

# AUTOFLAME

**MM Application  
Possibilities**  
控制模块  
应用领域

**AUTOFLAME**<sup>®</sup>





# MM Application Possibilities

## 控制模块应用领域



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Autoflame Engineering Ltd's policy is one of continuous improvement in both design and manufacture. We therefore reserve the right to amend specifications and/or data without prior notice. All details contained in this manual are correct at the time of going to print.

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## Important Notes

### 重要说明

**A knowledge of combustion related procedures and commissioning is essential before embarking work on any of the M.M./E.G.A. systems. This is for safety reasons and effective use of the M.M./ E.G.A. system. Hands on training is required. For details on schedules and fees relating to group training courses and individual instruction, please contact the Autoflame Engineering Ltd. offices at the address listed on the front.**

为了安全有效地使用控制模块/EGA 系统，控制模块/EGA 系统的操作员必须具有与燃烧相关的流程知识和调试知识。我们要求操作员参加实践培训，请按首页所述地址联系上 **Autoflame** 办公室详细了解团体培训课程和个别辅导的时间和费用。

## Short Form - General Terms and Conditions

### 一般条款

**A full statement of our business terms and conditions are printed on the reverse of all invoices. A copy of these can be issued upon application, if requested in writing.**

所有发票背面均都印有我方商业条款全文。客户可书面申请获取我公司的商业条款文件。

**The System equipment and control concepts referred to in this Manual MUST be installed, commissioned and applied by personnel skilled in the various technical disciplines that are inherent to the Autoflame product range, i.e. combustion, electrical and control.**

仅有专业人员才能安装、调试、使用本手册所提及的系统设备和控制原理。他们必须精通 **Autoflame** 产品所涉及的燃烧、电气和控制等技术学科。

**The sale of Autoflame's systems and equipment referred to in this Manual assume that the dealer, purchaser and installer has the necessary skills at his disposal. i.e. A high degree of combustion engineering experience, and a thorough understanding of the local electrical codes of practice concerning boilers, burners and their ancillary systems and equipment.**

经销商、采购商和安装人员必须具有丰富的燃烧工程从业经验、全面了解当地涉及锅炉、燃烧器和辅助系统/设备相关的电气行业规范方能使用本手册提及的 **Autoflame** 系统和设备。

**Autoflame's warranty from point of sale is two years on all electronic systems and components.**

**Autoflame** 保修条款: 对所有电子系统和部件实行两年售后保修

**One year on all mechanical systems, components and sensors.**

对所有机械系统、部件和传感器实行一年售后保修。

**The warranty assumes that all equipment supplied will be used for the purpose that it was intended and in strict compliance with our technical recommendations. Autoflame's warranty and guarantee is limited strictly to product build quality, and design. Excluded absolutely are any claims arising from misapplication, incorrect installation and/or incorrect commissioning.**

保修前提: 所有设备均按预期使用目的使用并严格遵守我方提供的的技术建议。**Autoflame** 产品保修条款仅适用于产品制造质量问题 and 设计问题。根据保修条款，**Autoflame** 不接受因误操作、误安装和/或调试导致的任何索赔请求。

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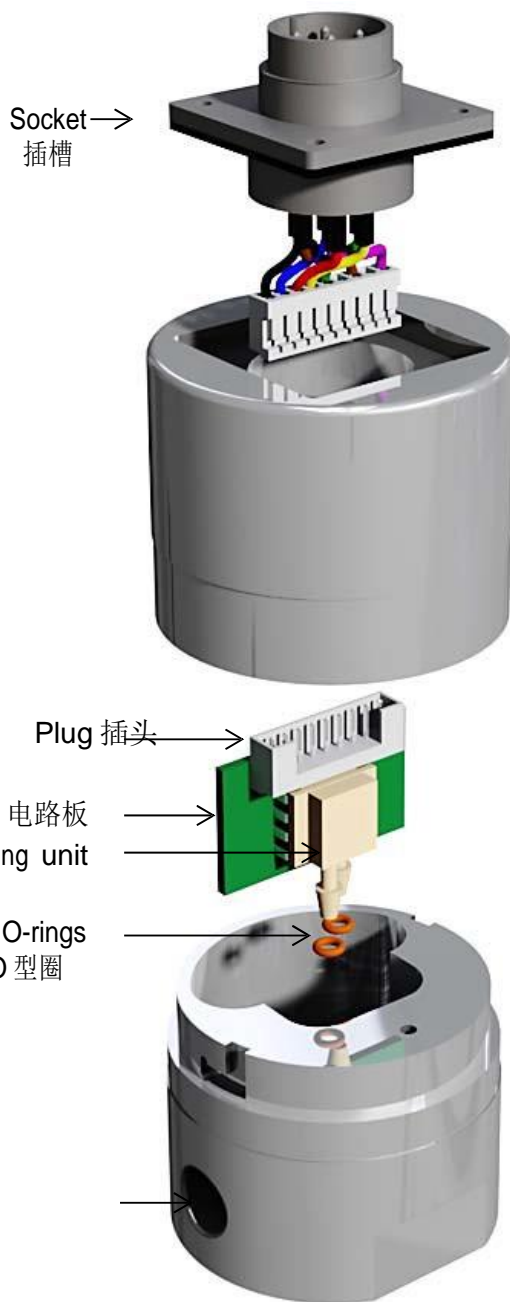
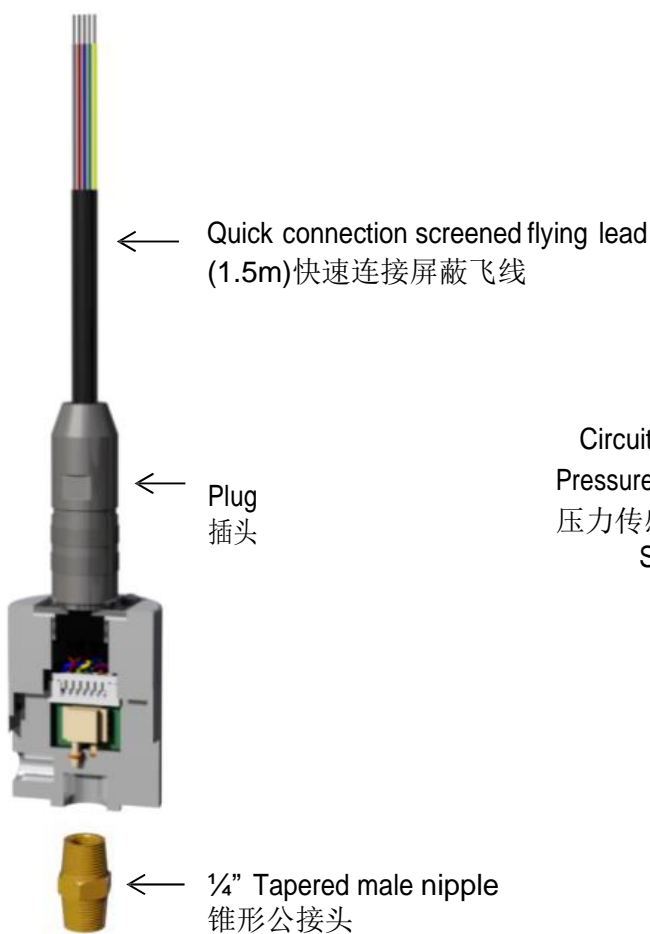
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# 1 SENSORS 传感器

## 1.1 Gas Pressure Sensor 燃气压力传感器

Gas Sensor 燃气传感器	Mk8 MMMk8 控制模块	Mini Mk8 MMMk8 微型控制模块
Brown 棕色	T31	T29
Purple 紫色	T32	T30
Blue 蓝色	T33	T48
Red 红色	T34	T49
Connect screen at only one end. 仅在一端连接屏幕		



1/8" NSP Nylon plug with breather hole NSP 尼龙塞通气孔

IP 52

NEMA 5

Housing & Lid 外壳和盖板 Aluminium 铝

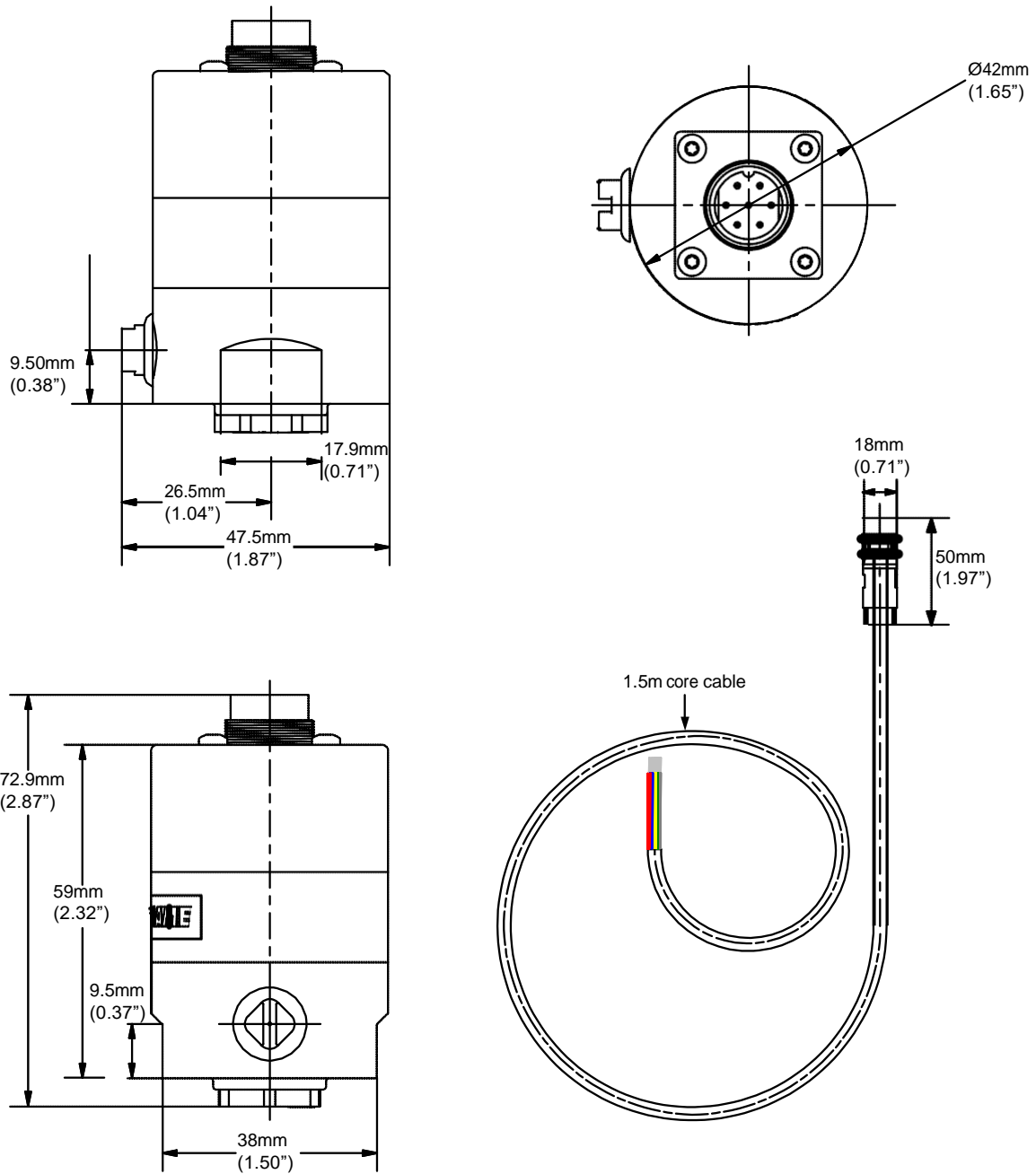
Power Consumption 功率消耗 0.1 Watts

Mounting 安装 In line as shown. Differential pressure hole away from any water source.  
与图示一致，差压孔应远离所有水源。

Drawing No 图纸号. 9004

Part No. 零件号	Min. Pressure 最小压力			Max. Pressure 最大压力			Zero Range 零范围		
	mbar	"wg	PSI	mbar	"wg	PSI	mbar	"wg	PSI
MM80006	12.5	5	0.18	65	25	1	-2.5 to 1.25	-1.0 to 0.5	-0.04 to 0.02
MM80008	52	25	0.75	340	135	5	-12.5 to 6.25	-5.0 to 2.5	-0.2 to 0.1
MM80011	115	50	1.8	750	300	11	-30 to 15	-12.0 to 6.0	-0.44 to 0.22
MM80012	207	83	3	1380	550	20	-55 to 27.5	-22.0 to 11.0	-0.8 to 0.4

Gas Pressure Sensor 燃气压力传感器



**Mk8 MM Mk8 控制模块**

If the Valve Proving System (VPS) facility is to be used then specific options/parameters must be set.  
如果使用阀门检验系统设备，则必须设置特定的选项和参数。

Option/Parameter 选项/参数	Mk8 MM Mk8 控制模块
125	Fuel pressure sensor mode – fuel 1 燃料压力传感器模式-燃料 1
126	Fuel pressure sensor mode – fuel 2 燃料压力传感器模式-燃料 2
127	Fuel pressure sensor mode – fuel 3 燃料压力传感器模式-燃料 3
128	Fuel pressure sensor mode – fuel 4 燃料压力传感器模式-燃料 4
129	VPS operation 阀门检验系统的运行
130	Gas valve configuration 燃气阀配置
132	Gas valve proving time 燃气阀检验时间
133	Maximum pressure change allowed during VPS 阀门检验系统运行时允许的最大压力改变
134	VPS valve opening time 阀门检验系统阀打开时间
136	Gas pressure switch – offset lower limit 燃气压力开关-补偿下限值
137	Gas pressure switch – offset upper limit 燃气压力开关-补偿上限值
Parameter 41 参数 41	Gas pressure units 燃气压力设备

**Mini Mk8 MM Mk8 微型控制模块**

If the Valve Proving System (VPS) facility is to be used then specific options/parameters must be set.  
如果使用阀门检验系统设备，则必须设置特定的选项和参数。

Option/Parameter 选项/参数	Mini Mk8 MM Mk8 微型控制模块
125	Fuel pressure sensor mode – fuel 1 燃料压力传感器模式-燃料 1
126	Fuel pressure sensor mode – fuel 2 燃料压力传感器模式-燃料 2
128	VPS sensor type 阀门检验系统传感器类型
129	VPS operation 阀门检验系统的运行
130	Gas valve configuration 燃气阀配置
131	Gas pressure units 燃气压力设备
132	Gas valve proving time 燃气阀检验时间
133	Maximum change allowed during proving time 检验时允许的最大改变
134	VPS valve opening time 阀门检验系统阀打开时间
136	Gas pressure switch – offset lower limit 燃气压力开关-补偿下限值
137	Gas pressure switch – offset upper limit 燃气压力开关-补偿上限值
156	Terminal T82 function 终端 T82 功能

**IT IS THE RESPONSIBILITY OF THE COMMISSIONING ENGINEERS TO ENSURE THAT  
THE RELEVANT VALVE PROVING SYSTEM STANDARDS ARE ADHERED TO.**

调试工程师有责任确保遵守相关的阀门检验系统标准。

### 1.1.1 Mk8 MM Valve Proving Schematics Mk8 控制模块阀门检验示意图

#### VPS and High/Low Pressure Limits using Autoflame Gas Pressure Sensor (3 valves)

阀门检验系统和高压/低压限值使用 Autoflame 燃气压力传感器（3 阀门）。

Option/ parameter 125 (126, 127, or 128 if fuel 2, 3 or 4) to 1  
选项/参数 125（126, 127 或 128，如是燃料 2, 3 或 4）至 1。

Option/ parameter 130 to 1 or 2  
选项/参数 130 至 1 或 2。

#### High/Low Pressure Limits using Autoflame Gas Pressure Sensor (3 valves)

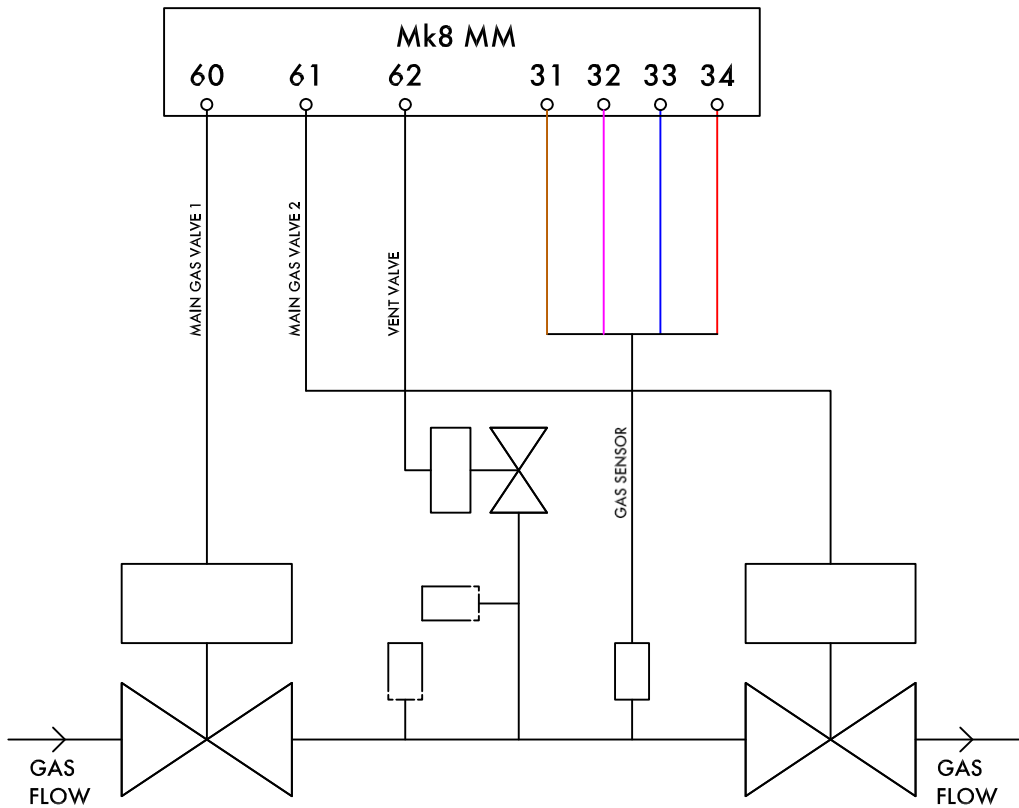
高/低压限值使用 Autoflame 燃气压力传感器（3 阀门）。

Option/ parameter 125 (126, 127, or 128 if fuel 2, 3 or 4) to 2  
选项/参数 125（126, 127 或 128，如是燃料 2, 3 或 4）至 2。

Option/ parameter 130 to 1 or 2  
选项/参数 130 至 1 或 2。

**Note:** Please refer to page 3 for full list of VPS options/parameters.

**注：** 请参考第三页关于阀门检验系统选项/参数完整列表。



Drawing No. 7947-A

VPS and High/low Pressure Limits using Autoflame Gas Pressure Sensor (2 valves)

阀门检验系统和高/低压限值使用 Autoflame 燃气压力传感器（2 阀门）。

Option/ parameter 125 (126, 127, or 128 if fuel 2, 3 or 4) to 1

选项/参数 125（126, 127 或 128，如是燃料 2, 3 或 4）至 1。

Option/ parameter 130 to 0

选项/参数 130 至 0。

High/low Pressure Limits using Autoflame Gas Pressure Sensor (2 valves)

高/低压限值使用 Autoflame 燃气压力传感器（2 阀门）。

Option/ parameter 125 (126, 127, or 128 if fuel 2, 3 or 4) to 2

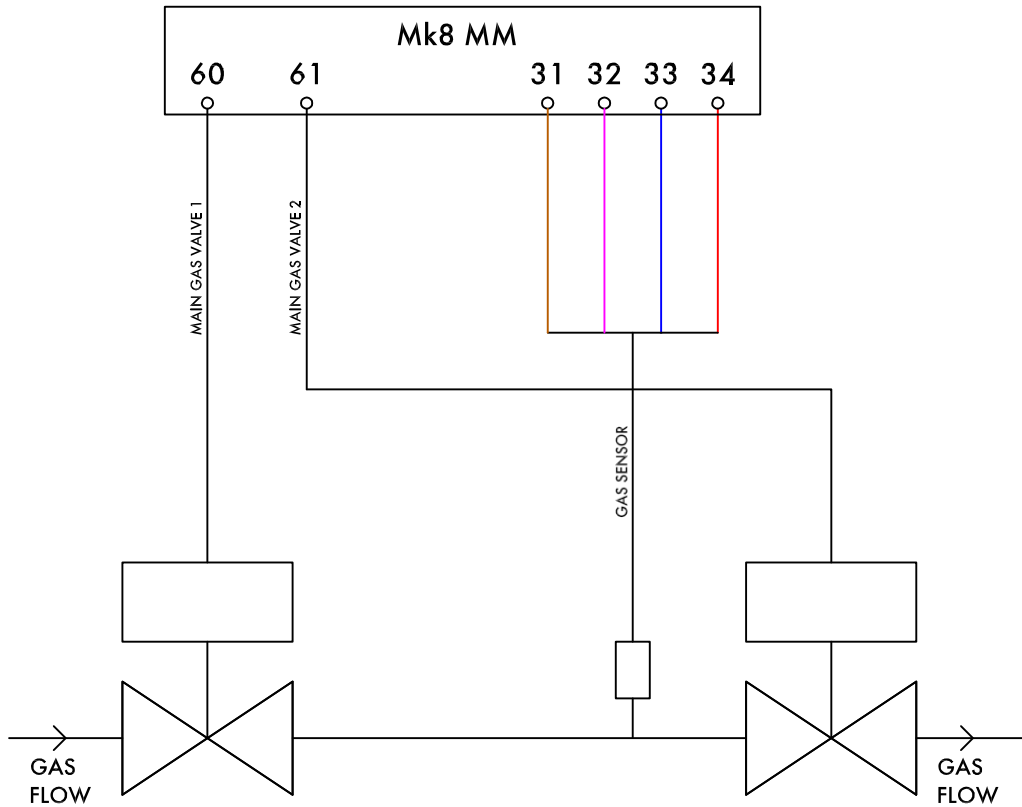
选项/参数 125（126, 127 或 128，如是燃料 2, 3 或 4）至 2。

Option/ parameter 130 to 0

选项/参数 130 至 0。

**Note:** Please refer to page 3 for full list of VPS options/parameters.

**注：** 请参考第三页关于阀门检验系统选项/参数完整列表。



Drawing No. 7947-B

VPS and High/Low Pressure Limits using Autoflame Gas Pressure Sensor (3 valves, single valve pilot)

阀门检验系统和高压/低压限值使用 Autoflame 燃气压力传感器（3 阀门，单阀控制）。

Option/ parameter 125 (126, 127, or 128 if fuel 2, 3 or 4) to 1

选项/参数 125（126, 127 或 128，如是燃料 2, 3 或 4）至 1。

Option/ parameter 130 to 4 or 5

选项/参数 130 至 4 或 5。

High/Low Pressure Limits using Autoflame Gas Pressure Sensor (3 valves, single valve pilot)

高/低压限值使用 Autoflame 燃气压力传感器（3 阀门，单阀控制）。

Option/ parameter 125 (126, 127, or 128 if fuel 2, 3 or 4) to 2

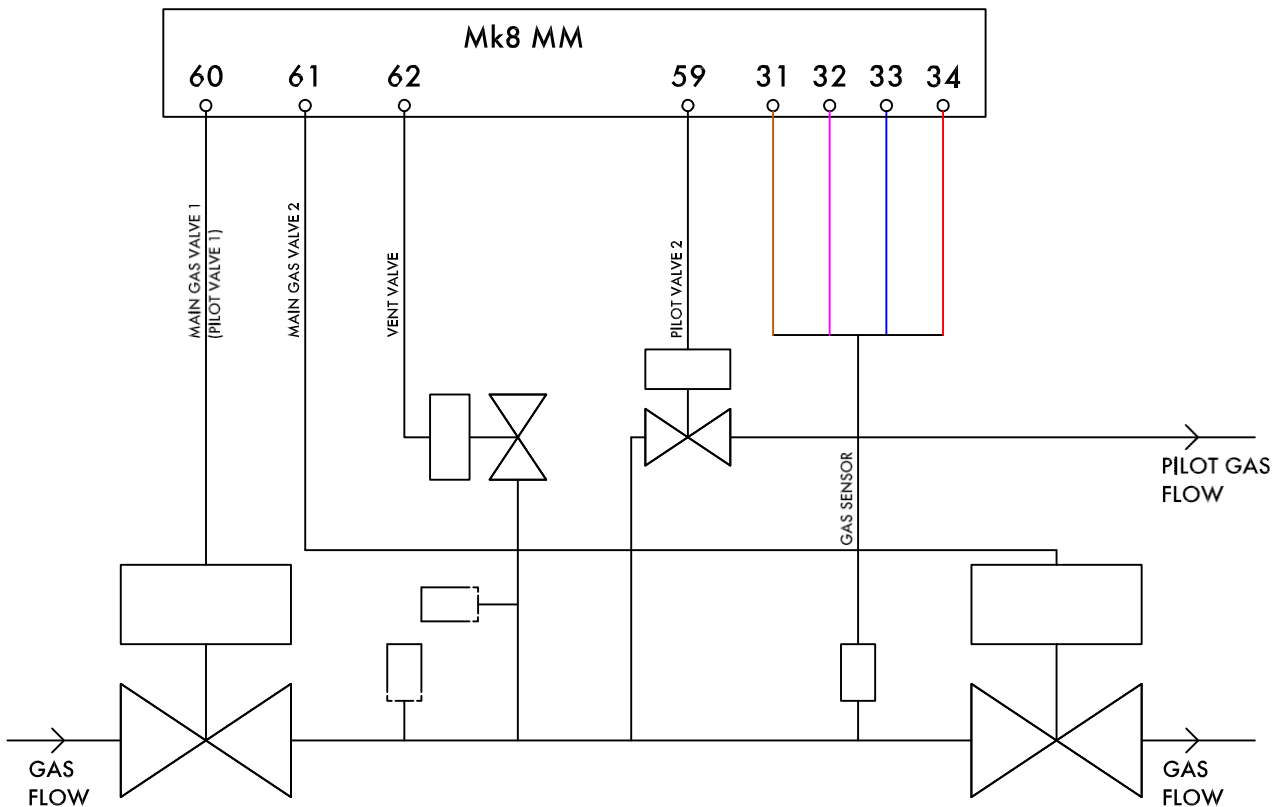
选项/参数 125（126, 127 或 128，如是燃料 2, 3 或 4）至 2。

Option/ parameter 130 to 4 or 5

选项/参数 130 至 4 或 5。

**Note:** Please refer to page 3 for full list of VPS options/parameters.

**注：** 请参考第三页关于阀门检验系统选项/参数完整列表。



Drawing No. 7947C

VPS and High/Low Pressure Limits using Autoflame Gas Pressure Sensor (2 valves, single valve pilot)

阀门检验系统和高压/低压限值使用 Autoflame 燃气压力传感器（2 阀门，单阀控制）。

Option/ parameter 125 (126, 127, or 128 if fuel 2, 3 or 4) to 1

选项/参数 125（126, 127 或 128，如是燃料 2, 3 或 4）至 1。

Option/ parameter 130 to 3

选项/参数 130 至 3。

High/Low Pressure Limits using Autoflame Gas Pressure Sensor (2 valves, single valve pilot)

高/低压限值使用 Autoflame 燃气压力传感器（2 阀门，单阀控制）。

Option/ parameter 125 (126, 127, or 128 if fuel 2, 3 or 4) to 2

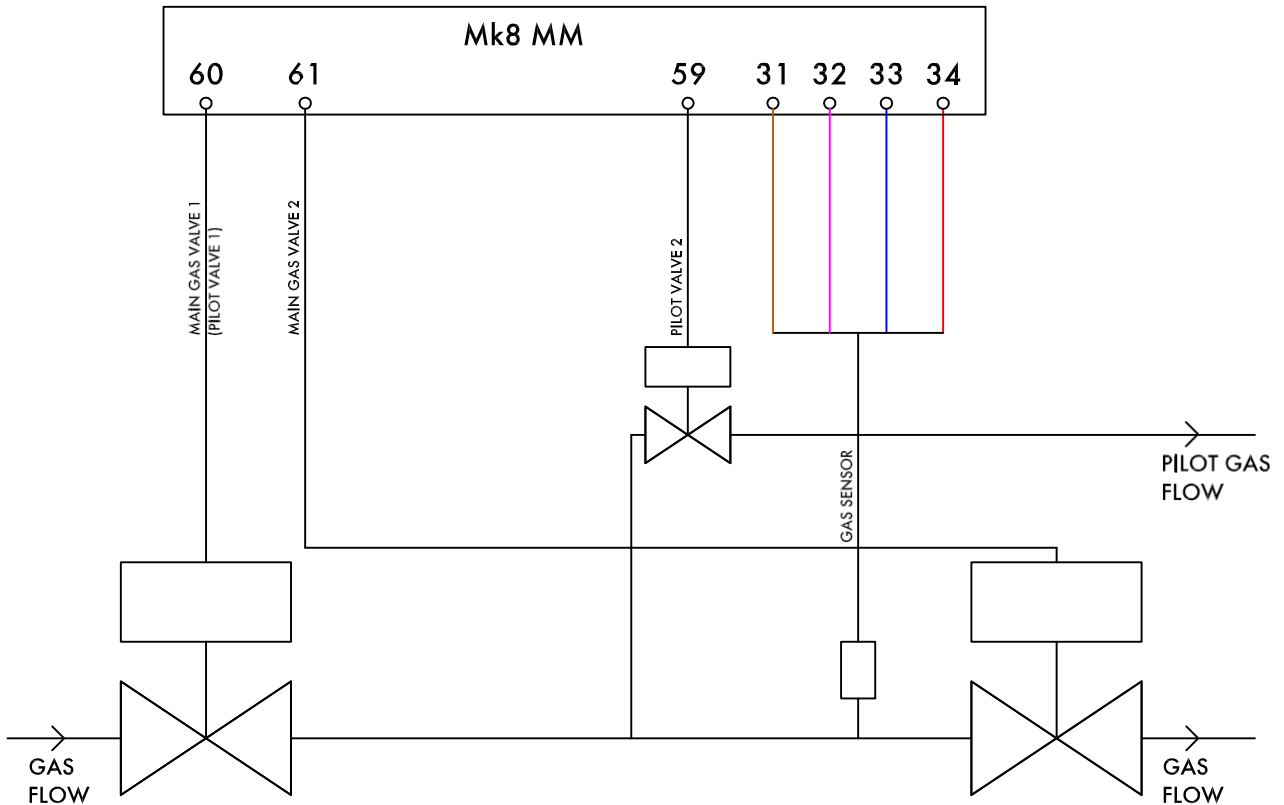
选项/参数 125（126, 127 或 128，如是燃料 2, 3 或 4）至 2。

Option/ parameter 130 to 3

选项/参数 130 至 3。

**Note:** Please refer to page 3 for full list of VPS options/parameters.

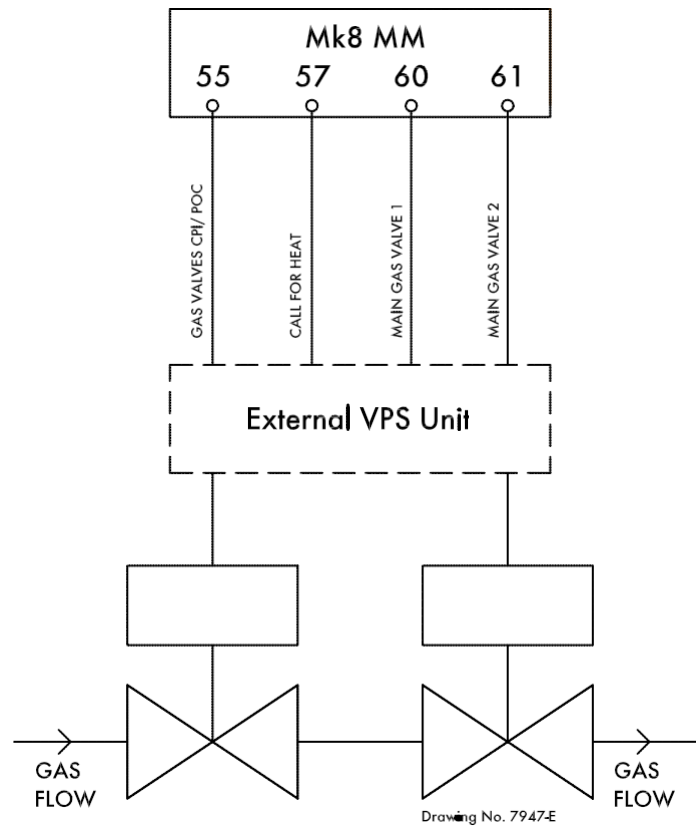
**注：** 请参考第三页关于阀门检验系统选项/参数完整列表。



Drawing No. 7947-D

External VPS 外部阀门检验系统

Option/ parameter 125 (126, 127, or 128 if fuel 2, 3 or 4) to 3  
 选项/参数 125 (126, 127 或 128, 如是燃料 2, 3 或 4) 至 3。





### 1.1.2 Mini Mk8 MM Valve Proving Schematics

#### Mk8 微型控制模块阀门检验示意图

##### VPS and High/low Pressure limits using Autoflame Gas Pressure Sensor (3 valves)

阀门检验系统和高/低压限值使用 Autoflame 燃气压力传感器（3 阀门）。

Option/ parameter 125 (126 if fuel 2) to 1  
选项/参数 125（126，如是燃料 2）至 1。

Option/ parameter 128 to 1  
选项/参数 128 至 1。

Option/ parameter 130 to 1 or 2  
选项/参数 130 至 1 或 2。

##### High/low Pressure Limits using Autoflame Gas Pressure Sensor (3 valves)

高/低压限值使用 Autoflame 燃气压力传感器（3 阀门）。

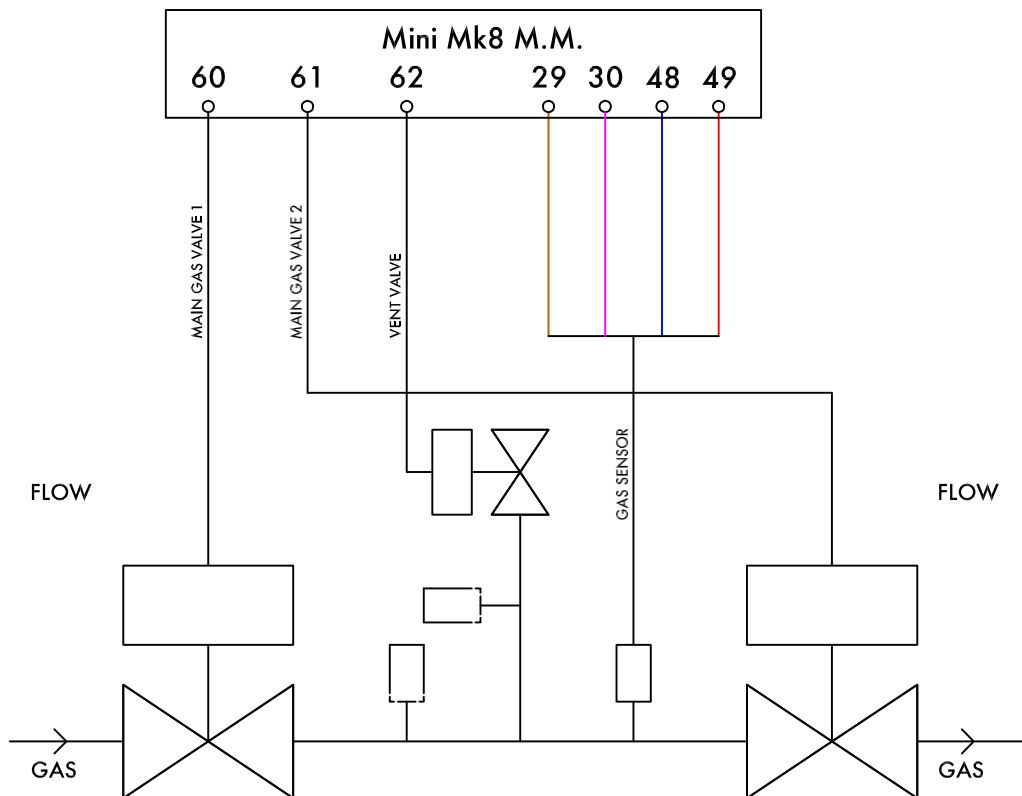
Option/ parameter 125 (126 if fuel 2) to 2  
选项/参数 125（126，如是燃料 2）至 2。

Option/ parameter 128 to 1  
选项/参数 128 至 1。

Option/ parameter 130 to 1 or 2  
选项/参数 130 至 1 或 2。

**Note:** Please refer to page 3 for full list of VPS options/parameters.

**注：** 请参考第三页关于阀门检验系统选项/参数完整列表。



Drawing No. 7940-A

VPS and High/low Pressure limits using Autoflame Gas Pressure Sensor (2 valves)

阀门检验系统和高/低压限值使用 Autoflame 燃气压力传感器（2 阀门）。

Option/ parameter 125 (126 if fuel 2) to 1

选项/参数 125（126，如是燃料 2）至 1。

Option/ parameter 128 to 1

选项/参数 128 至 1。

Option/ parameter 130 to 0

选项/参数 130 至 0。

High/low Pressure Limits using Autoflame Gas Pressure Sensor (2 valves)

