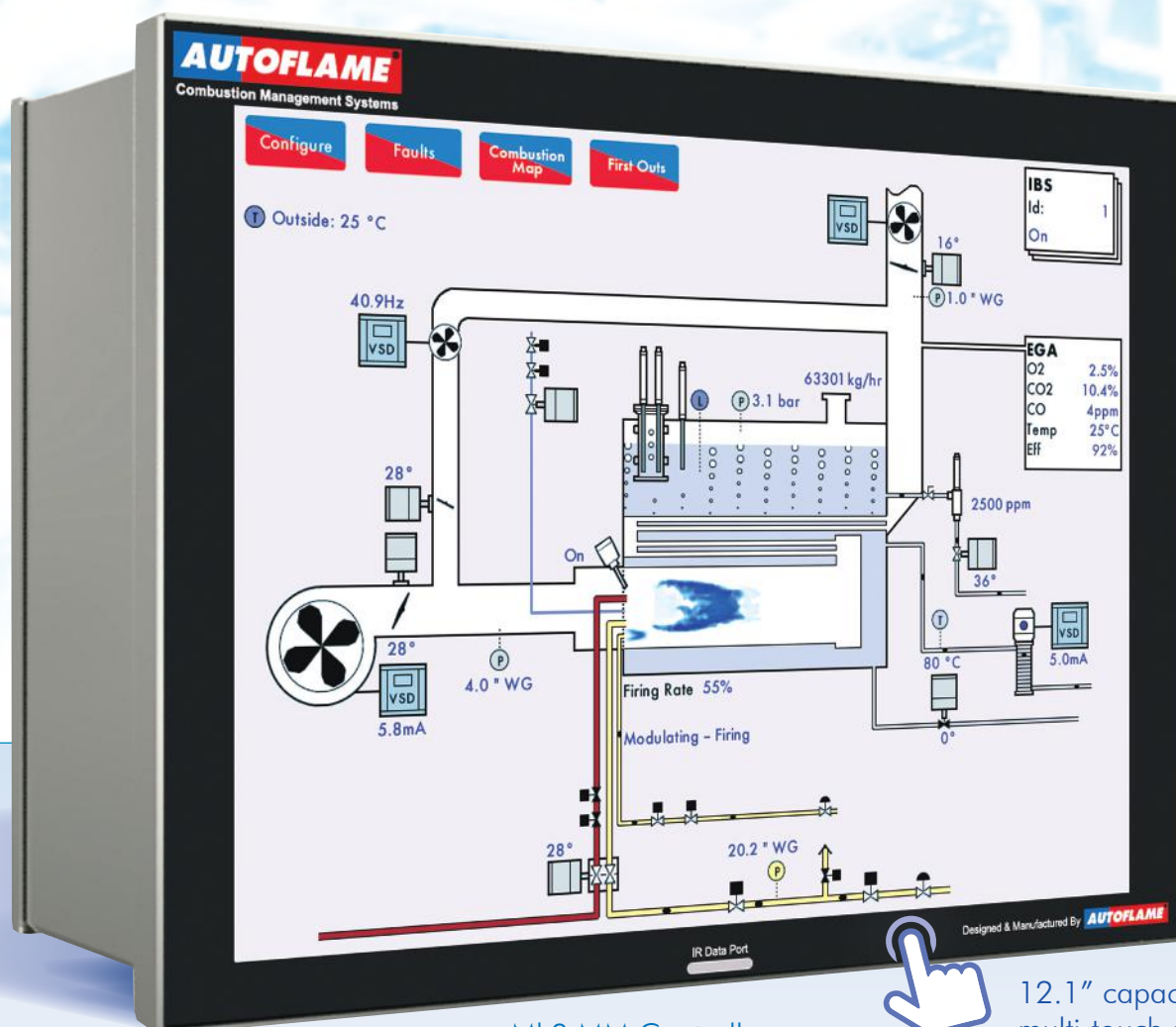




SOFTWARE  
UNLOCK



Mk8 MM Controller



12.1" capacitive  
multi-touch screen

# Unlock your boiler's potential

## Control more with software unlocks

Access codes unlock advanced features without the inconvenience of hardware changes or added modules:

- ✓ Autoflame water level management
- ✓ Analogue water level (requires Autoflame water level)
- ✓ TDS/Top blowdown
- ✓ Bottom blowdown
- ✓ Draught control
- ✓ Direct Modbus connectivity
- ✓ First out annunciation
- ✓ Fully metered, cross-limited control
- ✓ Steam flow & water flow metering

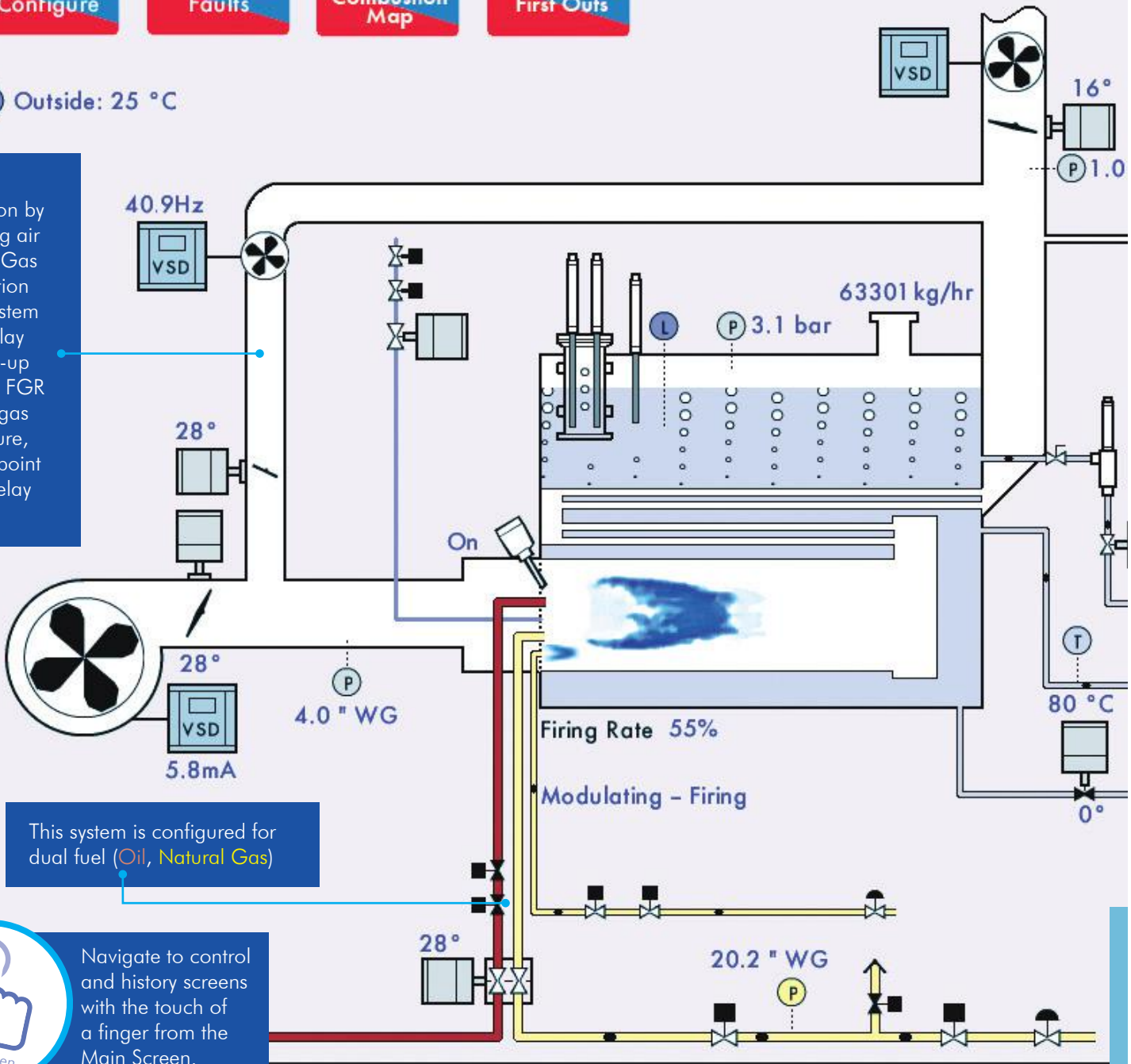
The Mk8 MM Controller is a Micro-Modulating system that offers comprehensive control over industrial and commercial boiler/burners.

