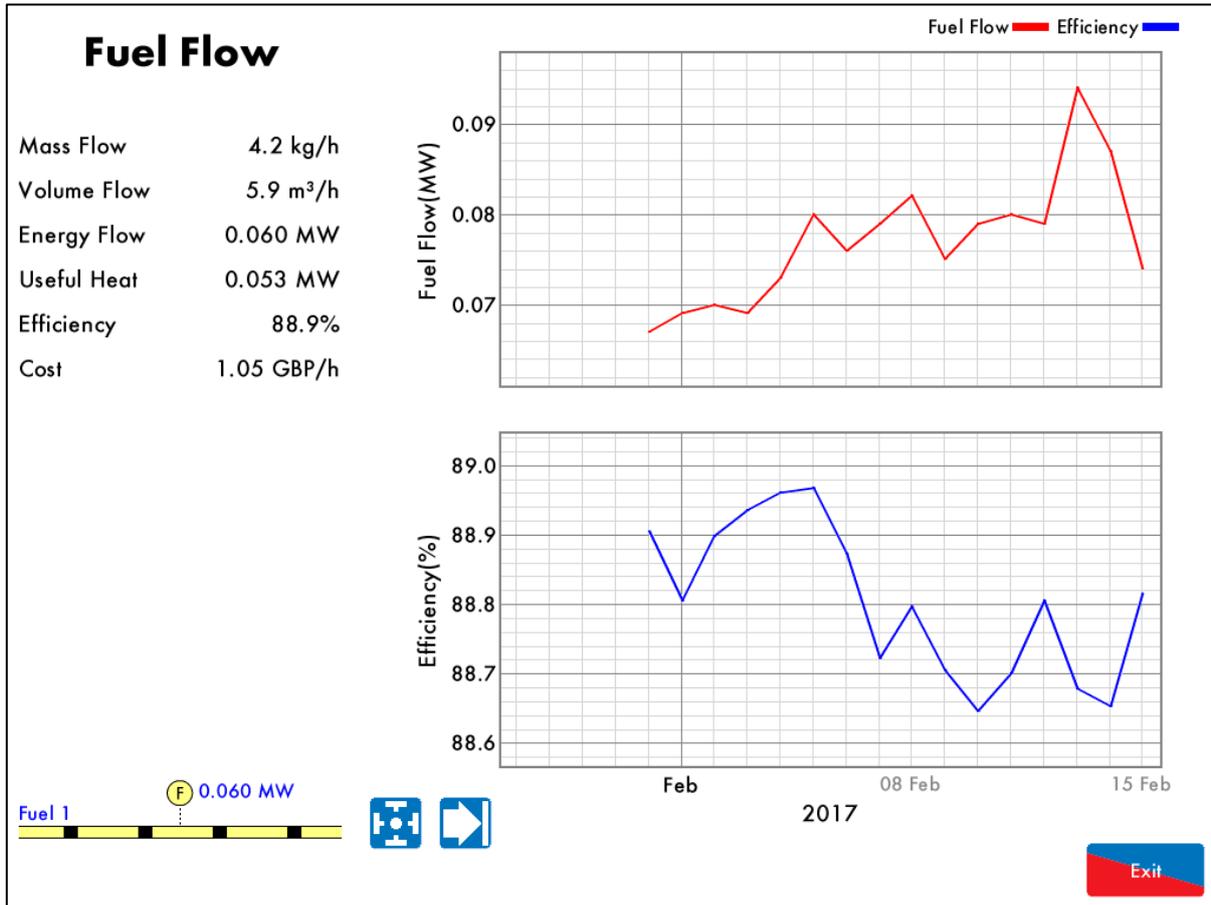


Figure 4.1.4.i Fuel Flow
图 4.1.4.i 燃料流量屏幕

Press on the fuel flow pipe in the sampling screen to access the fuel flow screen, which provides information on the current fuel being fired:

在采样屏幕上按下燃料流量管图标可以访问燃料流量屏幕，屏幕上将提供当前燃烧的燃料信息：

- Mass flow rate 质量流率
- Volume flow rate 体积流率
- Energy flow 能量流量
- Useful heat 可用热量
- Combustion efficiency 燃烧效率
- Fuel cost per hour 每小时燃料成本

The fuel costs and units are set in the Fuel Setup settings, see section 2.2.2. The currency is set in Commission Mode setting 5.

燃料成本和单位在燃料设置中设置，请见第 2.2.2 节，货币在调试模块设置 5 中设置。

The combustion efficiency is calculated in the EGA, and can be set as English or European, see Commission Mode setting 4.

燃烧热效率在烟气分析仪中计算，可以设置成英式或欧式计算方法，请见调试模式设置 4。

This data is logged for 3 years on the EGA. Use the   buttons to change the timescale of the data displayed, and press and drag on the axis to zoom in/out of the graph.

这些数据将在烟气分析仪上保存三年。按下   按钮可以更改数据显示的时间范围，按下并拖动中心轴可以放大或缩小图表。

4.2 EGA Overview

烟气分析仪概述

4.2.1 Features and Benefits

特点和优点

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

烟气分析仪可用于监控燃烧器或锅炉系统中产生的烟道烟气，同时还可以改善燃烧、提高效率、减少燃料消耗并通过 3 参数微调功能和燃烧安全限制提高安全性。

1. Stand-Alone: When in stand-alone mode, the EGA can be used without a Micro-Modulation (MM) module to monitor the combustion gases. The MM trim function and the combustion safety limits are not activated in this stand-alone mode of operation.

单机运行：在单机模式下，烟气分析仪在未配微型控制模块的情况下可以监控燃烧的烟气。在单机运行模式下不会启用控制模块微调功能和燃烧安全限制。

2. With MM: When interfaced with an MM, the EGA can monitor emissions or the 3-parameter combustion trim and safety limits can be activated. The emissions levels are monitored by the EGA and the MM makes small adjustments to the air damper to trim the online exhaust gas data back to the commissioned values.

配控制模块：烟气分析仪在连接控制模块后可以监控排放，3 参数燃烧微调功能和安全限值可以启用。排放等级可以通过烟气分析仪进行监控，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值。

The main benefits of the EGA include the ability to monitor the exhaust gases and bring them to the safe commissioned levels. Setting the combustion limits on the MM in conjunction with the EGA prevents unsafe combustion scenarios, reducing the fuel consumed in bad combustion. The exhaust and fuel data is logged for 3 years on the EGA and DTI, and can also be downloaded from the EGA.

烟气分析仪的主要优点包括监控排气并使其保持在安全调试水平。在控制模块和烟气分析仪上设置燃烧限值可以防止出现不安全的燃烧情况、减少在不良燃烧中的燃料消耗。烟气和燃料数据将在烟气分析仪和数据传输接口上保存三年，并可以从烟气分析仪上下载这些数据。

4.2.2 System Operation

系统运行

The EGA 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 EGA will then not be able to respond in time to combustion changes, resulting in incorrect operation of the trim function.

烟气分析仪通过排气管上安装的采样探头（需和烟气分析仪单独购买）对燃烧烟气进行采样。烟气通过烟气分析仪泵从排气管中抽出。在采样探头和烟气分析仪之间仅可使用提供的采样管。采样管的内径为 3mm，如使用大尺寸采样管，采样气体将在采样管中停留较长的时间。这样烟气分析仪就无法及时对燃烧的变化做出响应，导致无法正确使用微调功能。

Once the exhaust gases have entered the EGA 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 EGA is in idle mode, automatically through the drain solenoid.

烟气进入烟气分析仪后，冷却器将降低其温度，在进入传感器前将样本干燥以去除烟气中的冷凝水。运行时在冷却器中积累的冷凝水每隔 4 分钟排出一，当烟气分析仪处于空闲模式时每隔 10 分钟排出一，冷凝水将通过排水电磁阀自动排出。

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 EGA 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 EGA from the clear tubing at the bottom of the EGA casing.

烟气通过干滤器进行过滤，干滤器是一种细滤器，用于排出冷却过程中携带的各种粉尘颗粒。燃烧器在使用重燃油或脏油时必须使用外部微粒过滤器，用于排除过多的粉尘颗粒。烟气在离开过滤器后将对其压力进行再次检查，确保在进入泵前保持真空，烟气在离开泵时将对其压力进行检查。压力传感器将用于调节进入烟气分析仪的样本流量，以确保运行一致。烟气经过调节后可以进行准确的采样，采样后剩余的样气将从烟气分析仪外壳底部的干净管道中排出。

Note: The EGA needs to vent to atmosphere via the drain solenoid on the bottom; this is also where the EGA performs its air calibrations. Care should be taken to ensure the outlet is not restricted nor that contamination from exhaust gas occurs.

注：烟气分析仪需要通过底部的排水电磁阀将烟气排放到大气中，也是烟气分析仪执行空气校准操作时的空气入口。此时应注意出口没有任何堵塞且烟气不会造成污染。

4.2.3 Overview of 3-Parameter Trim

3 参数微调概述

The 3-parameter trim function can be enabled when the Mk8 EGA is used in conjunction with an MM module to manage the combustion. When the EGA 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 烟气分析仪和控制模块一同用于管理燃烧时可以启用 3 参数微调功能。当烟气分析仪检测到在线烟气读数和原调试数据之间存在差异时，微调功能将对空气挡板（可以选择通道 5 进行微调）进行微调，使在线数值与调试的读数保持一致。微调功能可以通过增加空气（富氧）或从调试空气中减少空气（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，且不影响安全性。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微调数据进行设置。微调数据将被转换成燃烧图，显示添加空气或在燃烧过程中减少空气时的燃烧器反应。Autoflame 系统可以持续监控氧气、二氧化碳和一氧化碳等 3 个参数，使微调燃烧过程更加安全有效。

Ingress of tramp air through an ill-fitting boiler or flue section will distort the O₂ reading and show an increase in this value. This results in the EGA reading the tramp air influence in the sample rather than just the actual combustion gases.

不适当的锅炉安装或烟道段进入了空气将改变氧气读数并显示数值增加，这会影响烟气分析仪对样气的读数，而不会显示实际的烟气读数。

Single parameter O₂ trim systems would see both 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.

单参数氧气微调系统可以检测到富氧（过多空气）燃烧的条件，从而关小空气挡板微调空气。在现实中，微调过程并不是在该点对燃烧气体进行微调，而是微调过多氧气的烟气。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.

同样，单参数二氧化碳微调系统将检测到烟道空气中存在低含量二氧化碳，使锅炉出现类似的危险。

Another benefit of the 3-parameter trim is that the EGA is continually measuring the formation of CO compared to its commissioned value. A higher CO reading can be attributed 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 参数微调的另一个优点是烟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。缺少空气将导致燃烧不完全并形成一氧化碳。同理，火焰周围的过多空气可能会冷却火焰边缘，导致不完全燃烧并产生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.

根据燃烧性能确定这 3 个参数可以将燃烧器微调至原始调试值，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.

当微调功能增加空气使燃烧返回调试值时，当燃烧器调节到一个新位置，空气挡板的移动偏差被加入到各空气位置，这样在调节过程中通过微调延续可以保持最佳燃烧。

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 always ensures safe combustion without any compromise.