高/低压限值使用 Autoflame 燃气压力传感器（2 阀门）。

Option/ parameter 125 (126 if fuel 2) to 2

选项/参数 125（126，如是燃料 2）至 2。

Option/ parameter 128 to 1

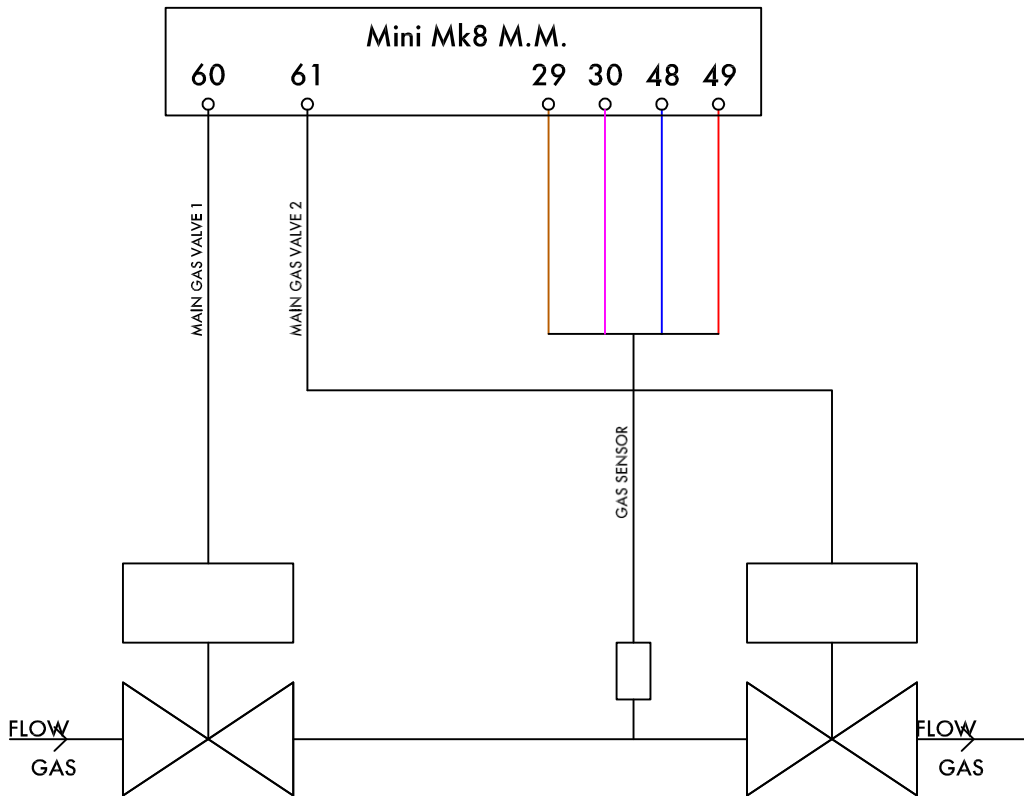
选项/参数 128 至 1。

Option/ parameter 130 to 0

选项/参数 130 至 0。

**Note:** Please refer to page 3 for full list of VPS options/parameters.

**注：** 请参考第三页关于阀门检验系统选项/参数完整列表。



Drawing No. 7940-B

VPS and High/low Pressure limits using Autoflame Gas Pressure Sensor (3 valves, single valve pilot)

阀门检验系统和高/低压限值使用 Autoflame 燃气压力传感器（3 阀门，单阀控制）。

Option/ parameter 125 (126 if fuel 2) to 1

选项/参数 125（126，如是燃料 2）至 1。

Option/ parameter 128 to 1

选项/参数 128 至 1。

Option/ parameter 130 to 4 or 5

选项/参数 130 至 4 或 5。

High/low Pressure Limits using Autoflame Gas Pressure Sensor (3 valves, single valve pilot)

高/低压限值使用 Autoflame 燃气压力传感器（3 阀门，单阀控制）。

Option/ parameter 125 (126 if fuel 2) to 2

选项/参数 125（126，如是燃料 2）至 2。

Option/ parameter 128 to 1

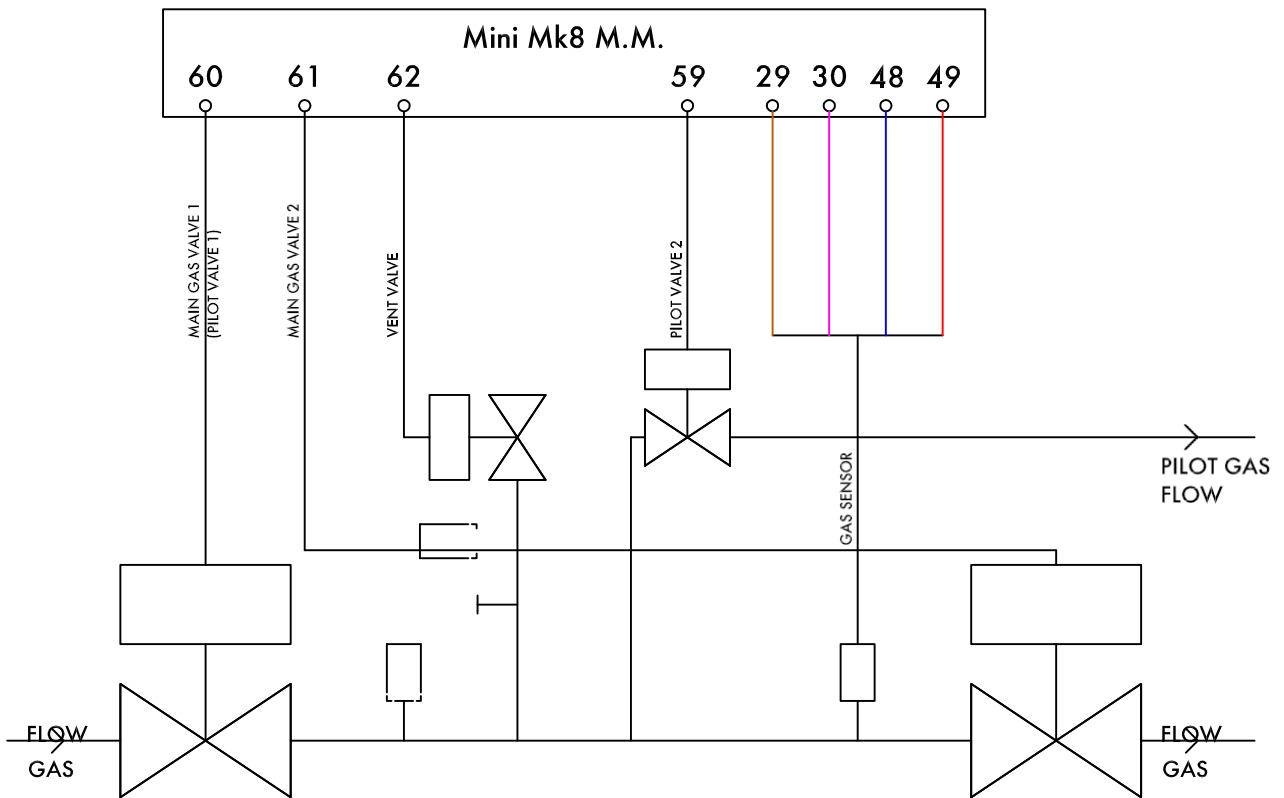
选项/参数 128 至 1。

Option/ parameter 130 to 4 or 5

选项/参数 130 至 4 或 5。

**Note:** Please refer to page 3 for full list of VPS options/parameters.

**注:** 请参考第三页关于阀门检验系统选项/参数完整列表。



VPS and High/low Pressure limits using Autoflame Gas Pressure Sensor (2 valves, single valve pilot)

阀门检验系统和高压/低压限值使用 Autoflame 燃气压力传感器（2 阀门，单阀控制）。

Option/ parameter 125 (126 if fuel 2) to 1

选项/参数 125（126，如是燃料 2）至 1。

Option/ parameter 128 to 1

选项/参数 128 至 1。

Option/ parameter 130 to 3

选项/参数 130 至 3。

High/low Pressure Limits using Autoflame Gas Pressure Sensor (2 valves, single valve pilot)

高/低压限值使用 Autoflame 燃气压力传感器（2 阀门，单阀控制）。

Option/ parameter 125 (126 if fuel 2) to 2

选项/参数 125（126，如是燃料 2）至 2。

Option/ parameter 128 to 1

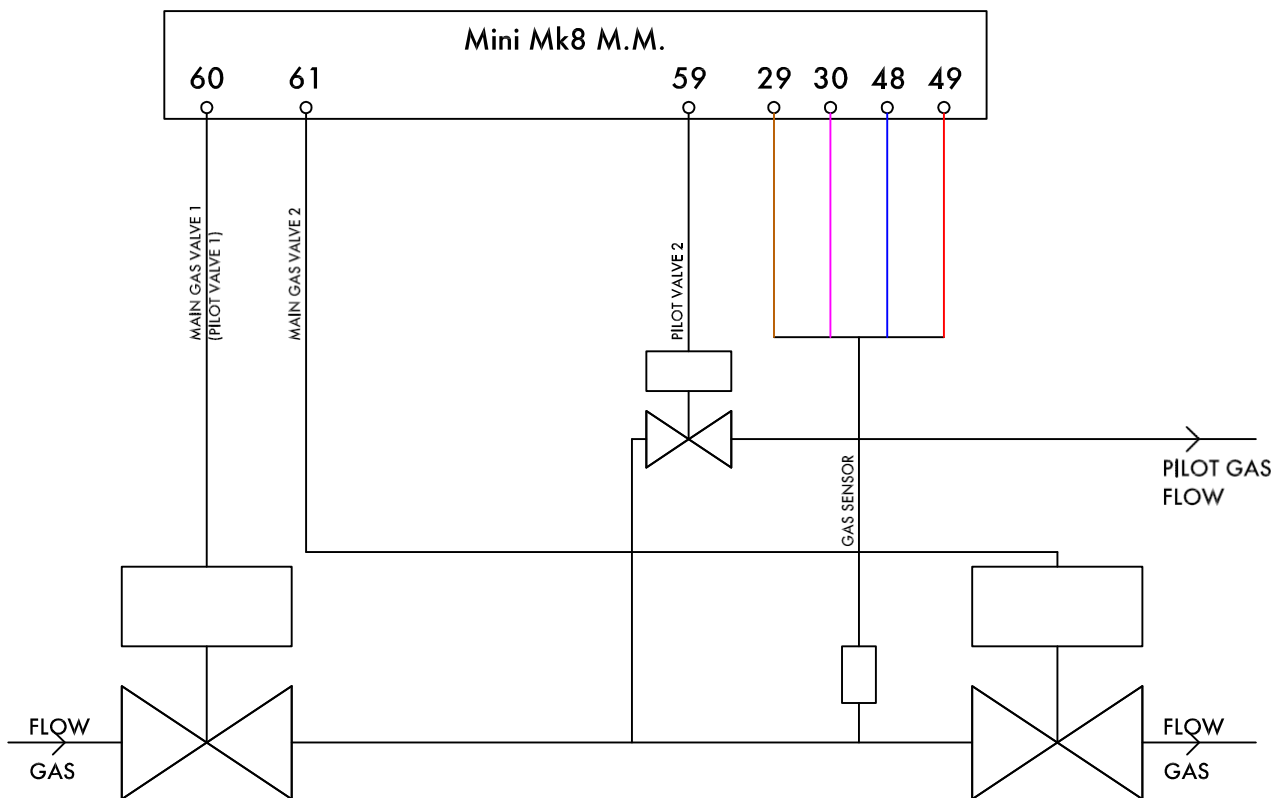
选项/参数 128 至 1。

Option/ parameter 130 to 3

选项/参数 130 至 3。

**Note:** Please refer to page 3 for full list of VPS options/parameters.

注：请参考第三页关于阀门检验系统选项/参数完整列表。



Drawing No. 7940-D

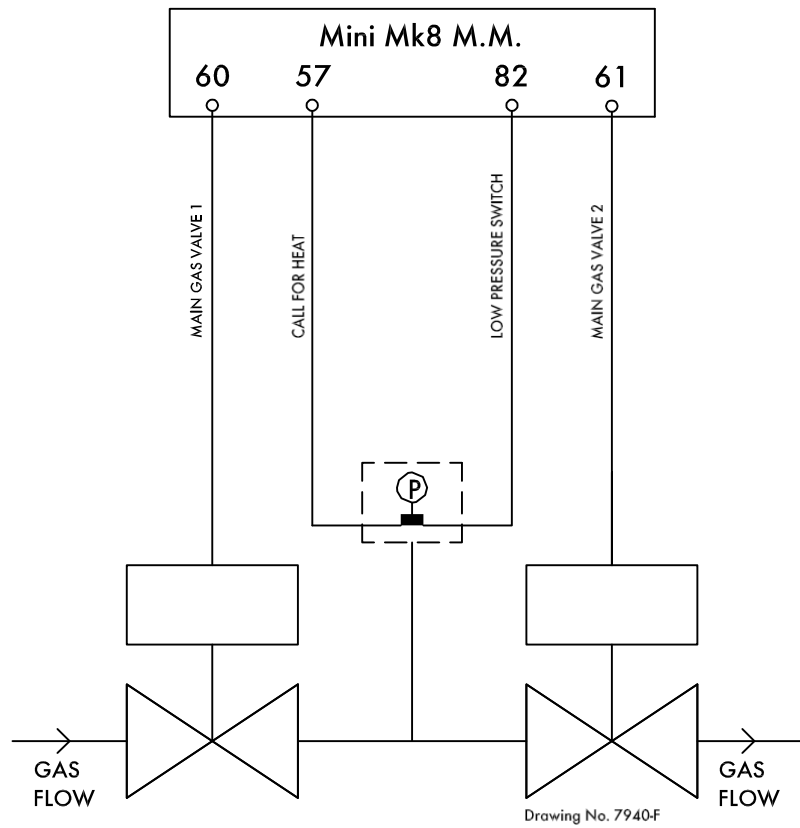
VPS using a Low Pressure Switch

阀门检验系统使用低压开关。

Option/ parameter 125 (126 if fuel 2) to 1  
选项/参数 125 (126, 如是燃料 2) 至 1。

Option/ parameter 128 to 0  
选项/参数 128 至 0。

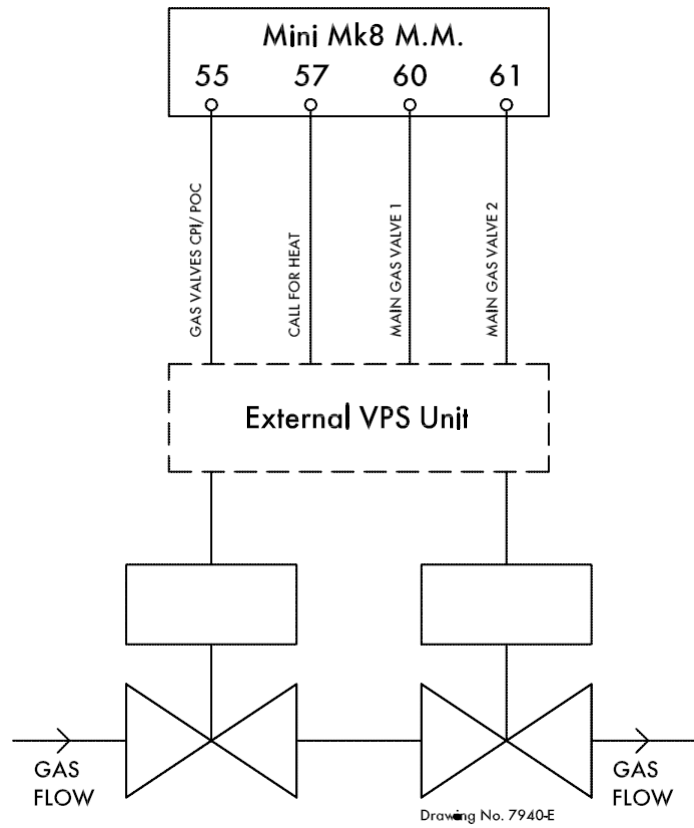
Option/ parameter 156 to 1  
选项/参数 156 至 1。



External VPS 外部阀门检验系统

Option/ parameter 125 (126 if fuel 2) to 3

选项/参数 125 (126, 如是燃料 2) 至 3。



### 1.1.3 Calculating Proving Time and Pressure Change 计算检验时间和压力改变

The following formulae may be used for calculating the proving time and pressure change allowed.  
以下公式可以用于计算检验时间和允许的压力改变。

They are based on DVGW requirements of a leakage rate of 0.1% of the maximum volume flow.  
根据德国燃气与水工业协会关于最大体积流量 0.1% 泄漏率的要求计算。

#### Valve Proving Time:

阀门检验时间:

$$V_{pt} = 4 \times \left( \left( \frac{I_p \times P_v}{M_{tp} \div 1000} \right) + 1 \right)$$

$V_{pt}$  - Valve proving time in seconds.  
阀门检验时间 (秒)

$I_p$  - Inlet pressure in millibars.  
进口压力 (毫巴)

$P_v$  - Pipe volume in litres (volume =  $\pi r^2 \times$  length, total volume of any interconnecting pipe between valve seals)  
管道体积 (升) (体积 =  $\pi r^2 \times$  长度, 阀门密封间连接管道的总体积)。

$M_{tp}$  - Maximum gas throughput in litres per hour.  
最大燃气流量 (升/小时)

#### Pressure change: 压力改变

$$\text{Pressure change} = 0.25 \times \text{Nominal inlet pressure (mBar)}$$

压力改变 = 0.25 x 额定进口压力 (mBar)

#### Example 示例

Valve proving time: 阀门检验时间:

Inlet pressure = 50mBar  
Pipe volume = 5litres  
Max gas flow = 100,000litres per hour

进口压力=50 毫巴  
管道体积=5 升  
最大燃气流量=100,000 升/小时

$$V_{pt} = 4 \times \left( \left( \frac{50 \times 5}{100,000 \div 1000} \right) + 1 \right)$$

$$V_{pt} = 14\text{secs}$$

Set option 132 = 15 seconds.

设置选项 132=15 秒。

Set parameter 132 = 15 seconds.

设置参数 132=15 秒。

*Note: option 132 is set in increments of 5 seconds, values must be rounded up.*

*注: 选项 132 设为增加 5 秒, 阀门必须保留整数。*

Pressure change: 压力改变:

Inlet pressure = 50mBar  
进口压力=50 毫巴

$$\text{Pressure change} = 0.25 \times 50\text{mBar}$$

压力改变=0.25 x50 毫巴

Set Option/Parameter 133 = 12.5 mBar  
设置选项/参数 133=12.5 毫巴

**Note: 注:**

This is a metric formula, therefore imperial units must converted before applying this calculation.  
应使用公制单位，计算前必须转换英制单位。

To convert PSI to mBar multiply your PSI value by 68.94.

将 PSI 转换为 mBar，用 68.94.乘以 PSI 值。

To convert Cubic feet to litres multiply your Cubic feet value by 28.31

将立方英尺转换为升，用 28.31 乘以立方英尺值。

To convert Cubic feet per hour to litres multiply your Cubic feet per hour value by 28.31

将立方英尺/小时转换为升，用 28.31 乘以立方英尺/小时。



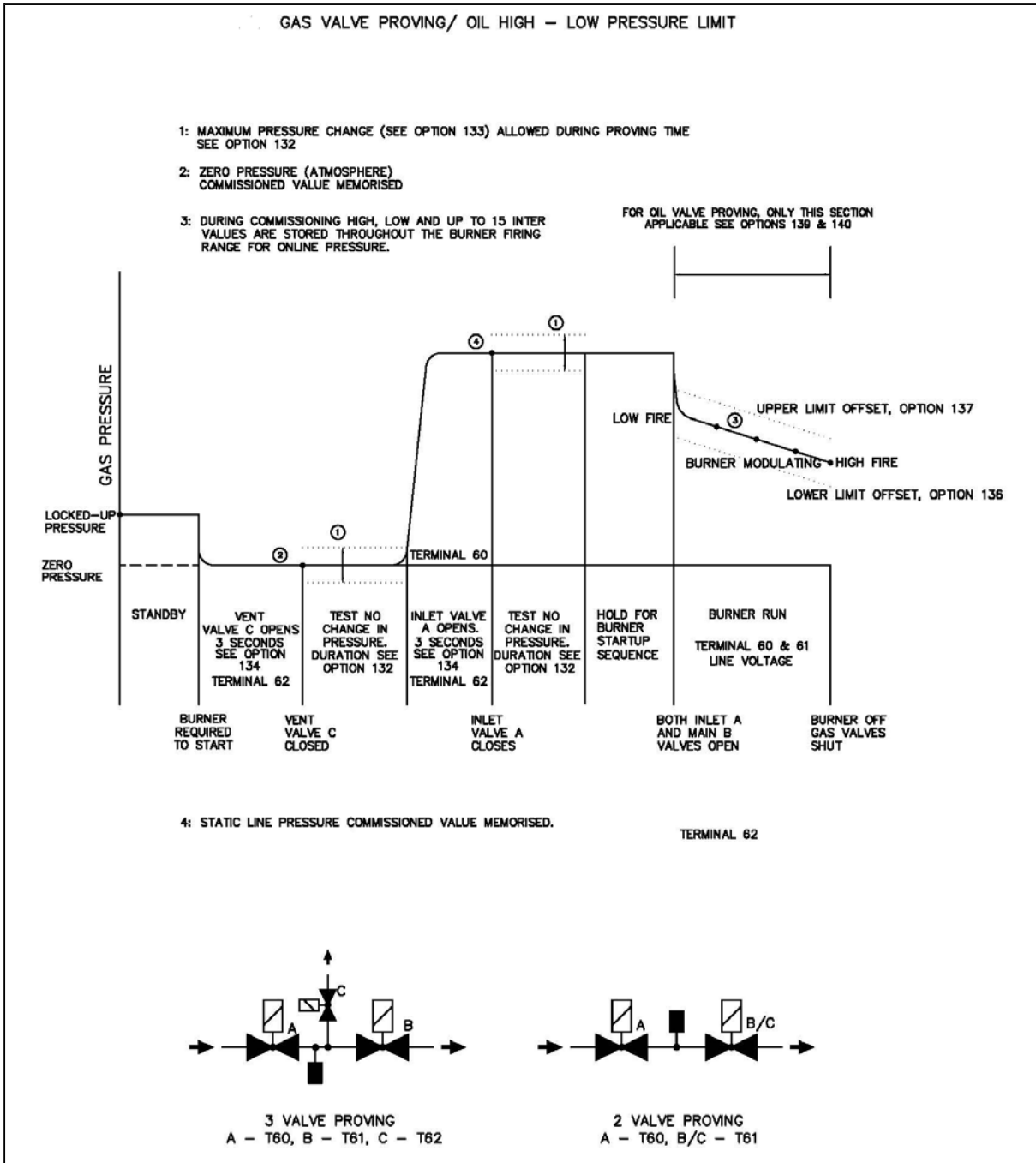


Figure 1.1.3.i Gas Valve Proving Diagram

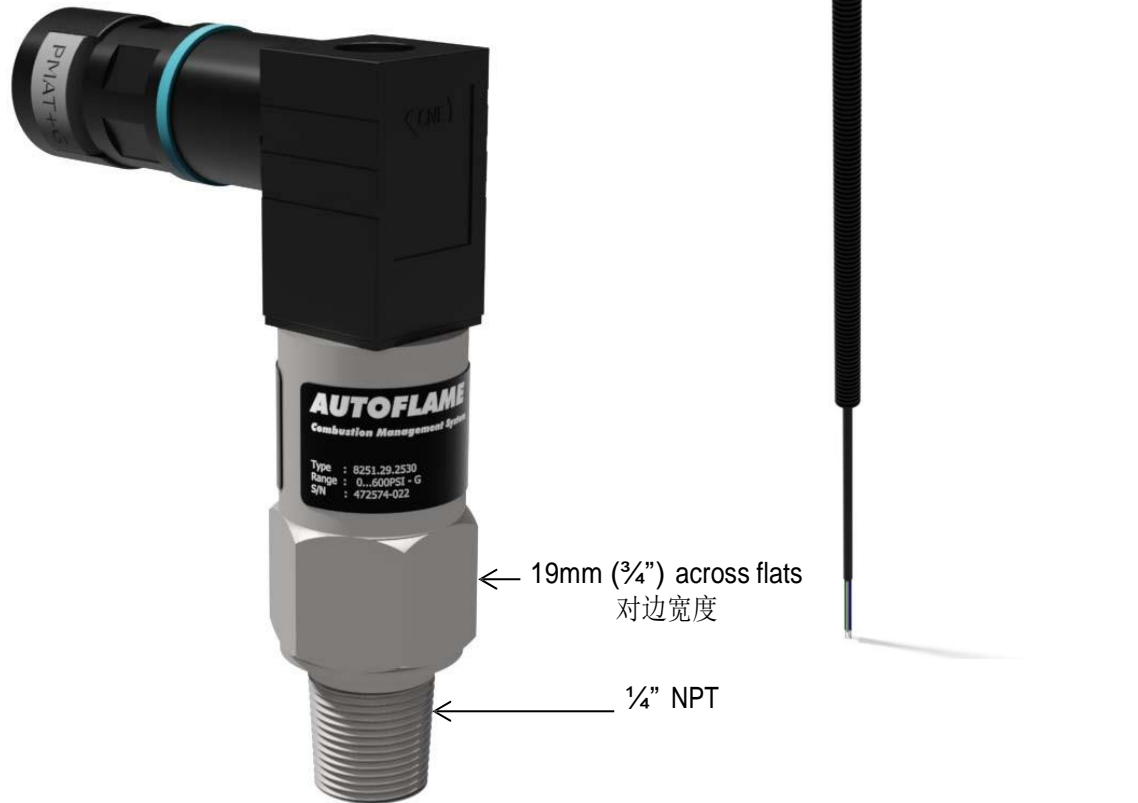
图 1.1.3.i 燃气阀检验图

Figure 1.1.3.i shows the sequence for the Aut flame gas valve proving and high/low pressure limits using an Aut flame gas sensor.

图 1.1.3.i 显示了 Aut flame 燃气阀检验以及高/低压力限值使用 Aut flame 燃气传感器的顺序。

## 1.2 Oil Pressure Sensor 燃油压力传感器

Oil Sensor 燃油传感器	Mk8 MMMk8 控制模块
Green (2) 绿色	T35
Blue (3) 蓝色	T48
Red (1) 红色	T49



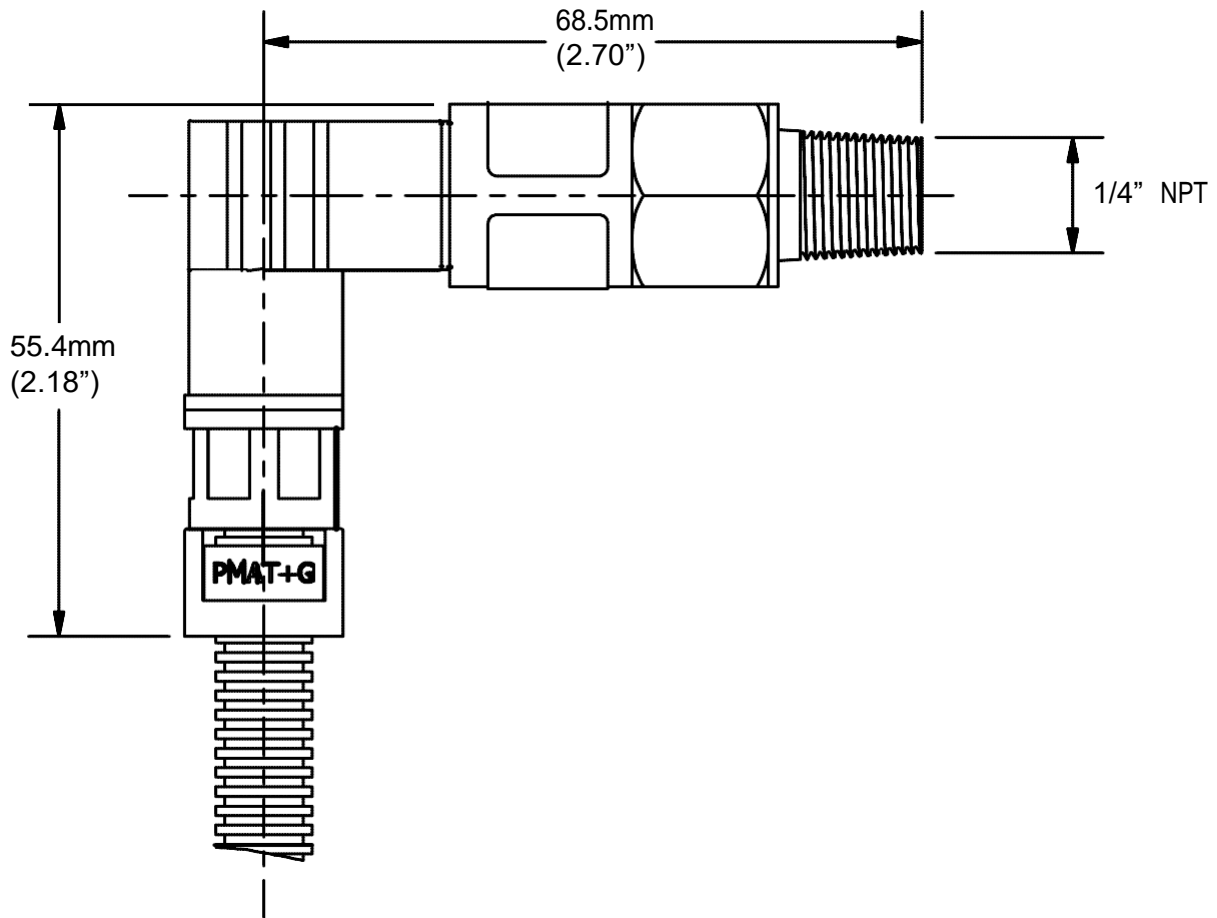
Drawing No. 图纸号: 9002

IP	65
NEMA	4
Torque setting 扭矩值	Max 25Nm 最大 25Nm
O-Ring material O 型圈材料	Viton 氟橡胶
Storage Temperature 储存温度	-25 to 85degC (-13 to 185degF) -25 至 85 摄氏度 (-13 至 185 华氏度)
Operating Temperature 运行温度	-25 to 85degC (-13 to 185degF) -25 至 85 摄氏度 (-13 至 185 华氏度)
Media Temperature 媒介温度	-25 to 125degC (-13 to 257degF) -25 至 125 摄氏度 (-13 至 257 华氏度)
Operating Range 运行范围	0 to 40 Bar (0 to 600 PSI) 0 至 40 Bar (0 至 600 PSI)
Over Pressure Rating 过压额定值	80 Bar (1160 PSI) 80 Bar (1160 PSI)
Burst Pressure Rating 爆裂压力额定值	290 Bar (4350 PSI) 290 Bar (4350 PSI)

Maximum 2.5mm flat blade screw driver for electrical connection.  
电气连接使用最大 2.5mm 平口螺丝刀。

Plug fits correctly in one position only, do not force.  
插头需要正确地连接一个位置，切勿用力。

Do not use case to tighten pressure connection.  
请勿用外壳拧紧压力连接件。

Oil Pressure Sensor 燃油压力传感器

**Note:** Flying lead supplied length 1.5m (PMA 1m).

注：提供的飞线长度为 1.5m (PMA 1m)。

Mk8 MM Mk8 控制模块

If the oil pressure sensor is being used, the following options/parameters need to be set.

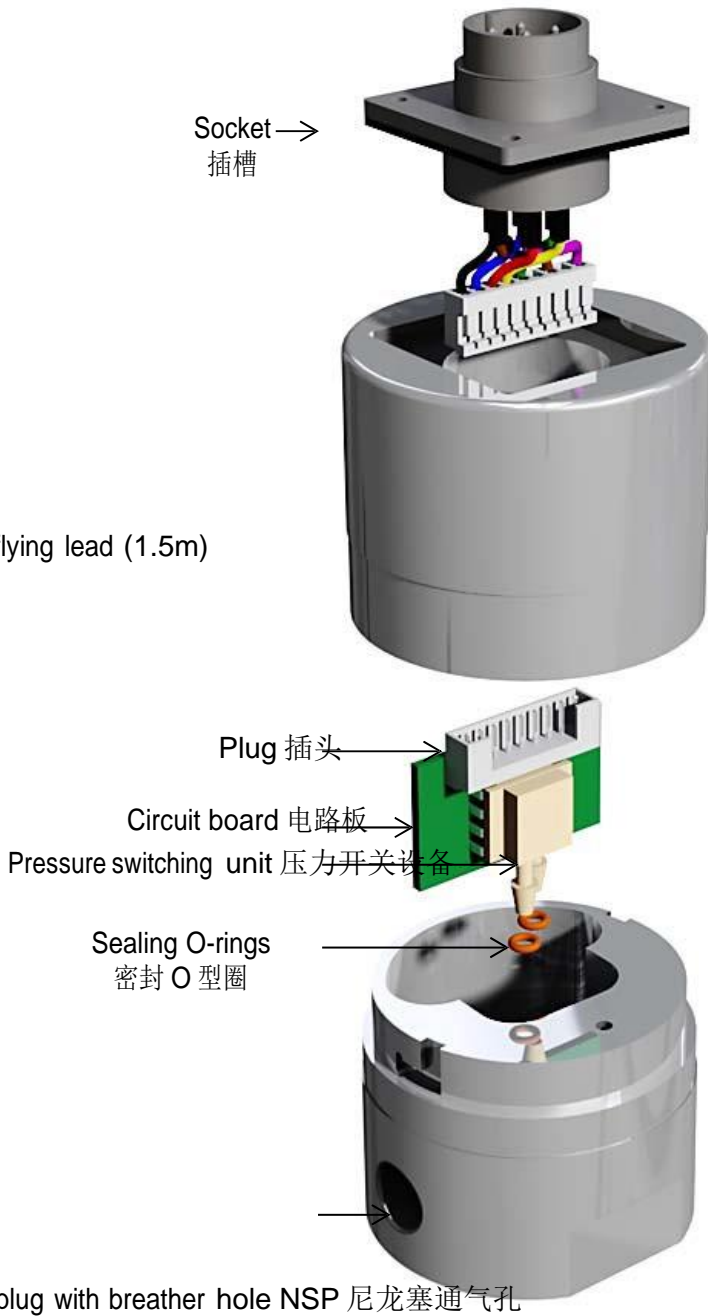
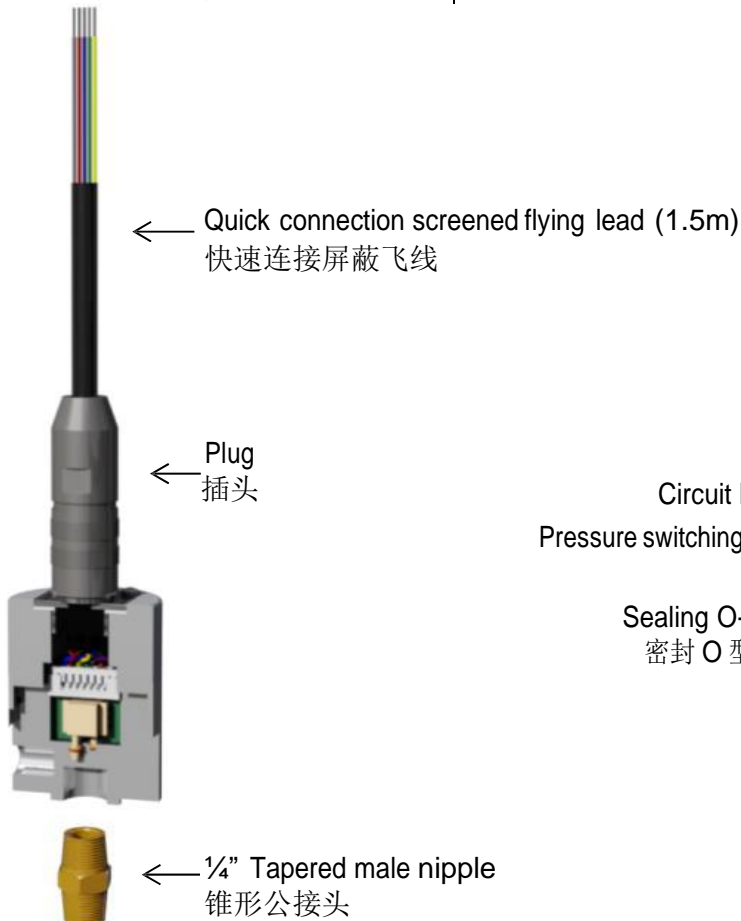
如果使用燃油压力传感器，则需要设置以下选项或参数。

Option/Parameter 选项/参数	Mk8 MM Mk8 控制模块
125	Fuel pressure sensor mode – fuel 1 燃料压力传感器模式-燃料 1
126	Fuel pressure sensor mode – fuel 2 燃料压力传感器模式-燃料 2
127	Fuel pressure sensor mode – fuel 3 燃料压力传感器模式-燃料 3
128	Fuel pressure sensor mode – fuel 4 燃料压力传感器模式-燃料 4
139	Oil pressure switch – offset lower limit 燃油压力开关-补偿下限值
140	Oil pressure switch – offset upper limit 燃油压力开关-补偿上限值
Parameter 42 参数 42	Oil pressure units 燃油压力设备

### 1.3 Air Pressure Sensor 空气压力传感器

Air Sensor 空气传感器	Mk8 MMMk8 控制模块	Mini Mk8 MMMk8 微型控制模块
Brown 棕色	T31	T29
Purple 紫色	T32	T30
Blue 蓝色	T33	T48
Red 红色	T34	T49

Connect screen at only one end.  
仅在一端连接屏幕。

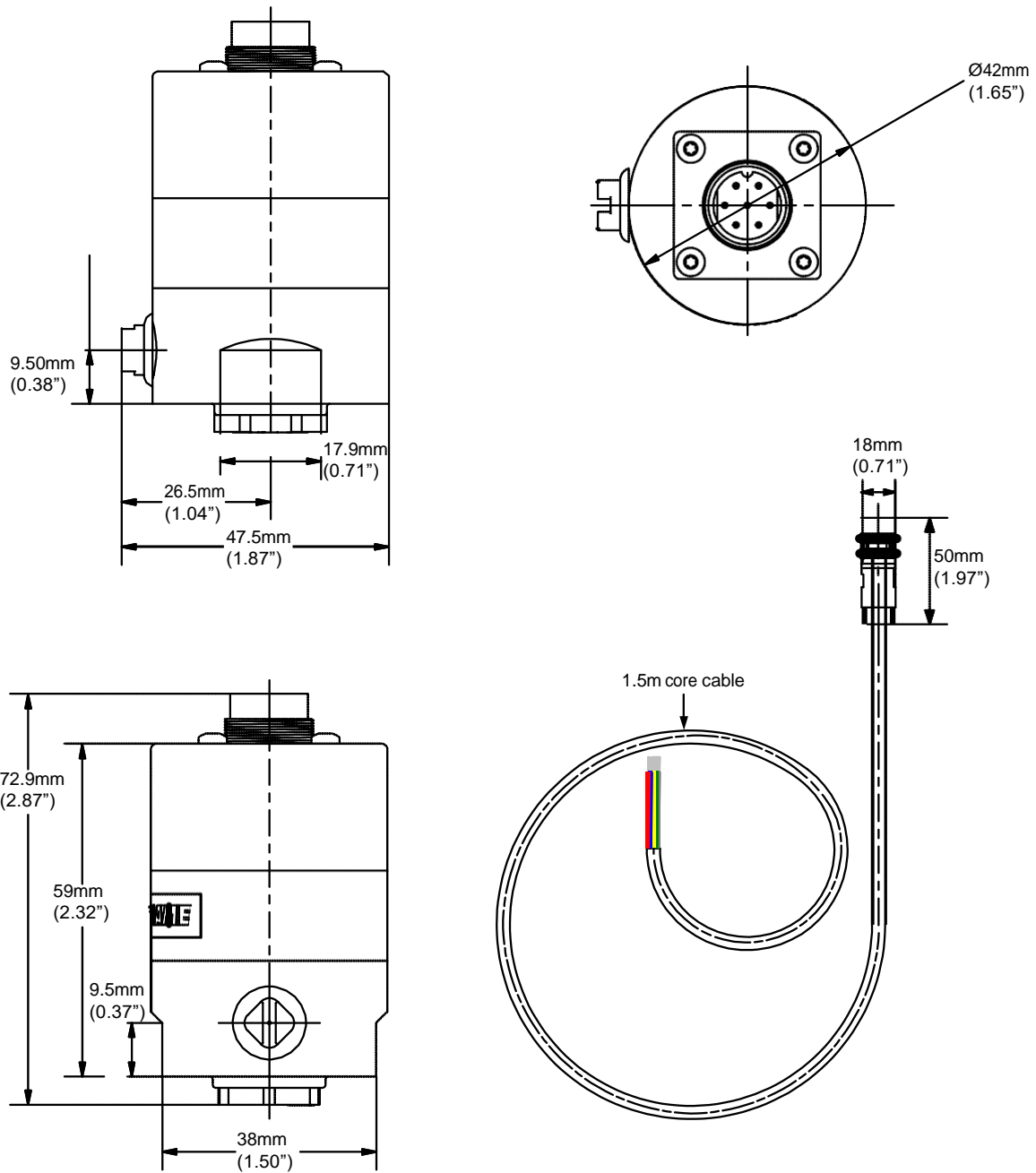


Drawing No. 图纸号 9005

IP	52
NEMA	5
Housing & Lid 外壳和盖板	Aluminium 铝
Power Consumption 功率消耗	0.1 Watts 0.1 Watts
Mounting 安装	In line as shown. Differential pressure hole away from any water source. 与图示一致，差压孔应远离所有水源