- Manage virtually all boiler processes from a single 12.1" multi-touch screen interface without any added modules.
- Ideal for steam and water boilers (watertube or firetube), kilns and steam generators. Designed for oil, natural gas or dual fuels.
- Linkageless servomotor system and automated flame safeguard create conditions for unmanned boilerhouse.
- Modbus connectivity allows for remote monitoring and management.

- Configure
- Faults
- Combustion Map
- First Outs

Outside: 25 °C

Optimize combustion by preheating air with Flue Gas Recirculation (FGR). System allows delay from start-up to enable FGR until flue gas temperature, boiler setpoint or time delay achieved.

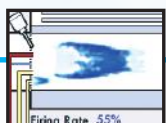


This system is configured for dual fuel (Oil, Natural Gas)



Navigate to control and history screens with the touch of a finger from the Main Screen.

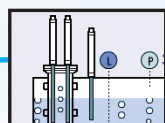
IR Data Port



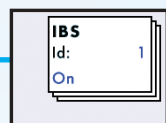
Temperature or Pressure Setpoints



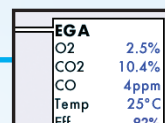
Flame Safeguard



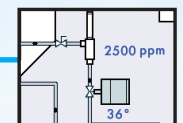
Water Levels



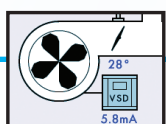
Intelligent Boiler Sequencing



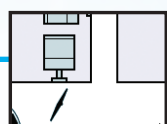
Exhaust Gas Analyser



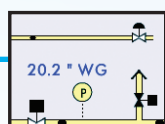
TDS/Blowdown



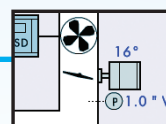
Variable Speed Drive



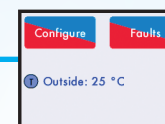
Fuel/Air Servomotors



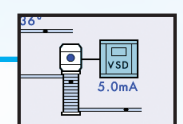
Valve Proving



Draft Control



Online Settings & Fault History



Feedwater Control

IBS  
Id:  
On

Optional functions like EGA, IBS, etc. will appear/disappear from screen when enabled/disabled.

EGA

O2 2.5%  
CO2 10.4%  
CO 4ppm  
Temp 25°C  
Eff 92%

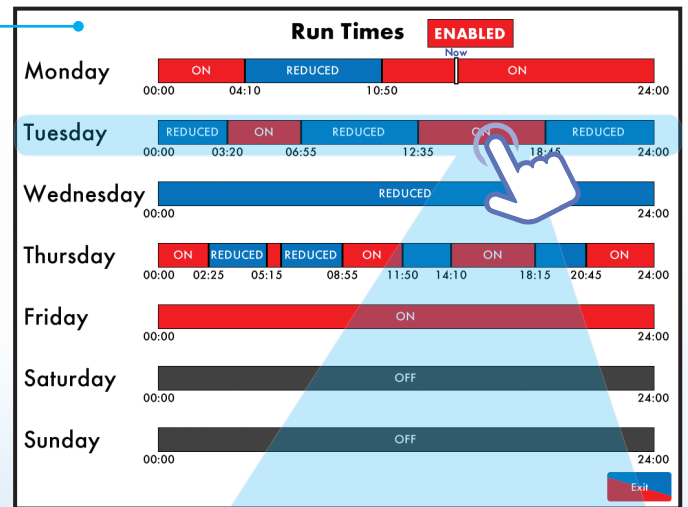
2500 ppm

36°

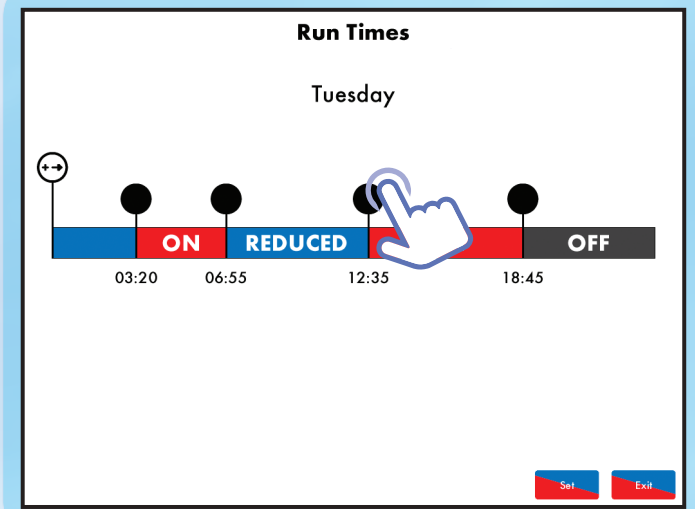
VSD  
5.0mA

This is the actual screen size 12.1" (24.5x18.5cm)

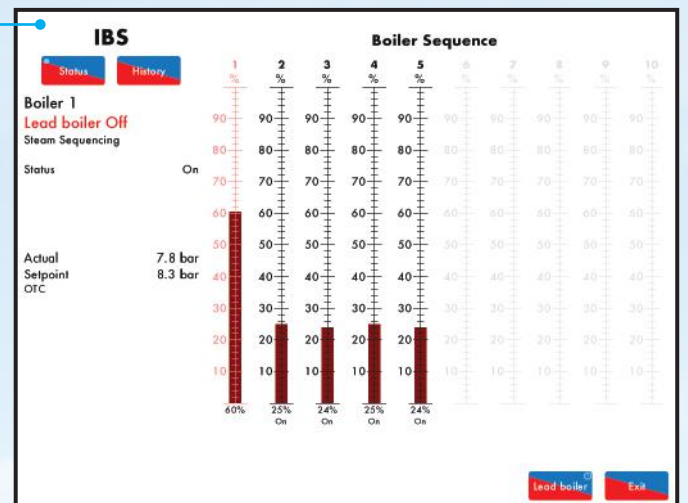
Schedule on, off and reduced (weekend) required temperature/pressure by day of week.



Drag black dot to adjust schedule.



Intelligent Boiler Sequencing (IBS) is the Autoflame lead-lag system. It manages the number of boilers firing at any given time, automatically taking unneeded boilers offline or into standby warming depending on demand. Users can manage up to 10 boilers.



Schedule the boiler plant to run when & how you need it.