作为一个安全功能，当空气被减少，燃料阀每移动 10 度，燃烧器进行调节时油气比将返回至调试位置。一旦新位置固定，系统将确定是否关小空气挡板，以确保始终安全燃烧。

4.3 EGA Trim Function

烟气分析仪微调功能

4.3.1 Trim Operation

微调操作

With the EGA trim facility it is possible to expand the MM 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.

在烟气分析仪微调设备中可以增加控制模块，测量并显示氧气、一氧化碳、二氧化碳和烟气温度以及锅炉温度或压力。也可以将氧气、一氧化碳和二氧化碳数值用于 3 参数微调，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，同时还可以使燃烧器/锅炉保持最佳燃烧效率。正确设置 3 参数有助于在保持最佳燃烧效率的同时保证安全。

During commissioning, for every paired value of fuel and air, the corresponding values of O₂, CO and CO₂ are stored. 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 MM unit will apply 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。在正常运行模式下，系统将对在线样本在任何位置的燃烧器燃烧率和调试数值进行比较。有 3 个单独的采样参数（氧气、一氧化碳和二氧化碳）可以证明调试值在任一位置的燃烧性能。控制模块中的软件将对通道 2 空气挡板位置或通道 5 变速驱动器进行校正，从而保证符合调试值。这些小更改可以确保符合最初输入的调试数据，无论排气管压力、环境温度/压力波动、气压条件或燃料压力如何变化。

The commission time is based on the residence time of the combustion gas. 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 is the time from the moment the gas leaves the burner, to the moment it exits the boiler into the flue. This time will vary depending on how the burner is firing and the burner turn down ratios. This residence time is displayed in the combustion map screen. The residence time is typically longer at low fire than at high fire due to the volume of the gases passing through the boiler.

调试时间取决于燃烧气体的剩余时间，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，燃烧变化大于 0.2% 氧气。该时间也是燃气离开燃烧器、从锅炉进入烟道的时间，该时间根据燃烧器的燃烧情况和燃烧器调节比会有所不同。剩余时间在燃烧图屏幕上显示，通常该时间在低火焰时会较长，在高火焰时则取决于通过锅炉的燃气量。

4.3.2 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 EGA, 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.

对氧气、二氧化碳和一氧化碳进行微调的 **Autoflame** 系统并非一个简单的氧气微调系统。如果仅测量和微调氧气，则对一氧化碳、二氧化碳或氮氧化物没有对照参考意义。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浓度大幅升高 ($\gg 100\text{ppm}$)。还可能出现的更危险问题是氧气可能会通过锅炉烟道的垫片和小缝隙进入锅炉。由于烟道中的烟气是在锅炉出口处测量，这可能导致氧气读数升高，即使在燃烧正常的情况下，例如：一氧化碳浓度值 ($\gg 100\text{ppm}$) 较高，氧气浓度值则较低。配备简单的氧气微调系统后将不会遇到这些潜在的危险问题。**Autoflame** 烟气分析仪可以对氧气、二氧化碳和一氧化碳进行持续测量，这 3 个参数如有任何变化都将对空气挡板进行微调，使燃烧值返回原先的调试值。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浓度的变化进行微调。

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

下表显示了使用氧气分析仪存在的潜在问题。

	O ₂ Analyser 氧气分析仪		3-Parameter Trim (Autoflame) 3 参数微调 (Autoflame)			
State 状态	O ₂ 氧气	CO 一氧化碳	O ₂ 氧气	CO ₂ 二氧化碳	CO 一氧化碳	
1	3	0	3	10	0	Commissioned 已调试
2	4	0	4	10	0	Trim 微调
3	4.5	100	4.5	10.5	100	Increased Trim 增加微调
4	5	200	5	10.5	100	No trim 未微调
5	4	500	5.5	10	0	Commission position 调试位置
6	3	1000+	5.5	10.5	50	Trim 微调

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

使用氧气微调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- 锅炉在过一段时间后容易发生泄漏，最常出现的位置是在排气管上分析仪测量烟气的位置。在该点出现泄漏时，分析仪将不测量烟气，而是大气中含 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。由于此时燃烧不正确，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- 两个分析仪仍检测到氧气读数增加。氧气分析仪继续关闭空气挡板，以减少通过系统的过多空气，从而产生一氧化碳。Autoflame 分析仪将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微调，从而产生过多的一氧化碳。Autoflame 分析仪检测到此种情况后，将空气挡板返回至调试值，从而确保在进一步调试前氧气、二氧化碳和一氧化碳数值返回至调试值（或接近），这样可以大大减少潜在危险。

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

状态 6- 氧气分析仪将发生危险燃烧，而 Autoflame 烟气分析仪系统将对此种不明确的情况进行检测。

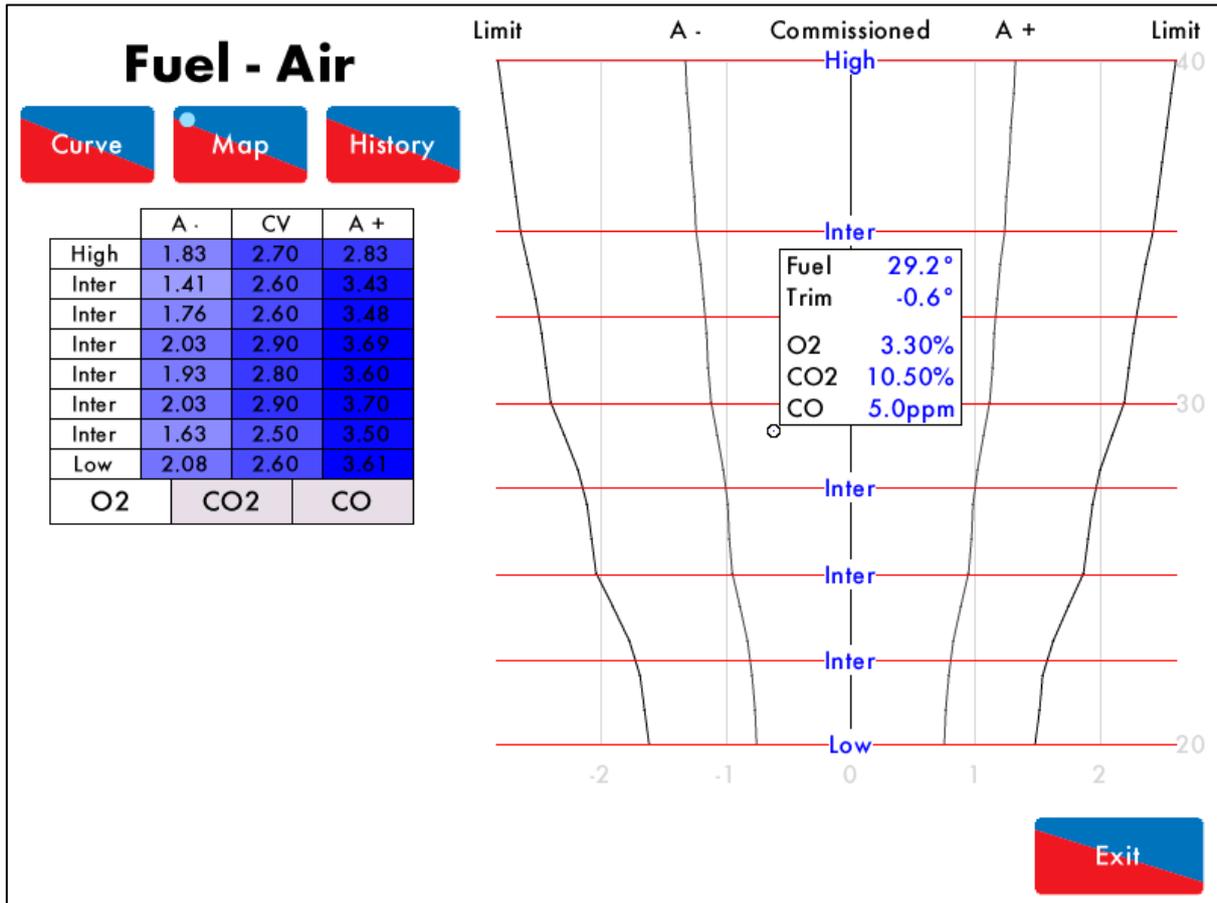


Figure 4.3.2.i Combustion Map Screen

图 4.3.2.i 燃烧图屏幕

The combustion map (see Figure 4.3.2.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 EGA values for O₂, CO₂ and CO. The graph on the right of the screen shows the amount of trim being added by the MM to control these emissions values so that they are as close to their commissioned values as possible. The small 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 4.3.2.i）显示了微调功能如何在系统中工作。按下控制模块主屏幕上的“燃烧图”按钮可以访问燃烧图屏幕。燃烧图清楚地显示了烟气分析仪对氧气、二氧化碳和一氧化碳的调试值。屏幕右侧图表显示了控制模块增加的微调数，以控制这些排放值，使数值更接近其调试值。小圆圈表明当前使用的微调位置和当前的燃烧值。

4.3.3 Trim Correction Calculation

微调校正值的计算

The additional correction calculated at each trim cycle is the combination of the correction determined for each of the combustion products O₂, CO₂ and CO. The correction for each component is independently calculated. The calculation steps for each combustion product are as follows, "A-" denotes Fuel-rich, "CV" denotes Commissioned Value, "A+" denotes Air-rich:

每个调试周期内计算的额外校正值是根据燃烧产物氧气、二氧化碳和一氧化碳的校正值计算而得，每种产物的校正值都是单独计算，计算步骤如下所述：“A-”是指富油，“CV”是指调试值，“A+”是指富氧：

The commissioned values are calculated by interpolation for the current fuel valve position.

调试值是根据当前燃料阀位置计算而得。

The current measured O₂ value is determined as air-rich or fuel-rich side of the commissioned value.
当前测量的氧气值是根据调试值的富氧值或富油值计算而得。

The adjustment which would give rise to the current reading is calculated by linear interpolation of the commissioned values.

导致当前读数上升的微调值是通过线性插值法计算的调试值而得。

Negate this adjustment to produce a correction.

调节值利用求反运算得出校正值。

The corrections for each product are then combined with additional weighting given to O₂ (x1.5) over CO₂ and CO (x1). This combined correction is then added to the running total correction and applied to the air channel. The total correction is limited by an option value set by default to $\pm 10\%$ for safety.