Part No. 零件号	Min. Pressure 最小压力			Max. Pressure 最大压力			Zero Range 零范围	
	mbar	"wg	PSI	mbar	"wg	PSI	mbar	"wg
MM80005	-0.75	0.3	0	65	25	1	-2.5 to 1.25	-1 to 0.5
MM80013	-1.5	0.6	0	130	50	2	-5 to 2.5	-2 to 1

Air Pressure Sensor 空气压力传感器



**Mk8 MM Mk8 控制模块**

If the air pressure sensor is being used, the following options/parameters need to be set.  
如果使用空气压力传感器，则必须设置以下选项或参数。

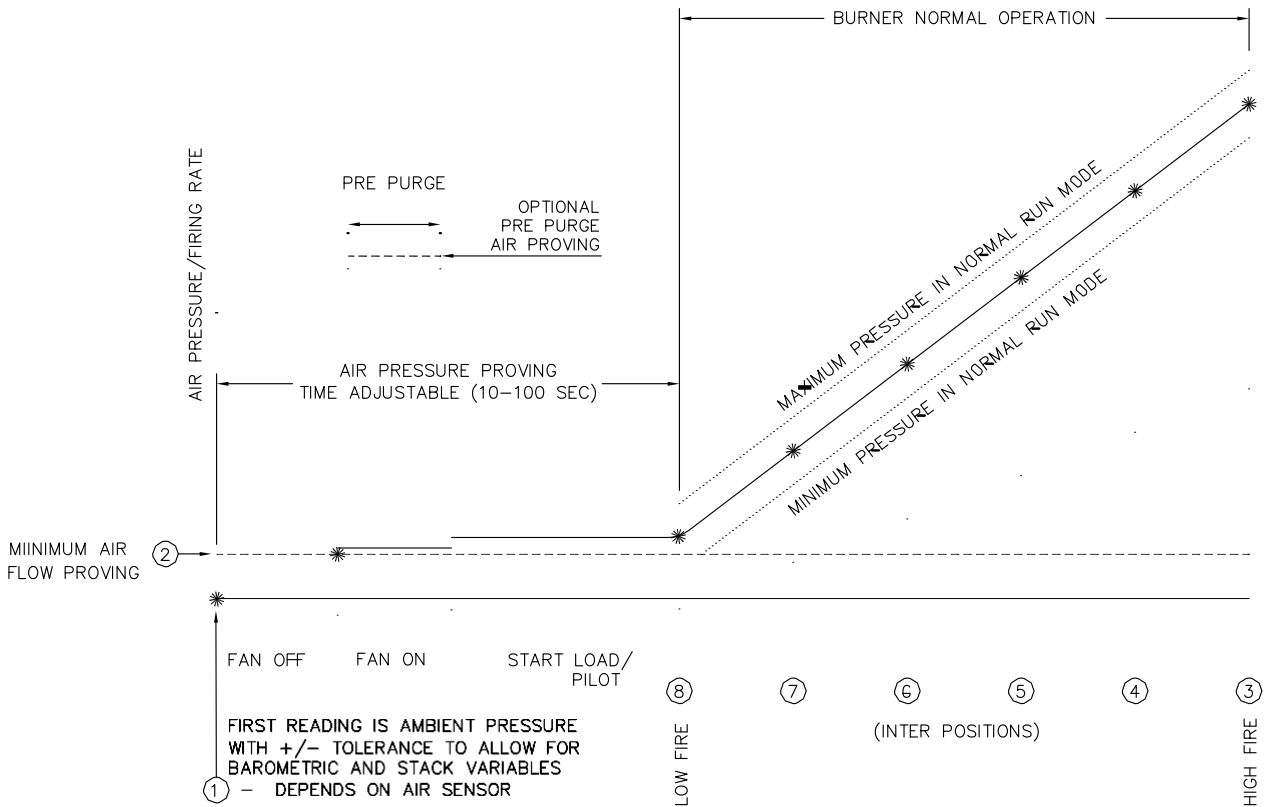
Option/Parameter 选项/参数	Mk8 MM Mk8 控制模块
141	Air proving pressure threshold for purge 吹扫时空气检验压力阈值
147	Air pressure error window 空气压力错误窗口
148	Air pressure sensor type 空气压力传感器类型
149	Air proving pressure threshold 空气检验压力阈值
Parameter 43 参数 43	Air pressure sensor units 空气压力传感器设备

**Mini Mk8 MM Mk8 微型控制模块**

If the air pressure sensor is being used, the following options/parameters need to be set.  
如果使用空气压力传感器，则必须设置以下选项或参数。

Option/Parameter 选项/参数	Mini Mk8 MM Mk8 微型控制模块
141	Air proving pressure threshold for purge 吹扫时空气检验压力阈值
146	Air pressure sensor units 空气压力传感器设备
147	Air pressure error 空气压力错误
148	Air pressure sensor type 空气压力传感器类型
149	Air proving pressure threshold 空气检验压力阈值

1.3.1 Air Pressure Proving 空气压力检验



Pressure sensors are dual channel and self-check.  
 压力传感器带有双通道和自检功能。

**Note:**

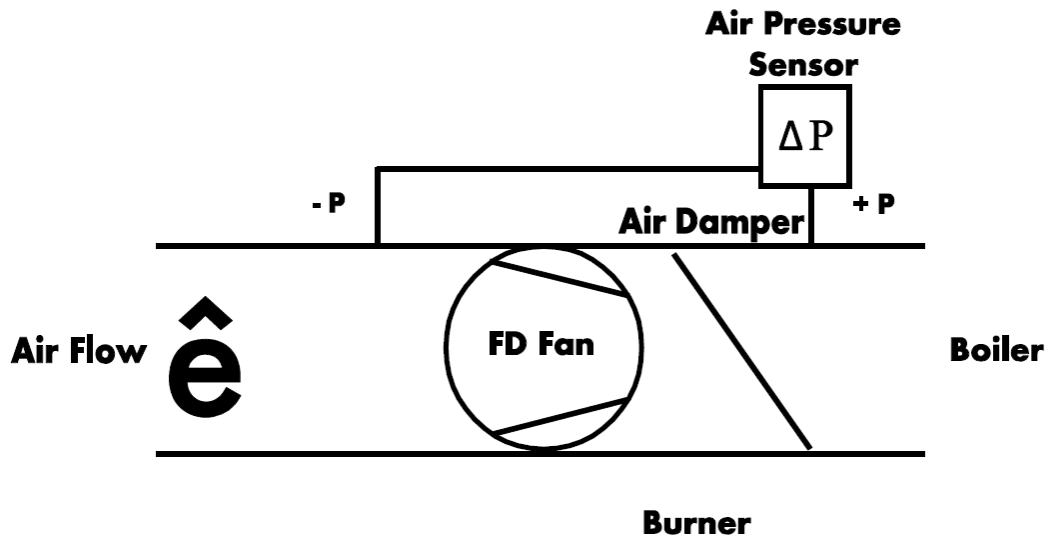
注:

1. Position 2 must be 0.25"wg (0.62mBar) higher than position 1  
 位置 2 必须高于位置 1 0.25"wg (0.62mBar)
2. Minimum pressure in normal run mode must be higher than position 2  
 正常运行模式下的最小压力必须大于位置 2。
3. Position 8 must be set equal to position 2 or higher  
 位置 8 必须与位置 2 相等或更高。
4. Default settings for minimum and maximum is 15% above and below entered value  
 最小和最大的默认设置大于或小于输入值 15%。

### 1.3.2 Air Pressure Tapped Fitting 空气压力螺丝固定

The Autoflame Air Pressure Sensor is supplied with a negative pressure port. This can be removed and installed as shown below, to measure a differential pressure. This is only necessary where the air pressure at low fire is below 0.4" w.g. or 1 mbar or when it is a local code requirement.

Autoflame 空气压力传感器提供一个负压口，传感器可以按下图所示安装拆除，以便测量压差。只有当低火焰时空气压力小于 0.4" w.g.或 1 mbar 或在地方法规要求下才能使用。





## 1.4 Steam Pressure Sensor 蒸汽压力传感器

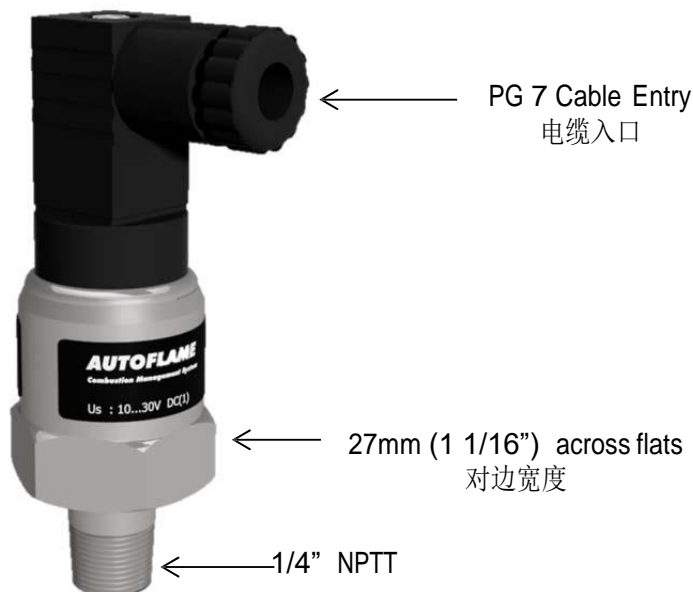
Steam Pressure Senso 蒸汽压力传感器	MM 控制模块
Blue (3)蓝色	T37
Green (2)绿色	T38
Red (1)红色	T39

**For correct operation the detector must be installed with a pressure siphon loop.**

**Do not install an isolation valve between the detector and the pressure vessel.**

为保证正常运行，检测器必须安装一个压力虹吸循环。

请勿在检测器和压力容器间安装隔离阀。



Drawing No. 图纸号 9033

IP	65
NEMA	4
Torque Setting	15-20Nm
扭矩值	15-20Nm
O-ring material	Viton
O 型圈材料	氟橡胶
Max storage temp	-25°C to +85 °C
最大储存温度	-25°C 至 +85 °C
Max operating temp	-25°C to +85 °C
最大运行温度	-25°C 至 +85 °C
Media temp (steam)	-25°C to +85 °C
媒介温度 (蒸汽)	-25°C 至 +85 °C

Part No 零件号	Actual Range 实际范围	Over Pressure 过压	Burst Pressure 爆裂压力
MM10010 (U)	0 – 3.4 bar (0 – 50 PSI)	8 bar (116 PSI)	12 bar (174 PSI)
MM10008 (U)	0 – 20 bar (0 – 300 PSI)	50 bar (725 PSI)	75 bar (1087 PSI)
MM10009 (U)	0 – 34 bar (0 – 500 PSI)	80 bar (1160 PSI)	100 bar (1450 PSI)
MM10017 (U)	0 – 100 bar (0 – 1450 PSI)	200 bar (2900 PSI)	300 bar (4351 PSI)

Plug fits correctly in one position only, do not force.

插头需要正确地连接一个位置，切勿用力。

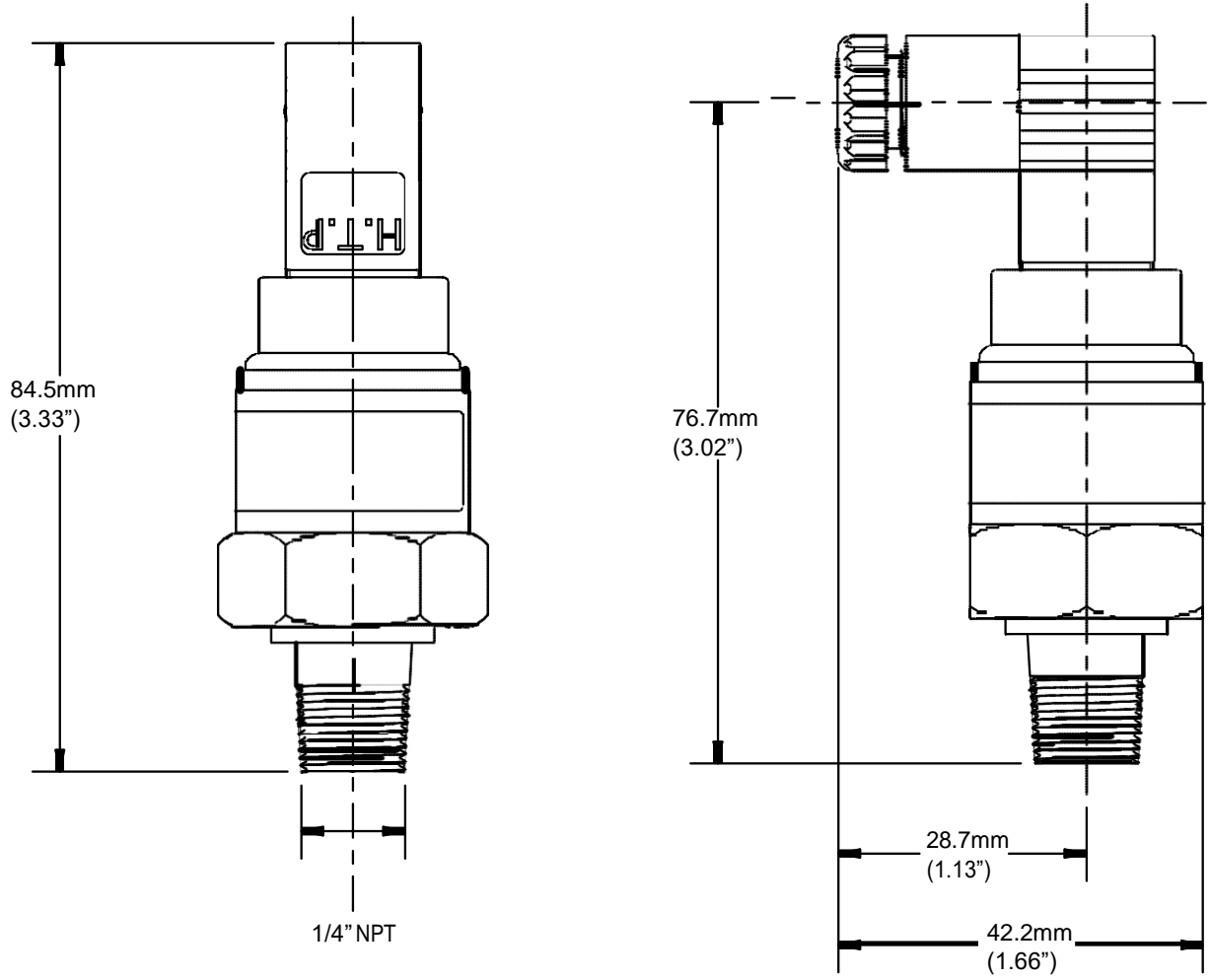
Do not use case to tighten pressure connection.

请勿用外壳拧紧压力连接件。

Maximum 2.5mm flat blade screwdriver for electrical connections

电气连接使用最大 2.5mm 平口螺丝刀。

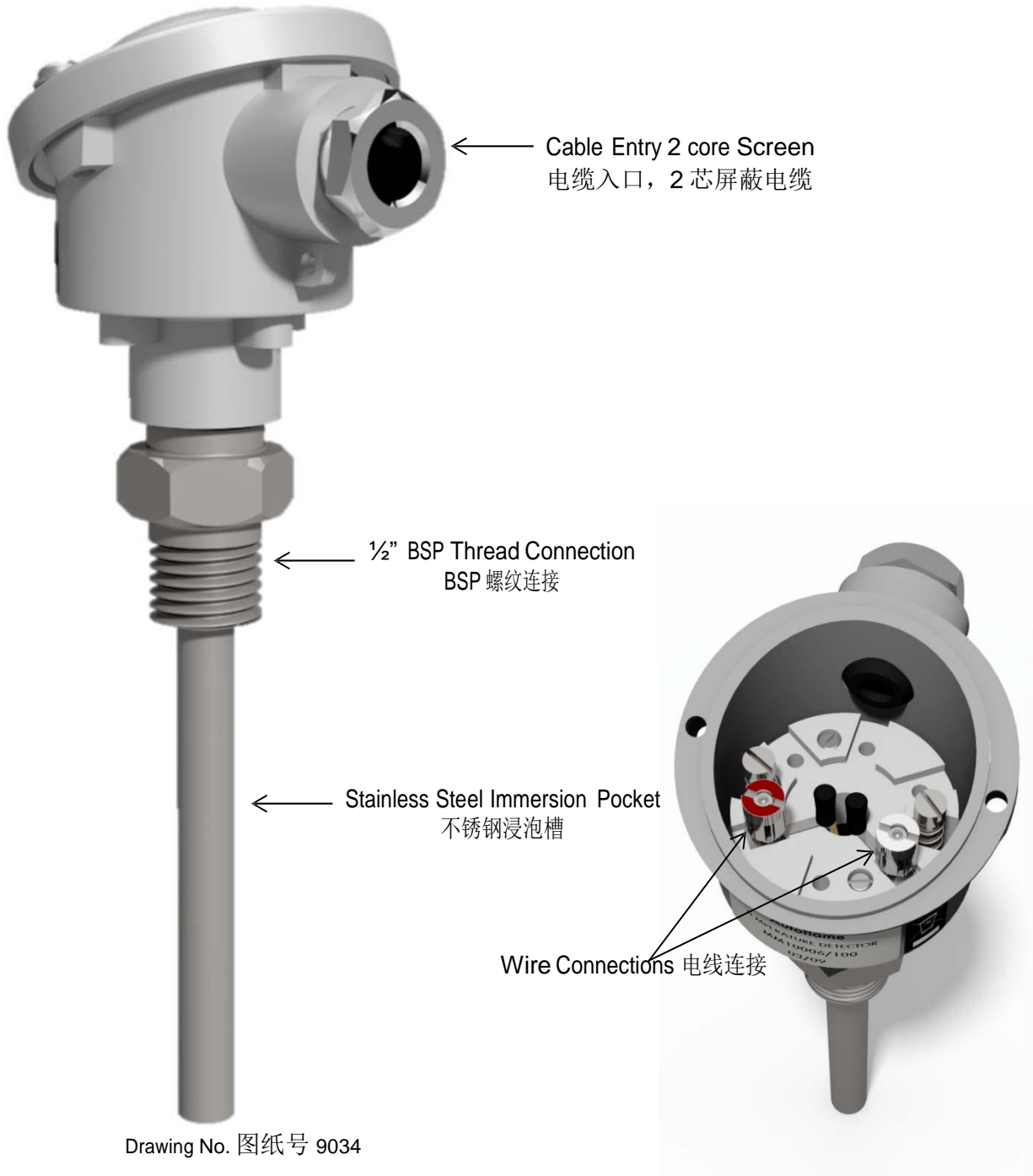
Steam Pressure Sensor 蒸汽压力传感器



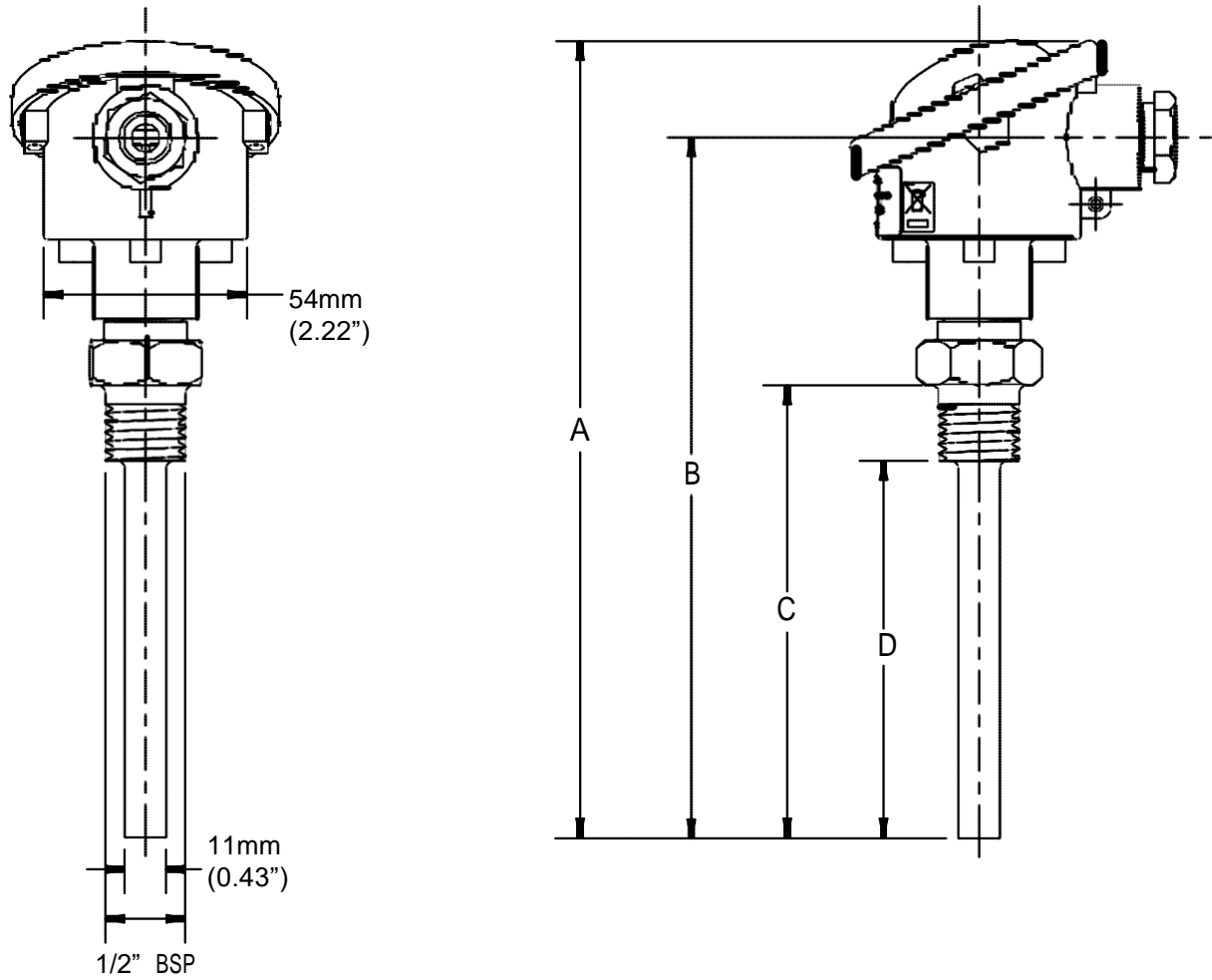
### 1.5 Water Temperature Sensor 水温传感器

Temperature Sensor 温度传感器	MM 控制模块
Red 红色	T38
Blue 蓝色	T37

Range: 0 – 400°C, 0 - 752°F.  
范围: 0 – 400°C, 0 - 752°F.



Temperature Sensor 温度传感器



Part No. 零件号	mm/inches			
	A	B	C	D
MM10006/100 (U)	211.42/ 8.32	185.75/ 7.31	120/ 4.72	100/ 4
MM10006/150 (U)	261.42/ 10.29	235.75/ 9.28	170/ 6.69	150/ 6
MM10006/200 (U)	311.42/ 12.26	285.75/ 11.25	220/ 8.86	200/ 8
MM10006/250 (U)	361.42/ 14.23	335.75/ 13.22	270/ 10.63	250/ 10
MM10006/400 (U)	511.42/ 20.13	485.75/ 19.12	420/ 16.54	400/ 12

### 1.6 Outside Temperature Sensor 外部温度传感器

Sensor	Mk8 MM
Red	19
Blue	20

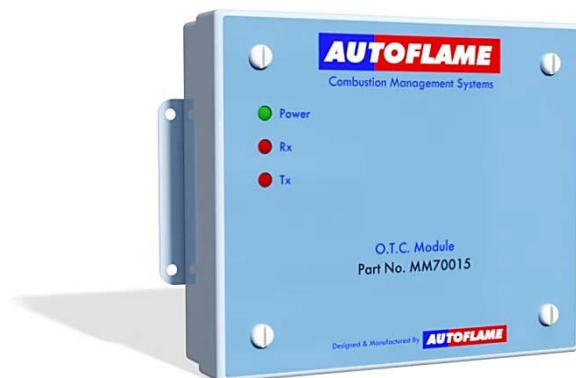
I.P. RATING	65
IP 额定值	
NEMA	4
Housing	Aluminium
外壳	铝
Power Consumption	Powered by MM
功率消耗	控制模块供电
Mounting	Any Orientation
安装	任意方向

传感器	Mk8 控制模块
红色	19
蓝色	20



Drawing No. 图纸号 9021

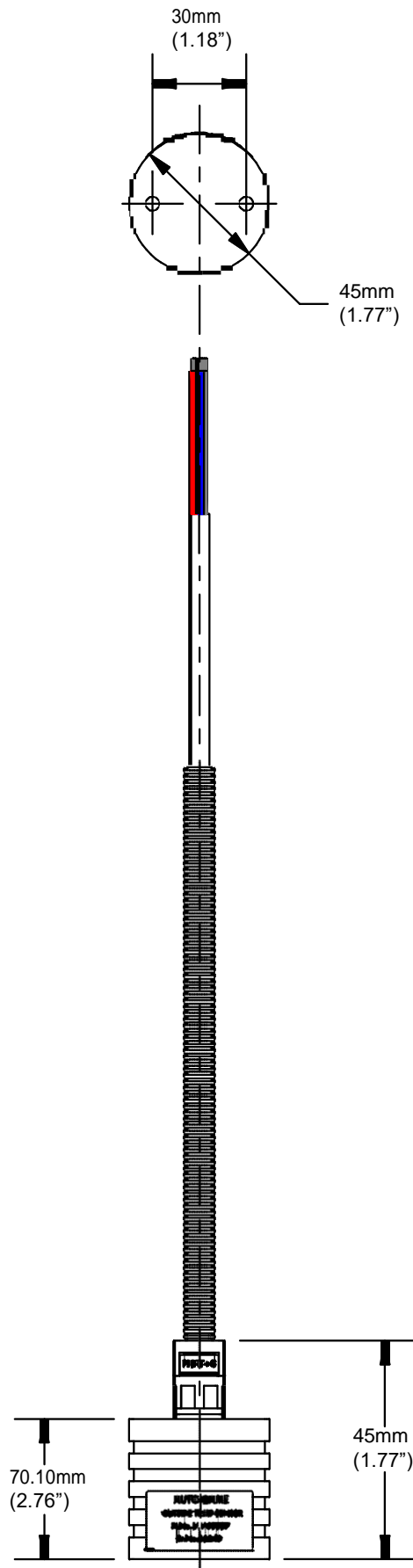
### Outside Temperature Compensation Module 外部温度补偿模块



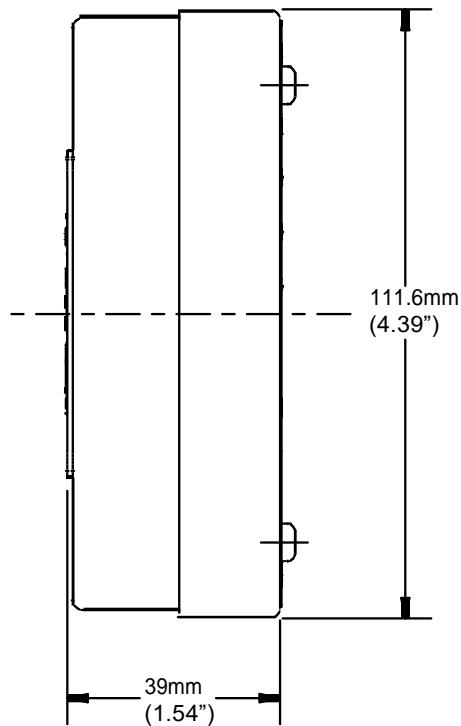
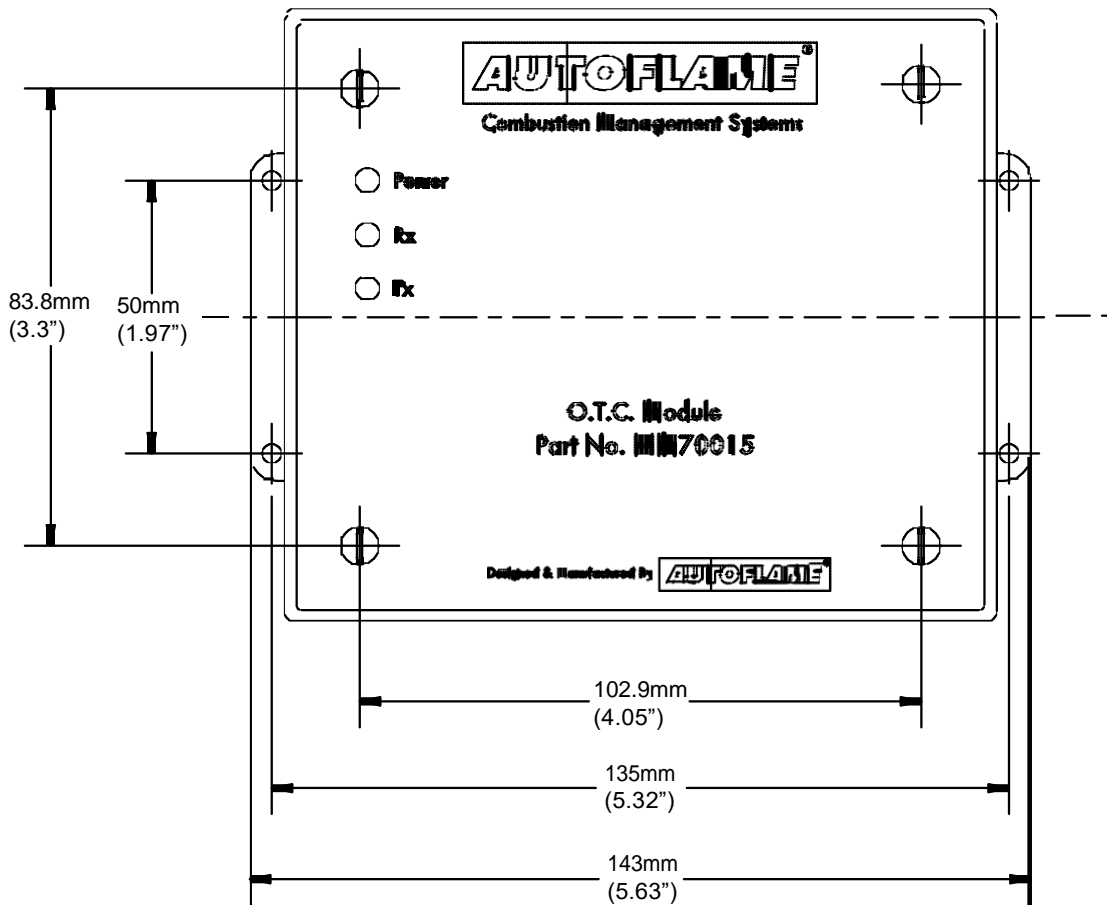
OTC Module	MM
外部温度补偿模块	控制模块
Black 黑色	T27
Red 红色	T28

Drawing No. 9022 图纸号 9022

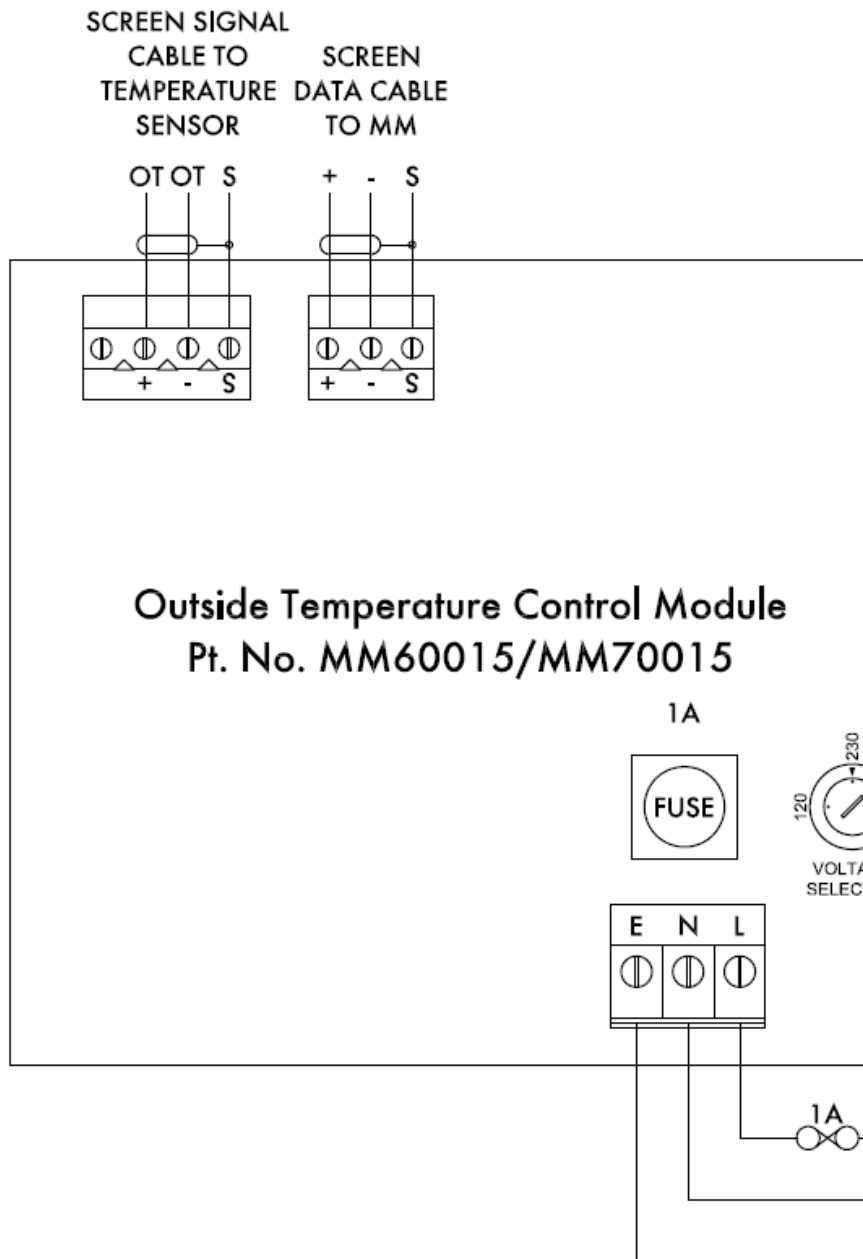
Outside Temperature Sensor 外部温度传感器



Outside Temperature Module 外部温度模块



Outside Temperature Module – Wiring 外部温度模块-接线



**IF IN DOUBT ASK AUTOFLAME  
TECHNICAL DEPARTMENT**

J.H./14.01.16/7946 iss1



Outside Temperature Compensation 外部温度补偿

Outside Temperature Compensation (OTC) is a function which allows the boiler's required setpoint to be automatically adjusted according to the outside air temperature. As the ambient air temperature increases the required setpoint will be decreased, and vice versa.

外部温度补偿功能允许根据外部空气温度自动调节锅炉所需设定点。随着环境空气温度的增加，所需设定点将降低，反之亦然。

To use OTC on a Mk8 MM, an outside temperature sensor is required, part number MM60007. If OTC is being used on MMs in a sequencing/DTI loop, then an outside temperature module is also required, part number MM70015. To use OTC on a Mini Mk8 MM, both an outside temperature module and an outside temperature sensor are required.

在 Mk8 控制模块上使用外部温度补偿时需要安装外部温度传感器，零件号为 MM60007。如果在排序/数据传输接口循环中的控制模块上使用外部温度补偿功能，则需要安装外部温度模块，零件号为 MM70015。在 Mk8 微型控制模块上使用外部温度补偿功能时，同时需要安装外部温度模块和外部温度传感器。

When using the outside temperature module with a sequencing/DTI loop, the module is wired to this comms loop. Outside temperature compensation should be enabled on all the MMs in the loop, and the module will transfer the outside temperature to all the MMs.

使用带有排序/数据传输接口循环的外部温度模块时，模块需要连接至该通信循环。外部温度补偿功能需要在所有控制模块上启用，此时模块将把外部温度传输至所有控制模块。

Option 选项	Mk8 MM and Mini Mk8 MM Mk8 控制模块和 Mk8 微型控制模块
80	Outside temperature compensation 外部温度补偿
81	Setpoint at minimum outside temperature 最低外部温度设定点
82	Minimum outside temperature 最低外部温度
83	Setpoint at maximum outside temperature 最高外部温度设定点
84	Maximum outside temperature 最高外部温度
Parameter 88 参数 88	Outside temperature sensor adjustment 外部温度传感器调节

If the actual outside temperature exceeds the boundaries set in options 82 and 84, the boiler setpoint will remain at the maximum or minimum setpoints specified by options 81 and 83.