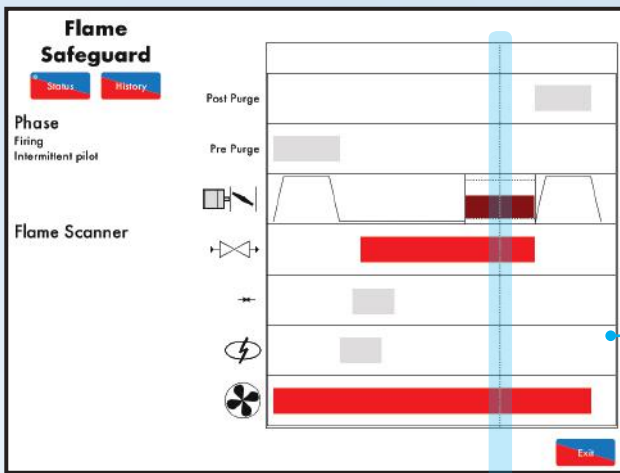
Read Only		
Options	Parameters	
#	Description	Value
1	MM: Boiler Temperature/Pressure Sensor Type	Medium pressure
2	MM: Modulating Motor Travel Speed Limit	1.5
3	Unused: Option 3	
4	Unused: Option 4	
5	MM: Purge Position	Channels 1 to 4 purge at OPEN position
6	PID: Proportional Band	1.0 bar
7	PID: Integral Time	60 seconds
8	MM: Servomotor Channels	Channels 1 & 2
9	MM: Internal Start Operation	Burner operates below setpoint
10	MM: Burner Switch-Off Offset	0.3 bar
11	MM: Burner Switch-On Offset	0.3 bar
12	EGA: EGA Functionality	Not optioned
13	EGA: EGA Fault Response	EGA faults generate Alarms (Burner stops)
14	MM: Warning Response	Warnings drive Common System Alarm output (I79)
15	MM: User Control	Burner on/off and setpoint control enabled
16	DTI: Sequencing and DTI enable	Sequencing disabled
17	Unused: Option 17	
18	EGA: Carry Forward of Trim	Enabled
19	EGA: O2 Upper Limit Offset	Disabled

Options and parameters that are not safety related can be adjusted, providing a sophisticated level of customisation. All of these are viewable while the boiler is online. Some can be set while the burner is running, ensuring minimum boiler downtime.

### Commission Data

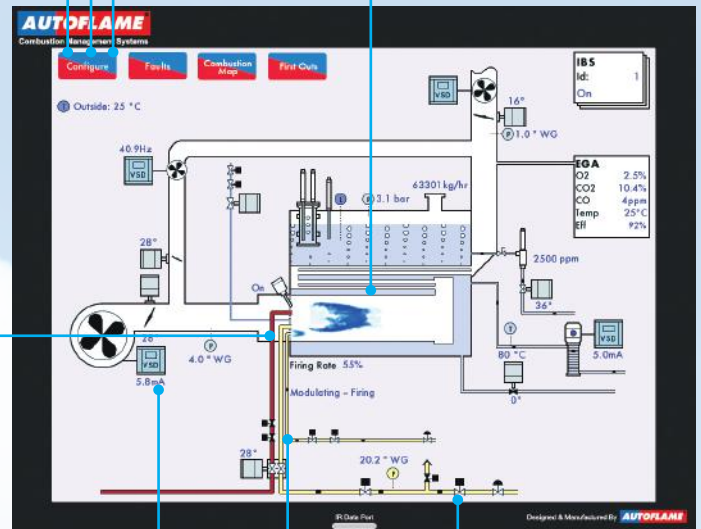
	Fuel	Output	Input
Open	85.1°	20.0mA	19.9Hz
High	72.2°	20.0mA	49.9Hz
Inter	68.4°	18.8mA	46.0Hz
Inter	63.6°	17.3mA	41.4Hz
Inter	59.0°	15.9mA	37.1Hz
Inter	55.4°	14.5mA	33.6Hz
Inter	51.9°	13.2mA	30.2Hz
Inter	47.8°	12.4mA	26.2Hz
Inter	43.0°	10.9mA	21.5Hz
Inter	40.2°	10.0mA	18.7Hz
Inter	38.6°	9.5mA	17.1Hz
Inter	37.5°	9.1mA	15.8Hz
Inter	36.0°	8.6mA	14.3Hz
Inter	35.3°	8.3mA	13.4Hz
Inter	33.9°	7.9mA	12.2Hz
Inter	32.3°	7.4mA	10.5Hz
Inter	31.6°	7.2mA	9.9Hz
Inter	30.9°	6.9mA	9.0Hz
Inter	30.3°	6.7mA	8.3Hz
Inter	29.7°	6.5mA	7.7Hz
Low	28.0°	5.9mA	5.9Hz
Closed	2.5°	20.0mA	19.9Hz
Golden	72.2°	20.0mA	20.0Hz

An engineer can quickly access commissioning data and modify Inter points during maintenance, reducing the downtime.



Post-Purge  
Pre-Purge  
Damper  
Main Valve  
Pilot  
Ignition  
Burner Motor

Flame Safeguard monitors & manages every stage of burner startup, including valve proving & IR/UV testing. Dotted vertical line slides right as the system advances through burner sequence.



### MM Servo Channels

Servo	VSD Ch 5	VSD Ch 6
1. Gas	40.2°	
2. Air	29.5°	
3. Unused		
4. Unused		
VSD Channels		
5. Blower	Output: 29.7 Hz	Input: 26.3 Hz
6. VFD	Output: 29.7 Hz	Input: 27.0 Hz

Focus on individual VSD or servomotor/valve history.

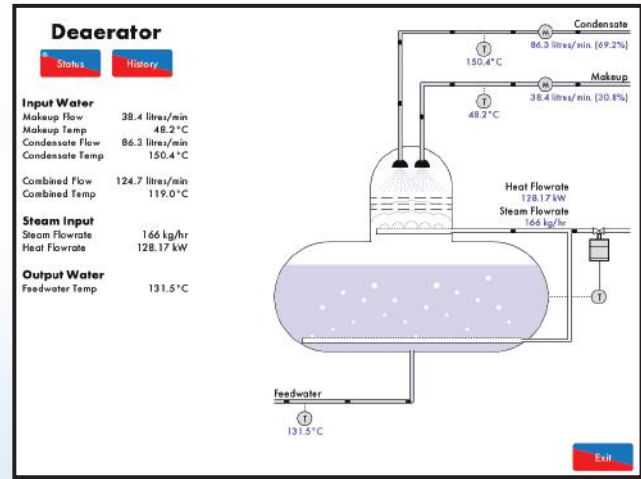
### Channels

Servo	VSD Channel 5	VSD Channel 6
1. Fuel	72.5°	
2. Air	72.3°	
3. FGR	86.2°	
4. S-Air	65.3°	
5. Draft Control	87.0°	
VSD		
1. VSD	6.8 mA	
2. VSD	6.9 mA	

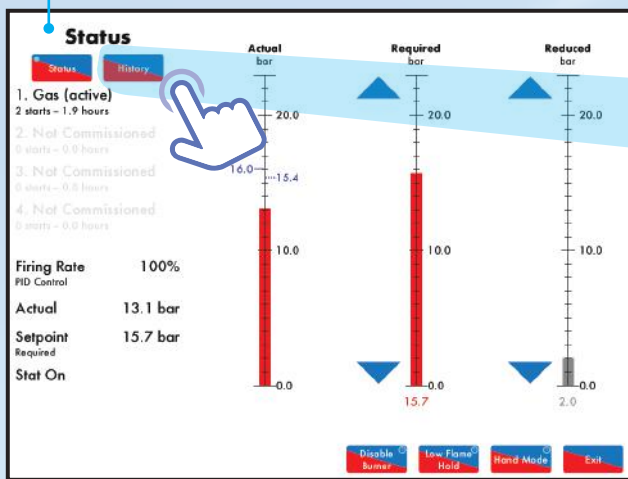
4 servomotors and 2 VSDs provide accurate and repeatable control of valves and dampers. 24 hour on-screen history enables immediate troubleshooting and optimising.