每种产物的校正值结合额外加权值即得出 O₂ (x1.5) 大于 CO₂ 和 CO (x1)。该组合校正值再加入到运行总校正值上并应用于空气通道。出于安全原因总校正值受一选项值的限制，选项值默认是 $\pm 10\%$ 。

Example 示例

The following shows an example calculation. At the current firing rate the interpolated commissioned values are:

以下显示了计算示例，即当前燃烧率下对应得调试值：

	Fuel Rich (A-) 富油 (A-)	Commissioned Value (CV) 调试值	Air Rich (A+) 富氧 (A+)
O ₂	2.8%	3.0%	3.4%
CO ₂	10.2%	10.0%	9.7%
CO	8ppm	5ppm	0ppm

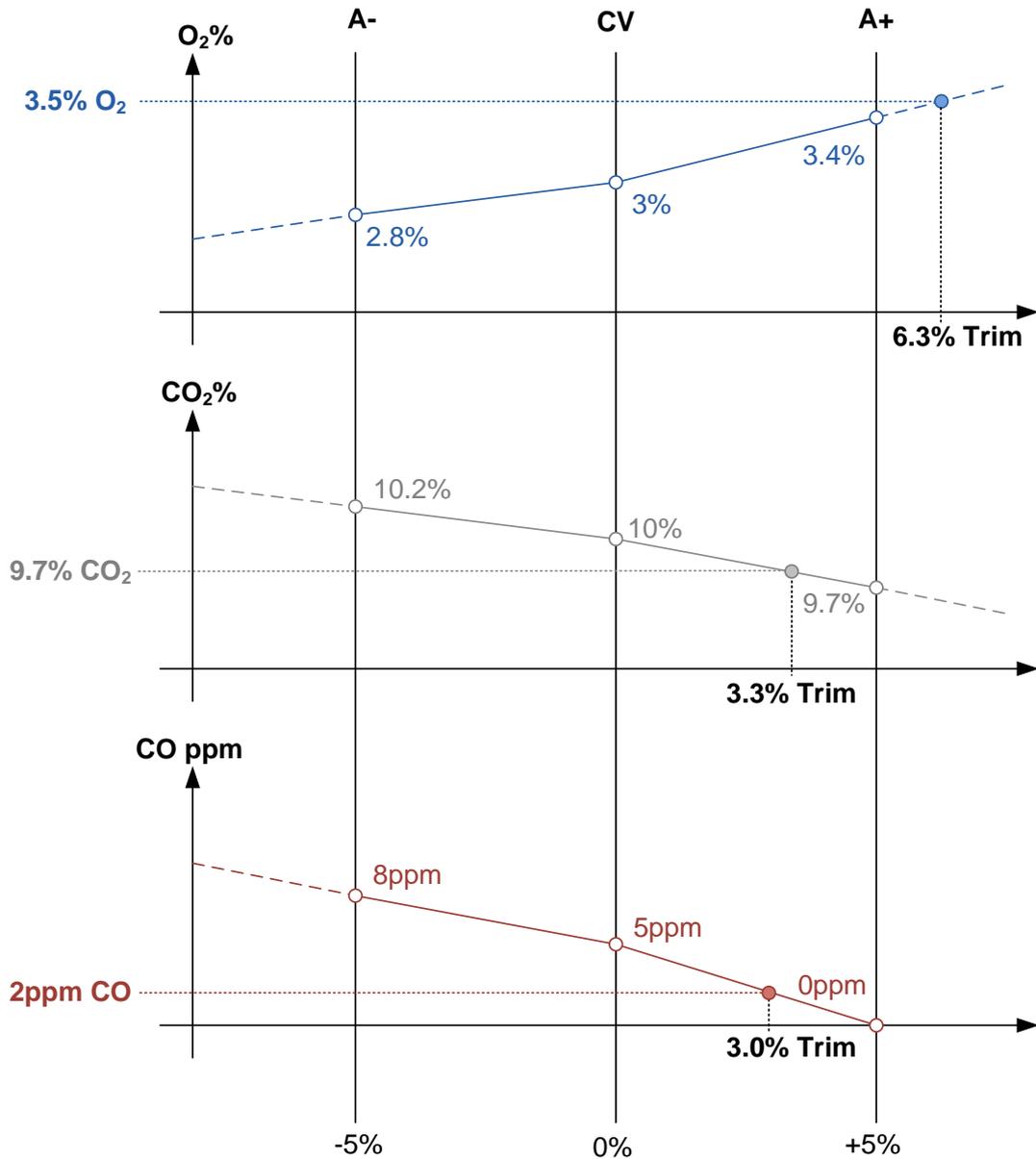
The current measured values are:

当前测量值：

	Measured 测量值
O ₂	3.5%
CO ₂	9.7%
CO	2ppm

Using linear interpolation the adjustments that would give rise to these concentrations are calculated:

利用线性插值法计算导致浓度上升得调节值：



These are negated and combined using their respective weightings:
 这些数值经过求反运算并加上各自得加权值:

	Correction 校正值	Weighting 加权值	Weighted Correction 加权校正值
O ₂	-6.3%	1.5	-9.4%
CO ₂	-3.3%	1.0	-3.3%
CO	-3.0%	1.0	-3.0%
Total 总计		3.5	-15.7%
Average 平均值			-4.5%

Giving an additional trim of -4.5%, which is then added to any existing trim; if for example, there was already +0.5% trim the resultant trim would be -4.0%. This trim fraction is then applied to the air channel, so if for example the air servo was at 52.0° a correction of -2.1° would be applied resulting in an air servo angle of 49.9°.

如额外微调值是-4.5%，则将该值加上任一个可用微调值。例如：微调值是+0.5%，则计算后的微调值则是-4.0%。该微调数再应用到空气通道中，即如果空气伺服装置的角度是 52.0 度，则根据其校正值-2.1 度可以得出空气伺服装置的角度是 49.9 度。

4.3.4 Trim Timing Operation 微调时序操作

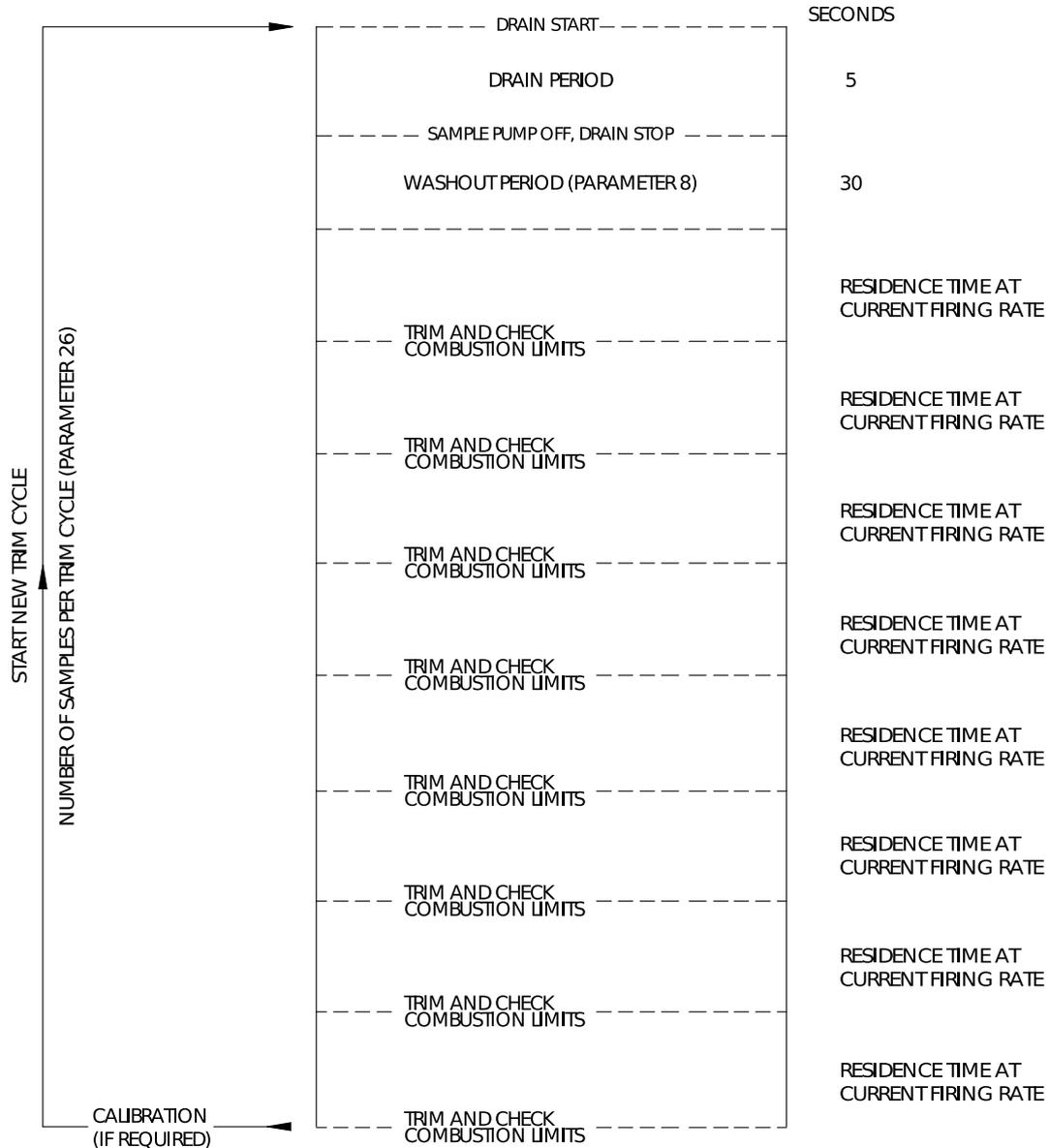


Figure 4.3.4.i Trim Timing Operation
图 4.3.4.i 微调时序操作

If a calibration is due during the trim cycle, the MM will delay the calibration until the cycle has ended.

在微调周期需要空气校准时，控制模块将延迟校准时间直至完成微调周期。

4.3.5 Channel 5 Trim (Mk8 MM Only) 通道 5 的微调 (仅用于 Mk8 控制模块)

When trim is set on channel 5, changing the MM options will make a difference between errors occurring or not. For the purposes of trim, the Mk8 MM 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 MM entered point will now be incorrect. These stored feedback values are used by the MM 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 微调时，更改控制模块选项将造成错误的发生。微调时 Mk8 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，例如：输入输出电压/电流范围和输入输出最小/最大频率。如果系统已经过调试，VSD 驱动的输出电压/电流范围或输入输出最小/最大功率后面被改变，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，而无论是否已选择了通道 5 微调。

4.3.6 Trim Delay 微调延迟

On burner start-up without calibration the EGA 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 EGA commences trim, to ensure that it is not correcting the air damper at high O₂ values. The total time delay before the EGA 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 EGA reads 5%O₂ and over-trims on air damper, reducing the O₂ too far.

燃烧器启动后如未校准，烟气分析仪将开始排水，并在 20.9%氧气（新鲜空气）的条件下开始采样，这样将降低调试值。因此在烟气分析仪开始微调前必须留出足够的时间，确保在高氧值时不会校正空气挡板的位置。烟气分析仪开始微调前的总延迟时间取决于锅炉的停留时间。如果微调开始前总延迟时间较短，烟气分析仪将读取 5%氧气并大幅度微调空气挡板，以便大幅减少氧气。

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（微调延迟）必须大于校准时间（参数 24），即至少要增加 40 秒。参数 24 设为默认的 120 秒时，选项 32 应设为至少 160 秒。微调前的总时间则为 200 秒（选项 32+参数 8）。这也取决于锅炉的停炉时间。

4.4 Combustion Efficiency Calculations

燃烧效率的计算

Based on dry gas.