如果实际外部温度超出选项 82 和 84 的设置范围，则锅炉设定点将保持在选项 81 和 83 设置的最高或最低设定点。

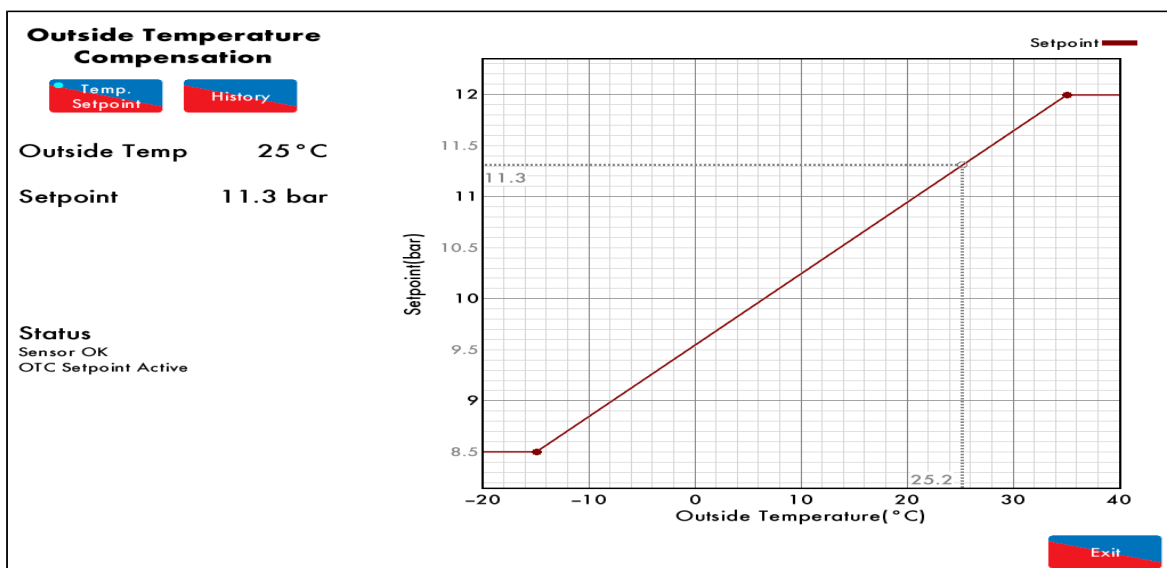


Figure 1.6.i Outside Temperature Compensation Screen – Mk8 MM

图 1.6.i 外部温度补偿屏幕-Mk8 控制模块

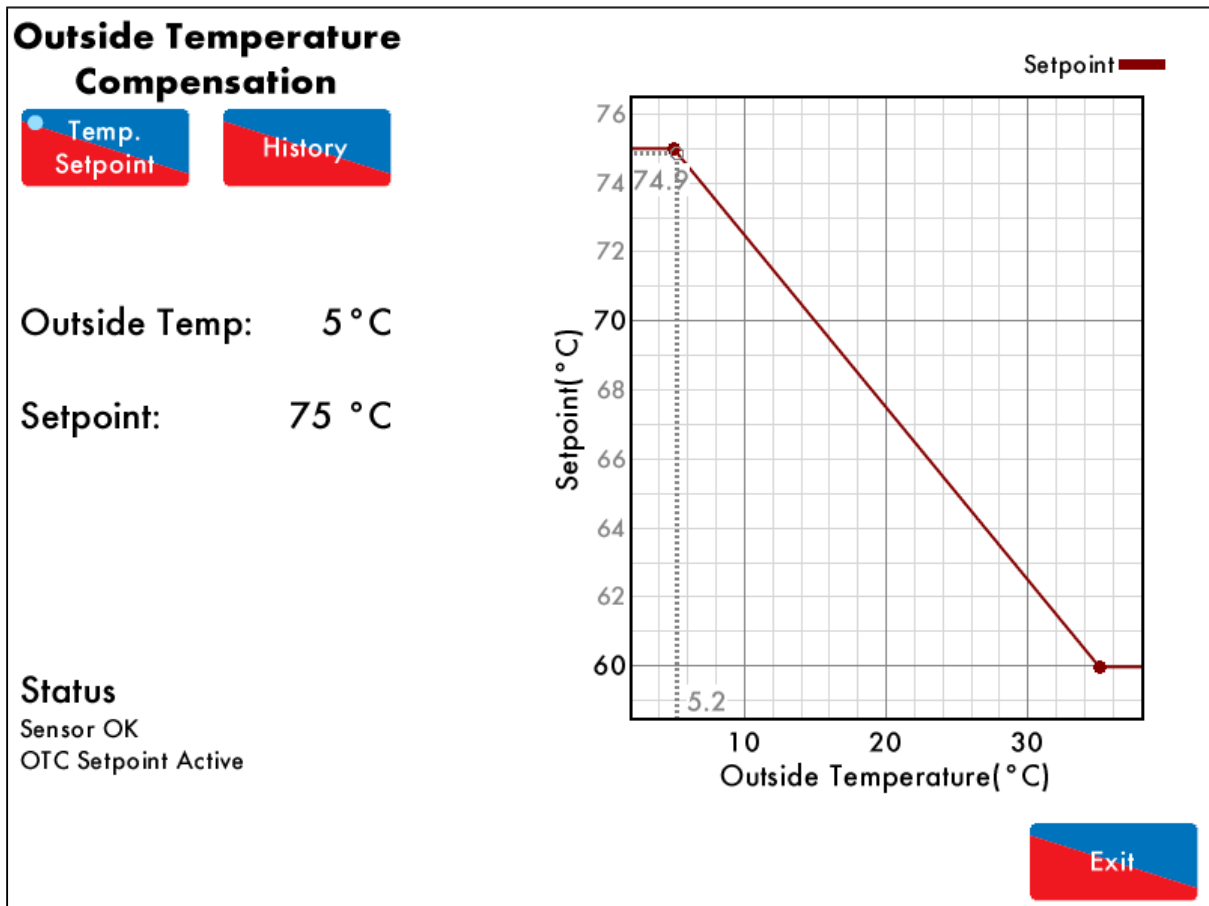


Figure 1.6.ii Outside Temperature Compensation Screen– Mini Mk8 MM

图 1.6.ii 外部温度补偿屏幕-Mk8 微型控制模块

**1.6.1 Night Setback 夜间温度降低**

Night setback function can be used to reduce the setpoint by the night setback offset. On the Mk8 MM and Mini Mk8 MM, the night setback function does not require outside temperature compensation to be enabled. For the Mk8 MM, an input is required on terminal 93 to activate the night setback offset, and for the Mini Mk8 MM an input is required on terminal 80.

夜间温度降低功能可以用于降低夜间温度降低补偿的设定点。在 Mk8 控制模块和 Mk8 微型控制模块中，夜间温度降低功能不需要启用外部温度补偿。在 Mk8 控制模块中，需要在终端 93 上输入激活夜间温度降低补偿，在 Mk8 微型控制模块中，需要在终端 80 上进行输入。

Option 选项	Mk8 MM Mk8 控制模块
79	Terminal T93 Function 终端 T93 功能
85	Night setback offset 夜间温度降低补偿

Option 选项	Mini Mk8 MM
85	Night setback offset 夜间温度降低补偿
Option/parameter 154 选项/参数 154	Terminal T80 Function 终端 T80 功能

## 2 FLAME SAFEGUARD 火焰保护

### 2.1 Burner Control Sequence Diagrams 燃烧器控制顺序图

The time to achieve safety shutdown where a fault is detected is within 4 seconds. The resulting safety shutdown state is defined by the shut-off valve terminals being de-energised.  
 当在四秒内检测出故障时需要时间实现安全关机。安全关机状态可以通过断开切断阀终端定义。

The maximum flame failure response time is 1second.  
 最大火焰故障响应时间是 1 秒。

#### Diagram Notes

##### 图示备注

If VPS is not optioned on the fuel selected, the VPS phases are bypassed.  
 如果在选择的燃料中未选择阀门检验系统，则可以绕过阀门检验系统。

Point idle – this phase is set at power up when no fuel selected on exit from lockout.  
 点空闲-该阶段在启动时进行设置，此时从锁定到退出不选择燃料。

Point recycle – this phase is set on exit from firing and post purge if VPS has not operated after burner run.  
 点再循环-如果阀门检验系统在燃烧器运行后未运行，则该阶段从燃烧到后吹扫退出时进行设置。

Point post purge – this phase is set only if post purge is optioned.  
 点后吹扫-只有在选择后吹扫后才能设置该阶段。

Point standby – this phase is set if VPS has operated after burner run.  
 点待机-当阀门检验系统在燃烧器运行后运行时设置该阶段。

Normal lockout is reset when either the mains lockout reset input is set for 2 seconds or the display screen lockout reset button is pressed for 2 seconds.  
 当主电源锁定重置输入设为 2 秒或按下显示屏锁定重置按钮 2 秒后可以重置正常锁定状态。

Prolonged lockout reset is set if either the mains lockout reset input or display screen lockout reset input is set for 10 or more seconds. Normal lockout is set on exit from permanent lockout reset after 20 seconds and is reset in the normal way.  
 当主电源锁定重置输入或显示屏锁定重置输入设为 10 秒或更长时间时可以设置长期锁定重置。正常锁定在 20 秒后从永久性锁定重置到退出时设置，同时可以按正常方式重置。

Blue waveforms indicate required condition. Values above/below waveform are time in seconds that the state must be continuously incorrect after which a lockout is set. If the waveform is not bold then the status is not important.

蓝色波形表示所需的条件。高于/低于波形数值时间以秒为单位，且必须在设置锁定后状态持续不正确。如果波形不变粗，则状态不重要。

The following burner control sequence diagrams are shown with example timings:

以下燃烧器控制所示的顺序图并带有计时：

- 3 second window ( $\pm 1$  second) for UV detection for simulated flame  
 紫外线检测模拟火焰 3 秒窗口 ( $\pm 1$  秒)。
- 1 second window for UV loss for flame failure  
 紫外线检测火焰故障 1 秒窗口。
- 3 second window ( $\pm 1$  second) for CPI loss for CPI input wrong state/ no CPI reset  
 CPI 输入错误状态/无 CPI 重置 3 秒窗口 ( $\pm 1$  秒)。

## 2 Flame Safeguard

- 3 second window ( $\pm 1$  second) for air switch loss for no air proving  
空气开关无空气检验 3 秒窗口 ( $\pm 1$  秒)。

The Mk8 MM and Mini Mk8 MM has the following default timings:  
Mk8 控制模块和 Mk8 微型控制模块有以下默认时间：

Burner control default timings 燃烧器控制默认时间	Seconds 秒
Flame failure response time 火焰故障响应时间	< 1
Time to achieve safety shutdown 安全关机时间	< 4
Time to achieve lockout 锁定时间	< 1

Drawing No. 7904  
图纸号 7904

## 2 Flame Safeguard

### 2.1.1 Interrupted Pilot - Gas 中断控制-燃气

目

PHASE DESCRIPTION	IDLE	RECYCLE	POSITION TO CLOSE	STANDBY	SECONDARY FURNACE INPUT RESET	WAIT FOR AIR SWITCH	VPS AIR PROVING	VPS BLEED OPEN	VPS GAS PROVING	ZERO AIR SENSOR	RUN TO PURGE	PURGE	RUN TO START	PRE IGNITION	1ST SAFETY TIME	PILOT PROVING	2ND SAFETY TIME GAS	MAIN FLAME PROVING	FINISH	POST PURGE
OPTION NUMBER	N/A	119	N/A	N/A	N/A	N/A	132	134	132	N/A	N/A	121	N/A	113	114	115	118	117	N/A	118
TIME (SECONDS)		3+120	N/A	N/A	N/A	N/A	10+30	3+20	10+30	N/A	N/A	5-300	N/A	3+5	1	3+5	1	5+20	N/A	0+100
INTERLOCKS/OUTPUTS																				
RUNNING INTERLOCK TRS																				
NON-RECYCLING INTERLOCK TRS																				
GAS VALVES C.P.I. (P.O.C.) TRS																				
AIR SWITCH TRS																				
FLAME SCANNER																				
TRIP SIGNALS TO FAN																				
BURNER OFF RUN																				
ATTAIN START/PURGE																				
START/MODULATE																				
POSITION MOTOR TRAVEL																				
STATUS ESCAPE FAN																				
POSITION MOTOR STATUS																				
BE OUTPUTS																				
BURNER MOTOR TRS																				
IGNITION TRS																				
PILOT FUEL VALVE TRS																				
MAIN FUEL VALVE 1 TRS																				
MAIN FUEL VALVE 2 TRS																				
VERT VALVE TRS																				
LOCKOUT INDICATION																				
FSR RELAY																				

## 2 Flame Safeguard



## 2 Flame Safeguard

### 2.1 .2 Interrupted Pilot – Oil 中断控制-燃油

PHASE DESCRIPTION	IDLE	RECYCLE	POSITION TO CLOSE	STANDBY	SECONDARY PROVING (CCT) SET	WAIT FOR INPUT RESET	WAIT FOR AIR SWITCH	ZERO AIR SENSOR	RUN TO PURGE	PURGE	RUN TO START	PRE IGNITION	1ST SAFETY TIME	PILOT PROVING	2ND SAFETY TIME OIL	MAIN FLAME PROVING	FIRING	POST PURGE	
OPTION NUMBER	N/A	119	N/A	N/A	N/A	N/A	N/A	N/A	N/A	121	N/A	113	114	115	123	117	N/A	118	
TIME (SECONDS)										112									
INPUTS/OUTPUTS		3 • 120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5-10 AIR NOT CHECKED 5-300 AIR CHECKED	N/A	3-5	3-10 LESS 1 SECOND UV NOT CHECKED 1 UV CHECKED	3-5	3-15 LESS 1 SECOND UV NOT CHECKED 1 UV CHECKED	5-20	N/A	0-100	
RUNNING INTERLOCK TR63																			
NON-RECYCLING INTERLOCK TR62																			
GAS VALVES C.P.I. (P.O.C.) TR65																			
AIR SWITCH TR64																			
FLAME SCANNER																			
DIRECTIVES TO FAN																			
BURNER OFF/RUN																			
ATTAIN START/PURGE																			
START/MODULATE																			
POSITION MOTOR TRAVEL																			
STATUS FROM FAN																			
POSITION MOTOR STATUS																			
IC OUTPUTS																			
BURNER MOTOR TR68																			
IGNITION TR63																			
PILOT FUEL VALVE TR69																			
MAIN FUEL VALVE 1 TR60																			
MAIN FUEL VALVE 2 TR61																			
VENT VALVE TR62																			
LOCKOUT INDICATION																			
FSR RELAY																			

## 2 Flame Safeguard

### 2.1.3 Intermitent Pilot - Gas with Post VPS 中断控制-燃气阀门检验系统

PHASE DESCRIPTION	IDLE	RECYCLE	POSITION TO CLOSE	STANDBY	SECONDARY PROOFING COU SET	WAIT CH INPUT RESET	WAIT FOR AIR SWITCH	ZERO GAS SENSOR	ZERO AIR SENSOR	RUN TO PURGE	PURGE	RUN TO START	PRE IGNITION	1ST SAFETY TIME	PILOT PROVING	MAIN FLAME PROVING	FRINGE	POST PURGE	VPS VERTING	VPS AIR PROVING	VPS BLEED OPEN	VPS GAS PROVING
OPTION NUMBER	N/A	119	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	127	N/A	113	114	115	117	N/A	118	134	132	134	132
TIME (SECONDS)											5-10 AIR NOT CHECKED	N/A	3-5	3-10 LV NOT CHECKED	115	5-20	N/A	0-100	3-20	10-30	3-20	10-30
MAIN SCOPUS STRIPS		3-100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5-300 AIR CHECKED	N/A		1	3-5	5-20	N/A					
RUNNING INTERLOCK TR3																						
NON-RECYCLING INTERLOCK TR2																						
GAS VALVES O.P.L (P.O.C) TR65																						
AIR SWITCH TR64																						
FLAME SCANNER																						
DIRECTIVES TO PUR																						
BURNER OFF/ON																						
ACTION START/PURGE																						
START/MODULATE																						
POSITION MOTOR TRAVEL																						
STATUS FROM/FAR																						
POSITION MOTOR STATUS																						
ESC OUTPUTS																						
BURNER MOTOR TR68																						
IGNITION TR63																						
PILOT FUEL VALVE TR69																						
MAIN FUEL VALVE 1 TR60																						
MAIN FUEL VALVE 2 TR61																						
VENT VALVE TR62																						
LOCKOUT INDICATION																						
FSR RELAY																						



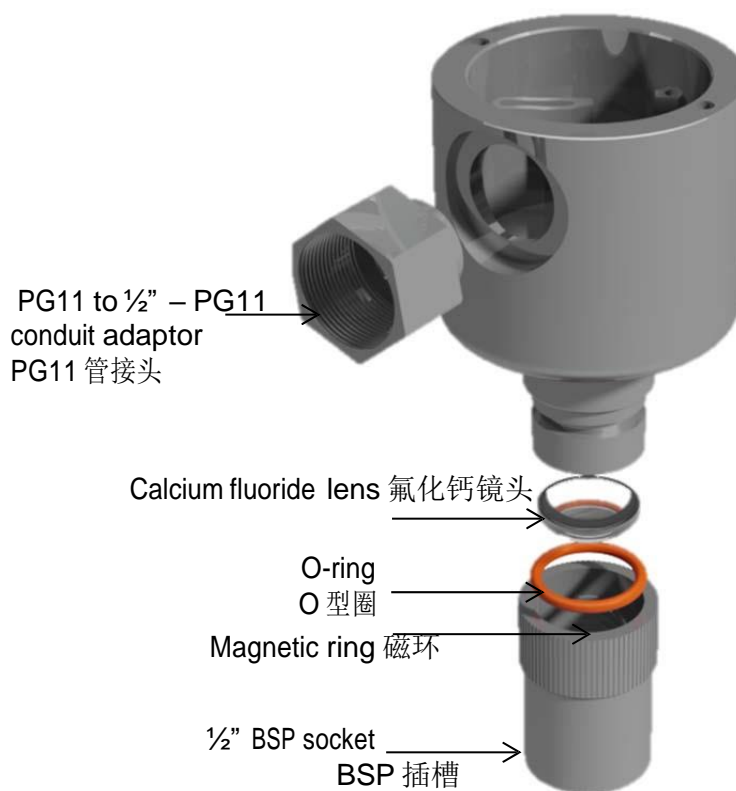
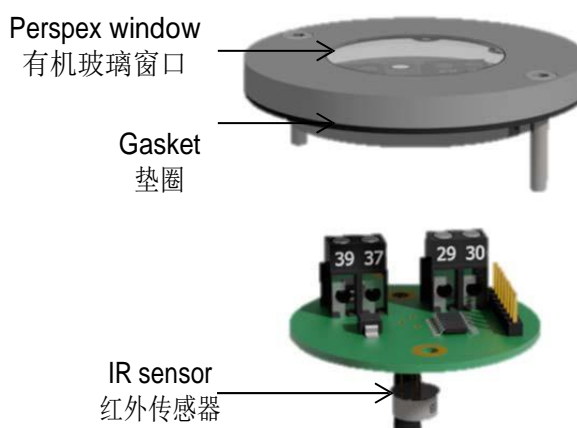
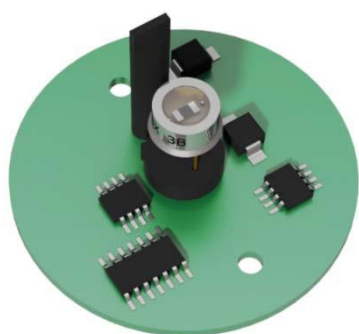
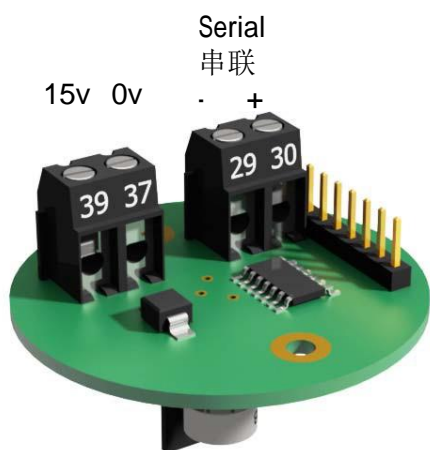
## 2.2 Flame Scanner Types 火焰扫描仪类型

### 2.2.1 IR End View Scanner 红外端视扫描仪

Part Number: MM 70017  
零件号: MM 70017

Maximum Operating Temperature: 60°C / 140°F  
最大运行温度: 60°C / 140°F

IR Scanner 红外扫描仪	Mk8 MM and Mini Mk8 MM Mk8 控制模块和 Mk8 微型控制模块
Yellow (29) 黄色	T29
Green (30) 绿色	T30
Blue (37) 蓝色	T48
Red (39) 红色	T49
<i>Connect screen at one end only. 仅在一端连接屏幕。</i>	



Drawing No. 图纸号 9023

IP  
Housing  
外壳  
Power Consumption

54  
Aluminium  
铝  
Powered by external 15V DC supply

## 2 Flame Safeguard

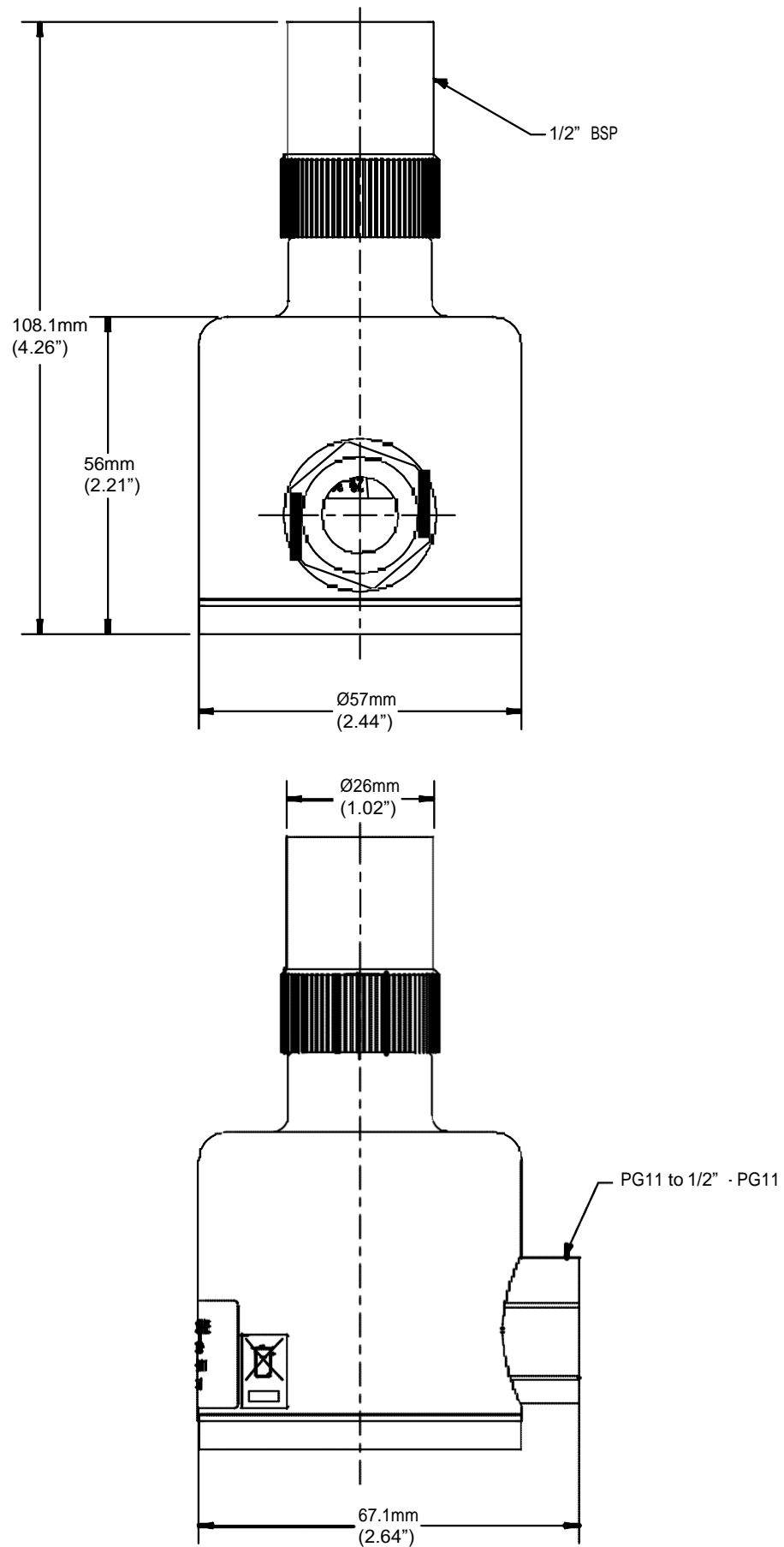
功率消耗  
Mounting  
安装

外部 15V DC 电源供电  
Any orientation so that photo tube faces flame  
任意位置，光电管面向火焰

**Note:** Power to the IR scanner is terminated when removed from the magnetic ring socket.  
注：从磁性环套取出红外扫描仪时断开电源。

## 2 Flame Safeguard

### IR End View Scanner 红外端视扫描仪



**2.2.2 Self-Check End View UV Scanner – High Sensitivity 自检端视紫外扫描仪-高灵敏度**

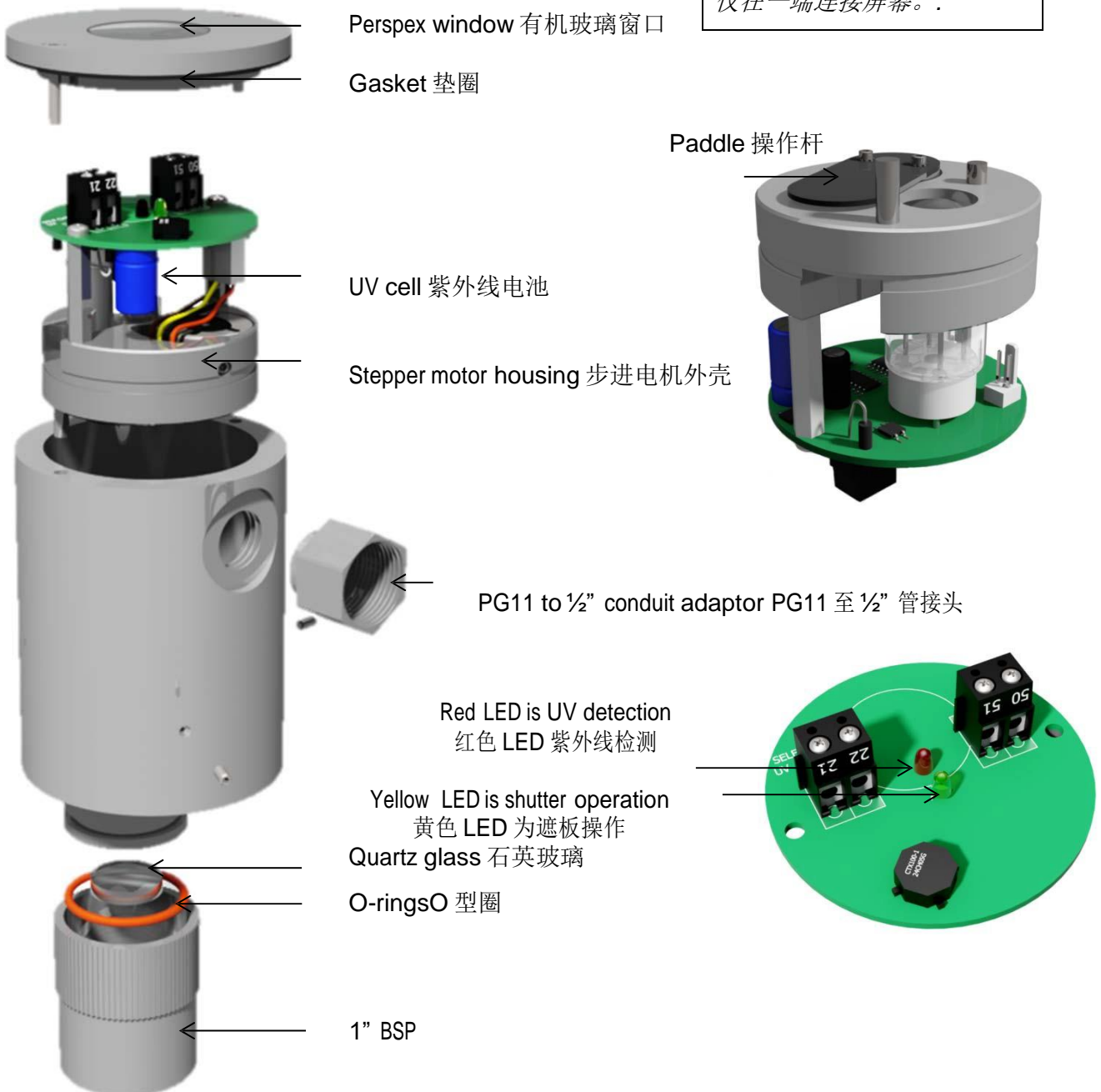
Part Numbers: MM60003/HS

零件号: MM60003/HS

Maximum Operating Temperature: 50°C / 122°F

最高运行温度: 50°C / 122°F

UV Scanner 紫外扫描仪	MM 控制模块
Red 红色	T51
Blue 蓝色	T50
Yellow 黄色	T21
Green 绿色	T22
<i>Connect screen at one end only 仅在一端连接屏幕。</i>	



Drawing No. 9024 图纸号 9024

**Power Consumption**

功率消耗

**Housing**

外壳

**Mounting**

安装

2 Flame Safeguard

**Max 0.5W**

最大 0.5W

**Aluminium**

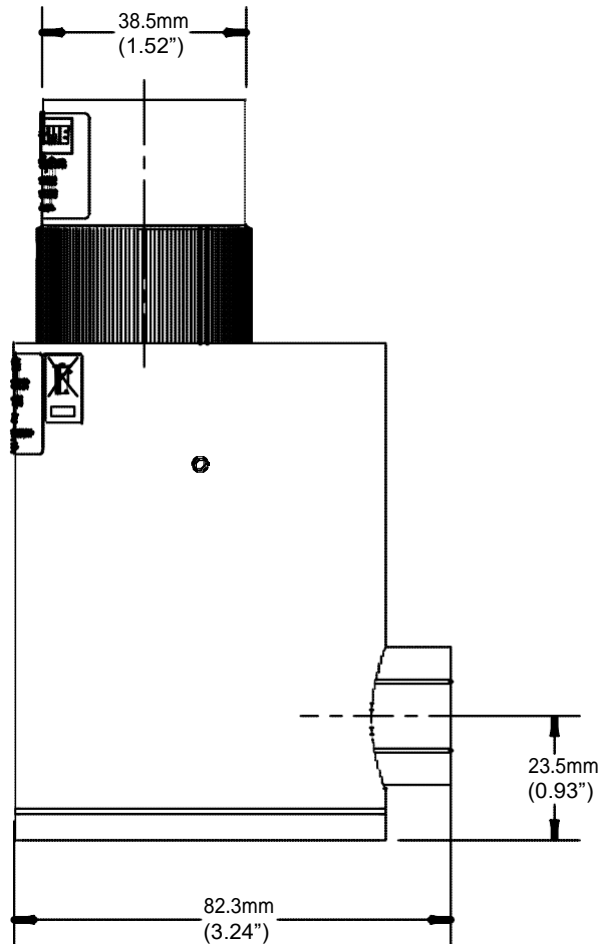
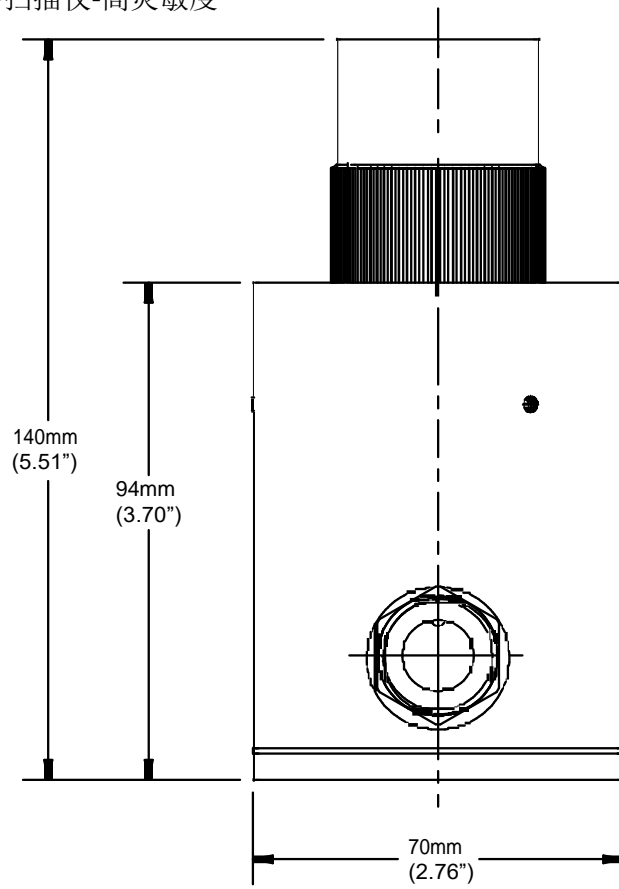
铝

**Any orientation**

任意方向

Self-Check End View UV Scanner – High Sensitivity

自检端视紫外扫描仪-高灵敏度



**2.2.3 Self-Check Side View UV Scanner – High Sensitivity**

自检侧视紫外扫描仪-高灵敏度

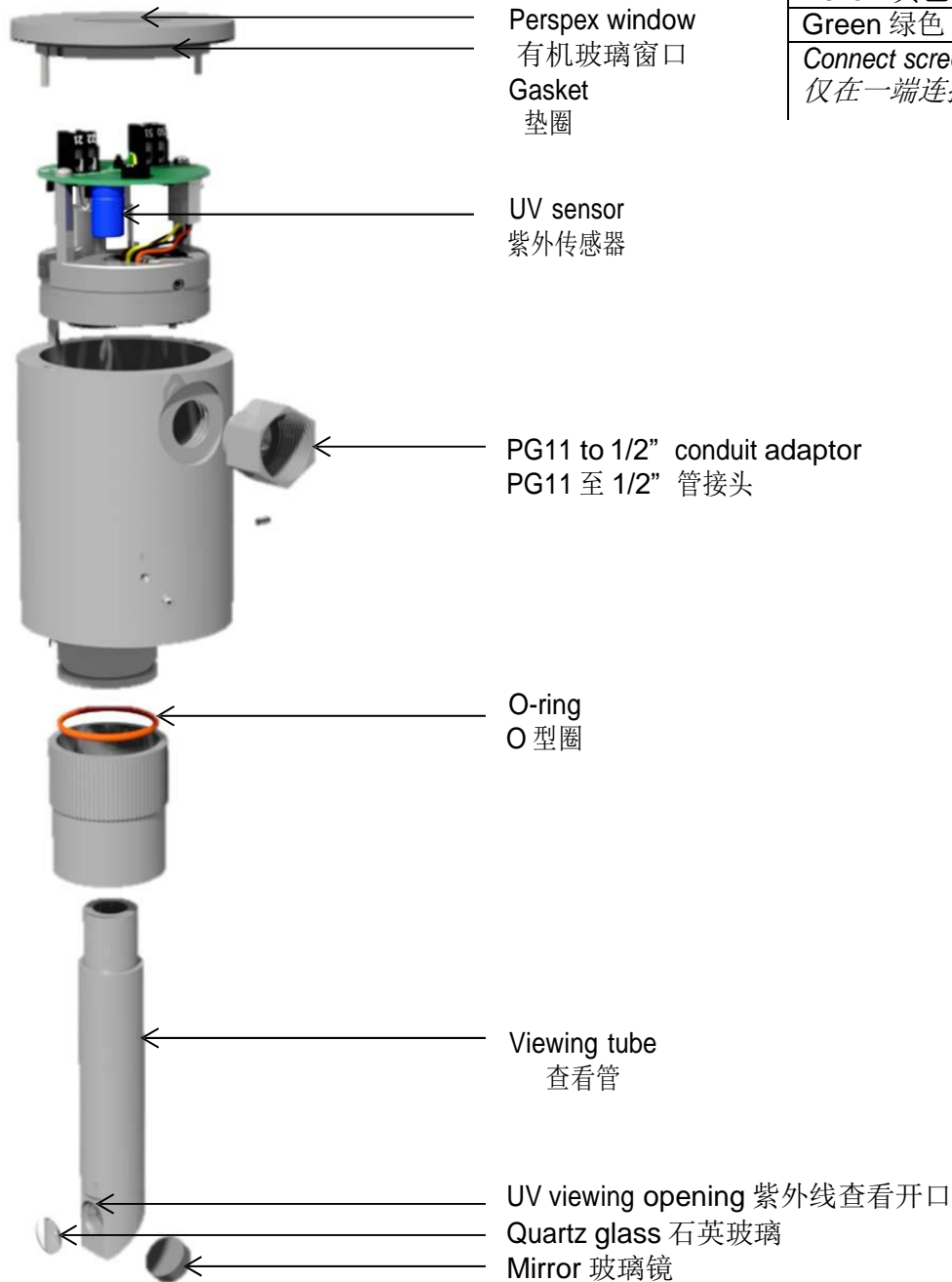
Part numbers: MM60003/HS/SV

零件号: MM60003/HS/SV

Maximum operating temperature: 50°C / 122°F

最高运行温度: 50°C / 122°F

UV Scanner 紫外扫描仪	MM 控制模块
Red 红色	T51
Blue 蓝色	T50
Yellow 黄色	T21
Green 绿色	T22
<i>Connect screen at one end only 仅在一端连接屏幕。</i>	