Lockouts	Phase	Occurred	Reset
1. VPS air proving fail	VPS Air Proving	14 Dec 15 12:21	14 Dec 15 12:21
2. VPS air zeroing	VPS Air Proving	14 Dec 15 12:21	14 Dec 15 12:21
3. Gas pressure low limit	VPS Gas Proving	14 Dec 15 12:19	14 Dec 15 12:19
4. VPS air zeroing	VPS Air Proving	14 Dec 15 11:43	14 Dec 15 11:43
5. Air Sensor Comms	Recycle	14 Dec 15 11:35	14 Dec 15 11:37
6. Air Sensor Comms	Recycle	14 Dec 15 09:49	14 Dec 15 11:18
7. Air Sensor Comms	Recycle	14 Dec 15 09:49	14 Dec 15 09:49
8. Air Sensor Comms	Recycle	11 Dec 15 11:52	11 Dec 15 12:18
9. Air Sensor Comms	Recycle	11 Dec 15 11:51	11 Dec 15 11:52
10. Air Sensor Comms	Recycle	11 Dec 15 11:51	11 Dec 15 11:51
11. Air Sensor Comms	Recycle	11 Dec 15 11:42	11 Dec 15 11:48
12. Air Sensor Comms	Recycle	11 Dec 15 11:40	11 Dec 15 11:42
13. Air Sensor Comms	Recycle	11 Dec 15 11:40	11 Dec 15 11:40
14. Air Sensor Comms	Recycle	11 Dec 15 11:40	11 Dec 15 11:40
15. Air Sensor Comms	Recycle	11 Dec 15 09:33	11 Dec 15 10:06
16. Air Sensor Comms	Recycle	11 Dec 15 09:33	11 Dec 15 09:33
17. Air Sensor Comms	Recycle	10 Dec 15 16:21	10 Dec 15 16:22
18. Wait Air Switch timeout	Wait Air Switch	10 Dec 15 12:07	10 Dec 15 12:54
19. No air proving	Purge	10 Dec 15 10:04	10 Dec 15 10:04
20. VPS air zeroing	VPS Air Proving	10 Dec 15 09:53	10 Dec 15 10:03
21. VPS air zeroing	VPS Air Proving	10 Dec 15 09:51	10 Dec 15 09:53
22. VPS air zeroing	VPS Air Proving	10 Dec 15 09:39	10 Dec 15 09:51

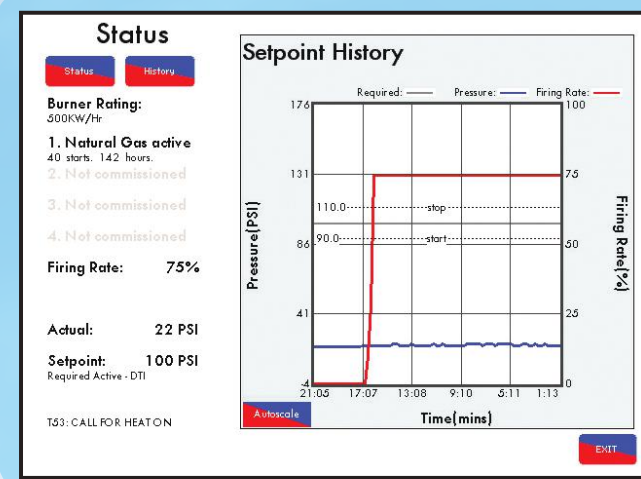
Error and Lockout logs allow engineers to view a history of burner operation to aid in troubleshooting. View the most recent 128 errors and lockouts.



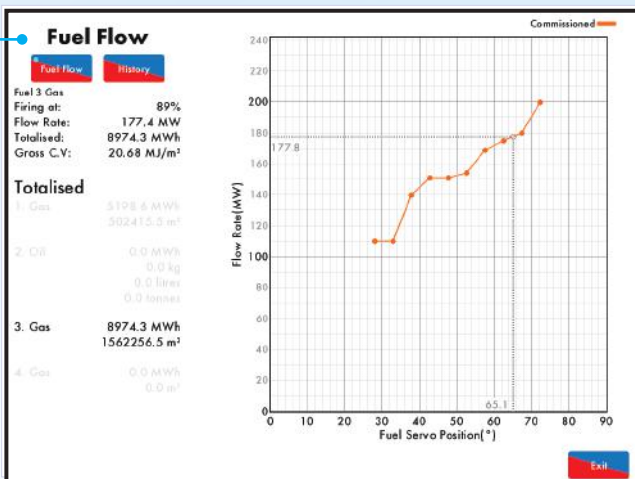
Monitor the boiler plant's deaerator tank from within a Mk8 MM.



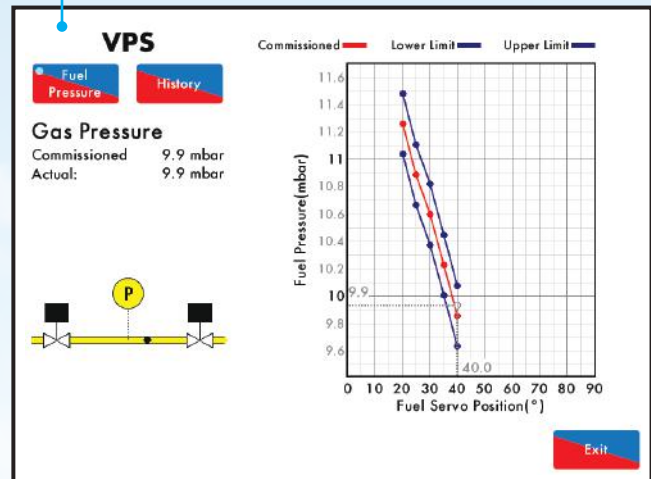
Easily change target setpoints for both the Required setpoints (for general output) & the Reduced setpoints (for when less steam or hot water is needed).



Quickly access boiler firing history and pressure or temperature history.



Enable fuel flow metering for the boiler without the cost of an external meter.



The Valve Proving System (VPS) tests the main gas valves to ensure seal integrity and safety.