根据干烟气计算

English Calculation:

英式计算方式

$$\% \text{ Combustion Efficiency} = 100 - (\text{sensible heat loss} + \text{hydrogen and moisture loss})$$

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

$K1 = 0.38$ 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)

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:

欧式计算方法：

$$\% \text{ Combustion Efficiency} = 100 - \text{sensible heat loss}$$

燃烧效率 (%) = 100 - 显热损失

$$\% \text{ Combustion Efficiency} = 100 - \left((TG - TA) \times \left(\frac{A}{20.9\% - O_2\%} + B \right) \right)$$

燃烧效率 (%) = 100

$A = 0.66$ Natural Gas (F1/F4) 天然气 (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)

4.5 Combustion Limits

燃烧限值

The combustion limits are only available when the EGA system is used in conjunction with a MM 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.

燃烧限值仅在烟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的烟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烟气值的一种补偿值或设为一种绝对值。根据烟气变量和应用条件计算出上限值和下限值，燃烧限值可以在氧气、二氧化碳、一氧化碳、一氧化氮和烟气温度等 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 MM 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的选项 19-27 和参数 94-97 进行调节。在调试燃烧器前，选项 12 必须正确设置并检查燃烧限值。

Offset Limits

补偿限值

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 MM. These values are entered after the commissioning of the EGA system has been completed throughout the firing range of the burner, according to health and safety requirements or environmental regulations.

标准（补偿）限值是一种涉及所有调试值的体积百分比，大于或小于氧气和二氧化碳值，浓度大于一氧化碳和一氧化氮浓度，温度大于烟气温度。如果在线烟气值大于燃烧曲线中调试值的补偿值，燃烧器将锁定或显示错误，这取决于控制模块上选项 12 的设置。根据健康和安全性要求或环境法，在整个燃烧范围内，这些数值都应在完成烟气分析仪系统调试后输入。

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 EGA 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体积百分比、浓度或温度。在这种形式下，氧气可能被设为一个偏低值，烟气温度和温度设为体积百分比。在仅有二氧化碳的情况下，偏高值可以按体积百分比输入。至于一氧化碳和一氧化氮，可以输入浓度偏高值。这些数值在烟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。

Combustion Limits Control Functions

燃烧限值控制功能

Using Option 13 on the MM module it is possible to have two distinct control functions on how the system will react when the limits of combustion are exceeded.

当超过燃烧限值时，利用控制模块上的选项 13 可以对系统反应实现以下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 MM module was commissioned on. An error will also appear on the MM module, and until the error is reset on the MM, the trim function will remain disabled, even if the combustion limits are no longer exceeded.

当超过控制限值时，微调功能将自动禁用，系统将在燃油空气比位置运行，该位置也是控制模块的调试位置。控制模块出现错误时，在重置控制模块上的错误前，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 exceeded the MM module will lockout the burner. The MM module will also display an error message, and until the lockout is reset on the MM module, the system will remain in a lockout condition.

当超过燃烧限值时，控制模块将锁定燃烧器。同时控制模块将显示错误消息，直至该错误被重置，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.

下图用图形方式显示了燃烧标准限值的作用。

4.5.1 O₂ Combustion Limits

氧气燃烧限值

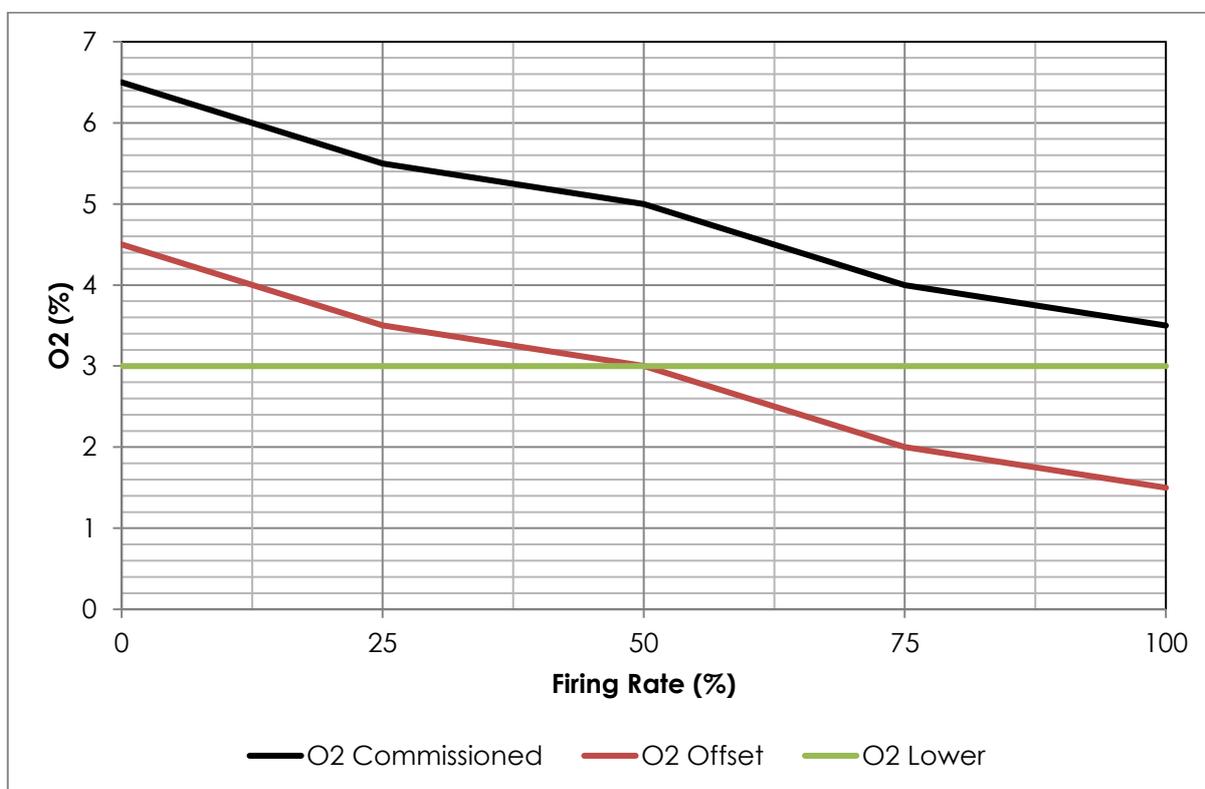


Figure 4.5.1.i O₂ limits example

图 4.5.1.i 氧气限值示例

Figure 4.5.1.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 4.5.1.i 显示了氧气限值示例。如果补偿限值设为 2%，当实际氧气值从调试值降至低于 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。

4.5.2 NO Combustion Limits

一氧化氮燃烧限值

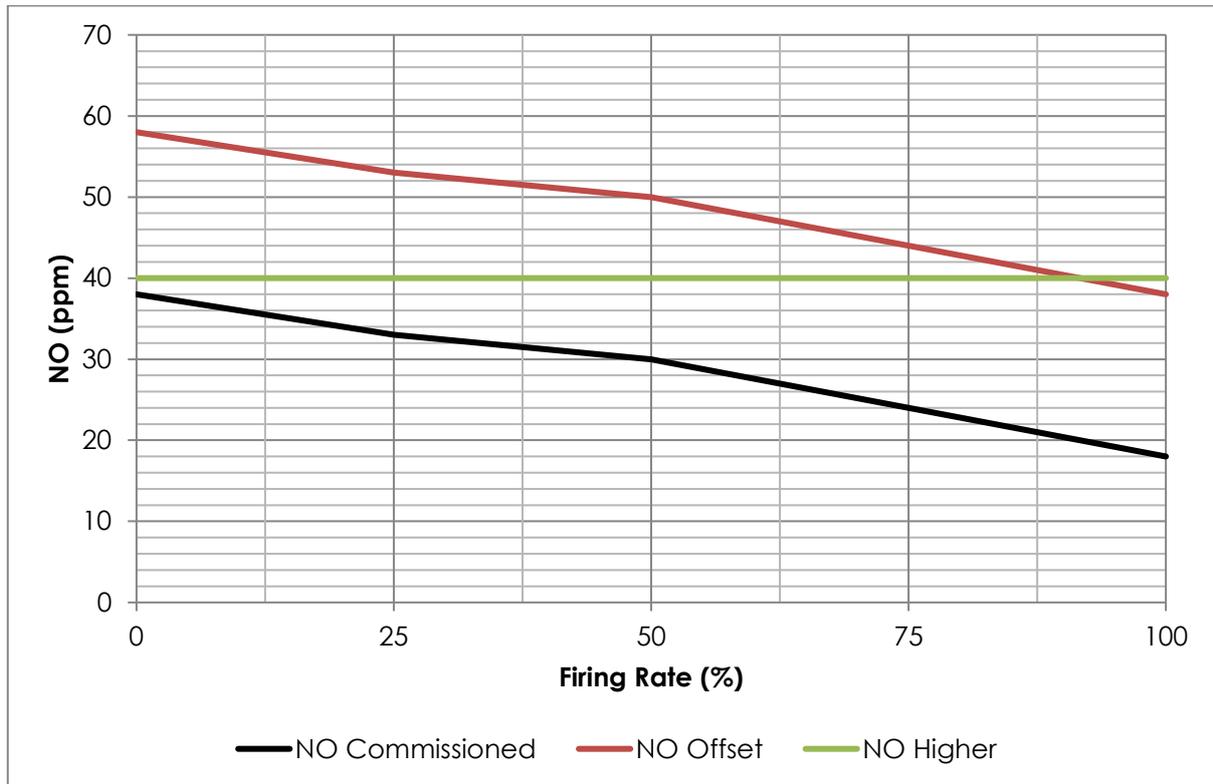


Figure 4.5.2.i NO limits example
图 4.5.2.i 一氧化氮限值示例

Figure 4.5.2.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 4.5.2.i 显示了一氧化氮限值示例。如果补偿限值设为 20ppm，当实际一氧化氮值从调试值升高大于 20ppm 补偿值时，燃烧器将发出警报（取决于终端 79 的操作）。如果绝对下限值设为 40ppm，当实际一氧化氮值升高大于 40ppm 时，燃烧器将发出警报。