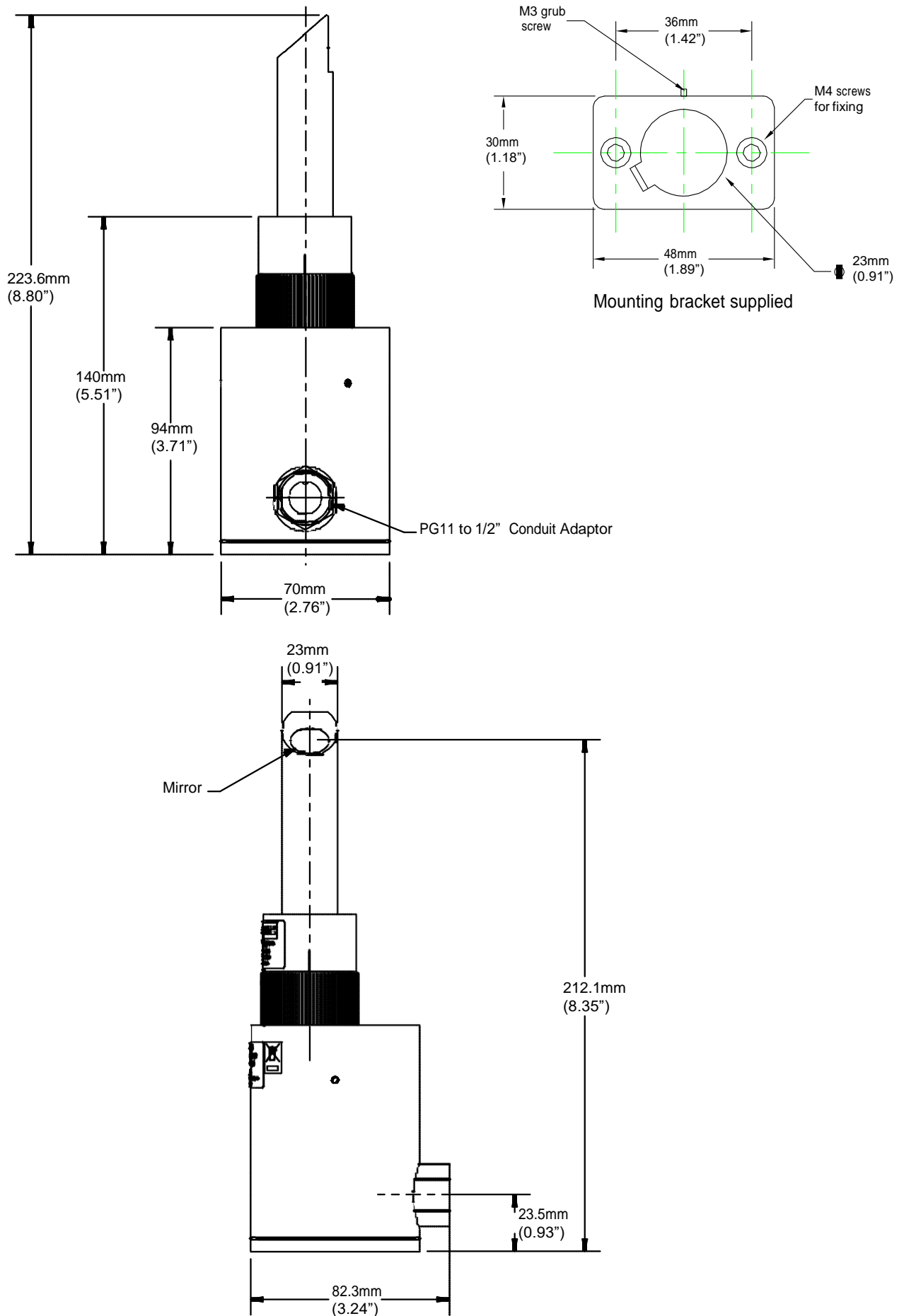
Drawing No 图纸号. 9025

IP  
Power Consumption  
功率消耗  
Housing & Lid  
外壳和盖板  
UV Cell  
紫外线电池

54  
Max 0.5W  
最大 0.5W  
Aluminium  
铝  
High Intensity  
高密度

## 2 Flame Safeguard

### Self-Check Side View UV Scanner – High Sensitivity 自检侧视紫外扫描仪-高灵敏度





2.2.4 Standard European Side Viewing UV Scanner 标准欧洲侧视紫外扫描仪

Part number 零件号: MM60004

Maximum Operating Temperature: 60°C / 140°F  
最高运行温度: 60°C / 140°F

UV Scanner 紫外扫描仪	MM 控制模块
Red 红色	T51
Blue 蓝色	T50
<i>Connect screen at one end only 仅在一端连接屏幕。</i>	

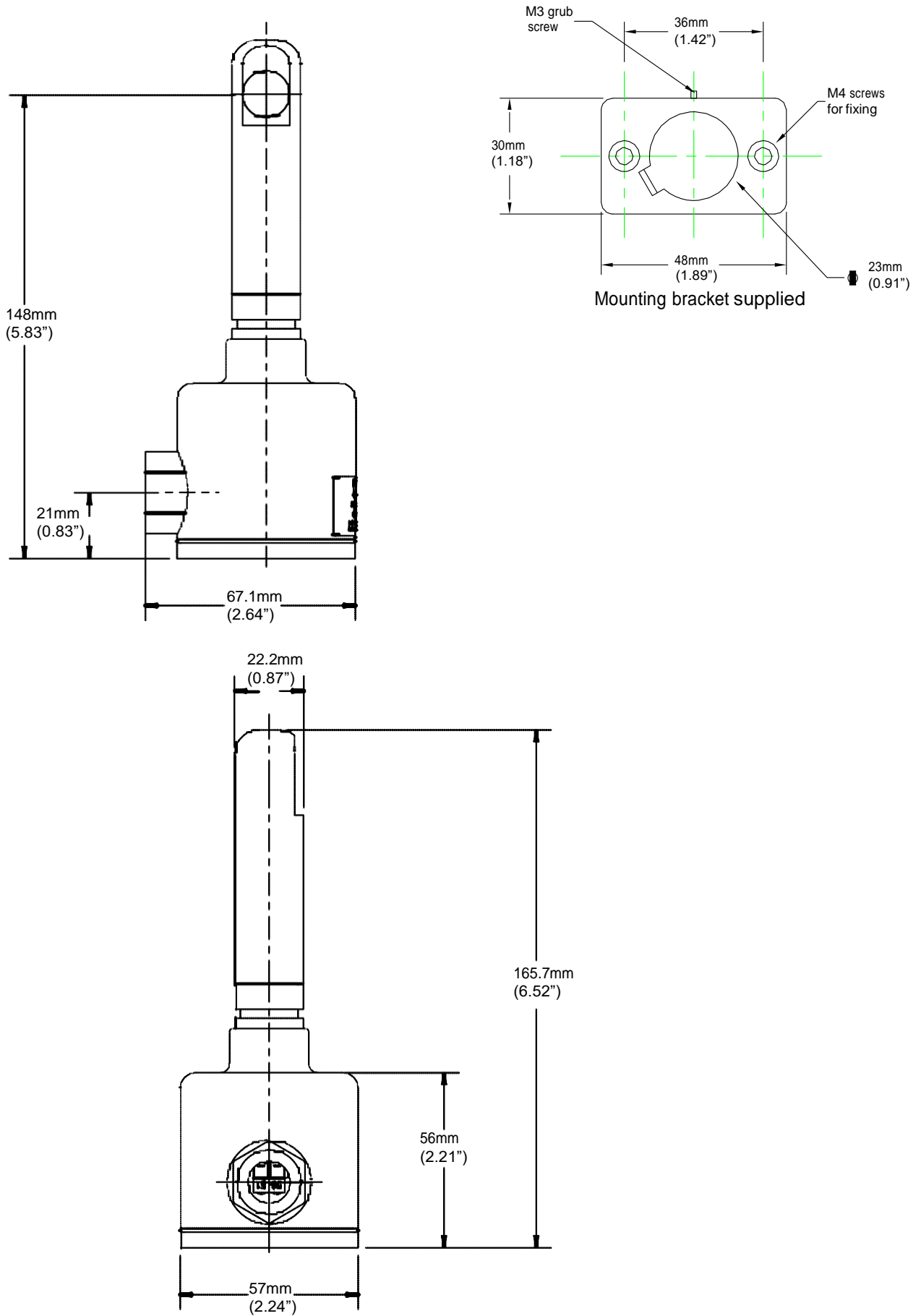


Drawing No. 图纸号: 9026

IP	54
NEMA	5
Housing	Aluminium
外壳	铝
Power Consumption	Powered by MM
功率消耗	控制模块供电
Mounting	Any orientation so that photo tube faces the flame
安装	任意方向, 光电管面向火焰

## 2 Flame Safeguard

### Standard European Side Viewing UV Scanner 标准欧洲侧视紫外扫描仪

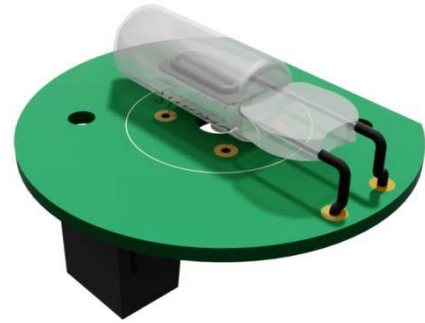
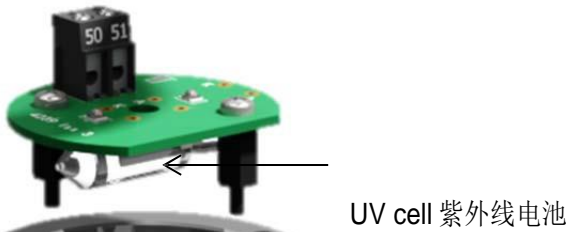
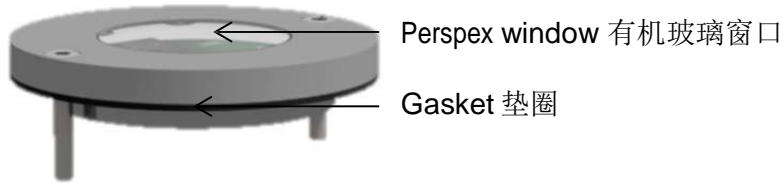


2.2.5 Standard North American UV Scanner – End Viewing 标准北美紫外扫描仪-端视

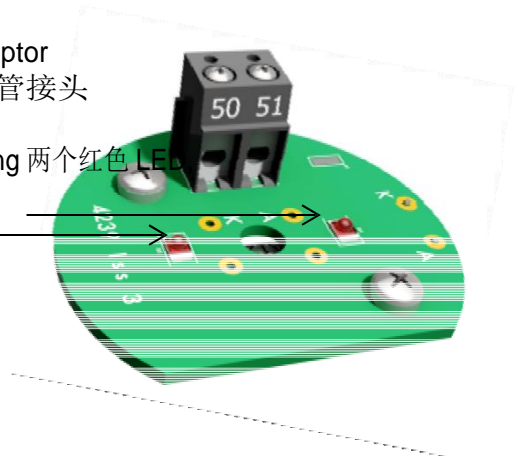
Part number: MM60004/U  
零件号: MM60004/U

Maximum operating temperature: 60°C / 140°F  
最高运行温度: 60°C / 140°F

UV Scanner 紫外扫描仪	MM 控制模块
Red 红色	T51
Blue 蓝色	T50
Connect screen at one end only 仅在一端连接屏幕。	



Two red LEDs showing UV detection  
两个红色LED显示紫外线检测



Quartz glass 石英玻璃

O-ring O型圈

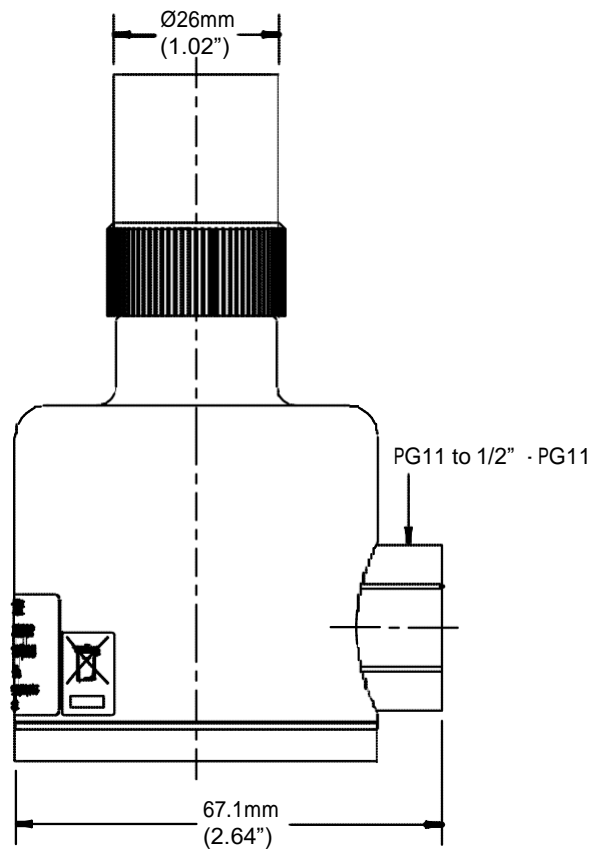
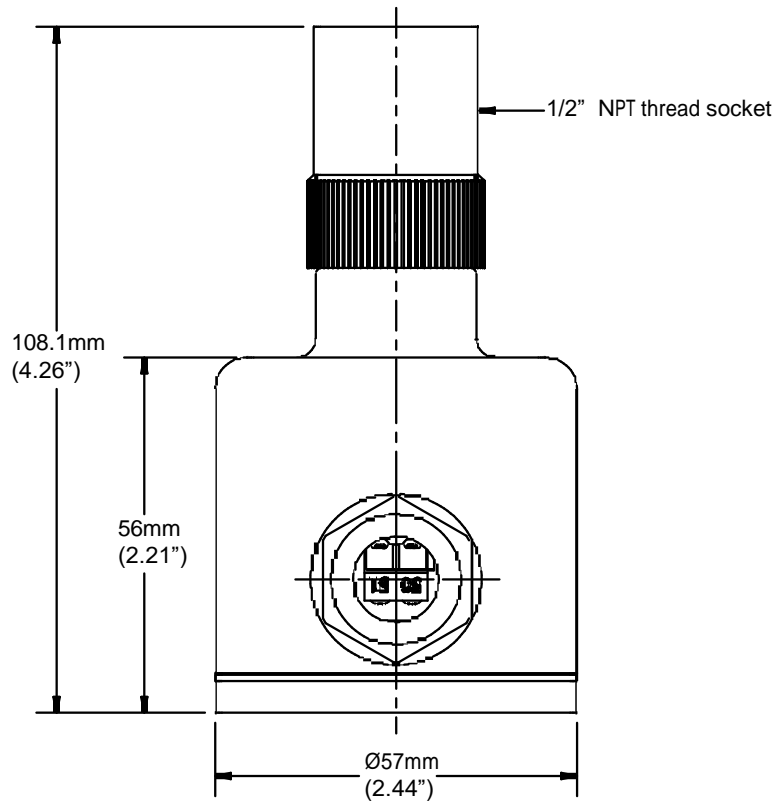
1/4"NPT thread socket 1/4"NPT 螺纹套

Drawing No. 图纸号 9027

IP	54
NEMA	5
Housing	Aluminium
外壳	铝
Power Consumption	Powered by MM
功率消耗	控制模块供电
Mounting	Any orientation so that photo tube faces flame
安装	任意方向, 光电管面向火焰

## 2 Flame Safeguard

### Standard North American End Viewing UV Scanner 标准北美端视紫外扫描仪



**2.2.6 Standard North American UV Scanner – End Viewing High Sensitivity**

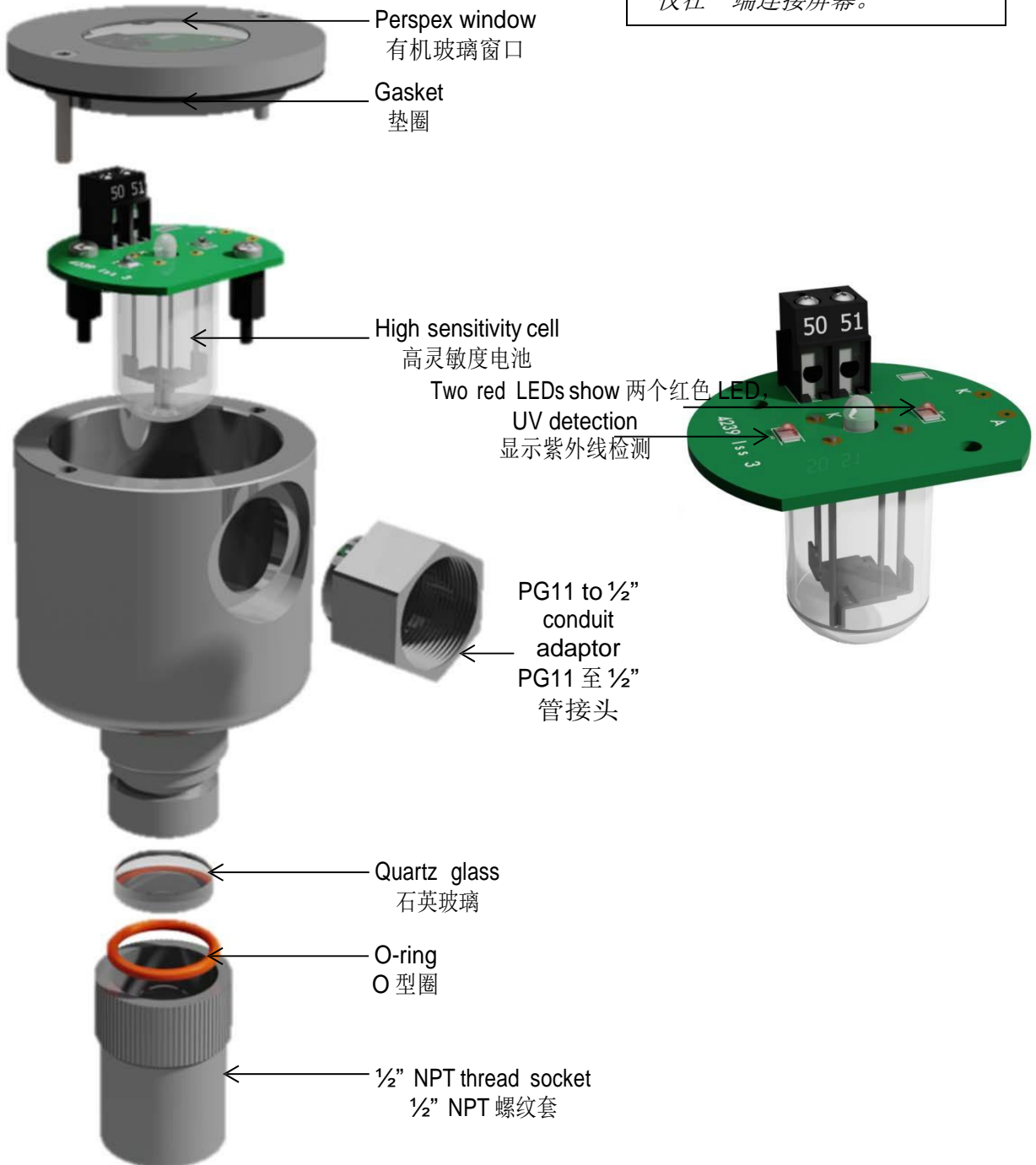
标准北美紫外扫描仪-端视高灵敏度

Part number 零件号: MM60004/HSU

Maximum operating temperature: 60°C / 140°F

最高运行温度: 60°C / 140°F

UV Scanner 紫外扫描仪	MM 控制模块
Red 红色	T51
Blue 蓝色	T50
Connect screen at one end only. 仅在一端连接屏幕。	



Drawing No. 图纸号: 9027

IP  
NEMA  
Housing

54  
5  
Aluminium

## 2 Flame Safeguard

外壳

Power Consumption

功率消耗

Mounting

安装

铝

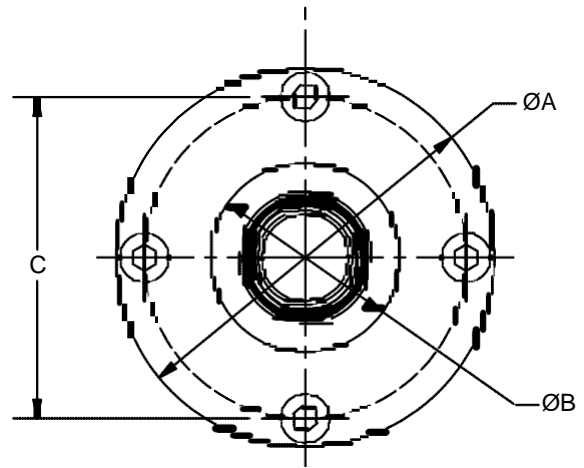
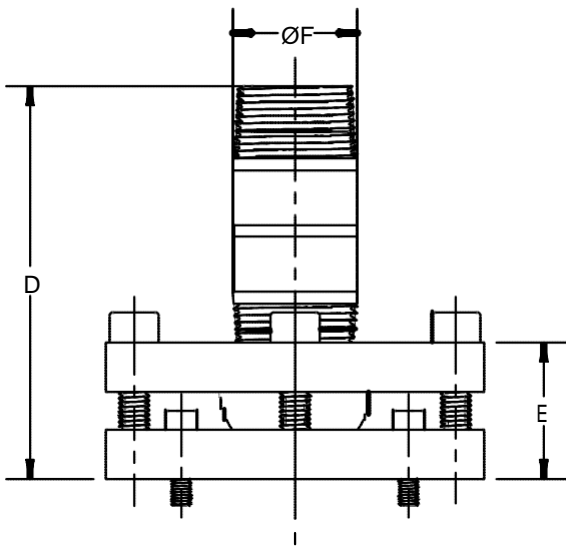
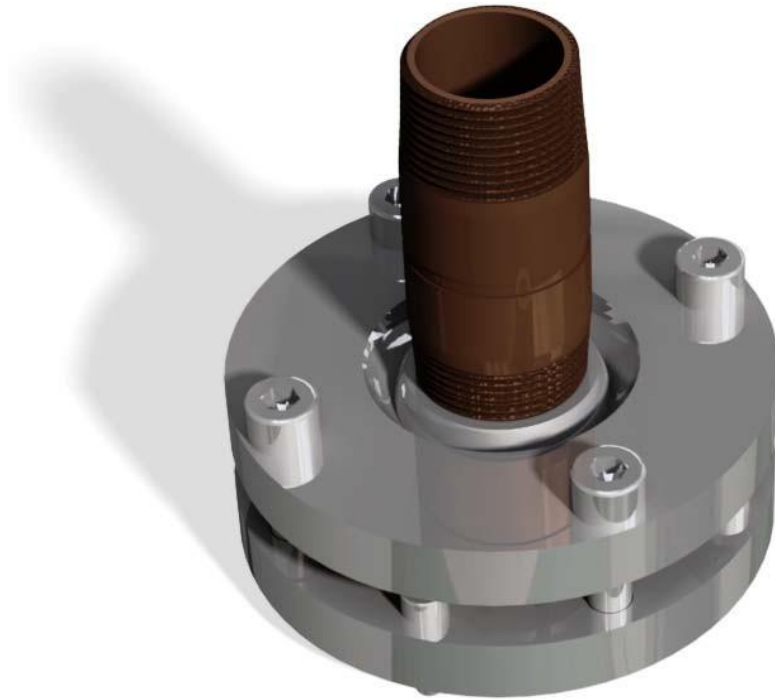
Powered by MM

控制模块供电

Any orientation so that photo tube faces flame

任意方向，光电管面向火焰

2.2.7 Swivel Mount Assembly 转座总成



Part 零件	Dimensions: mm (inches) 尺寸: mm(英寸)					
	A	B	C	D	E	F
Swivel mount 1" UVM60003 转座	100 (3.94)	50 (1.97)	85 (3.35)	104 (4.09)	36 (1.42)	33 (1.30)
Swivel mount 0.5" UVM60004 转座	100 (3.94)	50 (1.97)	85 (3.35)	86 (3.37)	36 (1.42)	26 (0.99)

## 2.3 Selection Of UV Scanner Types 紫外扫描仪类型的选择

### Normal Sensitivity 正常灵敏度

If the distance from the UV scanner to the flame is 500mm (20 inches), the normal sensitivity UV scanner types may be used.

如果紫外扫描仪至火焰的距离是 500mm (20 英寸)，则可以使用正常灵敏度紫外扫描仪。

MM 60004	Standard Side View 标准侧视
MM 60004/U	Standard End View 标准端视

The following considerations must kept in mind when selecting a UV scanner, 选择紫外扫描仪时必须考虑以下内容：

- Flame size  
火焰尺寸
- Flame shape (dependent on the burner used)  
火焰形状 (取决于使用的燃烧器)
- Flame intensity (a function of flame size and shape and fuel used)  
火焰强度 (火焰尺寸和形状的功能和使用的燃料)
- Flame obstructions  
火焰障碍

When the signal strength is low, a high sensitivity scanner type might be necessary for distances below 500mm (20 inches).

当信号强度弱时必须使用高灵敏度扫描仪且距离小于 500mm(20 英寸)。

**Note:** All self-check UV scanners are high sensitivity as standard.

**注：**所有自检紫外扫描仪都标配高灵敏度

### High Sensitivity 高灵敏度

If the distance from the UV scanner to the flame exceeds 500mm (20 inches) a high sensitivity UV scanner type is recommended.

如果紫外扫描仪至火焰的距离大于 500mm (20 英寸)，则可以使用高灵敏度紫外扫描仪。

MM 60003/HS	Self Check End View 自检端视
MM 60003/HS/SV	Self Check Side View 自检侧视
MM 60004/HSU	Standard End View 标准端视

The maximum safe distance a UV scanner can be from a flame is dependent on 紫外扫描仪至火焰的最大安全距离取决于以下内容：

- The intensity of UV radiation emitted from the main flame and pilot flame  
主火焰和引燃火焰释放的紫外线辐射强度。
- The geometry of the combustion chamber and available space  
燃烧室和可用空间的几何形状。

This will vary between applications but the maximum distance allowed is 1500mm (6 ft) between a high sensitivity scanner and flame.

上述内容在不同应用领域有所不同，但高灵敏度扫描仪和火焰允许的最大距离是 1500mm (6 英尺)。

**Note:** The above information is based on the results of tests conducted using a laboratory pilot flame supplied from a Bunsen burner of flame size 100x20mm.

**注：**上述信息来源于利用实验室引燃火焰的测试结果，引燃火焰由 **Bunsen** 提供，燃烧器火焰尺寸 100x20mm。

**Note:** The maximum allowable cable distance between the MM and a UV scanner is 25m (82ft).

**注：**控制模块和紫外扫描仪的最大电缆距离是 25m(82 英尺)。



**2.3.1 UV Installation 紫外扫描仪的安装**

The end view scanner is show in Figure 2.3.1.i. The size of the flame is allowed for the distance the UV scanner is away from the flame.

端视扫描仪见图 2.3.1.i，火焰尺寸允许紫外扫描仪远离火焰。

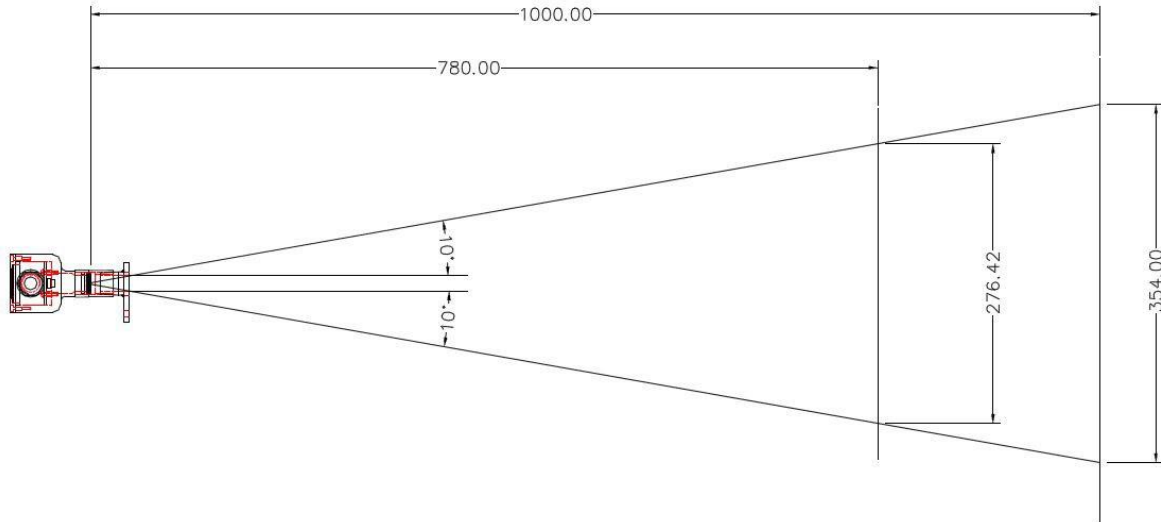


Figure 2.3.1.i UV Scanner Installation

图2.3.1.i 紫外扫描仪的安装

### 2.3.2 UV Self Adaptive Pulse Width Modulation

#### 紫外自适应脉冲宽度调制

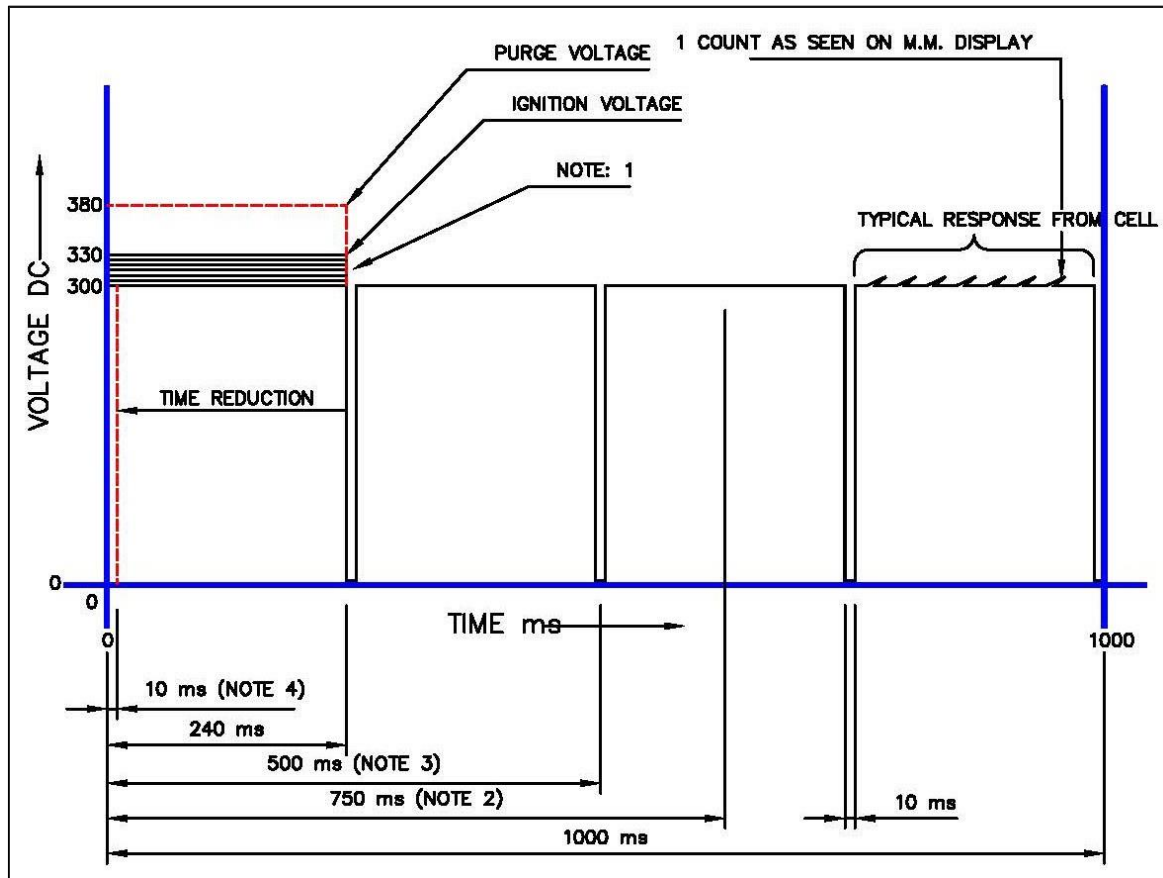


Figure 2.3.2.i UV Timing Diagram

图2.3.2.i 紫外时间图

Figure 2.3.2.i shows a timing diagram for the UV signal.

图 2.3.2.i 显示了紫外信号的时间图。

After first safety time, voltage is reduced by 5 volts every 500ms. This is providing the flame signal is above the U.V. setpoint. If below the U.V. threshold, voltage will remain at 330 volts. The voltage will not increase during main flame operation.

第一安全时间后，电压每隔 500ms 下降 5 伏，这可以使火焰信号高于紫外线设定点。如果电压小于紫外线阈值，电压将保持在 330 伏。电压在主火焰运行期间将不会增加。

If 5 counts or less have been detected over any 730ms period, the system will invoke a lockout. A short circuit between the two wires connected to the U.V. would produce 3 counts or less. This is the reason for nominating 5 counts as the lockout level.

如果在 730ms 期间检测到 5 个计数，则系统将触发锁定。连接紫外扫描仪的两个接线间出现短路时，将产生 3 个计数或更少。这就是为什么锁定位置为 5 个计数。

During normal operation, 300 volts would be applied for a 240ms period after the second safety time. This is providing the U.V. signal is above the U.V. setpoint which is set at 25 counts. The setpoint cannot be adjusted.

在正常运行期间，在第二安全时间后 240ms 将产生 300 伏电压，这就使紫外信号高于紫外线设定点，即为 25 个计数。该设定点无法调节。

If the UV count is above 25 counts then the time voltage is applied to the UV sensor is decreased by 1 ms every 500 ms. This time is reduced until a maximum of 10ms has been reached. This helps preserve

## 2 Flame Safeguard

the life of the UV scanner as the time that voltage is applied to the scanner is reduced dramatically.

如果紫外线计数大于 25，则施加紫外扫描仪的电压每 500ms 降低 1ms。该时间直至达到最大 10ms 时将减少。这可以保持紫外扫描仪的寿命，因为施加到扫描仪的电压时间将大幅减少。

Every 500ms the recorded counts are averaged and displayed on the MM screen.

每 500ms，记录的时间将取平均值并显示在控制模块屏幕上。

**Note:** When using a self-check scanner the timing reduction resets the minute when the paddle operates.

注：使用自检扫描仪时，时间减少将在开关运行时重置分钟数。

### 2.3.3 Dual Flame Scanner Operation

#### 双火焰扫描仪的运行

Dual flame scanner operation is designed to give extra safety to the flame detection system by there being a second scanner to verify that the other scanner is working correctly and is detecting a flame correctly in addition to the self-diagnostics built into the MM.

双火焰扫描仪主要设计用于为火焰检测系统提供额外安全保护，除控制模块安装了自诊断设备，还配有两个扫描仪，可以验证另一个扫描仪是否正常工作，并正确检测火焰。

Option/parameter 122 sets dual flame scanner operation.

选项/参数 122 用于设置双火焰扫描仪的运行。

Dual flame scanner operation 双火焰扫描仪的运行	MM Compatibility 控制模块兼容性
IR and UV 红外线和紫外线	Mk8 MM, Mini Mk8 MM Mk8 控制模块, Mk8 微型控制模块
IR and Ionisation 红外线和电离作用	Mini Mk8 MM Mk8 微型控制模块
IR or UV 红外线或紫外线	Mk8 MM Mk8 控制模块
Ionisation to UV switchover 电离作用至紫外线切换	Mini Mk8 MM Mk8 微型控制模块

Both scanners work independently in detecting a flame signal so it is not required that the two scanners have to read the same flame signal strength. It is recommended that a good flame signal is found on both scanners to ensure reliable operation of the dual scanners.

两个扫描仪单独运行，用于检测火焰信号，这样两个扫描仪无需读取相同的火焰信号强度。建议在两个扫描仪上获得较好的火焰信号，以便确保双扫描仪能可靠运行。

#### IR and UV. IR and Ionisation

##### 红外线和紫外线，红外线和电离作用

Both flame scanners must detect a flame when there should be and vice versa. If either flame scanner fails to see a flame when there should be a flame, the MM will lockout on no flame signal, even if the other scanner detects the flame. This is the same for simulated flame; only one scanner has to see a flame a when there should not be, for the MM to lockout.

两个火焰扫描仪必须在需要时能检测到火焰。如果在出现火焰时某个火焰扫描仪无法检测到火焰，则控制模块将在无火焰信号时锁定，即使另一个扫描仪检测到火焰。这同样适用于模拟火焰，在没有火焰时，如果仅有一个扫描仪检测到火焰，控制模块将锁定。

#### IR or UV

##### 红外线或紫外线

Either flame scanner must detect a flame when there should be and vice versa. If one flame scanner fails to see a flame when there should be but the other scanner does detect a flame, then the MM will continue to fire without a lockout. Only if both flame scanners fail to detect the flame when there should be and vice versa, will the MM lockout. This is the same for simulated flame; either or both scanners have to see a flame when there should not be, for the MM to lockout.

需要时任何一个火焰扫描仪都必须能检测到火焰。如果在出现火焰时某个火焰扫描仪无法检测到火焰，但另一个扫描仪可以检测到火焰，则控制模块将继续燃烧，而不会锁定。当出现火焰时如果两个火焰扫描仪都无法检测到火焰，则控制模块将锁定。这同样适用与模拟火焰。在没有火焰时，如果任一个或两个扫描仪都能检测到火焰，控制模块将锁定。

#### Ionisation to UV Switchover

##### 紫外线切换电离作用

The ionisation rod can be used to detect the pilot flame and then the UV scanner can be used to check the main flame. The pilot type must be set to interrupted pilot or continuous interrupted pilot (only available on the Mk8 MM) when using ionisation to UV switchover.

## 2 Flame Safeguard

电离作用杆可以用于检测引燃火焰，然后可以使用紫外扫描仪检查主火焰。使用紫外线切换电离作用时，引燃类型别想设置为中断引燃或继续中断引燃（仅适用 **Mk8** 控制模块）。

### AGA

澳大利亚燃气协会

The AGA (Australian Gas Association) requires that there are 2 types of technologies together checking the flame. Option 122 would need to be set to 3 on the Mk8 MM, and 5 and 6 on the Mk8 MM to comply with this regulation. The UV scanner must be self-check a self-check UV scanner to comply with the AGA regulations.