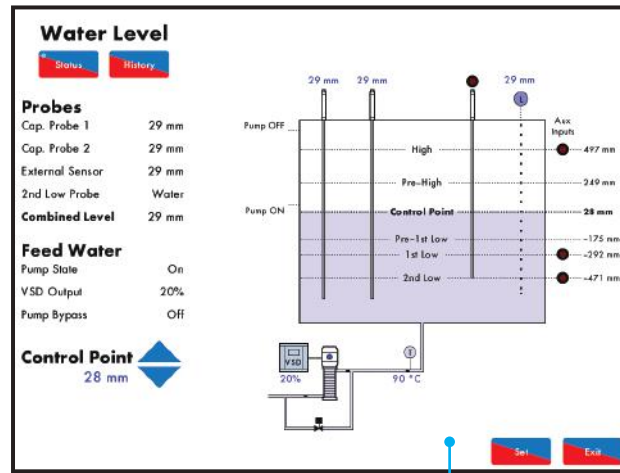
## Water Level Control

**Problem:** Inadequate water levels in the boiler can create very unsafe conditions.

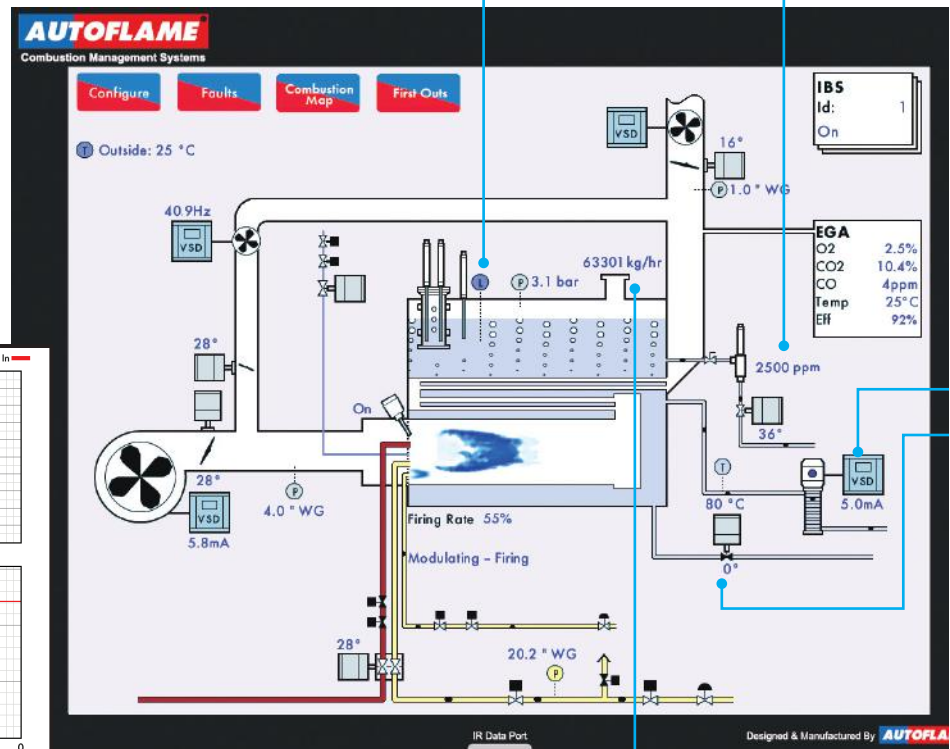
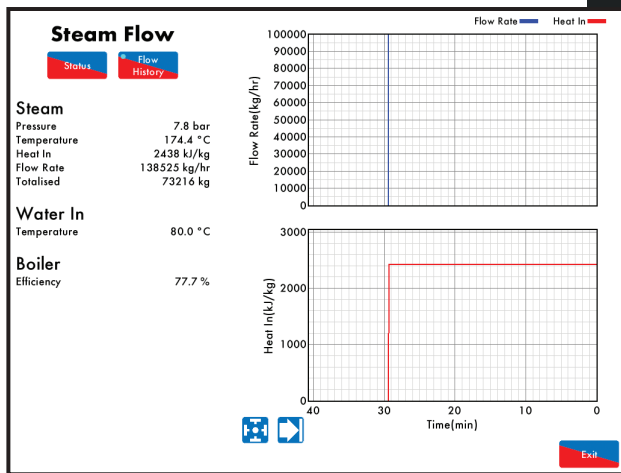
**Solution:** System safety is guaranteed as water level measurement is managed by two identical capacitance probes, both of which measure and control to the level switching points entered at the time of commissioning. The probes support up to 6 switch points (High level, 1st Low Level, 2nd Low Level, etc). The points trigger feedwater activation, alarms or lockouts, depending on commissioning.

**Problem:** Traditional water level management is not integrated with burner operation. This leads to inefficiency and suboptimal operation.

**Solution:** The Mk8 manages the boiler comprehensively, coordinating water levels, burner operation and steam pressure, to create the ideal scenario for fuel savings and emission reduction.



Configure with Autoflame probes or with analogue probes (requires added unlock)

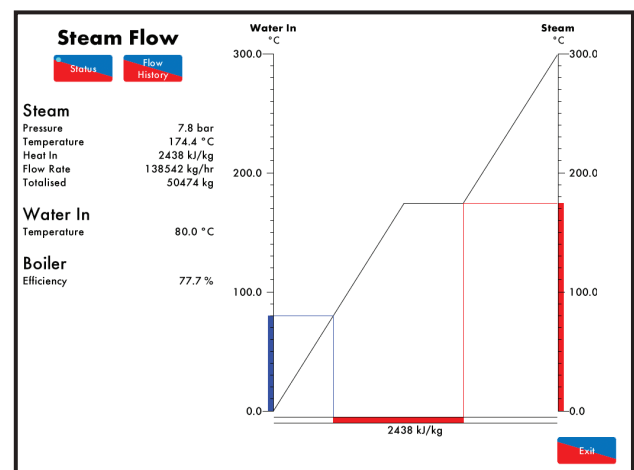


## Steam/Heat Flow Metering

**Problem:** Adding a traditional steam or heat flow meter involves a great deal of costly modifications to a boiler plant, including cutting, welding, wiring and installation of a water or steam flow meter.

**Solution:** Adding steam or heat flow metering to a Mk8 is as simple as optioning it in. Additional sensors increase accuracy. Once enabled, user has access to:

- ◆ Instantaneous steam & heat flow
- ◆ Gross/Net heat flow in the boiler calculated & displayed
- ◆ 24 hours of logged heat flow stored internally
- ◆ 2 years of heat flow data available on the Mk7 DTI
- ◆ Online analysis including instantaneous/totalised values, data logging & graphical display on the MM Controller & DTI
- ◆ Displayed in lbs/hr or kgs/hr



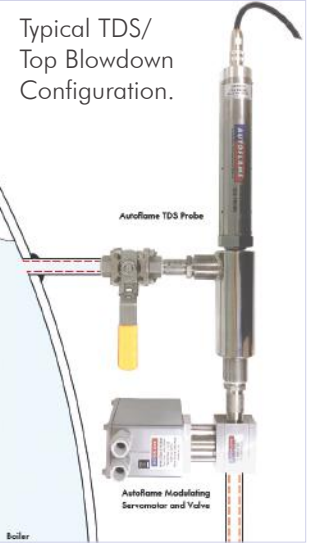
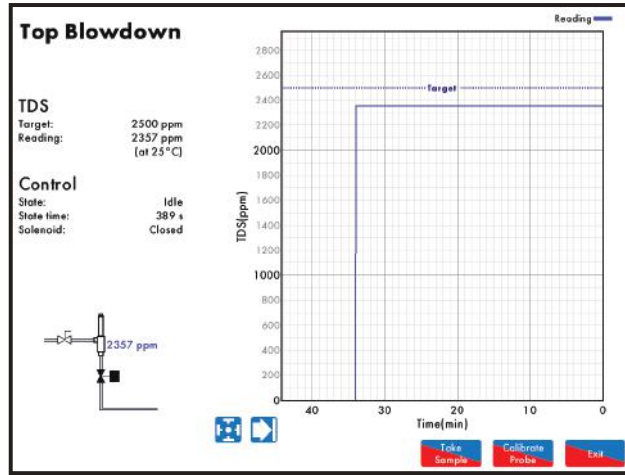
### TDS/Top Blowdown

**Problem:** Total Dissolved Solids (TDS) are undesirable particles that naturally build up in boiler water. Ignored TDS results in scaling, rust and a variety of other problems that lead to poor performance and boiler failure.

**Solution:** Autoflame's TDS Management System drains water near the surface (Top Blowdown) based on TDS readings from a probe. It continues to drain water (which is then refilled by a feedwater valve) until the probe determines that the water has reached prescribed TDS levels. The engineer can also choose to set Top Blowdown at timed intervals instead.

Key benefits:

- ◆ Prevents corrosion & scaling
- ◆ Improves boiler performance, safety & longevity



### Feedwater control

### Bottom Blowdown

**Problem:** Total Dissolved Solids (TDS) are undesirable particles that naturally build up in boiler water. Ignored TDS results in scaling, rust and a variety of other problems that lead to poor performance and boiler failure.

**Solution:** Bottom Blowdown removes sludge buildup at the bottom of the boiler by rapidly draining water at prescribed intervals.

Key benefits:

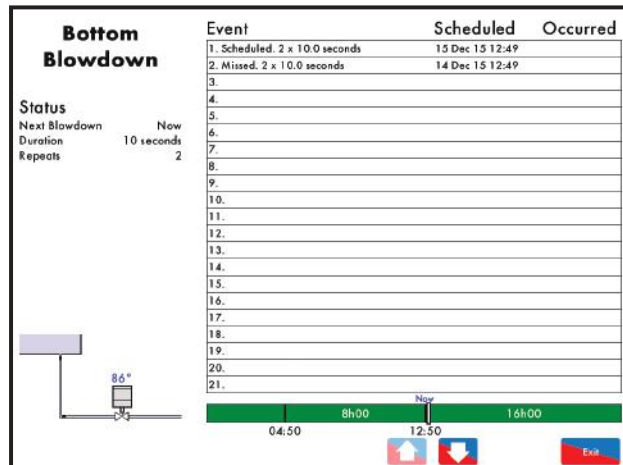
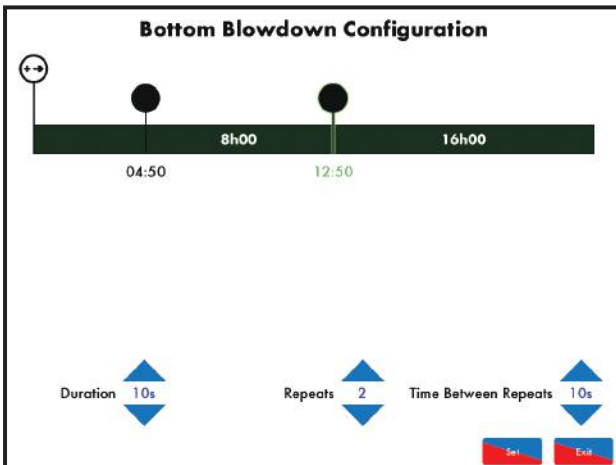
- ◆ Prevents sludge build up in bottom of boiler
- ◆ Eliminates need for manual blowdown/maintenance
- ◆ Improves boiler performance, safety & longevity



Software access code easily unlocks these features.