4.5.3 CO Combustion Limits

一氧化碳燃烧限值

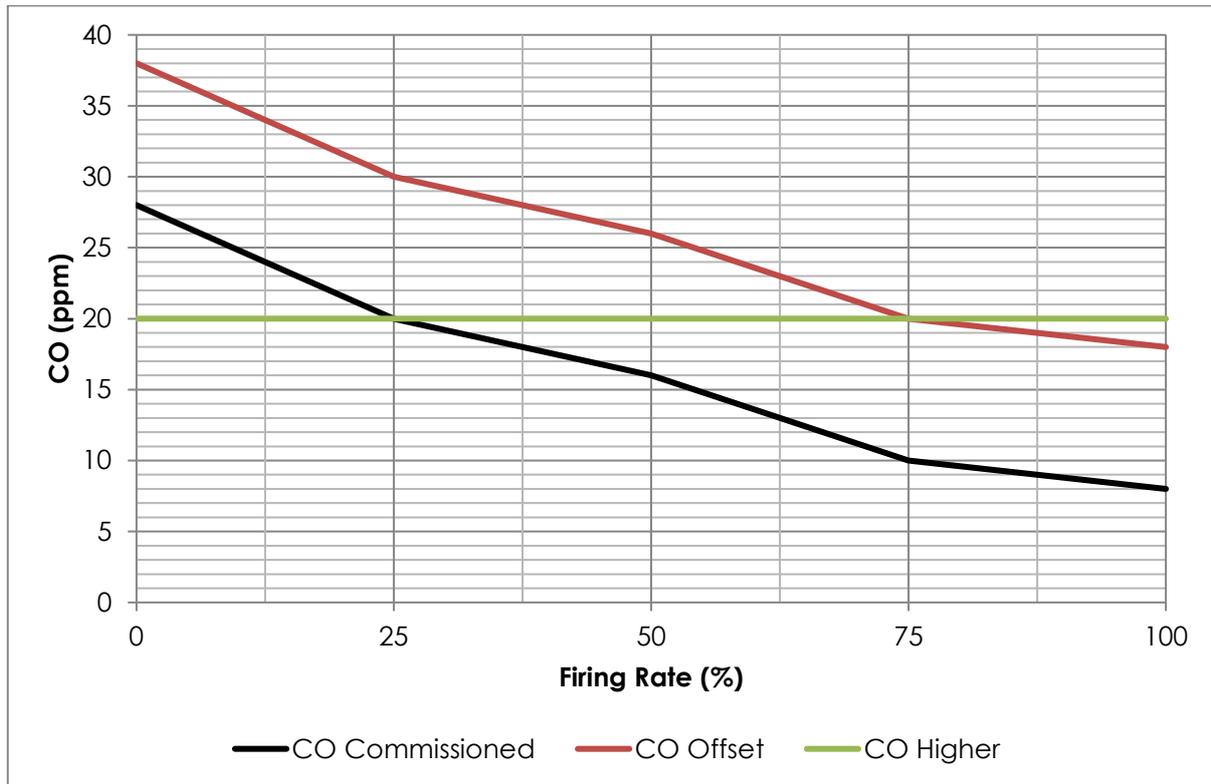


Figure 4.5.3.i CO limits example
图 4.5.3.i 一氧化碳限值示例

Figure 4.5.3.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 4.5.3.i 显示了一氧化碳限值示例。如果补偿限值设为 20ppm，当实际一氧化碳值从调试值升高大于 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。

4.5.4 Temperature Limits

温度限值

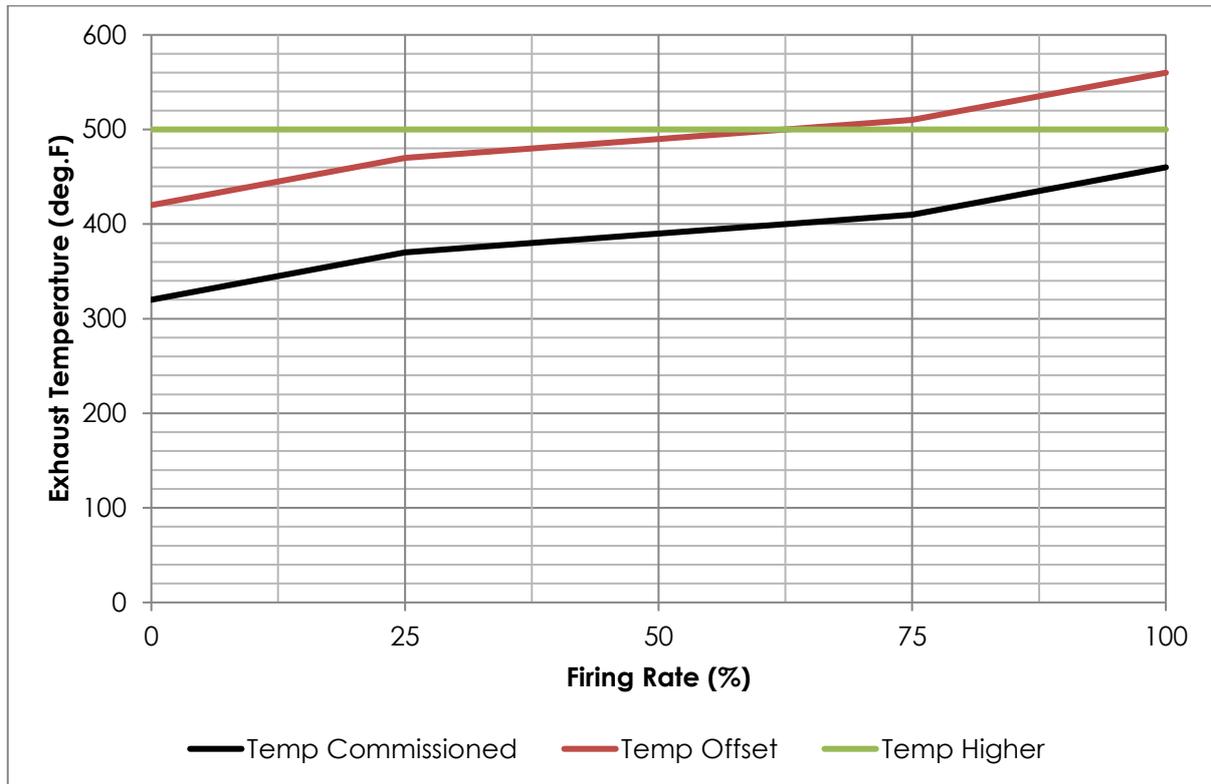


Figure 4.5.4.i Temperature limits example
温度限值例子

Figure 4.5.4.i shows an example of the exhaust temperature limits. If the offset limit was set to 100°F, then the burner would alarm (depending on the terminal 79 operation) when the actual exhaust temperature value rose above 100°F offset from the commissioned value.

图 4.5.4.i 显示了温度限值示例。如果补偿值设为 100 华氏度，当实际排气温度值从调试值升高大于 100 华氏度时，燃烧器将发出警报（取决于终端 79 的操作）。

If the absolute higher limit was set to 500°F, the burner would alarm when the actual exhaust temperature value rose above 500°F.

如果绝对上限值设为 500 华氏度，当实际排气温度值升高大于 500 华氏度时，燃烧器将发出警报。

4.6 Emission Gases Data Logging Units 烟气排放数据日志单元

The Mk8 EGA Evo logs gas concentrations for CO, NO, NO₂ and SO₂ in both PPM and mg/m³, so when the concentration unit is changed in EGA Setting 9, the graph on the EGA screen will display the emissions in the specified concentration unit.

第 8 代烟气分析仪以 PPM 和 mg/m³ 记录一氧化碳、一氧化氮、二氧化氮和二氧化硫的气体浓度，因此当浓度单元在烟气分析仪设置 9 中改变时，烟气分析仪屏幕上的图形将显示指定浓度单元的排放量。

The user has the option to download the long term EGA emissions data in either ppm or mg/m³. The preferred unit can be optioned first in Setting 9 (PPM and mg/m³) so that the downloaded long term emissions logs will have the same units as selected in Setting 9 before a download is taken.

用户可以选择下载长期的烟气分析仪排放数据(ppm 或 mg/m³)。可以先在设置 9 中选择首选单元(PPM 和 mg/m³)，以便在下载之前，下载的长期排放日志与设置 9 中选择的单位相同。

The long term EGA data also includes the NO_x concentration level (Combined NO and NO₂).
长期烟气分析仪数据还包括氮氧化物浓度水平(组合一氧化氮和二氧化氮)。

4.7 Downloading EGA Long Term Logs 下载烟气分析仪长期日志

The EGA stores emissions and other data internally for a period of up to 3 years, these data can be downloaded from the EGA and exported into an Excel spreadsheet via IR lead using Autoflame Download Manager software. Please refer to the Autoflame PC Software Guide for full details.

烟气分析仪在内部存储排放和其他数据长达 3 年，这些数据可以从烟气分析仪上下载，并使用 Autoflame 下载管理软件通过 IR 引线导出到 Excel 电子表格中。详情请参阅 Autoflame PC 软件指南。

On the Download Manger software, go to “Tools” and select “Download Long Term Logs”
在下载管理软件中，进入“工具”，选择“下载长期日志”

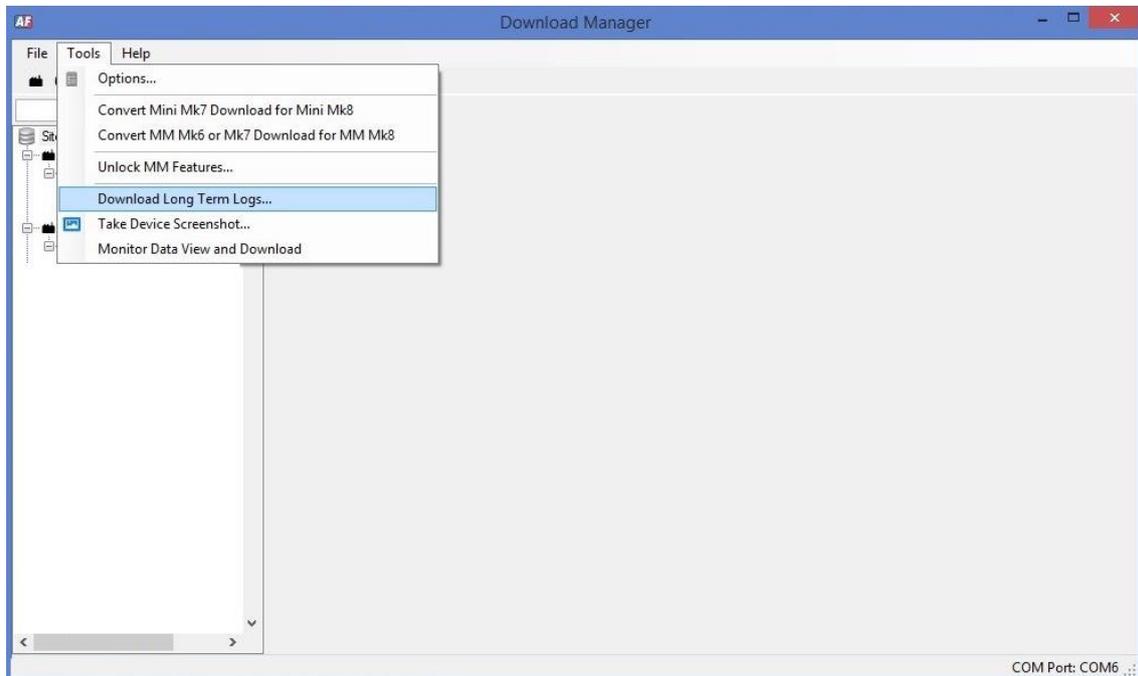


Figure 4.7 i: Autoflame Download Manager Software

图 4.7.i Autoflame 下载管理软件

On the newly opened “Download” window, select “Get Log Info”, the Download Manager will compile a list of downloadable EGA data.

在新打开的“下载”窗口，选择“获取日志信息”，下载管理器将编制一个可下载的烟气分析仪数据列表。

Tick the boxes for any data that you want to download or click “All” to select all the data in the list. Click “Start” and the Download Manager will start downloading the data into your PC.