澳大利亚燃气协会同时需要两种技术检查火焰。在 **Mk8** 控制模块上选项 122 需要设为 3，**Mk8** 控制模块设为 5 和 6，以满足上述规定。紫外扫描仪必须进行能够自检自检紫外扫描仪，以满足澳大利亚燃气协会的规定。

## 2.4 Mk8 MM Flame Detection Using An External Flame Switch

### 利用外部火焰开关进行 Mk8 控制模块火焰检测

To configure operation with a flame switch, option/parameter 122 must be set to 1.  
利用火焰开关进行设置时必须将选项/参数 122 设为 1。

The operation of Terminals 85 and 86 must be as follows:  
终端 85 和 86 的运行必须遵守以下规定：

When the flame switch indicates no flame, the voltage on Terminal 85 must be 0Vac, and the voltage on Terminal 86 must be mains voltage (110/230Vac).  
当火焰开关指示没有火焰时，终端 85 上的电压必须是 0Vac，终端 86 上的电压必须是主电压（110/230Vac）。

When the flame switch indicates the presence of a flame, the voltage on Terminal 85 must be mains voltage (110/230Vac), and the voltage on Terminal 86 must be 0Vac.  
当火焰开关指示存在火焰时，终端 85 上的电压必须是主电压（110/230Vac），终端 86 上的电压必须是 0Vac。

Terminal 85 is the functional input for detecting the flame.  
终端 85 属于功能输入，用于检测火焰。

Terminal 86 is solely for the purpose of checking that Terminal 85 is operating correctly.  
终端 86 的作用仅是检查终端 85 是否正常运行。

Terminal 86 must be seen to be the inverse of Terminal 85, i.e. if Terminal 85 is at 0Vac, terminal 86 must be at mains voltage and if Terminal 85 is at mains voltage, Terminal 86 must be at 0Vac.  
终端 86 必须与终端 85 相反，例如，如果终端 85 处于 0Vac，终端 86 在必须处于主电压，如果终端 85 处于主电压，则终端 86 必须处于 0Vac。

If Terminal 86 does not follow the inverse of Terminal 85 the following lockout will occur – ‘Terminal 86 inverse.’  
如果终端 86 与终端 85 不是呈相反状态，则将会出现锁定-终端 86 相反。

**Note:** High purge interlock (parameter #92) will not operate with flame switch.  
**注：**高吹扫联锁（参数 92）在有火焰开关时不会运行。

Within the MM there is a latency of 250 milliseconds on the monitoring of Terminal 85. To ensure a 1 second overall flame failure response time, it is essential that the response time of the flame switch is set to no more than 750 milliseconds.

在控制模块中，对终端 85 的监控有 250 毫秒的延迟。为确保 1 秒整体火焰故障响应时间，有必要将火焰开关的响应时间设为不超过 750 毫秒。

Flame switches often provide a volt free changeover contact to indicate the flame status. Alternatively, they may provide a pair of ‘inverse’ outputs. If the flame switch only provides a single output terminal, a relay will have to be installed between the flame switch and the MM to provide a set of volt free changeover contacts.

火焰开关通常提供无电压转换接触，以指示火焰状态。同时，火焰开关还会提供一对“相反”输出。如果火焰开关仅提供单独的输出终端，则必须在火焰开关和控制模块间安装继电器，以便提供完整的无电压转换接触。

## 2.5 Mini Mk8 MM Flame Detection Using Ionisation

### 利用电离作用进行 Mk8 微型控制模块火焰检测

As well as using UV or IR, the Mini Mk8 MM can detect a flame using an ionisation signal/flame rod. This is wired into terminal 64 and the cable must be shielded.

使用紫外线或红外线时，Mk8 微型控制模块可以利用电离信号或火焰杆检测火焰。Mk8 微型控制模块应与终端 64 相连且电缆必须屏蔽。

For ionisation, the flame will be signalled when the rectification voltage is above 30Vdc, the maximum sensed rectification voltage is 540Vdc, above which a Lockout will be generated.

关于电离作用，当整流电压大于 30Vdc 时将会发出火焰信号，可检测出的最大整流电压是 540Vdc，超过该电压值时将会导致锁定。



## 2.6 No Pre-Purge 无预吹扫

It is possible to minimise the burner start-up time by bypassing the pre-purge. The major advantage of this control means that the overall boiler efficiency is increased by minimising the heat loss to the stack during a purge cycle. This means the burner starts-up quicker therefore reaching setpoint in a reduced time. According to the EN676 European regulation, the burner is allowed to restart without a pre-purge if the burner has recycled due to operational temperature/pressure. When the burner is stopped by a lockout then this procedure is not allowed and the burner will have to start-up as normal with a pre-purge. In order for no pre-purge to be active, valve proving must take place and finish successfully. If this valve proving operation is successful then the burner may start-up without a pre-purge.

可以绕过预吹扫减少燃烧器启动时间，这种控制方法的主要优点是在吹扫阶段通过减少排气管热损失来提高锅炉的效率。这意味着燃烧器启动时间更快，可以在更短的时间到达设定点。根据 EN676 欧洲法规，如果燃烧器因运行温度/压力而再循环，则燃烧器允许在不进行预吹扫的情况下重启。当燃烧器因锁定而停止时，则不允许进行上述步骤。此时燃烧器将正常启动并带有预吹扫。为了不激活预吹扫，必须进行阀门检验并成功完成检验。如果阀门检验操作成功，则燃烧器则会在不进行预吹扫的情况下启动。

In order to initiate the no pre-purge feature, option/ parameter 143 must be set to a value of 1. During the first start-up the burner will start with a pre-purge initiated. Once the complete commissioning curve has been entered and the burner has started successfully, the burner will then start-up every time with no pre-purge. If the burner goes above its setpoint and turns off on high temperature/ pressure, then the next time the burner starts-up, it will go through the VPS operation and then light off without a pre-purge, i.e. the burner has shut down in a controlled manner and the gas valves have been checked for integrity.

为了不激活预吹扫功能，选项/参数 143 必须设为 1。在第一次启动时，燃烧器将在预吹扫情况下启动，当成功输入调试曲线且燃烧器成功启动后，燃烧器每次将会在没有预吹扫的情况下启动。如果燃烧器超过其设定点并在高温或高压下关闭，则下次燃烧器启动时将进行阀门检验系统运行，然后在没有预吹扫的情况下关闭，例如：燃烧器安控制的方式关闭，燃气阀已检查完整性。

According to the EN676 regulation, the burner is only allowed to work in this manner if VPS operation has been set to operate before the burner starts up; option/parameter 129 must be set to 0.

根据 EN676 的规定，如果阀门检验系统设为在燃烧器启动前运行，则选项/参数 129 必须设为 0。

The start sequence without pre-purge is as follows:

无预吹扫的启动顺序如下所示：

1. Firstly the system goes through its internal tests and relay checks.  
首先，系统进行内部测试和继电器检查。
2. Call for heat on Terminal 57 activates and the system will go through the VPS operation.  
调用热能激活终端 57，系统将进行阀门检验操作。
3. If this operation is successful then the MM will drive the channels to the light off or start position.  
如果该操作成功，则控制模块将驱动通道至关灯或到启动位置。
4. Once all channels reach the start position then the burner will light off.  
当所有通道都到达启动位置后，燃烧器将熄灯。

burner shuts down in an abrupt manner, e.g. loss of power to the unit, then the next time the burner starts-up a complete purge will be initiated.

燃烧器紧急关闭，例如设备断电，然后下次燃烧器将启动完整的吹扫流程。

If no pre-purge is enabled in option/parameter 143, and one or more of the following conditions occur, the next time the burner starts up, a complete pre-purge will be initiated:

如果在选项/参数 143 中启用预吹扫，则会出现一种或多种以下情况，下次燃烧器启动时将进行完整的预吹扫流程：



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- Burner lockout**  
燃烧器锁定。
- Loss of power to the MM**  
控制模块断电。
- VPS checks have failed**  
阀门检验系统检查失败。
- MM has been in standby for 24 hours or more**  
控制模块 24 小时或更长时间处于待机状态。

**Note:** Pre-purge is only available on fuels which are optioned as gaseous.  
注：预吹扫在选择燃料后才运行。

## 2.7 Continuous Pilot 持续控制

The Mk8 MM has a continuous pilot (pilot relight) feature. If continuous pilot is enabled, when the burner goes above its off differential of the required setpoint, the burner will continue to fire with only the pilot valves energised.

Mk8 控制模块配备了持续控制（控制再点火）功能。如果启用持续控制功能，当燃烧器超过所需设定点的离差时，燃烧器将在控制阀加电后继续燃烧。

To enable continuous pilot, set option/ parameter 111 to either 3 or 4 interrupted continuous pilot or intermittent continuous pilot. If the burner goes off on high temperature/ pressure, then the pilot will continue to fire for a time period, set in option 71. After the time set in option 71, if the main flame is not re-established through load demand, the system will shut down and recycle. Option 72 sets the offset above the required setpoint where during the time period, if the actual temperature/ pressure goes above this value, the pilot will turn off as well.

要启用持续控制功能，必须将选项/参数 111 设为 3 或 4，中断持续控制或间歇持续控制。如果燃烧器在高温或高压下停止，则在一定时间内还会继续控制火焰，该时间可以在选项 71 中设置。在选项 71 中设置时间后，如果通过加载未重新建立主火焰，系统将关闭并再循环。选项 72 用于在上述时间内设置高于所需设定点的补偿值，如果实际温度或压力大于该值，则控制将停止。

In the situation when the burner switches back to pilot flame the burner will open the pilot valves and after the second safety time (option/parameter 116), the burner will close its main valves. During the hot standby position the gas pressure is checked by the gas sensor, it is important that the main valves and pilot valves are connected with a small measuring pipeline. When burner is ready to go back to main flame the main fuel valves will open and after the second safety time the pilot valves will be closed and the normal operation will start again.

当燃烧器开关回到引燃火焰时，燃烧器将打开控制阀，在第二安全时间（选项/参数 116）后，燃烧器将关闭主阀门。在热待机位置，燃气传感器将检查燃气压力。主阀门和控制阀必须与小型测量管道相连。当燃烧器准备就绪回到主火焰时，主燃料阀将打开，在第二安全时间后，控制阀将关闭并再次启动正常运行。

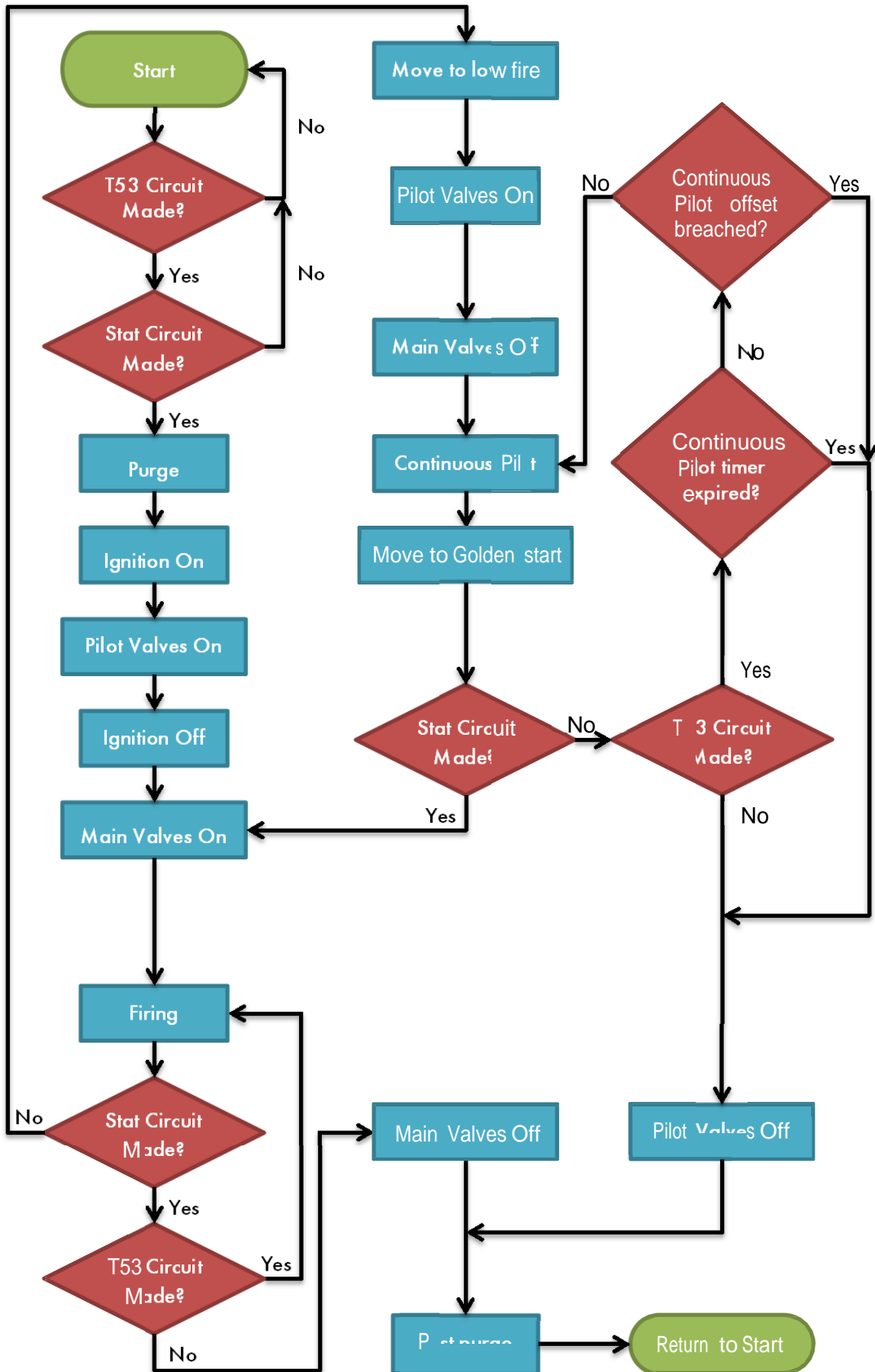
When default settings are used, the quickest the MM can go from pilot to high fire once the stat comes on is approximately 30 seconds. At the slowest motor travel speed and the maximum timings, it would take approximately 1minute and 30 seconds to from pilot to high fire.

当使用默认设置时，控制模块启动后到达高火焰的最快时间约 30 秒。在最低电机运行速度和最大时间时，到达高火焰的时间约为 1 分 30 秒。

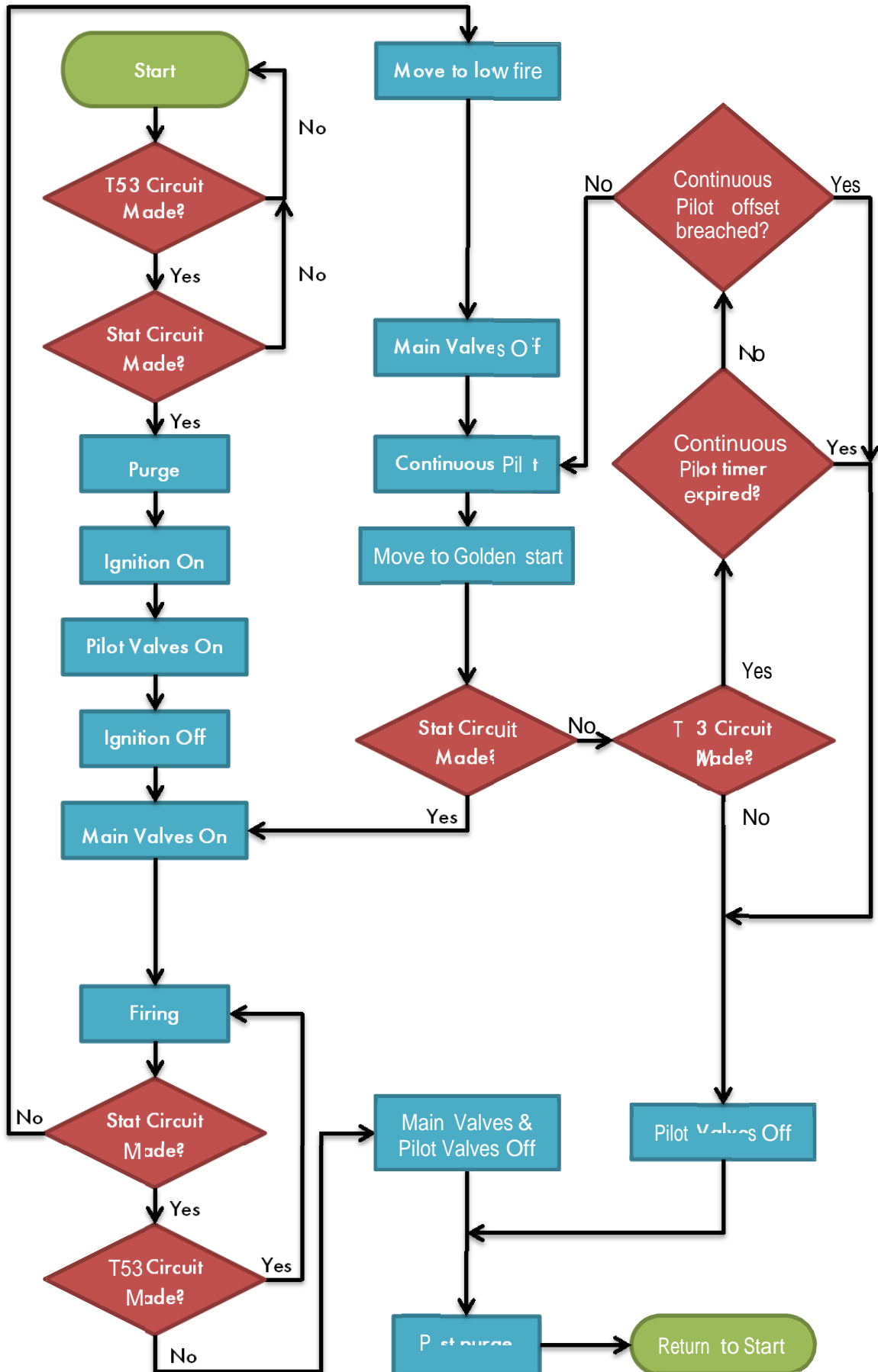
Recommend assured low fire shutoff is used with continuous pilot.

建议低火焰关闭使用持续控制。

2.7.1 Continuous Pilot with Interrupted Pilot Sequence 带中断控制顺序的持续控制



2.7.2 Continuous Pilot with Intermittent Pilot Sequence 带间歇控制顺序的持续控制



## 3 HAND, LOW FLAME HOLD AND AUTO

### 手动、低火焰保持和自动

#### 3.1 Hand Operation 手动操作

Hand operation enables the firing rate positions to be set to a specific position, in the range of low to high fire, when the burner is firing. Fuel flow metering must be entered. Sequencing will not operate correctly if the MM is in hand mode. Hand mode can only be activated when the burner is firing.

当燃烧器燃烧时，从低火焰到高火焰范围内，手动操作可以将燃烧率位置设定至指定位置，此时必须输入燃料流量计量。如果控制模块处于手动模式，则排序将不会正常运行。手动模式只有当燃烧器燃烧时可以启用。

##### Mk8 MM

##### Mk8 控制模块

The Mk8 MM will go into hand mode when a voltage is detected on Terminal 94 or when the hand mode button is pressed in the Status screen. Arrows will then appear on the screen which can be used to increase and decrease the firing rate. Once the hand mode is deactivated, the MM will go to auto mode and fire according to normal modulation. On the Mini Mk8 MM the transfer between hand and auto mode is always bumpless.

当在终端 94 上检测到电压或在状态屏幕上按下手动模式按钮时，Mk8 控制模块将进入手动模式。屏幕上将出现箭头，可以用于增加或降低燃烧率。当禁用手动模式时，控制模块将进入自动模式并正常调节火焰。在 Mk8 微型控制模块中，手动模式和自动模式可以自动切换。

If Hand and Low Flame Hold are selected at the same time via Terminals 94 and 95, then Low Flame Hold takes priority.

如果通过终端 94 和 95 同时选择手动模式和低火焰保持，则低火焰保持将优先运行。

##### Mini Mk8 MM

##### Mk8 微型控制模块

The Mini Mk8 MM will go into hand mode when the hand mode button is pressed in the Status screen. Arrows will then appear on the screen which can be used to increase and decrease the firing rate. Once the hand mode is deactivated, the MM will go to auto mode and fire according to normal modulation. On the Mini Mk8 MM the transfer between hand and auto mode is always bumpless.

在状态屏幕上按下手动模式按钮时，Mk8 微型控制模块将进入手动模式。屏幕上将出现箭头，可以用于增加或降低燃烧率。当禁用手动模式时，控制模块将进入自动模式并正常调节火焰。在 Mk8 微型控制模块中，手动模式和自动模式可以自动切换。

If the low flame hold input is activated on terminal 81 (see option/parameter 155), then this will take priority over the hand button pressed in the Status screen.

如果在终端 81（见选项/参数 155）上启用低火焰保持输入，则在状态屏幕上按下手动按钮后，低火焰保持将优先运行。

#### 3.2 Low Flame Hold 低火焰保持

Low flame hold is the state when the MM's firing rate goes to its low fire position, while the burner is firing. Fuel flow metering must be entered. Sequencing will not operate correctly if the MM is in low flame hold.

低火焰保持是当控制模块燃烧率到达其低火焰位置时的一种状态，测试燃烧器将继续燃烧，必须输入燃料流量计量。如果控制模块处于低火焰保持状态，则排序不会正常运行。

##### Mk8 MM

##### Mk8 控制模块

To put the Mk8 MM into low flame hold, put an input on terminal 95 go to the Status screen and press

#### 4 PID Control

the low flame hold button. The low fire position will be maintained until the input on terminal 95 is removed or the button is pressed again. When switching from low flame hold to auto the MM will return to normal modulation.

要使 Mk8 控制模块处于低火焰保持状态，必须使终端 95 的输入进入状态屏幕并按下低火焰保持按钮。低火焰位置将保持不变，直至删除终端 95 上的输入或再次按下低火焰保持按钮。将低火焰保持切换至自动时，控制模块将返回正常调节。

#### Mini Mk8 MM

##### Mk8 微型控制模块

To put the Mini Mk8 MM into low flame hold, go to the Status screen and press the low flame hold button, or put an input on terminal 81 (option/parameter 155 must be set to 2). Once out of low flame hold, the MM will return to normal modulation.

要使 Mk8 微型控制模块处于低火焰保持状态，进入状态屏幕并按下低火焰保持按钮或在终端 81 上（选项/参数 155 必须设为 2）进行输入。禁用低火焰保持时，控制模块经返回正常调节。

### 3.3 Auto Operation 自动运行

The MM 'Auto' operation enables the burner modulation to maintain the setpoint; the firing rate will modulate according to how far away the actual temperature or pressure is away from the required setpoint. The firing rate is determined from the fuel flow metering entered via option 57; the more accurate the fuel flow metering, the more accurate the firing rate.

控制模块自动运行可以使燃烧器保持设定点，燃烧率将根据实际温度或实际压力与所需设定点的差距而进行调节。燃烧率可以通过选项 57 在输入燃料流量计量后确定，燃料流量计量的越准确，则燃烧率越准确。

## 4 PID CONTROL

### PID 控制

The standard control algorithm used by Autoflame to control the fuel/air ratio is PID control; Proportional-Integral-Derivative control. The control algorithm compares the actual measured temperature or pressure and compares it to the user specified setpoint temperature or pressure. Depending on the measured and setpoint values, the MM's PID control will then either modulate the burner up or down. The rate of change or speed of the burner modulation in relation to changes in measured temperature or pressure is dependent on the settings of the PID control. The PID control action is the sum of the "Proportional" + "Integral" + "Derivative" actions of the PID control. Each contributes to how the 3 term PID control modulates the burner and each operates as outlined below.

Autoflame 使用用于燃料/空气比的标准控制算法是 PID 控制，即比例、积分、微分控制。控制算法比较了实际测量的温度或压力和用户特定的设定点温度或压力。控制模块 PID 控制根据测量值和设定点值不同来上下调节燃烧器。与测量温度或压力相关的燃烧器调节变化率或速度取决于 PID 控制的设置，PID 控制是“比例+积分+微分”控制的总和，每种都可以用于确定 PID 控制怎样调节燃烧器，各项运行如下所述。

The majority of applications can be controlled adequately using just the Proportional and Integral settings; a PI control setup.

利用比例和积分设置可以完全控制大部分应用程序，即 PI 控制设置。

**Modification to the Autoflame system settings should only ever be carried out by qualified combustion engineers. Changes to the Autoflame control system setup has the potential to make the controller operate in an unstable and potentially unsafe manner.**

Autoflame 系统设置必须由有资质的燃烧工程师进行，对 Autoflame 控制系统设置进行更改有可能导致控制器运行不稳定或出现不安全因素。

#### 4.1 Proportional Band 比例范围

The Proportional term is specified in option 6 by defining the "Proportional band" (P-Band). The P-Band is simply an offset from the setpoint pressure or temperature. Outside and below the P-Band, the MM's PID control will modulate the burner at maximum flame, upon reaching the P-Band, it will then modulate the burner linearly down (see option 6).

比例术语可以通过定义“比例范围”（P-band）在选项 6 中指定。比例范围简而言之是设定点压力或稳定的一种补偿，超过或低于该比例范围，控制模块的 PID 控制都将在最大火焰时调节燃烧器，直至达到比例范围内，然后再向下微调燃烧器（见选项 6）。

# 4 PID Control

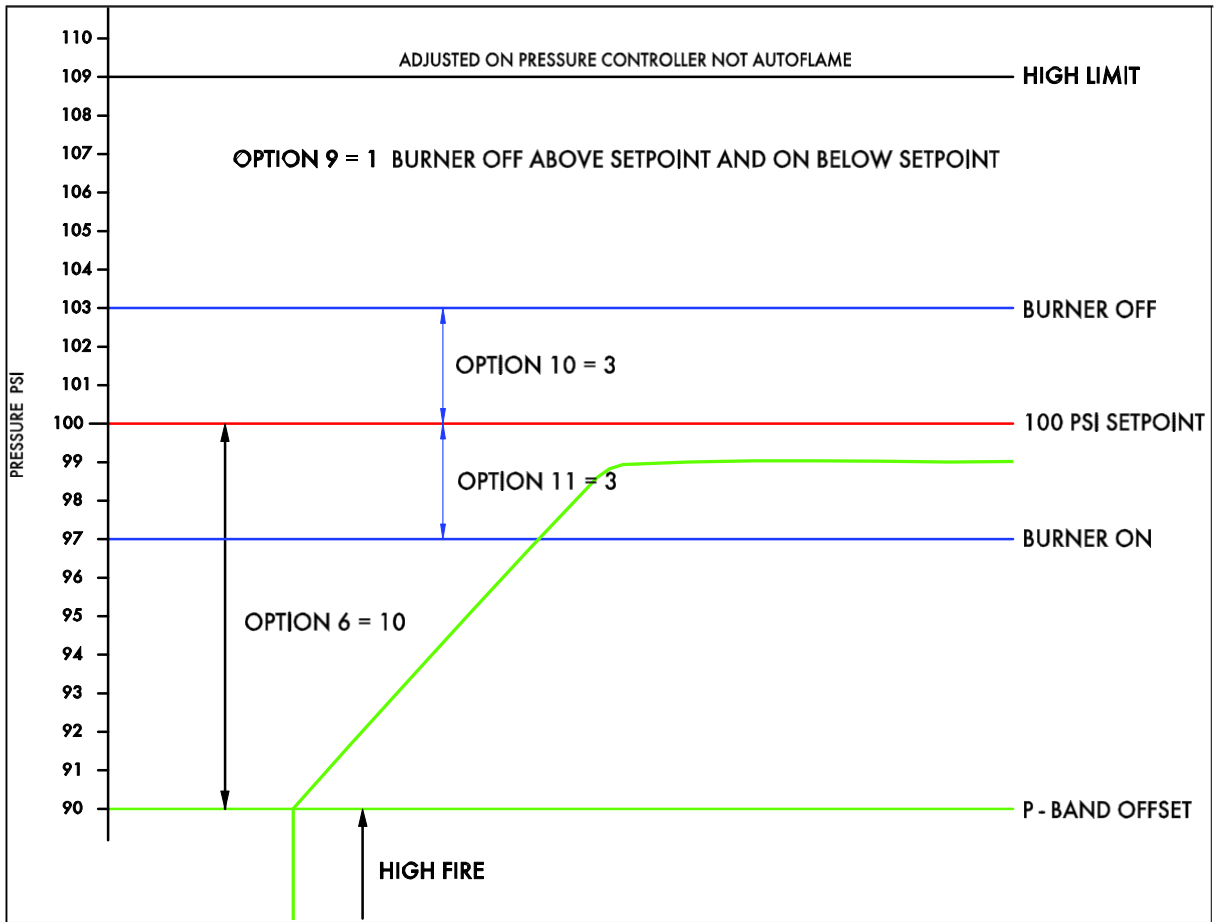


Figure 4.1.i Proportional Band  
图 4.1.i 比例范围



## 4.2 Integral Control 积分控制

The Integral term is specified in option 7, where the “Integral time”, also known as “Reset time”, is set. Within a threshold of the P-Band, the integral term has the effect of increasing or decreasing the burner firing rate by a specific amount every “n” seconds. The amount the firing rate is adjusted by is specified in parameter 106, the default is 10% of the difference between the measured and setpoint temperature or pressure values, and the time period this amount is added, every “n” seconds, “n” is specified in option 7, the default is 60s.

积分控制在选项 7 中指定，“积分时间”还称为“重置时间”，其数值设置在 P-band 阈值范围内。积分控制能根据每“n”秒的具体数量增加或降低燃烧器的燃烧率，燃烧率调节的数量在参数 106 中指定，默认值是测量温度或压力值和设定点温度或压力之间差值的 10%，以及每“n”秒时间范围内增加的量，“n”在选项 7 中指定，默认是 60 秒。

**Note:** The Mini Mk8 MM does not use parameter 106. Option 7 is integral time, for which every ‘n’ seconds, 10% of the present offset from the setpoint is added when below the setpoint, or removed when above the setpoint, to the present proportional value.

**注：**Mk8 微型控制模块不使用参数 106，选项 7 是积分时间，当数值低于设定点时，每“n”秒将会在设定点基础上增加 10%的补偿，当高于设定点时将会达到现有的比例值。

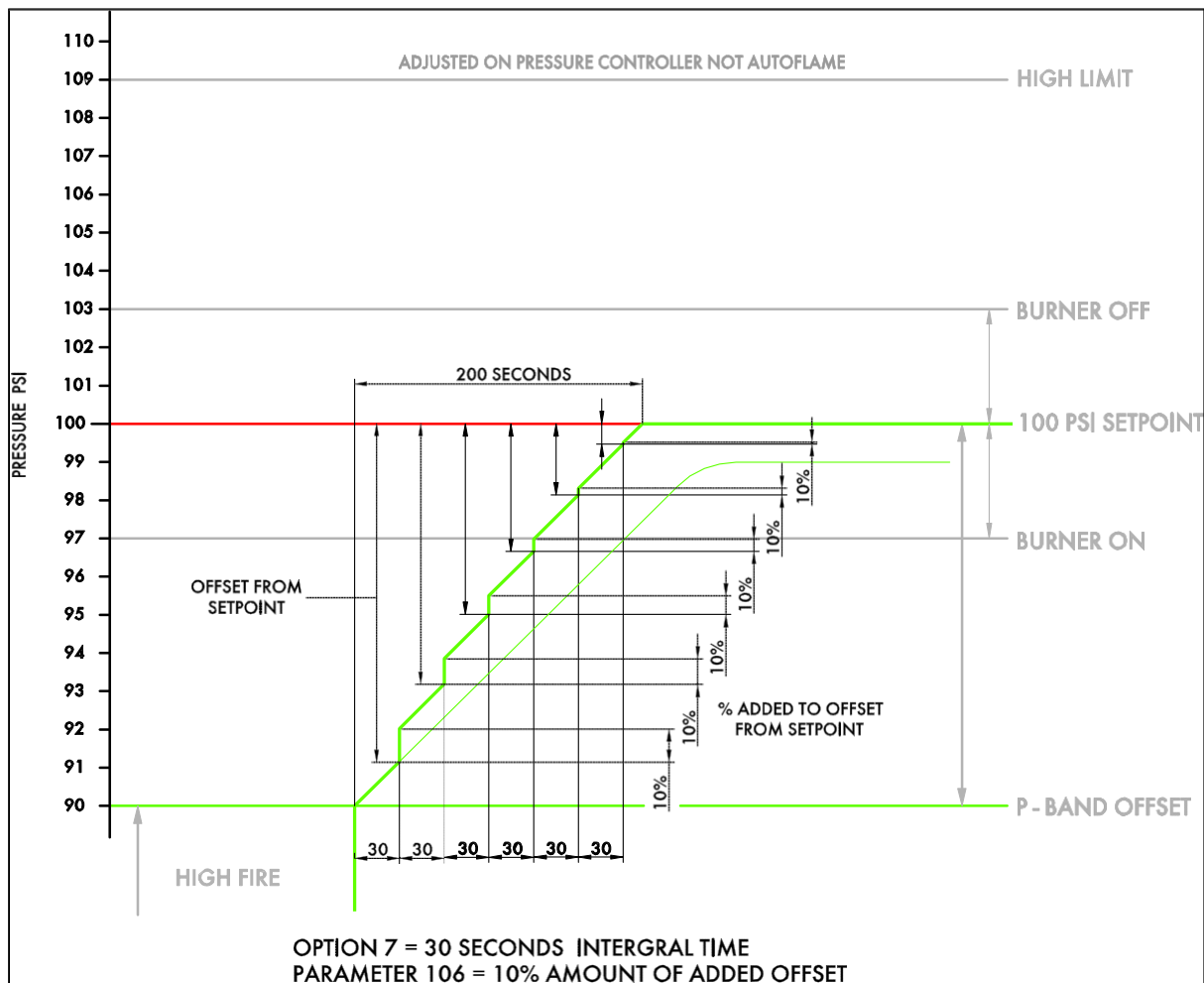


Figure 4.2.i Integral Control

图 4.2.i 积分控制

(Parameter 48 = 0.8, Integral operation band of P-Band)

(参数 48=0.8, P-band 积分运行范围)

### 4.3 Derivative Control 微分控制

The Derivative term of the control system analyses the rate of change in the difference between the measured and set point temperature or pressure. Derivative specific options are set in option 37, 38 and 39. The time interval over which the compared and measured temperature or pressure values are taken is set in option 37, the derivative dead-band or margin above and below the required set point in which no derivative action occurs is set in option 38, and the response sensitivity as a percentage of firing rate increase or decrease is defined in option 39.

控制系统微分控制用于分析测量温度或压力和设定点温度和压力之间差值的变化率。微分控制在选项 37、38 和 39 设置，比较温度或压力值和测量温度或压力值间的时间间隔在选项 37 中设置，高于或低于设定点的微分死区或范围在选项 38 中设置，此时没有微分控制，燃烧率增加或降低的响应灵敏度在选项 39 中定义。

**Note:** The Mini Mk8 MM does not use option 39. The derivative response sensitivity is set as default to 10% firing rate. The derivative time set via option 37 is the time taken to add/remove additional 10% to the firing rate based on the actual value and the required value.

注：Mk8 微型控制模块不使用选项 39。微分响应灵敏度设为 10%燃烧率的默认值。微分时间通过选项 37 设置，根据实际值和所需值的不同用于添加或删除额外 10%燃烧率。

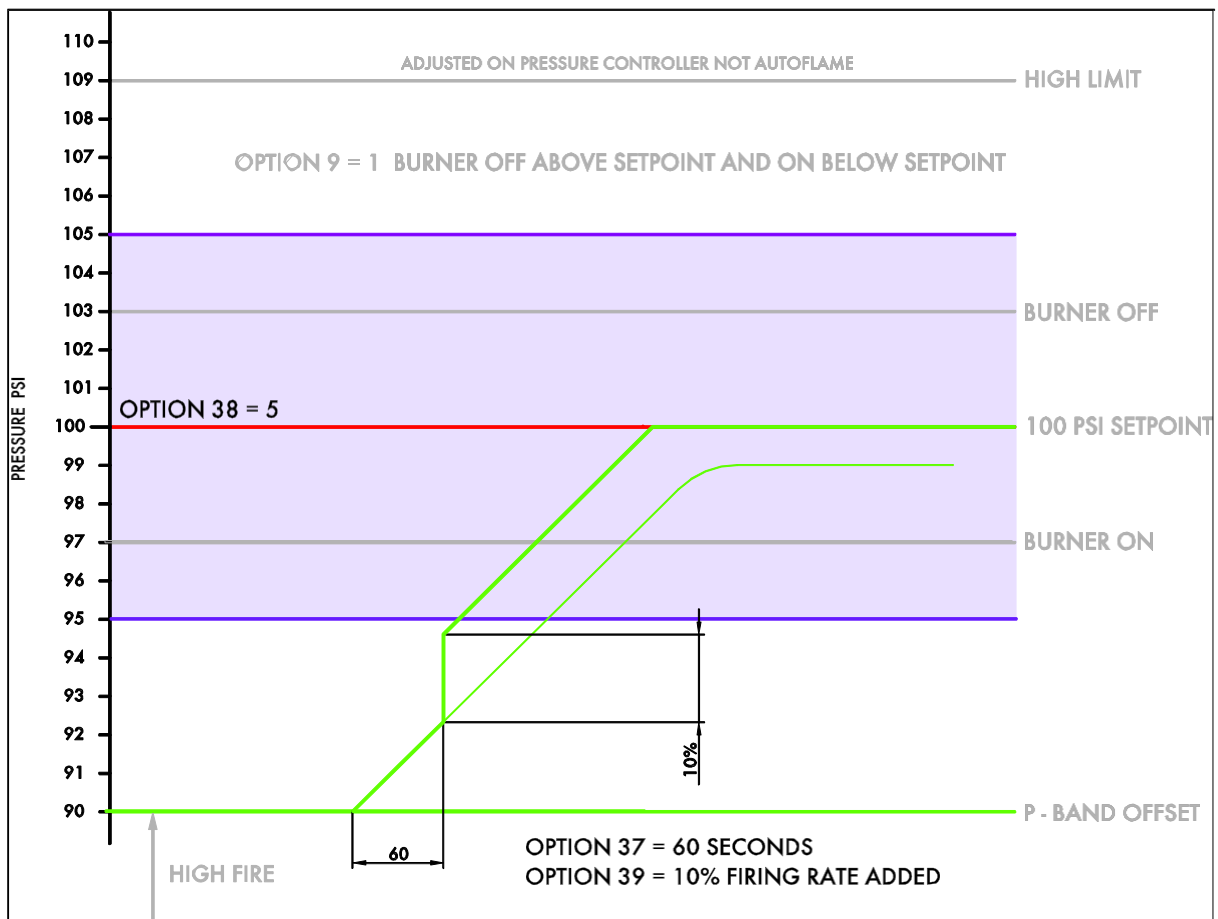


Figure 4.3.i Derivative Control

图 4.3.i 微分控制

**NOTE:** The derivative action occurs at all points outside of the deadband. This includes within the proportional band.

注：微分控制在所有点都超出死区时发挥功能，包括在比例范围内。

## 5 INTELLIGENT BOILER SEQUENCING 智能锅炉排序

The objective of Intelligent Boiler Sequencing (IBS) is to ensure that the minimum number of boiler/burner units are in operation at any one time to satisfy the heat or steam requirement imposed upon the boiler plant, in the case of multi-boiler installations.

智能锅炉排序的目的是确保在任一时间都保持最少数量的锅炉/燃烧器设备，从而在安装多锅炉时满足锅炉厂所需的热量或蒸汽。

The benefits from using IBS include an increased savings in electrical costs, a reduction in thermal stress on the lag boilers, and an increase in overall plant efficiency. It is possible on the MMs to select steam sequencing, low pressure steam sequencing and hot water sequencing.