No hardware changes or added modules required.

Expansion Features		
#	Feature	Status
1	Autoflame Water Level	Unlocked
2	Analogue Water Level	Unlocked
3	Top Blowdown	Unlocked
4	Bottom Blowdown	Unlocked
5	Draught Control	Unlocked
6	Direct Modbus	Unlocked
7	First Outs	Unlocked
8	Fully Metered System	Unlocked
9	Heat Flow	Unlocked



Commission Mode		
Options	Parameters	Expansion
#	Description	Value
140	FM: Fully Metered Function	Enabled
141	FM: Fuel Flow Meter Type	Volume Flow Meter (With square root extraction)
142	FM: Fuel Flow Meter Scaling	800 m <sup>3</sup> /hr at 20mA input
143	FM: Air Flow Meter Type	Volume Flow Meter (With square root extraction)
144	FM: Air Flow Meter Scaling	10000 m <sup>3</sup> /hr at 20mA input
145	FM: Fuel Temperature Sensor Enable	Enabled
146	FM: Air Temperature Sensor Enable	Enabled
147	FM: Fuel Pressure Sensor Enable	Enabled
148	FM: Air Pressure Sensor Enable	Enabled
149	FM: Maximum Fuel Channel Compensation	10.0 %
150	FM: Maximum Air Channel Compensation	10.0 %
151	FM: Action on Air Adjustment Failure	Generate Warning
152	FM: Action on Flow Meter Failure	Generate Warning
153	FM: Default absolute ambient air pressure	1013 mbar
154	FM: Fuel 1 Density	0.656 kg/m <sup>3</sup> @ 1013.25mbar 15°C
155	FM: Fuel 2 Density	0.680 kg/m <sup>3</sup> @ 1013.25mbar 15°C
156	FM: Fuel 3 Density	0.656 kg/m <sup>3</sup> @ 1013.25mbar 15°C
157	FM: Fuel 4 Density	0.800 kg/m <sup>3</sup> @ 1013.25mbar 15°C

## Direct Modbus/BMS Connectivity

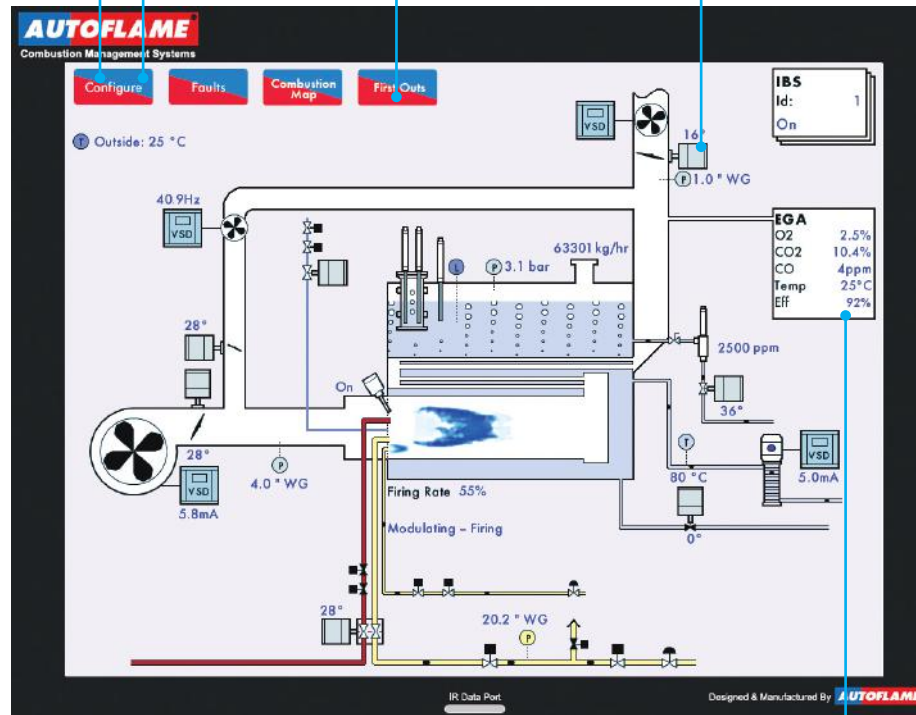
Connect to a Building Management System and through that the internet without the use of a DTI.



## Fully Metered, Cross-Limited Combustion Control

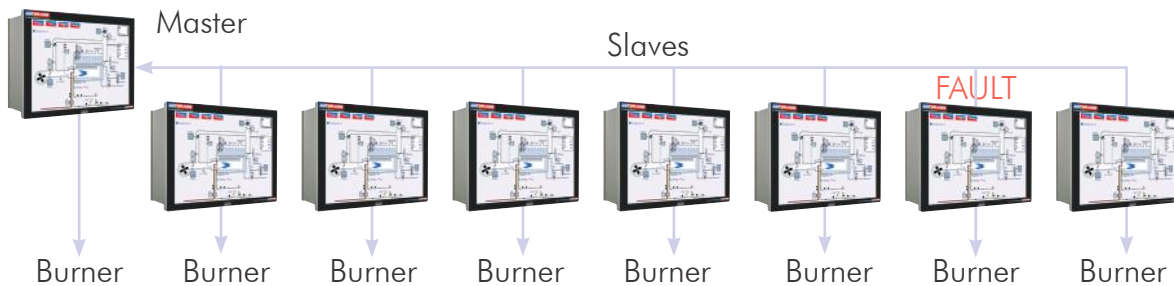
In many burner applications such as dryers, kilns and furnaces, monitoring stack emissions to commission and implement trim is simply not possible. Therefore it is necessary to measure the volume of fuel and air applied to the burner. This can be achieved by either volume or mass flow. Some large industrial water tube boilers also prefer fully metered combustion over the conventional parallel positioning.

The Autoflame fully metered cross-limited control system allows this to be done within an ununlockable feature in the Mk8 MM Controller, avoiding the need for costly Programmable Logic Controllers. (A PLC also requires customised logic to perform the safety and control functions that have been included with the Mk8.) The Mk8 MM Controllers provides a safer, more reliable and more cost effective solution, with the added advantage of fully redundant operation.



### Conditional Fault Response

For a large kiln, dryer or furnace application, one Controller can be configured as a Master with up to 9 Slave Controllers. This can be configured with Conditional Fault Response. For example, if a fuel flow meter for one of the burners becomes disabled, that burner can be disabled, or it can be set to run at commissioned levels. Either way, the remaining burners can be configured to observe the variance in fuel flow and compensate for the disruption. This means that the application can continue to provide the required heat until a convenient maintenance interval is available.



Ideally suited for industrial dryer, furnace and kiln applications.



## First Out Annunciation

The Mk8 can monitor non-Autoflame thermostats & switches with the First Out Annunciation system. For up to 15 inputs in a series control circuit, the first input that changes state will register as "fail" in the Mk8. **NEW:** Custom-label each input onscreen for easier identification.