选择你想下载的数据，或者点击“全部”选择列表中的所有数据。点击“开始”，下载管理器将开始下载数据到你的电脑。

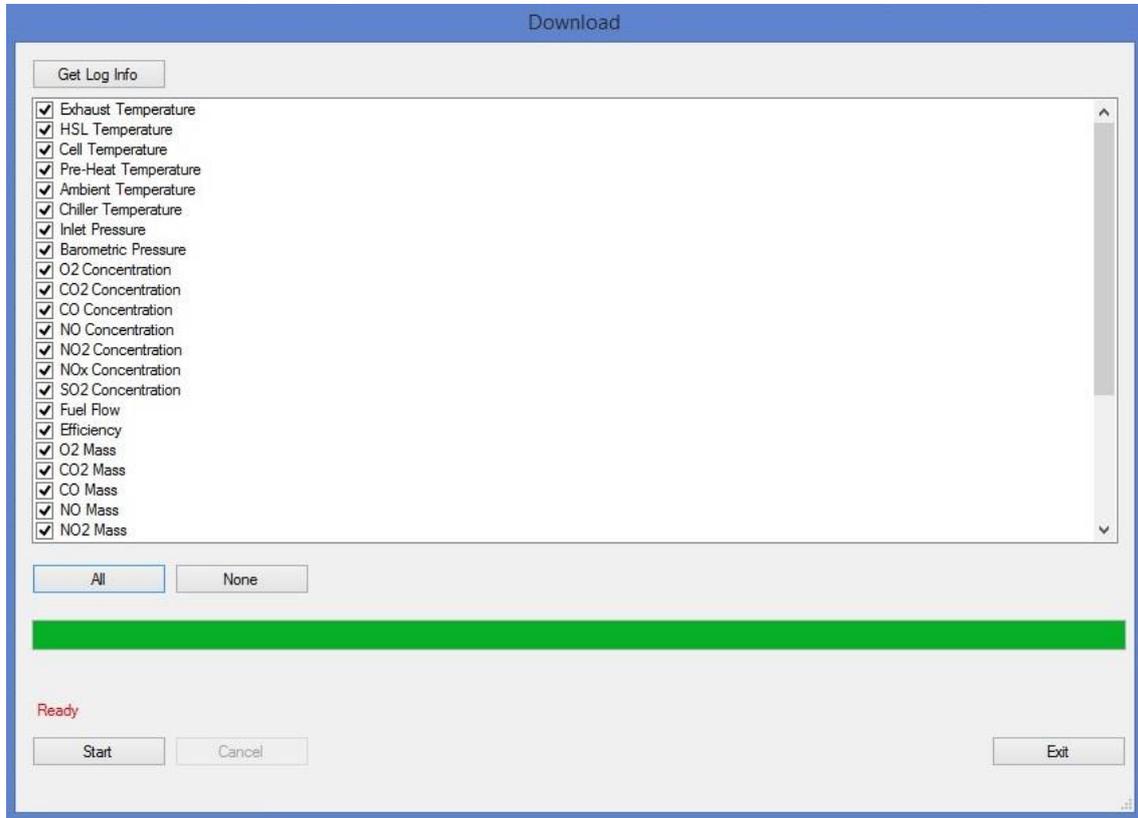


Figure 4.7 ii: selecting and downloading long term data from the EGA
图 4.7.ii 从烟气分析仪中选择和下载长期数据

5 REMOTE MONITORING

远程监控

5.1 Overview

概述

To access the EGA remotely for the purpose of monitoring, this can be done either by using a Mk8 DTI or by utilising the Direct Modbus feature available on the Mk8 EGA Evo. There are limited number of Modbus addresses available on the Mk8 EGA Evo which can be accessed directly without the need for a DTI.

为了监控的目的远程访问烟气分析仪，可以通过使用第 8 代数据传输接口或利用第 8 代烟气分析仪上可用的直接的 Modbus 特性来完成。在第 8 代烟气分析仪上不需要数据传输接口可以直接访问的 Modbus 地址数量有限。

Direct Modbus can be used if the EGA is set to Standalone (Setting 1 option 0). It is not possible to use Direct Modbus if the EGA is controlled by an MM (Setting 1 option 1). However in this case the Direct Modbus feature on the MM can be used to get the same live EGA values through the MM.

如果烟气分析仪设置为独立模式(设置 1 选项 0)，直接可以使用 Modbus。如果烟气分析仪是由一个控制模块(设置 1 选项 1)，就不可能使用直接 Modbus。但是在这种情况下，控制模块上的直接 Modbus 功能通过控制模块来获取相同的有效烟气分析仪值。

To access the EGA via DTI, please refer to the DTI setup guide for full details.

通过数据传输接口访问烟气分析仪，详情请参阅数据传输接口安装指南。

5.2 Wiring

接线

The standard MM serial communication pins on the EGA flying lead are used for Direct Modbus for the EGA. 在烟气分析仪接线上的标准控制模块串行通信针用于烟气分析仪直接 Modbus。

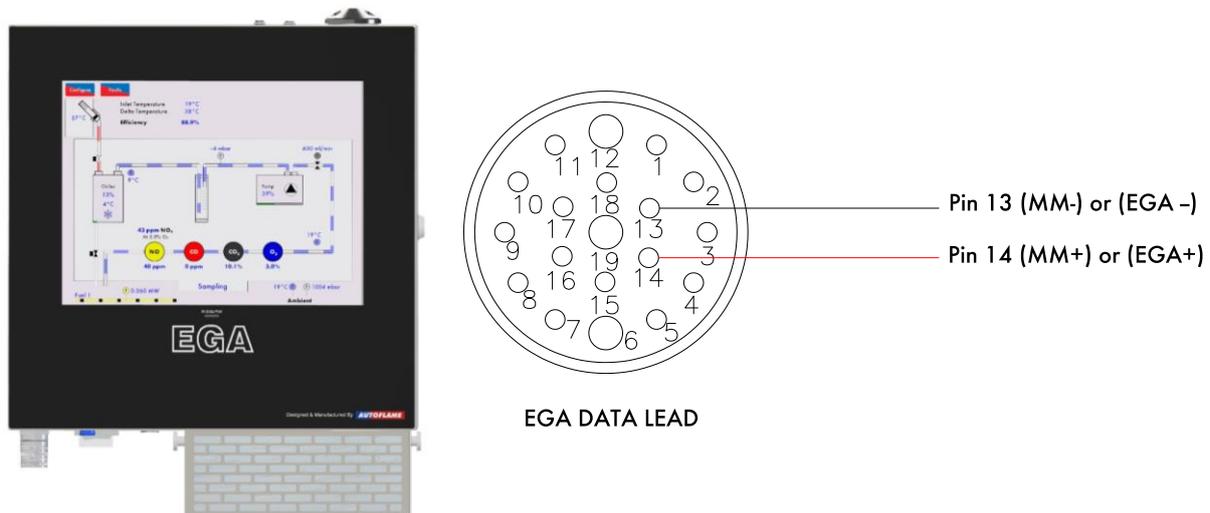


Figure 5.2 Direct Modbus connections on the EGA's flying lead
图 5.2 Modbus 接链烟气分析仪接线

5.3 Direct Modbus Settings Modbus 设置

The following EGA settings must be set to enable Direct Modbus to work correctly on the EGA:
以下烟气分析仪设置必须设置为启用直接 Modbus 以便烟气分析仪正常工作：

Setting 设置	Default 默认值	Range 范围	Description 说明
56	0	0 1	<u>Modbus Data Format</u> Modbus 数据格式 The Modbus data format on the EGA should be set the same as the baud rate used on the external Modbus communication program. 烟气分析仪 Modbus 数据格式应该同用于外部 Modbus 通信程序的波特率设置一样。 Binary Format 二进制格式 ASCII Format ASCII 格式
57	1	1 – 247	<u>Modbus Device ID</u> Modbus 设备 ID This ID is used to recognise the device on the external Modbus communication program. 此 ID 用于外部设备的 Modbus 通讯程序识别该设备。
58	0	0 1	<u>Modbus Baud Rate</u> Modbus 波特率 The baud rate on the EGA should be set the same as the baud rate used on the external Modbus communication program. EGA 上的波特率应设置为与外部 Modbus 通信程序使用的波特率相同。 9600 Baud 波特率 19200 Baud 波特率
59	0	0 1 2	<u>Modbus Parity Setting</u> Modbus 奇偶校验设置 The parity on the EGA should be set the same as one used on the external Modbus communication program. EGA 上的奇偶校验应设置为与外部 Modbus 通信程序中使用的相同。 No parity / 无奇偶校验 Odd parity / 奇校验 Even parity / 偶校验

5.4 Modbus Addresses Modbus 地址

There are 4 types of Modbus addresses:

Modbus 地址有 4 种类型:

0x Read/Write digital outputs – off/on commands

0x 读/写数字输出——关闭/开启命令

1x Read digital inputs – off/on signals/indications

1x 读取数字输入 - 关闭/开启信号/指示

These are binary values and have a 0/1 value indicating an off/on or no/yes value.

这些是二进制值，具有 0/1 值，表示关闭/开启或否/是值。

3x Read analogue inputs – variable data

3x 读取模拟输入 - 可变数据

4x Read/Write analogue outputs – variable adjustments

4x 读/写模拟输出 - 可变调整

These are multiple integer values and can have a value of 0 to 65534 and do not contain decimal points i.e. channel 1 position Modbus value is 900 which is equivalent to 90.0°

这些是多个整数值，可以具有 0 到 65534 的值并且不包含小数点，即通道 1 位置 Modbus 值为 900，相当于 90.0°

On the Mk8 EGA, the following addresses are available:

在 Mk8 EGA 上，可以使用以下地址：

Digital (1x Read)

数字量（1x 读）

Address 地址	Device 设备	Description 描述
10224	MM	EGA OK TO SAMPLE / EGA 可以采样
10993	EGA	AIR CAL IN PROGRESS / 空气校准进行中
10994	EGA	SELF CAL IN PROGRESS / 自我校准进行中
10995	EGA	CHILLER READY / 冷却器就绪
10996	EGA	AMBIENT TEMPERATURE OK 环境温度正常
10997	EGA	AMBIENT TEMPERATURE HIGH 环境温度高
10998	EGA	AMBIENT TEMPERATURE LOW 环境温度低
10999	EGA	UNUSED 1 / 未使用
11000	EGA	EGA READY / EGA 就绪
11001	EGA	CO OPTIONED / CO 选用
11002	EGA	NO OPTIONED / NO 选用
11003	EGA	SO2 OPTIONED / SO2 选用
11004	EGA	IMPERIAL UNITS / 英制单位
11005	EGA	IS SAMPLING / 采样中
11006	EGA	PRE HEAT SENSOR ENABLED / 预热传感器启用
11008	EGA	NO2 OPTIONED / NO2 选用

Analogue (3x Read)

模拟量（3X 读）

Address 地址	Device 设备	Description 描述
30601	EGA	FUEL SELECTED / 燃料已选择

30602	EGA	O2 CONCENTRATION / O2 浓度
30603	EGA	CO2 CONCENTRATION / CO2 浓度
30604	EGA	CO CONCENTRATION / CO 浓度
30605	EGA	NO CONCENTRATION / NO 浓度
30606	EGA	SO2 CONCENTRATION / SO2 浓度
30607	EGA	EXHAUST TEMPERATURE / 烟气温度
30608	EGA	EFFICIENCY / 热效率
30609	EGA	ERROR NUMBER / 错误代码
30611	EGA	DELTA TEMPERATURE / 温度差
30612	EGA	AMBIENT TEMPERATURE / 环境温度
30613	EGA	PRE HEAT TEMPERATURE / 预热温度
30615	EGA	NO2 CONCENTRATION / NO2 浓度
30616	EGA	AMBIENT PRESSURE / 环境压力

6 SERVICING AND TROUBLESHOOTING

维护和故障排除

6.1 Servicing

维护

The EGA 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.