使用智能锅炉排序的优点包括降低电力成本、减少延迟锅炉的热应力并增加锅炉厂的整体效率。在控制模块上可以选择蒸汽排序、低压蒸汽排序和热水排序。

There are variations of the IBS software that can be selected via the options/parameters procedure: hot water boilers, and steam boilers.

可以通过热水锅炉和蒸汽锅炉的选项/参数选择智能锅炉排序软件的变量。

A maximum of ten MM, EGA, universal I/O modules may be interconnected by a two wire screened data cable. Any MM interconnected may be selected as the lead boiler for the sequencing. The lead boiler is identified by:

控制模块、尾气分析仪和通用输入输出模块可以通过两个屏蔽数据电缆进行连接，相互连接的控制模块可以选择作为排序的主锅炉。主锅炉通过以下方式确定：

1. Connecting a mains voltage onto Terminal 88 (only on the Mk8 MM)  
在终端 88（仅适用 Mk8 控制模块）上连接主电源。
2. Selecting Lead boiler in the IBS screen  
在智能锅炉排序屏幕上选择主锅炉。
3. Instructing the modules via the DTI module (Data Transfer Interface) or by PC CEMS Audit software.  
通过数据传输接口模块或 PC CEMS Audit 软件为模块发出命令。

The sequence order of the MMs in the loop can be changed by changing their ID numbers or by changing the order on the DTI if shuffle sequencing is enabled through parameter 101.

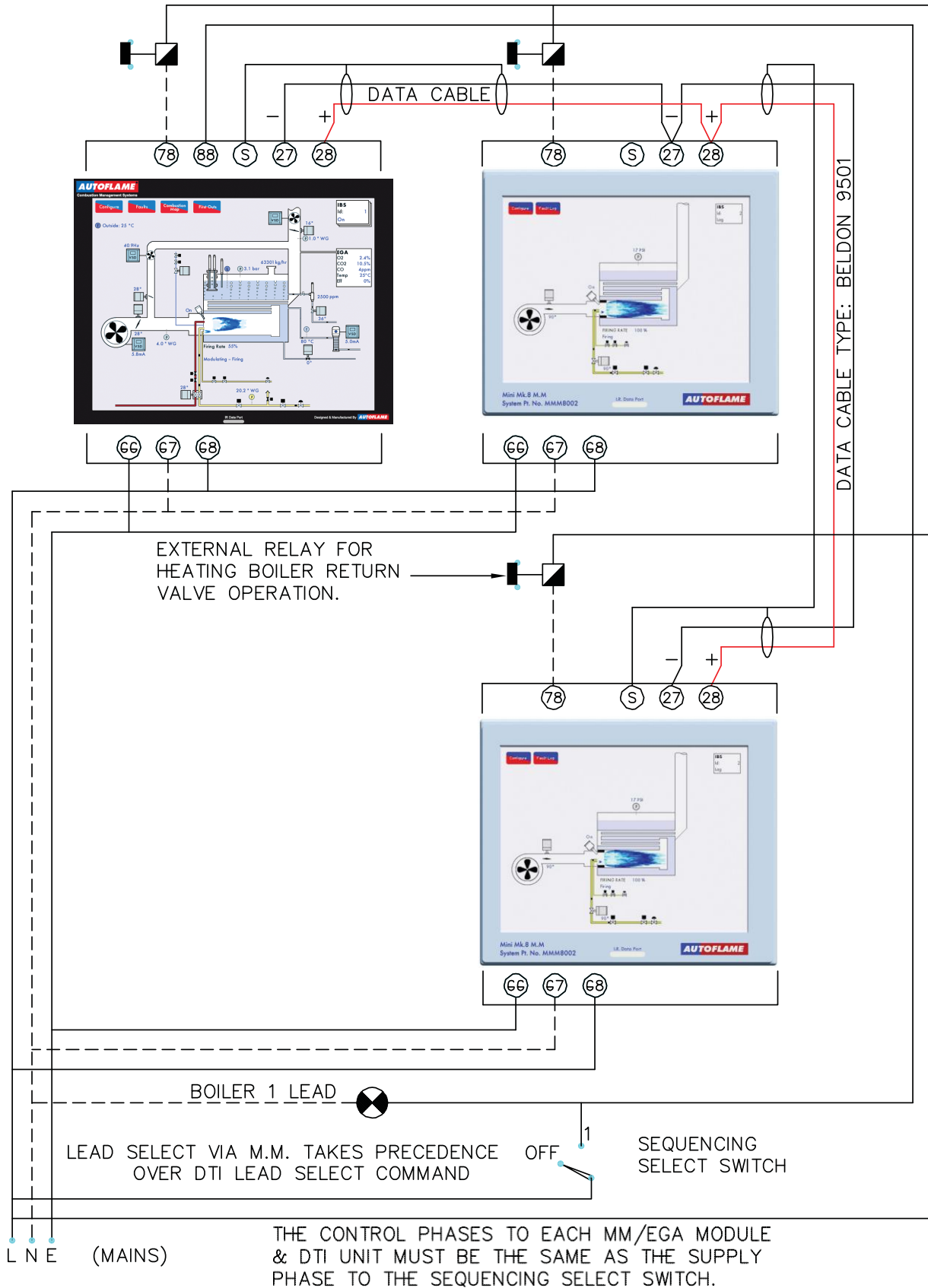
利用参数 101 启用移动排序后，控制模块的排序顺序可以通过改变其标识号或更改数据传输接口次序来更改。

Sequencing can be used with external load detector and multi-burner operation, but it cannot be used with external modulation.

排序可以与外部负载检测器和多锅炉运行一起使用，但不得与外部调节模块一起使用。

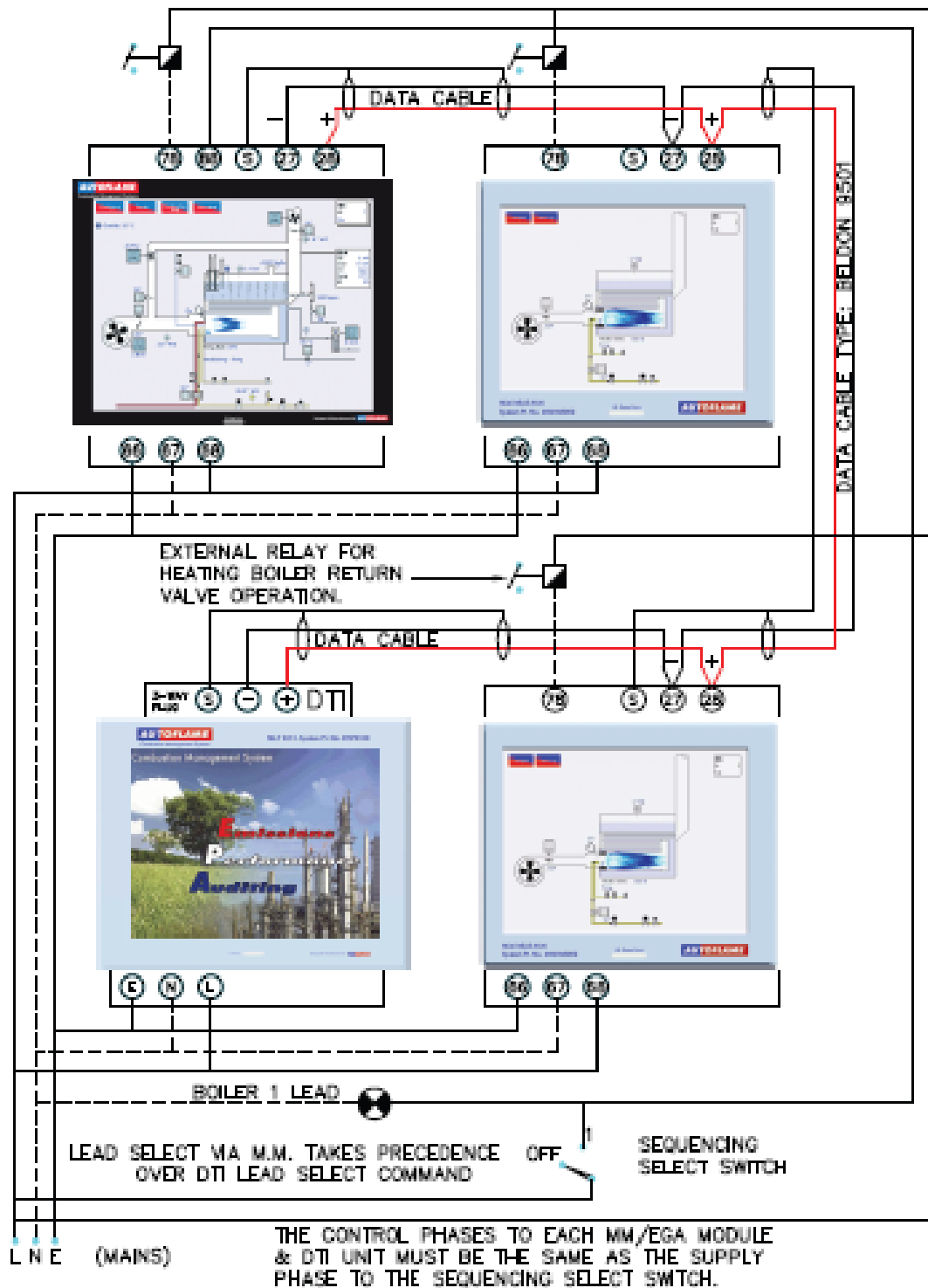
5.1 Sequencing Schematics 排序示意图

5.1.1 Sequencing Connection Diagram 排序连接图

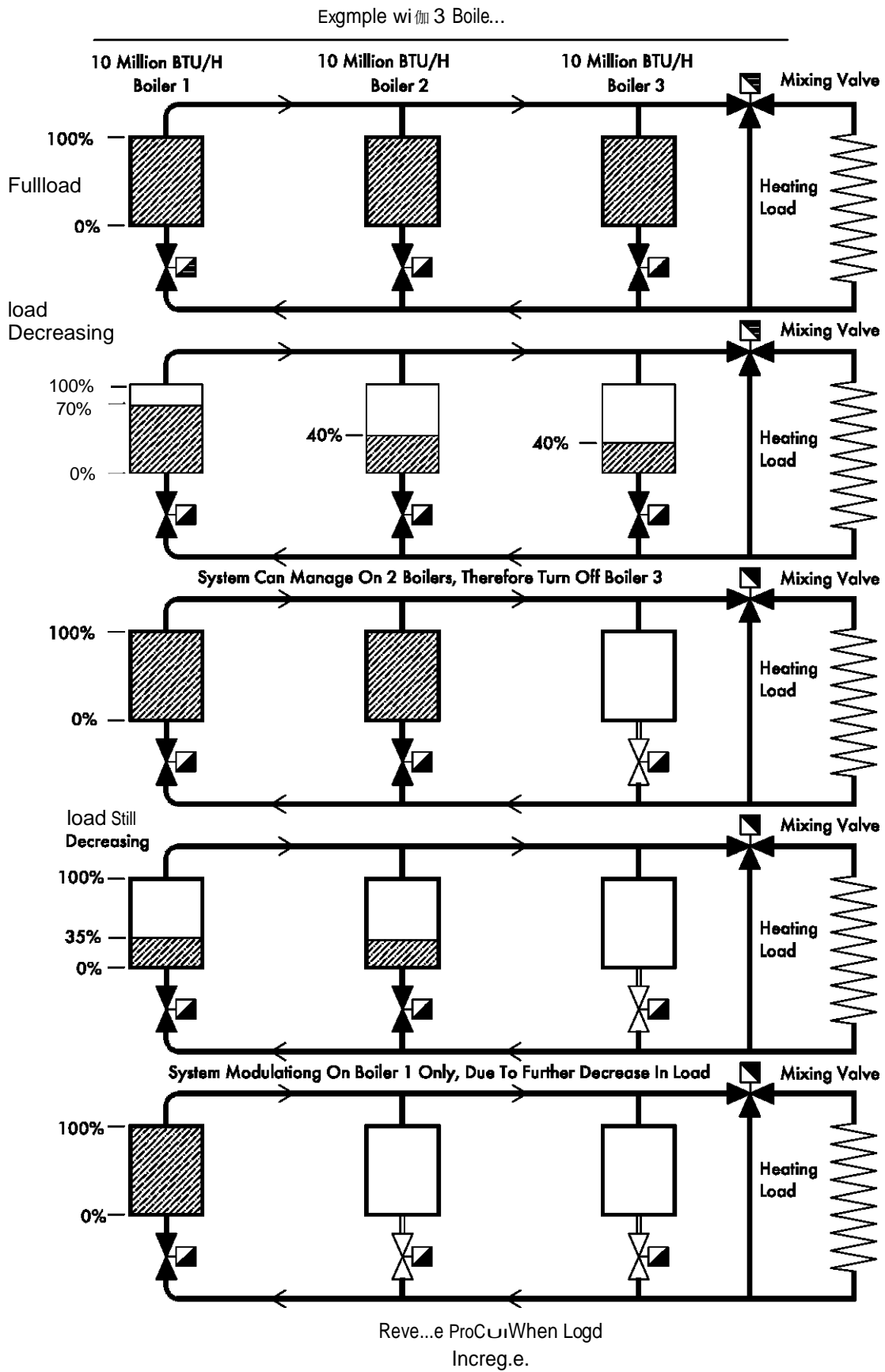


## 5 Intelligent Boiler Sequencing

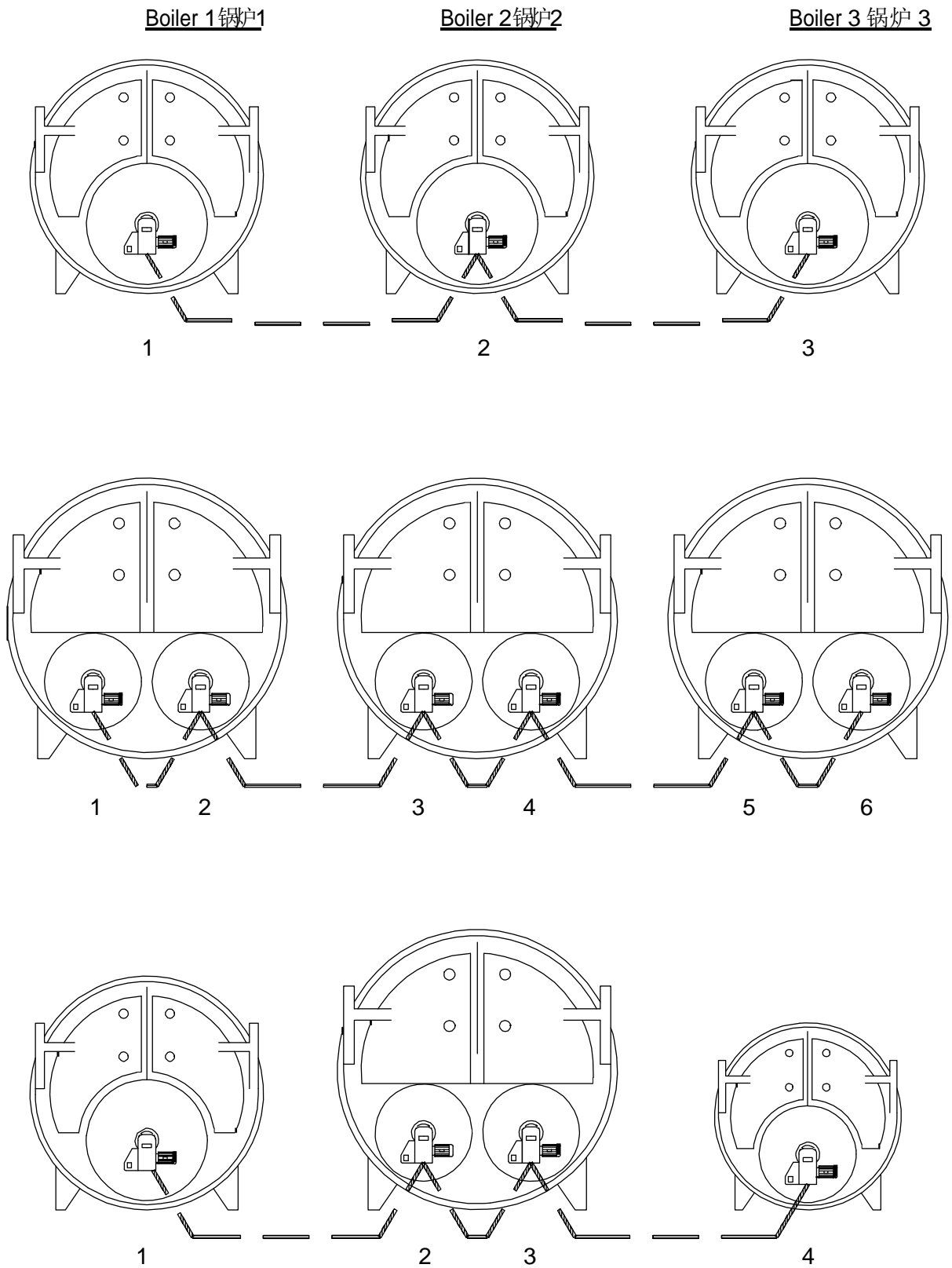
### 5.1.2 DTI Connection Diagram 数据传输接口连接图



5.1.3 Hot Water Example 热水示例



5.1.4 Single/ Multi-Burner Examples 单/多燃烧器示例

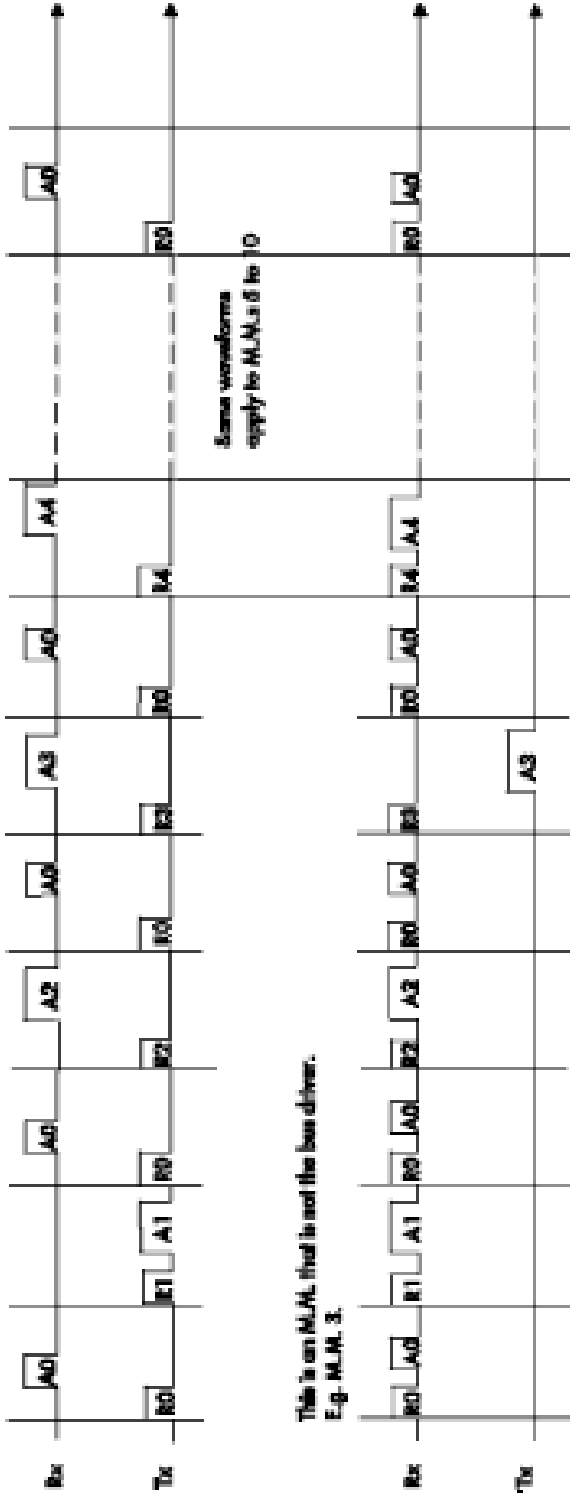


**Note:** Multi-burner operation is not available on the Mini Mk8 MM  
 注：多燃烧器运行无法用于 **Mk8** 微型控制模块。

5.1.5

**IBS Communications**  
IBS 通信

This is the M.M.L. that is sending the communications i.e. the Bus Driver  
E.g. M.M.L. 1.



This is an M.M.L. that is not the bus driver.  
E.g. M.M.L. 3.

Note: Only 1 M.M.L. is the bus driver.  
The bus driver is always the M.M.L. with the lowest ID number in the requesting loop.

- R0 - Request to D.T.L.
- R1 - Request to M.M.L. 1
- R2 - Request to M.M.L. 2
- R3 - Request to M.M.L. 3
- R4 - Request to M.M.L. 4
- R5 - Request to M.M.L. 5
- R6 - Request to M.M.L. 6
- R7 - Request to M.M.L. 7
- R8 - Request to M.M.L. 8
- R9 - Request to M.M.L. 9
- R10 - Request to M.M.L. 10
- A0 - Answer from D.T.L.
- A1 - Answer from M.M.L. 1
- A2 - Answer from M.M.L. 2
- A3 - Answer from M.M.L. 3
- A4 - Answer from M.M.L. 4
- A5 - Answer from M.M.L. 5
- A6 - Answer from M.M.L. 6
- A7 - Answer from M.M.L. 7
- A8 - Answer from M.M.L. 8
- A9 - Answer from M.M.L. 9
- A10 - Answer from M.M.L. 10



## 5.2 Sequencing Options and Parameters

### 排序选项和参数

Options and Parameters must only be changed by factory trained technicians who have a thorough appreciation of the Autoflame combustion systems and the combustion process in general. Any person changing Options and Parameters who does not have the correct factory training and understanding of these settings may place themselves and others in a potentially dangerous situation.

所有选项和参数都必须由工厂培训的技术人员进行更改，且技术人员完全了解 Autoflame 燃烧系统和燃烧过程。未经工厂正式培训或对设置不了解的人员更改选项和参数可能会对本人和他人造成危险。

The following tables show the sequencing options, parameters and expansion options (Mk8 MM only) for the Mk8 MM and Mini Mk8 MM.

下表显示了 Mk8 控制模块和 Mk8 微型控制模块的排序选项、参数和扩展选项（仅用于 Mk8 控制模块）。

Option 选项	Description 说明
16	Sequencing and DTI enable 排序和启用数据传输接口
33	MM identification 控制模块标识
35	Sequence scan time 排序扫描时间
40	Warming facility for low pressure steam 低压锅炉加热设备
41	Warming mode 加热模式
42	Standby setpoint 待机设定点
53	Steam sequencing burner off time 蒸汽排序锅炉关闭时间
54	Steam sequencing burner on time 蒸汽排序锅炉启动时间
57	Fuel flow metering 燃料流量计量
100 (Mini Mk8 MM only) (仅用于 Mk8 微型控制模块)	Sequencing/DTI or Modbus operation 排序/数据传输接口或 Modbus 运行
Parameter 参数	Description 说明
1	Sequence scan time set when unit goes offline 设备脱机时的排序扫描时间
3	Number of boilers initially on 锅炉最初启动数量
5	Modulation timeout 调节超时
57	Highest MM ID 最大控制模块标识
62	Hot water sequencing 热水排序
86	IBS change down threshold IBS 降低阈值
87	IBS change up threshold IBS 增加阈值
101	Shuffle sequencing 移动排序
Expansion Option (Mk8 MM only) 扩展选项（仅用于 Mk8 控制模块）	Description 说明
100	Sequencing/DTI or Modbus function 排序/数据传输接口或 Modbus 功能

## 5.3 Hot Water Sequencing 热水排序

### 5.3.1 Implementing Hot Water Sequencing 执行热水排序

For hot water sequencing, a temperature detector must be fitted to all the MMs (only master MMs in Multi-Burner operation if option 14 is set to 1 – Mk8 MM only) and option 1 must be set to 3 or 10. 进行热水排序时必须将温度检测器安装于所有的控制模块（如果选项 14 设为 1（仅用于 Mk8 控制模块），则仅需安装在多燃烧器运行中的主控制模块上），且选项 1 必须设为 3 或 10。

As sequencing is based on firing rate, the MMs must have fuel flow metering entered, see option 57. The burner rating is set as point 1 high fire in fuel flow commissioning. See the Mk8 MM Installation and Commissioning Guide and Mini Mk8 MM Installation and Commissioning Guide for more information on fuel flow commissioning.

由于排序是根据燃烧率进行，因此控制模块必须输入燃料流量计量值，见选项 57。燃烧器额定值在燃料流量调试中设为点 1 高火焰。关于燃料流量调试的更多信息请见 Mk8 控制模块安装与调试指南以及 Mk8 微型控制模块安装与调试指南。

The MMs can be configured for sequencing either in Commissioning Mode, or Online Changes; this allows the commissioning engineer to implement/adjust sequencing at a later date after the burners have been commissioned.

控制模块可以在调试模式中设置排序或在在线更改中设置，调试工程师可以在调试燃烧器后执行或调整排序。

Each MM in the sequencing loop must be set with an individual ID number through option 33; no two MMs can have the same ID number in sequencing, Multi-Burner operation, and when connected to a DTI/Modbus interface. The highest MM ID number should be set for that sequencing loop in parameter 57, so the system only looks for communications with these MMs. The maximum number of MMs that can be in a sequence loop is 10. If there is a DTI in the sequence loop, to control the sequence loop via the DTI, parameter 101 must be set to 1.

排序循环中的每个控制模块都必须通过选项 33 设有一个单独的标识号，两个控制模块不能在排序、多燃烧器运行和连接数据传输接口/Modbus 接口时有相同的标识号。在参数 57 中可以将控制模块最高标识号设为排序循环，这样系统仅需要寻找这些控制模块的通信。在排序循环中的控制模块最大数量为 10，如果在排序循环中有数据传输接口，则可以通过该数据传输接口控制排序循环，且参数 101 必须设为 1。

To enable sequencing, option 16 must be set to 1, or 3 for sequencing with DTI. If option 16 is set to 3, then the DTI/Modbus interface is capable of some remote control. The individual and global required setpoint, lead boiler select, sequence order, enable/disable and firing rate can be set remotely. If an MM's firing rate is set by the DTI/Modbus interface, then that MM will not follow the sequencing loop.

启用排序时选项 16 必须设为 1 或 3，用于带有数据传输接口的排序。如果选项 16 设为 3，则数据传输接口/Modbus 接口可以用于某些远程控制，单独设定点和全球所需设定点、主锅炉的选择、排序顺序、启用/禁用和燃烧率可以设为远程控制。如果控制模块的燃料率是通过数据传输接口/Modbus 接口设置，则控制模块不会进行排序循环。

For hot water sequencing, option 53 must be set to 0 to disable the standby warming which is used in steam sequencing. Options 40 and 41 must be set to 0 on all the MMs in the sequencing loop. If warming is required for lag hot water boilers, then hot water sequencing can function like steam sequencing by setting option 62.

热水排序中选项 53 必须设为 0，以禁用用于蒸汽排序的待机加热功能。在排序循环中的所有控制模块中，选项 40 和 41 都必须设为 0。如果延迟热水锅炉需要加热，则热水排序能像选项 62 设置的蒸汽排序一样工作。

In a sequence loop, there is one lead burner, and the rests are lag MMs. The lead burner identifies its own firing rate by looking at its fuel flow metering data, proportional to the system's load requirements. Having established the percentage firing rate and maximum heating capacity, the MM

## 5 Intelligent Boiler Sequencing

will calculate the amount of heat being contributed to the system by this burner.

在排序循环中有一个主锅炉，其他都为延迟控制模块。主锅炉可以通过查看其燃料流量计量数据识别燃烧率，燃料流量计量数据与系统的负载要求呈正比。在确定燃烧率百分比和最大加热能力后，控制模块将计算燃烧器向系统传递的热量。

The sequence scan time, see option 35, sets after how long the firing rates of all the MMs in the loop are assessed. The scan time has a critical effect on the responsiveness of the sequencing system. Too long a scan can result in the boilers not coming online quick enough to meet the load demand; too short a scan time (shorter than the burner start-up time) can cause another boiler to be brought online before the previous lag boiler has started firing. The scan time should normally be set at minimum, the start-up time for the burner.

排序扫描时间可以在循环中所有控制模块的燃烧率确定后在选项 35 中设置，扫描时间的关键作用是影响排序系统的响应时间。如果时间过长，锅炉可能不会快速联机以满足负载要求，如果时间过短，则扫描时间（小于燃烧器启动时间）可能导致锅炉在延迟锅炉开始燃烧前联机。正常的扫描时间至少应与燃烧器的启动时间相同。

The lead burner looks at its firing rate and sends a command to the lag MMs to either being contribute to load because it cannot reach the setpoint, or to stop contributing to the load because the system has met the load demand. Only one lead burner can be selected at one time, if more than 1 is selected as lead burner, then the MMs will ignore the sequencing loop commands and return to independent firing. Parameter 2 sets how often the 'bus driver' MM requests and transmit information to the other MM The 'bus driver' is always the MM with the lowest ID number.

主锅炉确定燃烧率后将向延迟控制模块发送命令，因为控制模块不会到达设定点，当系统已经满足负载要求时控制模块将停止加载。一次只能选择一个主锅炉，如果一次选择了多个主锅炉，则控制模块将忽略排序循环命令并返回独立燃烧。参数 2 用于设置“主线驱动器”控制模块请求信息或向其他控制模块传递信息的频率，主线驱动器始终是带有最小标识号的控制模块。

The MMs will start, continue or stop contributing to the load based on the change up and down thresholds, see parameter 86 and 87. The next lag MM will be brought online if the lead burner cannot cope with the load demand, and its firing rate is above the change up threshold. Alternatively, the MM will go into standby, warming or offline if the last two lag MMs have a total combined firing rate less than the change down threshold, because the system can cope with the load demand.

控制模块将根据上下变化的阈值启动、继续运行或停止，见参数 86 和 87。如果主燃烧器无法满足负载要求，则会连接下一延迟控制模块，且燃烧器将大于上阈值。同样，如果最后两个控制模块的总燃烧率小于下阈值，控制模块将进入待机、加热或脱机状态，因为系统可以应对负载要求。

For example, if the change up threshold in parameter 87 is set at 90%, then if the last firing MM in the sequence is above 90% firing rate, then upon the elapse of the next scan time, the next lag MM will be brought online. If at the next scan time, the firing rates of the last two online lag MM are 30% and 40% respectively, and the change down threshold in parameter 86 is set at 80%, then the last lag MM will go into standby, warming or off depending on how the sequencing mode is set.

例如，如果在参数 87 中将上阈值设为 90%，在排序中如果最后燃烧的控制模块 90% 的燃烧率，则在经过下一扫描时间后，下一延迟控制模块将联机。如果在下一扫描时间，最后两个联机的延迟控制模块燃烧率分别为 30% 和 40%，在参数 86 中下阈值设为 80%，则最后延迟控制模块将进入待机、加热或脱机状态，这取决于排序模式的设置。

If a lag burner fails to start when requested, the scan time will be decreased by the offset set in parameter 1, until it is automatically ignored from the sequencing communication loop. If a lag burner fails to modulate after being requested to contribute to the load requirement, then that MM will be ignored from the sequencing communication loop after a time delay set in parameter 5.

如果一个延迟燃烧器在请求后没有启动，则扫描时间将根据参数 1 中设置的补偿值而减少，直至在排序通信循环中自动忽略。如果一个延迟燃烧器在请求后没有根据负载要求调节，则在选项 5 中设置时间延迟后，在排序通信循环中将忽视该控制模块。

## 5 Intelligent Boiler Sequencing

After a power recycle, the number of MMs which are initially set on when the MMs start up again, is set in parameter 3.

在动力循环后，则控制模块再次启动后最初设置的控制模块数量可以在参数 3 中设置。

### 5.3.2 Two Port Valve Operation

#### 两端口阀的运行

In hot water sequencing, when there is no demand for all of the lag boilers to be on, the system will close the two port valves on the lag boilers that do not need to be on. This will stop the hot water circulating in the system from passing through the boiler and the heat being wasted. It is possible to use Terminal 78 which is a switched neutral to control the two port valve. This works by switching to neutral once the burner has stopped firing but if the temperature of the boiler ever gets above the required set point then Terminal 78 will switch back even if the boiler is not firing.

在热水排序中，当所有延迟锅炉没有要求启动时，系统将关闭不需要启动的延迟锅炉上两个端口阀，这将关闭系统中的热水循环。可以使用切换至中性的终端 78 来控制两个端口阀。当燃烧器停止燃烧时可以切换至中性，但如果锅炉的温度高于所需设定点时，终端 78 将切换回来，即使锅炉不再燃烧。

- When the two port valve is closed on an OFF lag boiler, if at any time, the residual heat in that boiler is above the required setpoint, the valve is opened immediately and the heat is let through the system. The two port valve then stays open.  
在关闭的延迟锅炉上关闭两端口阀时，如果在任何时候锅炉中的剩余热量高于所需设定点，则阀门将立即打开，热量将通过系统排出，然后两端口阀保持打开状态。
- When the lead boiler recognises that it needs a lag boiler to come online after the sequence scan time, the lag boiler will then run its relay tests. This will open the two port valve immediately and it will then stay open.  
当主锅炉识别出需要延长锅炉在排序扫描时间后联机时，延长锅炉将进行继电器测试，这将立即打开两端口阀并保持打开状态。

For the two port valve to close, the lag boiler must be in standby mode, and the actual setpoint must be on or below the required setpoint; it must be in this condition for at least one minute.

如果要想两端口阀关闭，延长锅炉必须处于待机模式，且实际设定点必须高于或低于所需设定点，只有在至少一分钟内保持此条件，两端口阀才可关闭。

Terminal 78 on the MM is a switched neutral connection for controlling a two port valve that would normally be installed in the boilers return pipe connection to the common return header. This facility ensures that boilers that are switched 'offline' do not contribute return temperature water to the flow header thereby diluting the flow temperature to the building.

控制模块终端 78 切换到中性连接后可以控制两端口阀，通常两端口阀安装在锅炉回水管上，回水管与常见的回水头相连。该设备可以确保脱机的锅炉不会将返回水传递至流量头，从而可以降低建筑物的流量温度。



## 5.4 Steam Sequencing 蒸汽排序

### 5.4.1 Warming Steam Boilers 加热蒸汽锅炉

The difference between steam pressure sequencing is the warming periods; the IBS settings explained in section 5.3.1 are the same (see section 5.4.2 for options 40, 41 and 53). By keeping the lag boilers at low fire when they are in standby/ warming, when they are requested by the lead MM to come online and contribute to the load, they will not be started from cold.

蒸汽压力排序间的差别在于加热时间，第 5.3.1 节所述的 IBS 设置是相同的（见 5.4.2 节关于选项 40、41 和 53）。当延迟锅炉处于待机/加热状态时，延迟锅炉将保持低火焰，当延迟锅炉被主控制模块要求联机时，它们将不会在冷启动。

A steam boiler is at risk of thermal shock if not warmed before running at high fire. If the lag boiler is required to contribute to the steam load, then the boiler must be warm in order to contribute quickly in a safe manner. If the boiler is started from cold and allowed to fire at a high firing rate straight away then this may cause damage to the boiler. The tubes will increase in temperature and if the boiler started from a cold position then this will cause thermal shock to the boiler.

如果蒸汽锅炉在高火焰运行前不加热，则有可能受到热冲击的风险。如果延迟锅炉被要求增加蒸汽负载，则锅炉必须进行加热，以便快速进入安全状态。如果锅炉冷启动并允许直接在高火焰率下燃烧，则可能对锅炉造成损坏。管道的温度将增加，如果锅炉在冷位置启动，则将会对锅炉造成热冲击。

Additionally, not warming a steam boiler can result in a slow response to meet the system's steam demand. For process applications and critical sites such as hospitals, it is imperative that the steam is met efficiently and quickly. If one of the boilers fails, or locks out then it is very important that the next boiler in the sequencing loop gets up to pressure as quickly as possible. Therefore, if this starts up from a cold status then this will take a long time to get up to pressure safely. By warming this lag boiler this means that the boiler will maintain a pressure, offset from the required setpoint in order to ensure that when required this gets up to pressure quickly.

此外，蒸汽锅炉不加热可能会导致响应迟缓，以满足系统的蒸汽要求。至于工艺应用和关键场所如医院，蒸汽必须满足高效、快速的要求。如果一个锅炉发生故障或锁定，则在排序循环中的下一个锅炉需要尽快满足压力要求，因此，如果锅炉从冷状态下启动，则会花费很长时间才能达到安全压力。如果加热延迟锅炉，则就意味着锅炉将保持在一定压力下，可以从所需设定点快速获得补偿，以便确保快速满足压力要求。

### 5.4.2 Implementing Steam Sequencing

#### 执行蒸汽排序

When the IBS software control package is applied to steam boilers, its operation is similar to hot water sequencing but with additional features and enhancements as explained below. In the case of heating boilers only two states in the control form exist, either on or off. When steam boiler variations of IBS are optioned there are three states which are controlled sequentially.

当 IBS 软件控制程序包应用至蒸汽锅炉时，其运行与热水排序相似，但还包括以下所述的附加功能和增强功能。使用加热锅炉时，在控制模式下仅存在两种状态，即启动或停止。当选择蒸汽锅炉变量时，将存在按顺序控制的三种状态。

Just like in hot water sequencing, steam sequencing is used to ensure that only the minimum boilers required are contributing to meet the required setpoint, reducing fuel consumption.