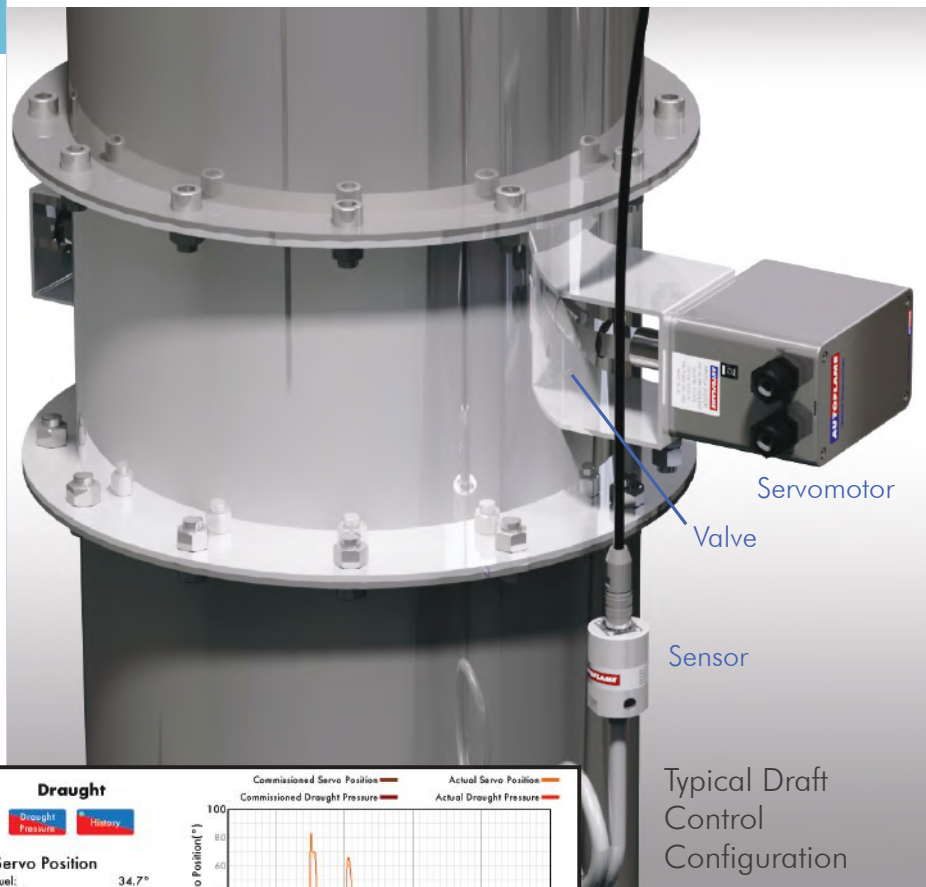
## Draft Control

**Problem:** Both heat transfer and combustion depend on the motion of flue gases. If stack pressure is not optimal, these gases will exit the flue too quickly (wasting heat) or too slowly (causing unstable flame, poor combustion, dangerous unburned fuel). A tall stack is more susceptible to a changing pressure due to stack temperature or wind velocity.

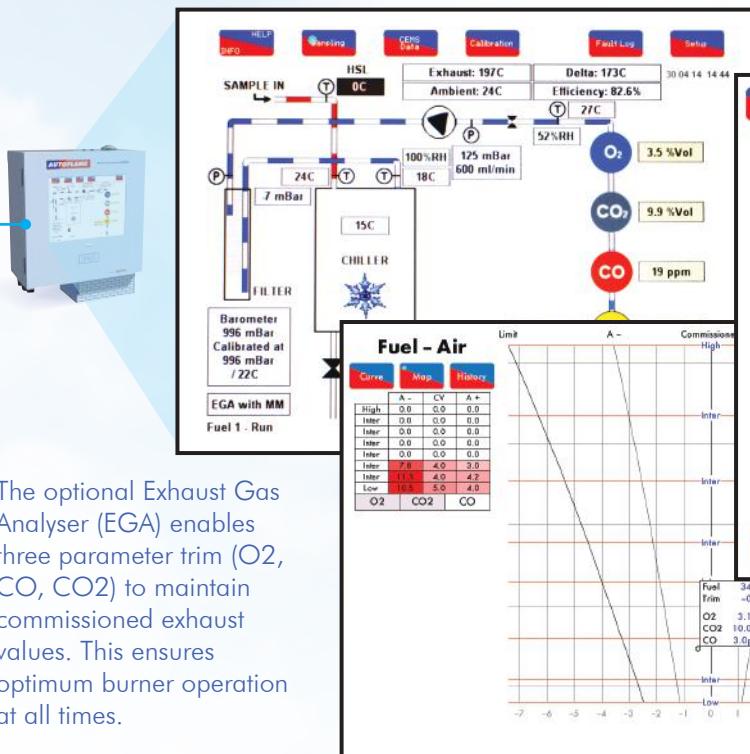
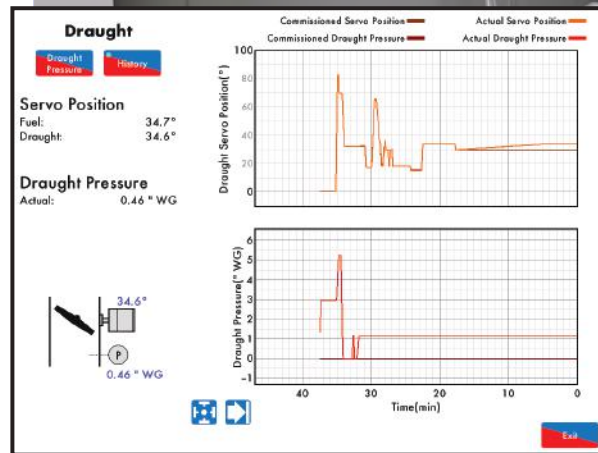
**Solution:** Draft control manages the draft from stacks to optimise heat transfer from the hot gases to the boiler tubes. A sensor in the stack monitors pressure. A damper modulates to increase or decrease flue gas flow based on commissioned pressure targets.

Key benefits:

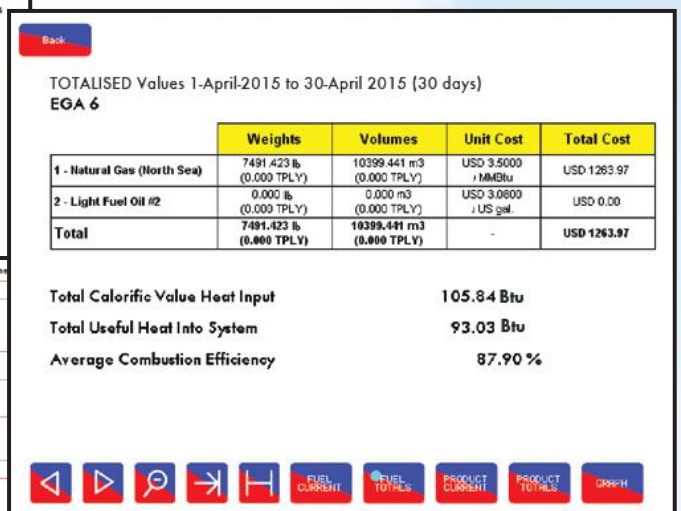
- ◆ Improves heat transfer
- ◆ Improves combustion efficiency
- ◆ Reduces ambient boiler heat loss
- ◆ Improves flame retention
- ◆ Reduces soot accumulation



Typical Draft Control Configuration



The optional Exhaust Gas Analyser (EGA) enables three parameter trim (O<sub>2</sub>, CO, CO<sub>2</sub>) to maintain commissioned exhaust values. This ensures optimum burner operation at all times.



View total fuel usage and emissions reports for up to 2 years with an EGA.

# Choosing the correct controller

The Mini Mk8 is ideal for budget applications focused mainly on burner control.

The Mk8 MM offers expandability and is focused on complete boiler control.