烟气分析仪是一种非常灵敏的仪器，用于分析烟道中的烟气，因此需要定期维护，确保通过微调功能获得准确的读数并保证安全运行。

Due to the technology used within the Autoflame E.G.A, to ensure accurate and reliable operation the EGA requires annual servicing. Servicing the EGA and sampling probe is crucial to maintain the correct operation of the EGA and must be done regularly. For firing on natural gas, the EGA must be sent back every 12 to 18 months depending on the boiler room conditions. For firing on oil, this would be shortened to 6 to 12 months.

由于 Autoflame 烟气分析仪使用了高科技，因此未确保准确、可靠的运行，需要每年对烟气分析仪进行维护。维护烟气分析仪和采样探头对烟气分析仪的正确运行至关重要，因此必须定期进行。使用天然气燃烧时，根据锅炉房的环境，烟气分析仪必须每隔 12 至 18 个月返还公司进行维护，用燃油燃烧时，每隔 6 至 12 个月返还维护。

Failure to send back the EGA when it is due for a service will cause the operation and life of the EGA 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 EGA. Further issues such as pump problems, chiller faults and inaccurate trim operation will occur.

烟气分析仪在需要维护时如未返还维护将会影响烟气分析仪的运行和寿命。传感器在长期使用后精度会降低，因此也需要定期更换。探头因为长期进行采样工作，很容易被积累在燃烧器中的堆积物和灰尘堵塞，如果不及时维护将会导致读数不准确，影响烟气分析仪的可靠性。另外也可能导致泵故障、冷却器故障和不准确的微调操作。

6.1.1 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, causing EGA faults.

在仅使用燃气时，排气管上安装的探头不可能连续不断的进行维护，我们建议每年对探头检查一次，确保没有堵塞。使用重燃料或固体燃料时，管道出口处可能会积累沉淀物，导致烟气分析仪上出现故障。

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 to pull out the deposits, otherwise the deposits will be pushed further into the probe assembly.

用双杀将长钻头（7mm/0.275 英寸）插入出口管可以清洁沉淀物，旋转钻头或拉动钻头可以将沉淀物拉出，否则沉淀物将会被更深地推入探头总成。



Figure 6.1.1.i Method of Cleaning a Blocked Outlet Tube

图 6.1.1.i 清洁堵塞出口管示意图

6.1.2 Servicing EGA Sampling Probe 烟气分析仪采样探头的维护

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

如果烟气分析仪采样探头的过滤器总成出现堵塞，则必须拆卸探头并安装一个精细过滤器和粗过滤器。检查探头是否堵塞，将探头连接至烟气分析仪，使烟气分析仪开始采样。如果泵压力或流量降低于 550 ml/分钟，则应该更换过滤材料。

1. To disassemble the probe, unscrew the casing from the base of the probe. See diagram in section 1.6.1. The whole of the internal assembly can now be withdrawn from the sample connection end.
要拆卸烟枪，请在烟枪底座拧松固定烟枪外壳的螺丝。请参见第 1.6.1 节中的图表。现在可以从烟枪底座连接端取出整个内部组件。
2. Remove the sampling tube and thermocouple from the EGA and unscrew the end cap.
从烟气分析仪上取下采样管和热电偶，并拧下烟枪外壳。
3. Retract the filter and thermocouple from inside the probe at the same angle.
按相同角度从烟枪内部将过滤器和热电偶拉出。
4. Replace the filter on the end of the thermocouple; the thermocouple can also be replaced.
在烟枪的顶部更换过滤器，热电偶也可以被更换。
5. Loose the 2mm set screw located above the cap extract the thermocouple.
拧松 2mm 固定螺钉，取出热电偶。
6. Replace the thermocouple and retighten the set screw.
更换热电偶并拧紧固定螺丝。
7. Check that the stainless steel filter and inner sample tube are clear inside.
检查不锈钢过滤器和连接管内部是否干净。

8. Very carefully push the delicate pre-formed filter onto the stainless steel filter.
非常小心地将精致的预制过滤器推到不锈钢过滤器上。
9. Slide the inner assembly back into the stainless steel outer casing.
将内部总成推回不锈钢外壳内。
10. Reassemble by sliding the assembly into the casing and screw together.
将总成滑动至外壳内部并拧紧内部螺丝。

After reassembly connect the probe to the EGA and check the pump pressure and flow.
重新装回后将探头连接到 EGA 并检查泵压力和流量。

6.2 Shipping 运输

The EGA is a scientific instrument with delicate components. Whenever the EGA is shipped it is essential that the EGA is returned using its original packaging.

烟气分析仪是一种配备精密组件的科学仪器，因此在运输或返还时必须使用原包装。

Ensure that couriers treat the package appropriately and label it as containing a delicate scientific instrument. If the EGA is damaged in transit, repair costs will be incurred.

确保快递员正确地处理包装，在包装上应贴上标签，注明是精密的科学仪器。如果烟气分析仪在运输时损坏，则必须支付维修费。

Please contact Autoflame or your local Tech Centre to obtain new Autoflame EGA packaging.

请联系 Autoflame 或当地技术中心获取烟气分析仪的新包装。

6.3 Fault Codes 故障代码

There are two types of faults on the EGA, errors and warnings. Errors stop the EGA from sampling, and Warnings do not stop the EGA from sampling. If the EGA is connected to an MM, option 13 will set where the MM turns the burner off or continues running when an EGA fault occurs.

烟气分析仪上有两种类型故障，即错误和警告。出现错误时烟气分析仪将停止采样，但出现警告时烟气分析仪不会停止采样。如果烟气分析仪连接了控制模块，则可以利用选项 13 设置控制模块关闭燃烧器、或当烟气分析仪出现故障时控制模块是否继续运行。

Please refer to the MM Installation and Commission Guides for EGA fault codes displayed on the MM.

关于控制模块上显示的烟气分析仪故障代码，请参考控制模块安装和调试指南。

Note: The EGA will display the fault message relevant to the component, e.g. if the fault code 0 will display as 'CO Cell Invalid' on the EGA fault screen, for a CO cell fault.

注：烟气分析仪将显示与组件相关的故障消息，例如：如果故障代码 0 在烟气分析仪故障屏幕上显示“CO Cell Invalid 一氧化碳传感器无效”，则表示一氧化碳传感器出现故障。

Fault 故障	Message 消息	Type 类型
0	Cell Invalid 传感器无效 <ul style="list-style-type: none"> The displayed cell is either not detected or the incorrect type has been fitted on start-up (O₂, NO, CO, CO₂, NO₂, SO₂). 显示的传感器未检测到、或在启动时安装了错误类型的传感器（O₂, NO, CO, CO₂, NO₂, SO₂）。 Check the cell has been installed correctly. 检测传感器是否正确安装。 	Error 错误
1	Cell Data Loaded 加载传感器数据 <ul style="list-style-type: none"> A new displayed cell has been detected and calibration data has been reloaded. 检测到显示的新传感器并已重新加载校准数据。 This is the correct response to a new cell being fitted. 安装新传感器后这属于正确的反应。 	Warning 警告
2	Blocked Input 输入阻塞 <ul style="list-style-type: none"> Input pressure below optioned fault threshold. 输入压力小于选定的故障阈值。 Check Commission Mode setting 47. 检查调试模式设置 47。 Check the air inlet filter, and the external particulate filter, if fitted. 检查进气过滤器和外部颗粒过滤器（如安装）。 	Error 错误
3	Blocked Output 输出阻塞 <ul style="list-style-type: none"> Barometric pressure is above optioned fault threshold. 大气压大于选定的故障阈值。 Check Commission setting 48. 检查调试模式设置 48。 	Error 错误
5	Ambient Temperature Low 环境温度低 <ul style="list-style-type: none"> Ambient temperature is below 3°C (37.4°F) 环境温度低于 3 度（37.4 华氏度） 	Warning 警告
6	Ambient Temperature High 环境温度高 <ul style="list-style-type: none"> Ambient temperature is above 42°C (107.6°F) 环境温度高于 42 度（107.6 华氏度） 	Warning 警告
7	Chiller Frozen 冷却器被冻住 <ul style="list-style-type: none"> Chiller temperature is below 0°C 冷却器温度低于零度 Chiller will then shut down to warm up, if the temperature goes above this low limit of 0°C, the fault will automatically clear and the EGA will resume normal operation. 冷却器将停机加热，如温度高于最低限值零度，则故障将自动排除，烟气分析仪将重新正常工作。 	Error 错误
8	Chiller Temperature High 冷却器温度高 <ul style="list-style-type: none"> Chiller is not cooling 冷却器不制冷 	Warning 警告
10	Flow Out of Range 流量超出范围 <ul style="list-style-type: none"> Sample flow rate is less than 500ml/min or more than 700ml/min 样本流率低于 500ml/分钟或高于 700ml/分钟 For the main pump in a standard EGA, this fault is an error. For the self-calibration pump in a self-calibration EGA, this is a Warning. 如标准烟气分析仪上安装了主泵，则该故障是一种错误。如自校准烟气分析仪上安装了自校准泵，则该故障属于一种警告。 	Error or Warning 错误或警告
11	Self-Cal Low Pressure 自校准压力低 <ul style="list-style-type: none"> Self-calibration has failed due to low source gas pressure. 自校准功能因供气压力低出现故障。 Check the indicated gas supply, this fault could mean there is no gas in the bottle. 检查指定的标气源，本故障代码可以表示气瓶中无气。 	Warning 警告