与热水排序相同，蒸汽排序可以用于确保仅需要最少数量的锅炉满足所需设定点，从而减少燃料消耗。

#### Mk8 MM and Mini Mk8 MM

#### Mk8 控制模块和 Mk8 微型控制模块

## 5 Intelligent Boiler Sequencing

The steam sequencing operation has 4 sequencing states:

蒸汽排序运行有以下四种排序状态:

- On** – the burner fires and modulates freely to meet the required setpoint. The burner will start and stop according to the above and below offset differentials (see options 9, 10 and 11).  
启动-燃烧器燃烧并自动调节以满足所需设定点的要求，燃烧器将根据大于或小于的补偿差异值（见选项 9,10 和 11）启动和停止。
- Standby** – the burner remains at the low fire position to meet the standby setpoint (set as an absolute value in option 42). The burner will start and stop according to the above and below offset differentials (see options 9, 10 and 11).  
待机-燃烧器保持在低火焰位置以满足待机设定点的要求（在选项 42 中设为绝对值）。燃烧器将根据大于或小于的补偿差异值（见选项 9,10 和 11）启动和停止。
- Warming** – the burner remains at the low fire position to meet the standby setpoint (see option 42) and runs according to a timer of X minutes firing (see option 54) and Y minutes not firing (see option 53). If option 54 is set to 0, then the burner will continually fire at the low fire position to meet the standby setpoint in the warming state.  
加热—燃烧器保持低火焰位置以满足待机设定点的要求（在选项 42 中设为绝对值）并根据 X 分钟燃烧（见选项 54）和 Y 分钟不燃烧（见选项 53）定时器的时间运行。如果选项 54 设为 0，则燃烧器将在低火焰位置继续燃烧以满足加热状态下待机设定点的要求。  
The burner can also be controlled by a (warming) thermostat fitted in the boiler shell, wired to terminal 82 (see option/ parameter 156).  
燃烧器可以通过安装在锅炉外壳上的（加热）恒温器进行控制，锅炉外壳与终端 82 相连（见选项/参数 156）。
- Off** – the burner does not fire.  
停止-燃烧器不燃烧。

As well the options/parameters given in section 5.3.1, the following also need to be set for steam sequencing:

除 5.3.1 节给出的选项/参数外，蒸汽排序还需要设置以下选项：

- Option 41 – Sets whether all the lag boiler states, either the first lag is kept in standby state with the second lag in warming and the remaining lag MMs off, or all the lag boilers after the first lag boiler are kept in warming state and there are no boilers offline.  
选项 41-设置所有延迟锅炉状态，即第一延迟锅炉是否处于待机状态，第二延迟锅炉是否处于加热状态，其他延迟控制模块是否关闭，或第一延迟锅炉后的所有延迟锅炉是否处于加热状态且没有锅炉脱机。
- Option 42 – Sets the standby setpoint for sequencing where non-return valves are installed; the first lag boiler will aim to maintain this standby setpoint when in the warming/standby phase. This is set as absolute value.  
选项 42-当没有安装止回阀时设置排序的待机设定点，在加热/待机阶段，第一延迟锅炉将保持在该待机设定点，该值应设为绝对值。
- Options 53 – Sets the steam sequencing burner off time. This is the time in minutes for how long the boiler will be off for during Warming mode.  
选项 53-设置蒸汽排序锅炉的停止时间，即在加热模式下确定锅炉停止时所需的分钟数。
- Option 54 – Sets the steam sequencing burner on time. This is the time in minutes for how long the boiler will be in low flame hold for the boiler to heat up to its standby setpoint, when in Warming mode. Options 42, sets the standby setpoint.  
选项 54-设置蒸汽排序锅炉的启动时间。即在加热模式下确定锅炉加热至待机设定点时处于低火焰保持的分钟数，选项 42 用于设置待机设定点。

### 5.4.3 Low Pressure Steam Sequencing

#### 低压蒸汽排序

For steam boiler plants where check (non-return) valves are not installed, or the required setpoint is less than 2 Bar (20 PSI), it is not possible to use a standby setpoint. Each pressure sensor would read the same pressure value, regardless of individual boiler temperature/ pressure. A thermostat (aquastat) can be installed into the boiler shell, and option 40 must be set to low pressure steam sequencing.

没有安装止回阀或所需设定点小于 2 Bar (20 PSI)的蒸汽锅炉厂不能使用待机设定点。每个压力传感器将读取相同的压力值，而无论单个锅炉的温度和压力是多少。恒温器（水温自动调节器）可以安装在锅炉外壳上，而且选项 40 必须设为低压蒸汽排序。

For the Mk8 MM, a 230V/ 120V input on terminal 93 (see option 79) will initiate the warming for that lag boiler, and this will fire according to the warming interval timings in options 53 and 54.

至于 Mk8 控制模块，终端 93（见选项 79）上的 230V/ 120V 输入最初将加热延迟锅炉，锅炉将根据加热时间间隔进行燃烧（见选项 53 和 54）。

For the Mini Mk8 MM, a 230V/ 120V input on terminal 82 (see option/ parameter 156) will initiate warming for that lag boiler, and this will fire according to the interval timings in options 53 and 54.

至于 Mk8 微型控制模块，终端 82（见选项/参数 156）上的 230V/ 120V 输入最初将加热延迟锅炉，锅炉将根据加热时间间隔进行燃烧（见选项 53 和 54）。

## 5.5 Troubleshooting – Sequencing

### 故障排除-排序

The IBS software can be used for up to 10 MM modules. It can be burners with water level control and also EGAs.

IBS 软件可以用于多达 10 个控制模块，包括带有水位控制和尾气分析仪的燃烧器。

#### Troubleshooting

#### 故障排除

If the IBS software is not turning the lag boilers on and off as needed to meet load demand, this indicates that there is an issue with the sequencing communications.

如果 IBS 软件没有启动或停止延迟锅炉以满足负载要求，这表明排序通信出现问题。

Fuel flow metering must be set correctly on all the MMs as this is used to determine the firing rate and burner rating which the IBS software looks at to decide whether to bring on or turn off lag boilers.

所有控制模块上的燃料流量计量都必须正确设置，因为该值可以用于确定燃烧率和锅炉额定值，从而 IBS 软件能够确定是否启动或停止延迟锅炉。

The MMs must be connected via a Beldon 9501 daisy chain configuration, with the data cable screened at one end.

所有控制模块都必须通过百通 9501 菊花链结构进行连接，一端配有屏蔽数据电缆。

During firing, an MM will be removed from the sequence loop should any of the following occur:

在燃烧期间，如果出现以下问题，控制模块将从排序循环中去除：

- Communications to the MM has timed out  
控制模块通信超时。
- The MM has been disabled remotely via the DTI or a BMS with option 16 set to 3  
控制模块通过数据传输接口或电池管理系统（选项 16 设为 3）被远程禁用。
- Option 16 on the MM is not set to 1 or 3  
控制模块上选项 16 未设为 1 或 3。
- The MM is in an error, burner lockout or expansion alarm state  
控制模块出现故障，燃烧器锁定或处于报警状态。
- The MM has not started modulating within the required time  
控制模块在所需时间内没有启动调节。
- The DTI is manually controlling the firing rate  
数据传输接口被手动控制燃烧率。
- Modulation exerciser is being used  
正在使用调节器模拟器。
- Option 47 has been set for cold-start routine  
选项 47 被设为常规冷启动。
- The MM is in Hand or Low Flame Hold mode  
控制模块处于手动或低火焰保持模式。
- The MM has been optioned for Modbus  
Modbus 已选择了控制模块。

#### Testing Communications with an LED

#### 带 LED 的测试通信

When having communications problems between Autoflame M.Ms., a simple test with a standard 5V LED can confirm if they are due to hardware or wiring problems.

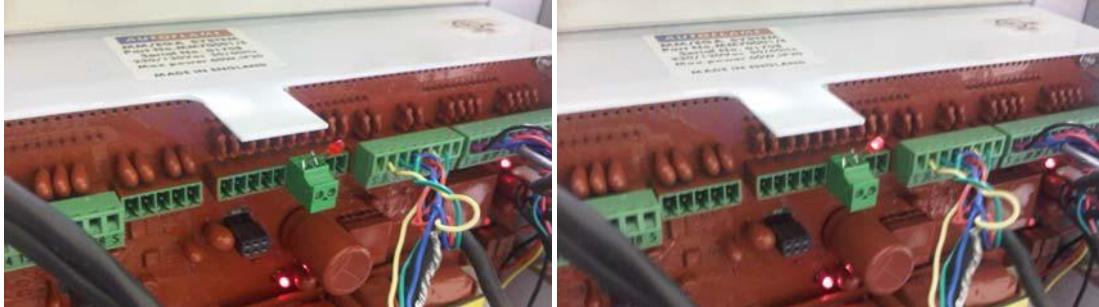
当 Autoflame 控制模块间出现通信故障时，可以用一个标准的 5VLED 进行简单的测试，确定是硬件问题还是接线问题。



### 5 Intelligent Boiler Sequencing

Take a standard 5V LED and wire it into terminals 27 and 28 of the MM ensuring correct polarity (black connected to the negative leg of the LED). If the MM is communicating, the LED will flash intermittently. If the LED does not flash, check the polarity is correct on the LED. If the LED still does not flash, please contact Autoflame Sales Department. Do this for all the MMs in the sequence.

使用一个标准的 5V LED 并连接至控制模块的终端 27 和 28 上，确保电极连接正确（黑色连接 LED 的负极）。如果控制模块开始通信，则 LED 将间歇闪烁。如果 LED 没有闪烁，则检查 LED 的电极连接是否正确。如果 LED 仍未闪烁，请连接 Autoflame 销售部。同时按顺序测试所有控制模块。



## 6 MULTI-BURNER OPERATION – MK8 MM

### 多燃烧器运行-Mk8 控制模块

#### 6.1 Multi-Burner Commissioning

##### 多燃烧器的调试

Multi-Burner operation is only available on the Mk8 MM  
多燃烧器仅在 Mk8 控制模块上运行。

Terminals 23 and 24 are used for Multi-Burner communications; a screen must be connected at one end, please see section 6.6.

终端 23 和 24 用于多燃烧器通信，端部必须安装一个屏幕，见第 6.6 节。

Options 43, 44 & 51 have to be set correctly to implement multi-burner operation. Both the MMs in multi-burner operation must have identical software (MM, BC & DI). The MMs can be commissioned simultaneously or individually by setting option 43 to 0.

执行多燃烧器运行时必须正确设置选项 43、44 和 51。多燃烧器中的两个控制模块必须安装相同的软件（MM, BC 和 DI）。可以通过将选项 43 设为 0 对控制模块进行同时调试或单独调试。

Before commissioning, set the ID number for the MMs through option 44. The master burner must have ID number 1 and the slave burner must have the ID number 2 or greater. The multi-burner ID is independent of sequence ID number, which should also be set as required via option 33. Option 51 must be set to the highest multi-burner ID in the multi-burner loop as set in option 44.

调试前，通过选项 44 设置控制模块的标识号，如果主锅炉的标识号为 1，则从锅炉的标识号必须是 2 或更大。多燃烧器的标识与排序标识号不同，排序标识号可以通过选项 33 进行设置。在多燃烧器循环中，选项 51 必须设为多燃烧器的最大标识号，多燃烧器循环可以在选项 44 中设置。

**It is the commissioning engineer's responsibility to ensure that no adverse effects are caused as a result of this, particularly, stress to a boiler not designed to have only one burner firing. It is strongly recommended that they are commissioned simultaneously.**

调试工程师有责任确保设置后不会出现负面影响，尤其是向锅炉施压时，不会只有一个燃烧器燃烧。我们强烈建议同时对燃烧器进行设置。

Proceed to commissioning as detailed in Mk8 MM Installation and Commissioning Guide. After commissioning the units, if commissioned individually, option 43 will need to be set to 1 or 2 as appropriate.

按 Mk8 控制模块安装与调试指南所示进行调试。调试设备后，如果单独进行调节，则选项 43 必须设为 1 或 2。

For fuel flow metering, both MMs should be firing, all burners will follow the firing rate of the unit being metered. Each MM has to have its fuel flow metering done individually one at a time. Please refer to the Mk8 MM Installation and Commissioning Guide for information on how to enter fuel flow metering.

至于燃料流量计量，两个控制模块都必须燃烧，所有燃烧器将遵守计量设备的燃烧率。每个控制模块每次都必须进行燃料流量计量，关于如何输入燃料流量计量值请参考 Mk8 控制模块安装与调试指南。

For single point change, all burners will follow the firing rate of the unit being re-commissioned. It is not possible to perform single point change on more than one unit at a time. When more than unit requires recommissioning, these can be done one after another or with a full recommission on all units at the same.

对于单点更改，所有燃烧器都必须遵守再调试设备的燃烧率。一次不能对多个设备进行单点更改，当一个以上的设备需要重新调试时，必须一个接一个进行或同时重新调试所有设备。

## 6.2 Normal Operation 正常运行

### Fully Linked 完全连接

If option 43 is set to 1, (multi-burner for fire tube applications), then all MMs will fire simultaneously. The slaves will always take the firing rate from the master, including when the master has been put in low flame hold or hand mode. All MMs will start-up together and phases are checked for multi-burner sync – position to purge, position to start, ignition and modulation.

如果选项 43 设为 1（多燃烧器用于火管），则所有控制模块将同时燃烧。当主锅炉处于低火焰保持或手动模式时，从锅炉将从主锅炉获得燃烧率。所有控制模块将一起启动并检查多燃烧器同步吹扫位置、启动位置、点火位置和调试位置。

All burners will fire simultaneously at all times; the internal stat of all MMs will open if any one of the burners is shut down by external stat.

所有燃烧器始终同时燃烧，如果某个燃烧器通过外部控制器被停止，则所有控制模块的内部控制器将打开。

If a lockout or error occurs on one of the MMs, then both burners will turn off, until the lockout/error has been reset. Both MM will proceed to start-up and fire simultaneously

如果某个控制模块被锁定或出现错误，则两个燃烧器将关闭，直至锁定/错误被重置。两个控制模块将继续启动并同时燃烧。

A load detector does not need to be wired to the slave MMs, only the master MM. The load detector input on the slave MMs can be left open circuit; it will not be error checked during multi-burner operation.

负载检测器不需要与从控制模块连接，只需连接主控制模块即可。负载检测器在从控制模块上的输入设备可以保持开路，多燃烧器运行期间将不会检查错误。

For hand and low flame hold modes, the inputs must be wired to terminals 94 and 95, respectively, on the master MM. No inputs are required on the slave MMs.

在手动模式和低火焰保持模式，输入设备必须分别与主控制模块上的终端 94 和 95 连接，从控制模块不需要输入。

For sequencing with multi-burner, the Master MMs can be connected via terminals 27 and 28 in a daisy chain configuration. Option 16 should be set to 1 or 3 on all master MMs. If the all the MMs are connected to a DTI, then they should all be connected be via terminals 27 and 28 in a daisy chain configuration, including the slave MMs, Option 16 should be set to 0 on all slave MMs. This would allow the DTI to gather information from all the MMs in the loop. The lead boiler switch should only be wired to terminal 88 on the master MMs.

多燃烧器排序时，主控制模块可以通过菊花链结构中的终端 27 和 28 连接。所有主控制模块上的选项 16 都应设为 1 或 3。如果所有控制模块都与一个数据传输接口连接，则控制模块应通过菊花链结构中的终端 27 和 28 连接，其中包括从控制模块，所有从控制模块上的选项 16 都应设为 0，这样数据传输接口可以从循环中的所有控制模块上搜集信息。主锅炉开关应与主控制模块上的终端 88 相连。

If there is a loss in communications between the MMs, all of them will open their internal stat and a 'multi-burner communications fault' alarm will occur. They will all shut down and only start once all are communicating via the multi-burner link.

如果控制模块间失去通信，则所有控制模块都将打开其内部统计，此时将出现多燃烧器通信故障报警。控制模块将关闭，只有通过多燃烧器可以再次启动通信。

### Independent fault

#### 独立故障

If option 43 is set to 2 (multi-burner for water tube applications), then both MMs can fire simultaneously and independently.

如果选项 43 设为 2（用于水管的多燃烧器），则两个控制模块将同时和单独燃烧。

The slave will always take its firing rate from the master, including when the master has been put in low flame hold or hand mode, apart from when the master is not firing or is in a lockout state. If the master MM is powered off, has an error or multi-burner communications loss, all burners will shut down.

当主控制模块处于低火焰保持或手动模式时，从锅炉始终从主控制模块获得其燃烧率，除非主控制模块未燃烧或处于锁定状态。如果主控制模块断电，则会出现错误或多燃烧器通信丢失，此时所有燃烧器都将关闭。

If a slave MM is powered off, has an error, lockout or multi-burner communications loss, then the other MMs will continue to fire independently. When the master MM is powered back on, the error is reset or the multi-burner communications is recovered, all burners will then start-up in sync and resume firing in multi-burner operation. When the slave MM is powered up, the error, lockout or multi-burner communications recovered, it will restart and resume multi-burner operation.

如果从控制模块断电、出现错误、锁定或多燃烧器通信丢失，则其他控制模块将单独继续燃烧。当主控制模块重新加电后，错误将被重置或恢复多燃烧器通信，所有燃烧器将同步启动并在多燃烧器运行中保持燃烧。当从控制模块加电，所有错误、锁定或多燃烧器通信都将恢复，控制模块将重启并保持多燃烧器运行。

A load detector does not need to be wired to the slave MMs, only the master MM. The load detector input on the slave MMs can be left open circuit; it will not be error checked during multi-burner operation.

负载检测器不需要与从控制模块连接，只需连接主控制模块即可。负载检测器在从控制模块上的输入设备可以保持开路，多燃烧器运行期间将不会检查错误。

For hand and low flame hold modes, inputs can be wired to terminals 94 and 95 on all MMs. When the master is put into low flame hold or hand, all units will follow the master. If a slave MM is put into hand or low flame the burner will continue to follow the master.

在手动模式和低火焰保持模式，输入设备必须分别与主控制模块上的终端 94 和 95 连接。当主控制模块处于低火焰保持模式或手动模式时，所哟设备都将跟随主控制模块运行。如果从控制模块处于手动模式或低火焰保持模式时，燃烧器将继续跟随主控制模块运行。

When they fire independently, the MM will go into hand or low flame hold if the input is active on its terminals 94 and 95, respectively.

当控制模块单独燃烧时，如果终端 94 和 95 分别启动输入，则控制模块将进入手动或低火焰保持模式。

### 6.3 Multi-Burner with Water Level Control

#### 带水位控制的多燃烧器

With water level control must be enabled on the master only  
主控制模块上必须启用水位控制功能。

All MMs can fire simultaneously or independently as per section 6.2 with water level safety provided by the master MM. If the master MM is powered off, has a communications loss or an error or expansion alarm, then the slave MMs will all shut down, until the master MM is powered on, communications restored or the error or expansion alarm has been reset.

当主控制模块提供水位安全时，所有控制模块都将根据 6.2 节所述同时燃烧或单独燃烧。如果主控制模块断电、出现通信丢失、错误或报警，则从控制模块将全部关闭，直至主控制模块重新加电、恢复通信或错误/报警被重置。

If the master MM has a normal lockout or is not running due to internal or external stat, when option 43 is set to 1, then the slave MMs will continue to fire independently. Unless the master is powered off, has a communications loss, develops an error or an expansion alarm.

如果主控制模块出现正常锁定或因为内部/外部状态未运行，当选项 43 设为 1 时，则从控制模块将单独继续燃烧，除非主控制模块断电、出现通信丢失、错误或报警。



In order to meet BS EN 12953, the minimum requirements for safe water level control are to have an independent high integrity self-monitoring low water cut off, in addition to the level control. When using the Autoflame water level control, an auxiliary 2nd low probe must be fitted to meet these requirements in the EU.

为了满足 BS EN 12953 的规定，除水位控制外，安全水位控制的最低要求是有独立、高完整性自我监控低水切断功能。当使用 Autoflame 水位控制时，必须安装辅助二级低水位探针，以满足 EU 的要求。

## 6.4 Multi-Burner with EGA 带尾气分析仪的多燃烧器

### Multi-Burner with Single EGA

#### 带单独尾气分析仪的多燃烧器

The multi-burner function can be used in conjunction with the Exhaust Gas Analyser (EGA) to monitor and trim the emissions. When using the multi-burner function it is possible use only one EGA if the boiler has a common stack and the burners are firing into the same combustion chamber. The following modules are required:

多燃烧器功能可以与尾气分析仪一起使用，用于监控并调节尾气。使用多燃烧器功能时，如果锅炉有通用排气管且燃烧器在相同的燃烧室燃烧，则有可能使用一个尾气分析仪，此时需要以下模块：

- 2 or more Mk8 MMs for multi-burner application  
2 个或更多数量用于多燃烧器运行的 Mk8 控制模块。
- 1 x Mk8 EGA and sampling probe to measure the exhaust gases from the common stack  
1 个 Mk8 尾气分析仪和采样探针，用于测量通用排气管排出的废气。

The EGA sampling probe is mounted in the stack, and the EGA communicates with the master MMs through the data link on terminals 25 and 26. The EGA data is then transferred over to the slave MMs via the multi-burner data link on terminals 23 and 24. In addition to the multi-burner options the following EGA options will need to be set on the master only:

尾气分析仪采样探针安装于排气管上，尾气分析仪与通过终端 25 和 26 上的数据链接与主控制模块通信。然后尾气分析仪的数据通过终端 23 和 24 上的多燃烧器数据链接传递给从控制模块。除了多燃烧器选项外，还需要在主控制模块上设置以下尾气分析仪选项。

- Option 12 – EGA Operation  
选项 12-尾气分析仪的运行。
- Option 33 – MM Identification (master MM ID must match EGA ID)  
选项 33-控制模块标识（主控制模块标识必须与尾气分析仪标识匹配）。

All burners need to be either fully commissioned simultaneously, with the points in the combustion curve entered at the same point and at similar angular degrees to ensure that all burners are firing with good emissions throughout the firing range. Alternatively the systems can be commissioned independently with the option 12 set to 1 EGA Monitoring only and then set to 2 or 3 afterwards with trim values entered in single point change on the master MM only. Once trim is commissioned on the master MM, all burners will modulate as normal and follow the trim as set in the Master MM.

所有燃烧器都必须同时进行调试，按同一个点和相似角度在燃烧曲线上输入各点，确保所有燃气都在燃烧范围内燃烧。此外，系统也可以通过将选项 12 设为 1（仅适用尾气分析仪监控）进行单独调试，然后在主控制模块上单个点输入微调数据后将选项 12 设为 2 或 3。在主控制模块上进行微调后，所有燃烧器都应进行正常调节并遵守主控制模块设置的微调值。

Safety limits of combustion on EGA can also be used with multi-burner operation, allowing the user to set absolute or offset limits of O<sub>2</sub>, CO, CO<sub>2</sub>, NO and exhaust temperature, on the master MM only. Any combustion limits alarms will operate as set in EGA option 13 on the master MM. Please refer to the Mk8 MM Installation and Commissioning Guide for more information on setting up combustion limits.

## 6 Multi-Burner Operation – Mk8 MM

尾气分析仪上燃烧安全限值仅可以用于多燃烧器的运行，只有在主控制模块上，用户才允许设置或补偿氧气限值、一氧化碳限值、二氧化碳限值、一氧化氮限值和尾气温度限值。在主控制模块尾气分析仪选项 13 上可以设置燃烧限值报警。关于设置燃烧限值的更多信息，请参考 Mk8 控制模块安装与调试指南。

In critical situations where one of the MMs is in fault condition, single burner firing can be used however we would recommend that the EGA be optioned to monitor only or completely disabled to ensure reliability. Provided no changes are made to the combustion either through re-commissioning, or single point change, the EGA can be re-optioned when required.

在危险情况下，当某个控制模块出现故障时，则可以利用单个燃烧器燃烧，我们建议选择尾气分析仪进行单独监控或完全监控，从而确保可靠性。如果燃烧没有出现更改或没有进行单点更改，则尾气分析仪将在需要时被重新选择。

### Multi-Burner with individual EGAs

#### 带单个尾气分析仪的多燃烧器

If the master and slave MMs fire into individual combustion chambers, an EGAs can be used for each MM, by mounting the sampling probes in the individual flue or in the first pass, before the flues join to meet a common stack.

如果主控制模块和从控制模块在单独的燃烧室中燃烧，则每个控制模块可以使用一个尾气分析仪，在烟道接口接入通用排气管前，在单独烟道或第一个通道处可以安装采样探针。

The EGA sampling probe is mounted in the stacks, and the EGA communicates with the each MM individually through a direct data link on terminals 25 and 26, these cannot be wired in parallel or series. In addition to the multi-burner options the following EGA options will need to be set on each MM:

尾气分析仪采样探针安装在排气管上，尾气分析仪通过终端 25 和 26 上的数据链接与每个控制模块保持通信，终端可以串联或并联连接。除了多燃烧器选项，在各控制模块上需要设置以下尾气分析仪选项。

- Option 12 – EGA Operation  
选项 12-尾气分析仪运行。
- Option 33 – MM Identification (MM ID must match EGA ID)  
选项 33-控制模块标识（控制模块标识必须与尾气分析仪标识匹配）。

All burners need to be either fully commissioned simultaneously, with the points in the combustion curve entered at the same point and at similar angular degrees to ensure that all burners are firing with good emissions throughout the firing range. Alternatively the systems can be commissioned independently with the option 12 set to 1 EGA Monitoring only and then set to 2 or 3 afterwards with trim values entered in single point change one system at a time. Once all systems are commissioned, burners will modulate as normal and trim to their own trim curve.

所有燃烧器都必须同时进行调试，按同一个点和相似角度在燃烧曲线上输入各点，确保所有燃气都在燃烧范围内燃烧。此外，系统也可以通过将选项 12 设为 1（仅适用尾气分析仪监控）进行单独调试，然后在主控制模块上单个点输入微调数据后将选项 12 设为 2 或 3。在主控制模块上进行微调后，所有燃烧器都应进行正常调节并遵守主控制模块设置的微调值。

Safety limits of combustion on EGA can also be used with multi-burner operation, allowing the user to set absolute or offset limits of O<sub>2</sub>, CO, CO<sub>2</sub>, NO and exhaust temperature. Any combustion limits alarms will operate as set in EGA option 13, the effect on other multi-burner systems is dependent on option 43 setting. Please refer to the Mk8 MM Installation and Commissioning Guide for more information on setting up combustion limits

尾气分析仪上燃烧安全限值仅可以用于多燃烧器的运行，只有在主控制模块上，用户才允许设置或补偿氧气限值、一氧化碳限值、二氧化碳限值、一氧化氮限值和尾气温度限值。在主控制模块尾气分析仪选项 13 上可以设置燃烧限值报警。关于设置燃烧限值的更多信息，请参考 Mk8 控制模块安装与调试指南。

## 6 Multi-Burner Operation – Mk8 MM

Note: When using multiple EGA's the CEMS on the master EGA is based on the total of all systems, the slaves CEMS is only on the individual MM.

注：使用多尾气分析仪时，主尾气分析仪上的烟尘烟气连续自动监测系统(CEMS)则根据系统运行，从 CEMS 仅在单独的控制模块上运行。

### 6.5 Multi-Burner External Modulation 多燃烧器外部调节

Multi-burner can be used with both permanent external modulation and switched external modulation. Only the master MM needs to be wired for external modulation, please see Mk8 MM Installation and Commissioning Guide for the connections.

多燃烧器可以用于永久性外部调节和切换外部调节。只有主控制模块需要连接至外部调节，关于连接的更多信息请参考 Mk8 控制模块安装与调试指南。

#### Permanent External Modulation

##### 永久性外部调节

With option 45 set to 1 or 2 and option 55 set to 0 for permanent external modulation the following occurs when there is an error/lockout:

永久性外部调节需要将选项 45 设为 1 或 2，选项 55 设为 0，当出现错误/锁定时将出现以下情况：

- Option 43 = 1  
选项 43=1

If either the master or slave MM has a lockout, then both MMs will go into standby. Once the fault condition has been cleared, both MMs will start up in sync.

如果主控制模块或从控制模块出现锁定，则两个控制模块都将进入待机状态，只有当故障情况被清除时，两个控制模块才会同步启动。

- Option 43 =2  
选项 43=2

If the master has a lockout, then the slave MM will continue to fire at low flame hold. Once the lockout is reset, the master MM will go through its start-up sequence and the MMs will sync once it has reached firing; they will continue to fire as per the external modulation signal.

如果主控制模块出现锁定，则从控制模块将在低火焰保持模式下继续燃烧。只有当锁定被重置时，主控制模块才会进入启动排序阶段，只有当主控制模块到达燃烧位置时，两个控制模块才会同步并根据外部调节信号继续燃烧。

If the slave MM has an error/lockout, then the master MM will continue to fire on its own, following the external modulation to reach the setpoint.

如果从控制模块出现错误或锁定，则主控制模块将继续燃烧并根据外部调节信号到达设定点。

#### Switched External Modulation

##### 切换外部调节

With option 45 set to 0, and option 55 set to 1 for switched external modulation, a line voltage on terminal 88 switches the MM from internal PID to external modulation. Switched modulation cannot be used with sequencing, and the following occurs when there is a lockout:

切换外部调节需要将选项 45 设为 0，选项 55 设为 1，终端 88 上的线电压将把控制模块从内部 PID 切换至外部调节。切换调节不能与排序一起使用，当出现锁定时将出现以下情况：

- Option 43 = 1  
选项 43=1

When the terminal 88 input is switched on, both the MMs change to external modulation. If either the master or the slave MM has a lockout with either external modulation switched on or off, both MMs will go into standby. Once the fault has cleared, they will start up and fire in sync.

当终端 88 输入启动时，两个控制模块将变换至外部调节。如果主控制模块或从控制模块出现锁定且无论外部调节是启动或关闭，则两个控制模块都将进入待机状态。只有当故障情况被清

除时，两个控制模块才会同步启动并燃烧。

□ **Option 43 = 2**  
选项 43=2

With the switched external modulation input turned off on terminal 88, so that both MMs are using the internal PID, if the master or slave has a lockout, then the other will continue to fire following the internal PID. Once the fault has cleared, they will fire simultaneously with internal PID.

当切换外部调节输入设备在终端 88 上被关闭时，两个控制模块将使用内部 PID。如果主控制模块或从控制模块出现锁定，则另一个控制模块将运行内部 PID 并继续燃烧。只有当故障被清除时，控制模块才会使用内部 PID 并同时燃烧。

If the MMs are switched on for external modulation and the master MM has a lockout, then the slave MM will go to internal PID and continue to fire. Once the lockout has been reset, the master MMs will go through the start-up sequence and synchronise with the slave MM once it has reached firing status. They will continue to fire following the external modulation.

如果控制模块被切换至外部调节且主控制模块出现锁定，则从控制模块将进入内部 PID 并继续燃烧。只有当锁定被重置时，主控制模块才会进入启动排序阶段并与从控制模块保持同步并达到燃烧状态。两个控制模块将根据外部调节信号继续燃烧。

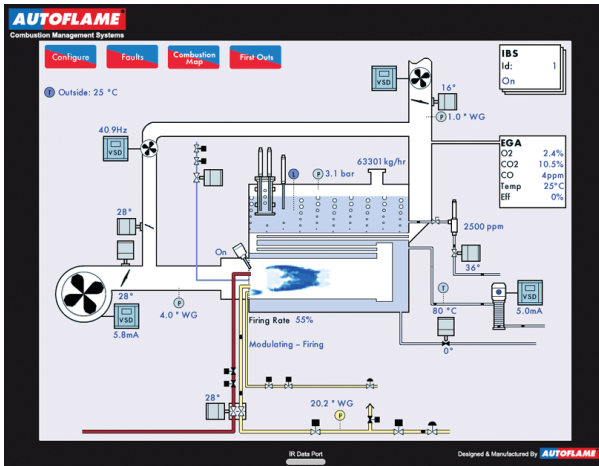
If the MMs are switched on for external modulation and the slave MM has a lockout, the master MM will continue to fire with external modulation. Once the fault has been reset, they will sync when the slave MM reaches firing status, and continue with external modulation.

如果控制模块被切换至外部调节且从控制模块出现锁定，则主控制模块将在外部调节下继续燃。只有当故障被重置后，两个控制模块才会同步，从控制模块达到燃烧状态并继续进行外部调节。

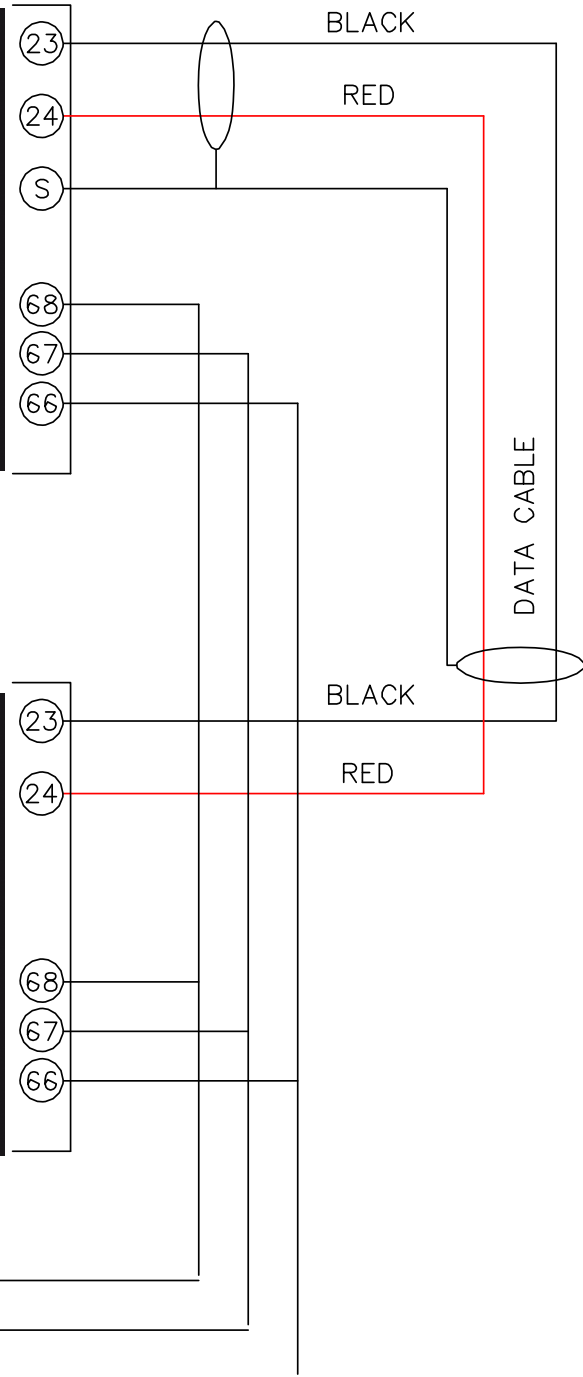
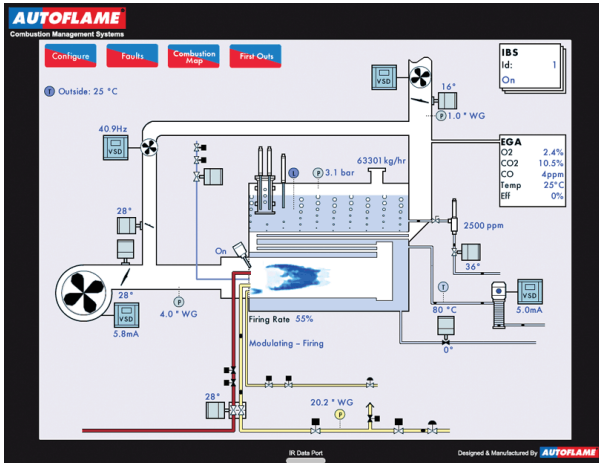


## 6.6 Connection Between Mk8 MM Modules for Multi-Burner 用于多燃烧器的 Mk8 控制模块连接

Mk8 MM Module 1  
Mk8 控制模块 1



Mk8 MM Module 2 Mk8 控制模块 2



NOTE:

Data cable type: Beldon 9501  
Connect screen of data cable to alternate MMs

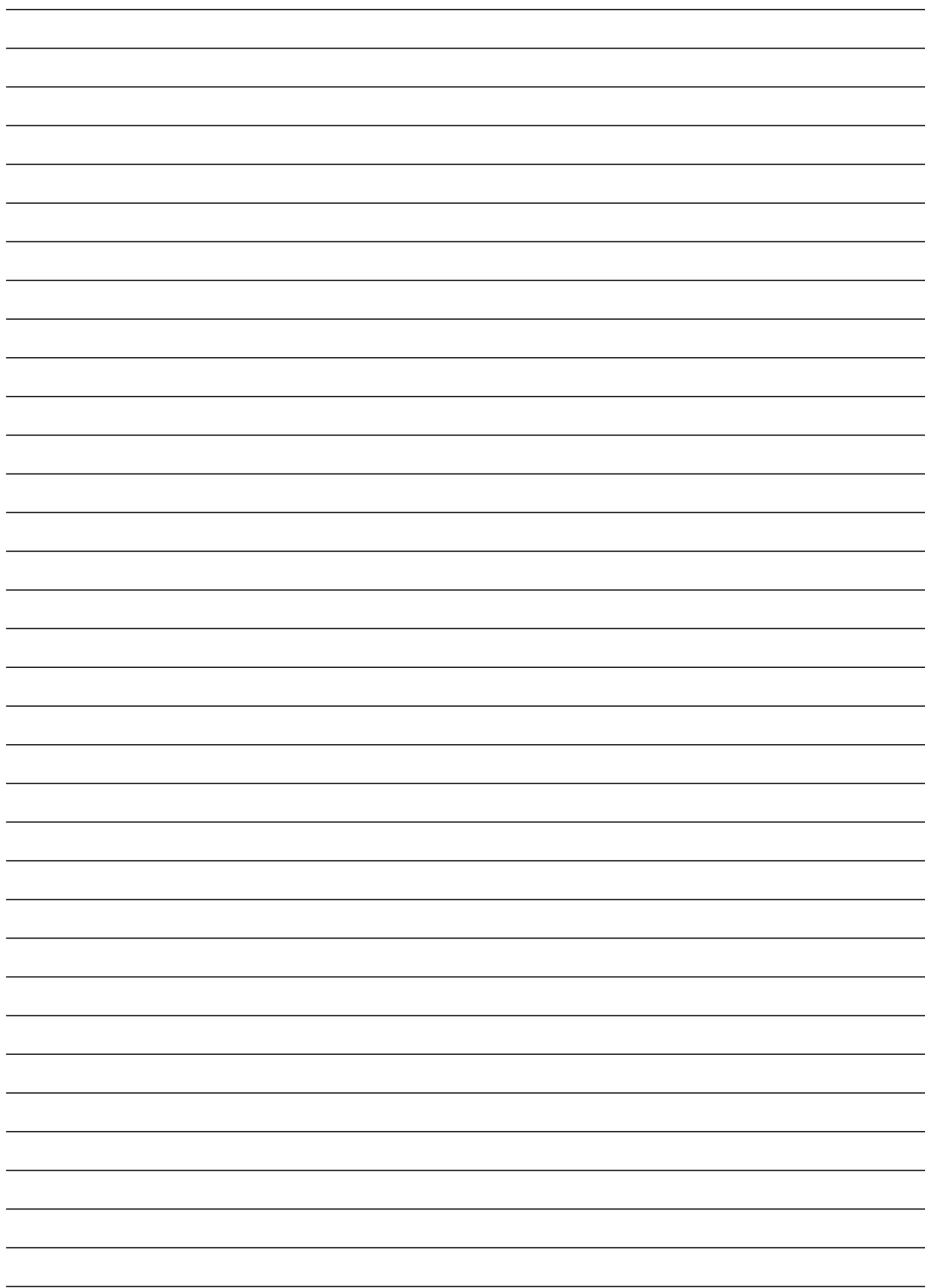
注:

数据电缆类型: 百通 9501

将数据电缆屏板连接至控制模块。







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