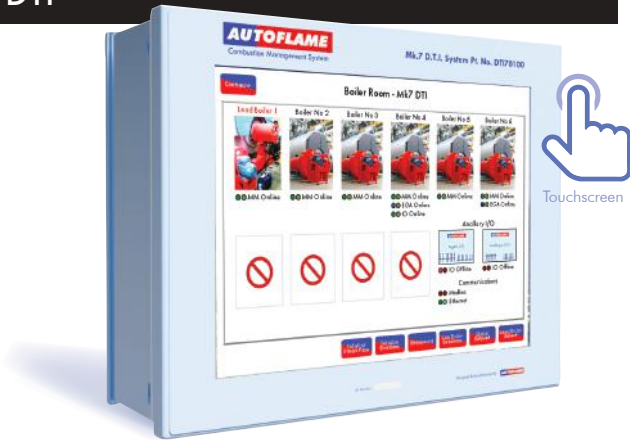
Standard Features	Mini Mk8 MM Controller	Mk8 MM Controller
Screen size	7" (14x10.7cm)	12.1" (24.5x18.5cm)
Touchscreen	Single-touch resistive	Multi-touch capacitive
Flame safeguard	✓	✓
Air/fuel ratio control	✓	✓
IBS/lead-lag sequencing	✓	✓
Scheduling	✓	✓
Commissioning	✓	✓
VSD management	✓	✓
Reporting/graphing	✓	✓
FGR (Flue Gas Recirculation)	✓	✓
Channels	3 servos/1 VSD	4 servos/2 VSD 5th servo via access code
Lockout/error logging	Most recent 64 errors/lockouts	Most recent 128 errors/lockouts
Number of fuel curves	2	4
VPS (Gas Valve Proving)	✓	✓
Outside temperature	✓	✓
Login security	✓	✓
Back up commissioning data via IR port	✓	✓
Boiler log entries	1000	1000
Dual fuel support	✓	✓
Air pressure monitoring & proving	✓	✓
Oil pressure monitoring	–	✓
Fuel flow metering	✓	✓
Golden start facility	✓	✓
Commissioning points	20	20
Customizable graphics	✓	✓
Flame rod/UV change over option	✓	✓
Multi-language display	✓	✓
Metric/Imperial	✓	✓
UL, CE, AGA approvals	✓	✓
On-board technical manual	✓	✓
<b>Available with software access code</b>		
Direct Modbus connectivity	✓*	✓
Autoflame Water Level Management (AF WLM)	–	✓
Analogue water level management (requires AF WLM)	–	✓
Steam/heat flow metering	–	✓
Top blowdown/TDS	–	✓
Bottom blowdown	–	✓
Draft control	–	✓
First out annunciation	–	✓
Fully metered, cross-limited combustion control	–	✓
*Mini Mk8 does not require access code		
<b>Requires additional module or component</b>		
Indirect Modbus connectivity	Requires DTI	Requires DTI
O2 trim	Requires O2 Module	Requires O2 Module
Three parameter trim (O2, CO2, CO)	Requires EGA	Requires EGA
Emissions monitoring & reporting	Requires EGA	Requires EGA



SOFTWARE UNLOCK



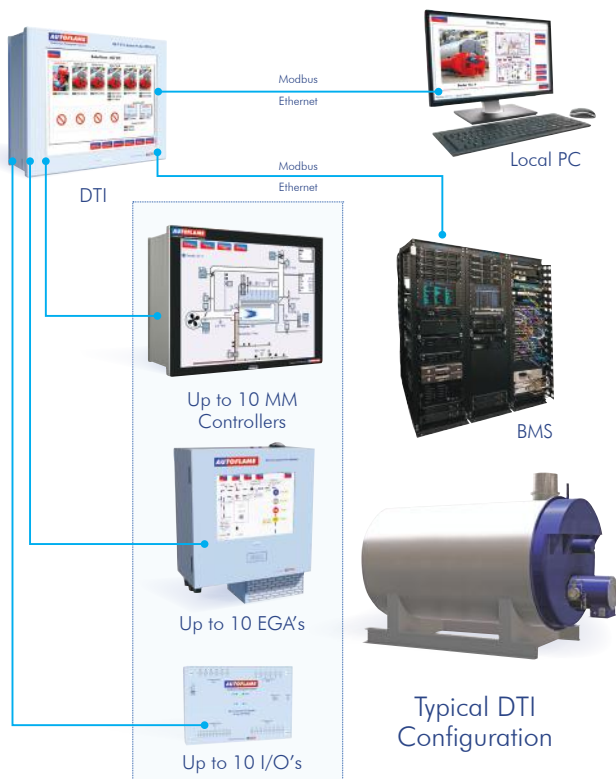
## Mk7 DTI



## Remote monitoring, control & data storage

### Data Transfer Interface (DTI)

- ◆ View live streaming data of up to 10 boilers from a single DTI, through a local PC or BMS
- ◆ Enables BMS integration with the boiler plant via MODBUS and Ethernet
- ◆ View up to 150 items of information from each MM Controller and each EGA
- ◆ Stores up to 2 years of data history on all boilers



## Mk8 EGA EVO



## Enable trim & emissions monitoring/auditing

### Exhaust Gas Analyser (EGA)

- ◆ Enables 3 parameter trim on Mk8 MM Controller for improved burning efficiency.
- ◆ Continuous Emissions Monitoring System (CEMS) for display & data trending. View reports by user-definable time periods (6 hours, 8 days, 500 days, etc.) based on:
  - ◆ Total weight & volumetric emissions
  - ◆ Total cost of fuel (calculated by current cost per tonne of fuel)
  - ◆ Weight & volumetric emissions per exhaust gas ( $O_2$ ,  $CO_2$ ,  $CO$ ,  $NO$ ,  $NO_2$ ,  $SO_2$ ) & per fuel
- ◆ Specifically designed for current regulations on emissions monitoring
- ◆ MM Controller or Standalone Operation modes
- ◆ Six 4-20mA analogue outputs of all combustion data for remote logging, printing or chart recording
- ◆ Automated cell calibrations on bottled calibration gas (EPA version of EGA)

## Custom Panels

Our in-house custom manufactured panels are usually the lowest cost, highest quality option. This is because we can engineer it with the MM Controller and other accessories to customer requirements, creating a complete factory solution that offers:

- ◆ Seamless integration of controller and all electrical
- ◆ Complete quality control overseen by our engineers
- ◆ Faster installation of a single finished unit instead of multiple components





## Ancillary Equipment

Autoflame manufactures to the highest quality standards a range of servomotors, probes, scanners, sensors, valves and other parts to support its burner/boiler management system. These are all designed and manufactured in house to maintain the highest quality control.

## Local Installation & Support

Autoflame has partnerships with more than 95 Technology Centres worldwide. To maintain our reputation for quality, safety and reliability, Autoflame ensures they receive regular training to keep up to date with our latest innovations.

## About Autoflame

Founded in 1972, Autoflame is a world leader in boiler/ burner management systems for both commercial and industrial applications. Based near London, England, it ensures industry-leading quality control and innovation by performing in-house R&D, engineering, software development, manufacturing production, and technical support.

Privately owned by its founder, Brendan Kemp, Autoflame currently has more than 10,000 systems in operation globally, and is now specified as standard equipment in some of the world's most prestigious organisations.

## Autoflame patents related to Boiler Automation, Efficiency & Safety

**Europe:** 1022515, 1373796, 1384944, 1384945, 1384946, 60014980.3, 60201594.4, 60202855.8, 60203002.1, 60203040.4, 09252836.3, 11778663.2, 1022515, 10151584.9

**UK:** 1022515, 1373796, 1384944, 1384945, 1384946, 2412958, 2448624, 2448625, 0823303.3, 0907125.9, 1018178.2, 1214740.1, 1318174.8, 0907125.9, 1018178.2

**USA:** 6024561, 6520122, 6978741, 12/946.615, 6024561, 7249573, 13/591922, 13/651029  
**Canada:** 2295458

Depending on the application, the ideal solution may involve any or all of these components.