Fault 故障	Message 消息	Type 类型
12	Self-Cal High Pressure 自校准压力高 <ul style="list-style-type: none"> Self-calibration failed due to high source gas pressure. 自校准功能因供气压力高出现故障。 Check the pressure regulator for the gas supply. 检查气源的压力调节器 	Warning 警告
13	HSL Out of Range 加热采样线超出范围 <ul style="list-style-type: none"> Heated Sample (HSL) temperature is out range. 加热采样线温度超出范围 Check the HSL supply fuse and check the connections 检查加热采样线电源保险丝和连接 	Warning 警告
14	Excess Calibration Drift 校准偏差较大 <ul style="list-style-type: none"> Calibration drift is out of range. 校准偏差超出范围 Check Commission Mode Settings 23 to 26. 检查调试模式设置 23 为 26。 	Error 错误
15	Temperature Sensor 温度传感器 <ul style="list-style-type: none"> The displayed temperature sensor is faulty. 显示的温度传感器出现故障。 Check the connections on the thermocouple and the pre-heated air sensor 检查热电偶和预热空气传感器之间的连接。 	Error or Warning 错误或警告
16	Pressure Sensor 压力传感器 <ul style="list-style-type: none"> The displayed pressure sensor is faulty. 显示的压力传感器出现故障。 Please contact Autoflame or local approved Autoflame tech centre. 请联系 Autoflame 或当地经授权的 Autoflame 技术中心。 	Error 错误
17	Chemical Sensor 化学传感器 <ul style="list-style-type: none"> The displayed chemical cell is faulty, check the connections. 显示的化学传感器出现故障。 	Error 错误
18	Optical Sensor 光学传感器 <ul style="list-style-type: none"> CO₂ cell is faulty, check the connections. 二氧化碳传感器出现故障。检查连接。 	Error 错误
19	Optical Bulb 光学灯泡 <ul style="list-style-type: none"> CO₂ cell bulb current is below 50mA. 二氧化碳传感器灯泡电流低于 50mA。 Check the connections. 检查连接。 	Warning 警告
20	Fan Blocked 风扇堵塞 <ul style="list-style-type: none"> Ventilation fan frequency is below 40Hz. 通风风扇频率低于 40Hz。 Check the air inlet filter. 检查进气过滤器。 	Warning 警告
21	EEPROM Write Failed EEPROM 写入失败 <ul style="list-style-type: none"> EEPROM data could not be written after multiple attempts. EEPROM 数据在多次尝试后无法读取。 	Error 错误
22	EEPROM Read Failed EEPROM 读取失败 <ul style="list-style-type: none"> EEPROM data could not be read after multiple attempts. EEPROM 数据在多次尝试后无法读取。 	Error 错误

Fault 故障	Message 消息	Type 类型
23	Clock Not Set 时钟未设置 <ul style="list-style-type: none"> • Clock not set. 时钟未设置 • Check the battery on the main PCB. 检查主 PCB 板上的电池。 	Warning 警告
24	Service Interval 服务间隔时间 <ul style="list-style-type: none"> • Service interval has expired. 服务间隔时间已到期 • Check Commission Mode setting 54 for service interval and 55 for service interval error period. 服务间隔时间请检查调试模式设置 54，服务间隔时间错误请检查调试模式设置 55。 	Error or Warning 错误或警告
25	Calibration Result Invalid 校准结果无效 <ul style="list-style-type: none"> • A cell calibration is rejected. 传感器校准被拒绝 • Check gas bottles are in correct port. 检查气瓶是否安装在正确的进气口上。 	Warning 警告
26	Software Error 软件错误 <ul style="list-style-type: none"> • Please contact Autoflame or local approved Autoflame tech centre. 请联系 Autoflame 或当地经授权的 Autoflame 技术中心。 	Warning 警告
27	Software Error 软件错误 <ul style="list-style-type: none"> • Check the software versions installed in the EGA are compatible. 检查安装在烟气分析仪上的软件版本是否兼容。 • Please contact Autoflame or local approved Autoflame tech centre. 请联系 Autoflame 或当地经授权的 Autoflame 技术中心。 	Error 错误
28	Software Error 软件错误 <ul style="list-style-type: none"> • Software is corrupt, re-install EB software. 软件损坏，请重新安装 EB 软件。 • Please contact Autoflame or local approved Autoflame tech centre. 请联系 Autoflame 或当地经授权的 Autoflame 技术中心。 	Error 错误
29	Software Error 软件错误 <ul style="list-style-type: none"> • Please contact Autoflame or local approved Autoflame tech centre. 请联系 Autoflame 或当地经授权的 Autoflame 技术中心。 	Warning 警告
30	Display Communications 显示通信 <ul style="list-style-type: none"> • Check connections between display PCB and main PCB. 检查显示 PCB 板和主 PCB 板之间的连接。 • Please contact Autoflame or local approved Autoflame tech centre. 请联系 Autoflame 或当地经授权的 Autoflame 技术中心。 	Error 错误
31	Display Log Write Fail 显示日志写入失败 <ul style="list-style-type: none"> • Unable to write CEMS data to the SD card, check the SD card. 无法向 SD 存储卡写入 CEMS 数据。检查 SD 存储卡。 	Error 错误

6.3.1 General Troubleshooting

一般故障排除

- Ambient Temperature – This must be between 5 – 40°C (40 – 140°F). 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 – 环境温度必须在 5-40 摄氏度（40-140 华氏度）之间。通过 PCB 板上传感器测量的温度也可以用二氧化碳传感器上的传感器进行测量。

- 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 EGA. 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。如果冷却器未降低自身温度，则需要检查风扇是否正常运行。如果锅炉房内的环境温度较高，则必须将冷空气送入烟气分析仪。在较热环境下可以使用空调，在寒冷环境下可以使用加热保护柜。

- If the EGA 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.

如果烟气分析仪安装在灰尘较多的环境下，终端上积累的微粒可能导致电弧击穿。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。

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

如持续获得 20% 的氧气读数，这表明 Mk8 烟气分析仪正采集新鲜空气，请通过以下方法排除故障：

- a. Check all piping is airtight
检查所有管道是否密闭
- b. Check sample tube is not blocked
检查采样管是否堵塞
- c. Check that there are no leaks on the flue
检查烟道是否有漏气点
- d. Check the pinch valve tubing for leaks
检查夹管阀管道是否有泄露

6.3.2 Faults on MM

控制模块故障

In the event of an EGA failure, an error will appear on the EGA screen of the MM. The MM will show 'See EGA for fault description.' All other screens on the MM are still viewable whilst there is an EGA error. The switched neutral alarm output Terminal 79 can be set to become active or remain inactive in the event of an EGA 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 EGA error is reset and becomes fully operational once again.

烟气分析仪出现故障时，控制模块上的烟气分析仪屏幕上将显示错误消息，控制模块将显示“查看烟气分析仪故障说明”。烟气分析仪出现故障后仍可以查看控制模块上的其他屏幕，同时还可以将零线报警输出终端 79 设启动或保持非活动（见选项 12）。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（微调 and 限值测试禁用）继续运行或锁定燃烧器，直至烟气分析仪错误被重置并再次开始工作。

It is possible to remove and re-install the EGA at a later date without the burner needing to be re-commissioning if using the trim function with an MM module. After removing the EGA set Option 12 on the MM module to 0. Once the EGA 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 MM module will load up as normal and will not be required to be re-commissioned.

使用控制模块的微调功能时，可以取下烟气分析仪并在后期重装，而不必对燃烧器进行重新调试。取下烟气分析仪后请将控制模块上的选项 12 设为 0。烟气分析仪模块准备号重装时，请将选项 12 重新设回以前的数值，但条件是燃烧未随调试模块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 MM module it is required that the error is reset on the MM module as well as the EGA. If the error is not reset on the MM, the EGA and MM will not communicate with each other. This will mean the EGA will display “No Fuel Selected” when in run with MM mode until the error is reset.

控制模块上出现错误代码时，需要在控制模块和烟气分析仪上重置错误，如果无法在控制模块上重置错误，烟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时，烟气分析仪将显示“未选择燃料”，直至那个错误被重置。

When first going into commissioning mode, the MM invokes an EGA 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，控制模块将请求烟气分析仪校准。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。

The table below shows the EGA errors on the MM. Option 13 sets the way the MM responds to an EGA error.

下表显示了在控制模块上出现的烟气分析仪错误。设置选项 13 设置控制模块对烟气分析仪错误的响应。

EGA Error	Description
烟气分析仪错误	说明
1	<p>EGA Internal Error 烟气分析仪内部错误</p> <p>Check EGA for fault. 检查烟气分析仪的故障</p>
2	<p>No Communications 无通讯</p> <p>Check parameter 10 is set to correct EGA version. 检查参数 10 是否设为正确的烟气分析仪版本。 Check EGA operating mode is selected as 'EGA with MM.' 检查烟气分析仪运行模式是否选择为“配置控制模块的烟气分析仪”。 Check wiring between EGA and MM (terminals 25 and 26 on MM). 检查烟气分析仪和控制模块之间的连接（控制模块上终端 25 和 26）。</p>
3	<p>O₂ Upper Limit 氧气上限值</p> <p>Current O₂ value is above upper offset limit of commissioned value.* 当前氧气值大于调试值的上限补偿值。* Check exhaust gas readings and option 19. 检查烟气读数和选项 19。</p>
4	<p>O₂ Absolute Limit 氧气绝对限值</p> <p>Current O₂ value is below absolute limit.* 当前氧气值小于绝对限值。* Check exhaust gas readings and option 25. 检查烟气分析仪读数和选项 25。</p>
5	<p>O₂ Lower Limit 氧气下限值</p> <p>Current O₂ value is below lower offset limit of commissioned value.* 当前氧气值小于调试值得下限补偿值。* Check exhaust gas readings and option 22. 检查烟气读数和选项 22。</p>
6	<p>CO₂ Upper Limit 二氧化碳上限值</p> <p>Current CO₂ value is above upper offset limit of commissioned value.* 当前二氧化碳值大于调试值得上限补偿值。* Check exhaust gas readings and option 20. 检查烟气读数和选项 20。</p>
7	<p>CO₂ Absolute Limit 二氧化碳绝对限值</p> <p>Current CO₂ value is above absolute limit.* 当前二氧化碳值大于绝对限值。 Check exhaust gas readings and option 26. 检查烟气读数和选项 26。</p>
8	<p>CO₂ Lower Limit 二氧化碳下限值</p> <p>Current CO₂ value is below lower offset limit of commissioned value.* 当前二氧化碳值小于调试值的下限补偿值。* Check exhaust gas readings and option 23. 检查烟气读数和选项 23。</p>
9	<p>CO Upper Limit 一氧化碳上限值</p> <p>Current CO value is above upper offset limit of commissioned value.* 当前一氧化碳值大于调试值的上限补偿值。* Check exhaust gas readings and option 21. 检查烟气读数和选项 21。</p>
10	<p>CO Absolute Limit 一氧化碳绝对限值</p> <p>Current CO value is above absolute limit.* 当前一氧化碳值大于绝对限值。* Check exhaust gas readings and option 27. 检查烟气读数和选项 27。</p>

11	NO Upper Limit 一氧化氮上限值
Current NO value is above upper offset limit of commissioned value.* 当前一氧化氮值大于调试值的上限补偿值。*	
Check exhaust gas readings and parameter 94. 检查烟气读数和选项 94。	
12	Exhaust Temperature Upper Limit 排气温度上限值
Current exhaust temperature is above upper offset limit of commissioned value.* 当前排气温度大于调试值的上限补偿值。*	
Check exhaust gas readings and parameter 96. 检查烟气读数和选项 96。	
13	Exhaust Temperature Absolute Limit 排气温度绝对限值
Current exhaust temperature is above absolute limit.* 当前排气温度大于绝对限值。*	
Check exhaust gas readings and parameter 97. 检查烟气读数和选项 97。	

*When option 12 is set to 3 for trim and combustion limits, the combustion limits are evaluated once per trim cycle. A combustion limit error will occur if the current exhaust value has crossed the combustion limit for the number of trim cycles set in parameter 17 (the default value is 3 cycles).

*当微调和燃烧限值得选项 12 设为 3 时，则在每个微调周期将对燃烧限值检查一次。当微调周期在参数 17（默认值是 3 个周期）中已设定，如当前排气值超过该周期得燃烧限值，则燃烧限值将出现错误。

Technical Manual
Mk8 EGA EVO
Part#. MM82004/E
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