

-weishaupt-

info

The capabilities of Weishaupt combustion managers



Combustion managers

W-FM50, W-FM100, W-FM200

Weishaupt burners with digital combustion management have been operating on a wide variety of heat generators and thermal process plant for more than 15 years. The technology's universal adaptability to completely different burner types and operating conditions is compelling.

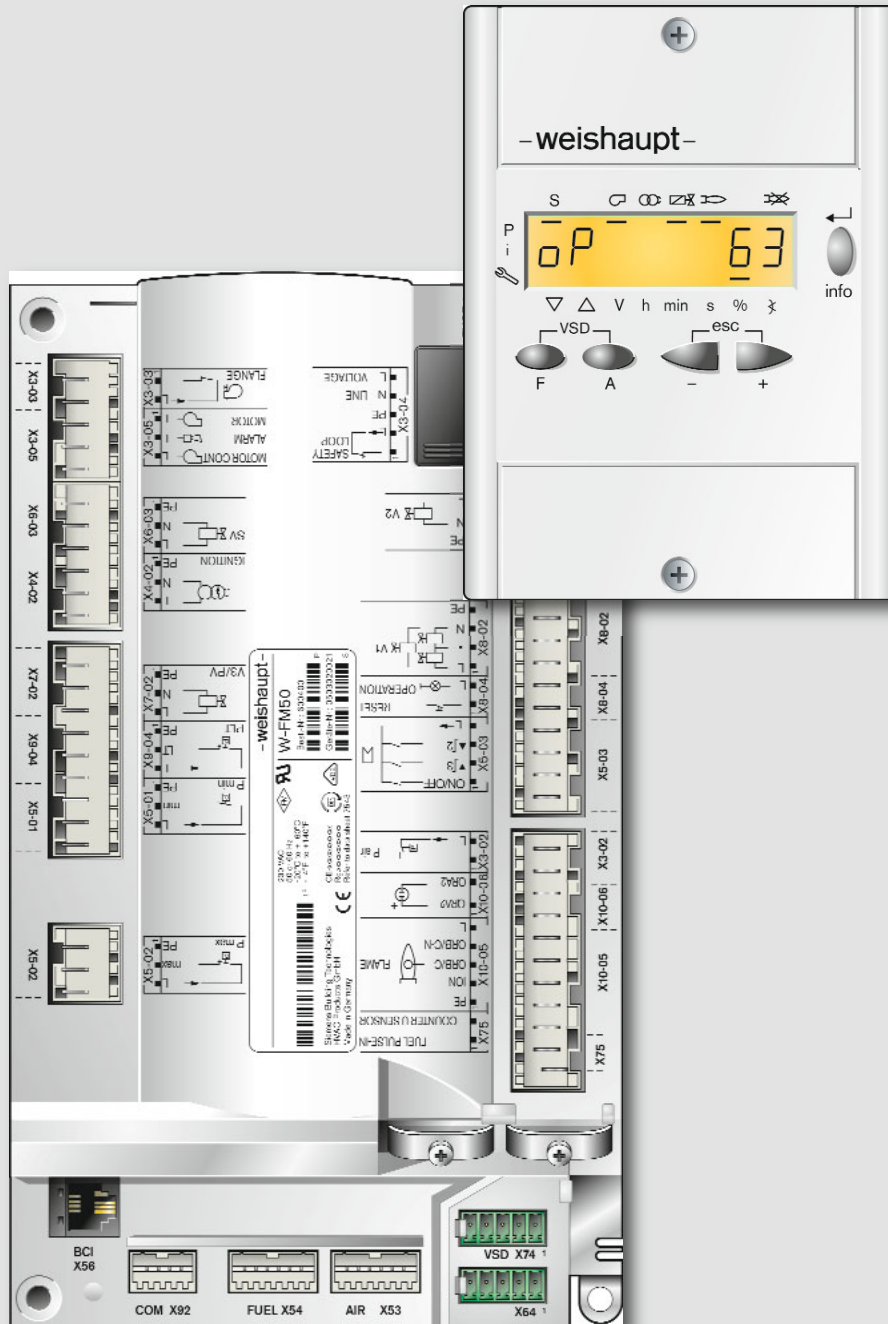
Close collaboration in Weishaupt's own R&D Centre with the combustion manager manufacturers leads to the development of bespoke products that continually establish new benchmarks.

Today, it is possible to cover the full spectrum of combustion technology applications with just a few different types of combustion manager.

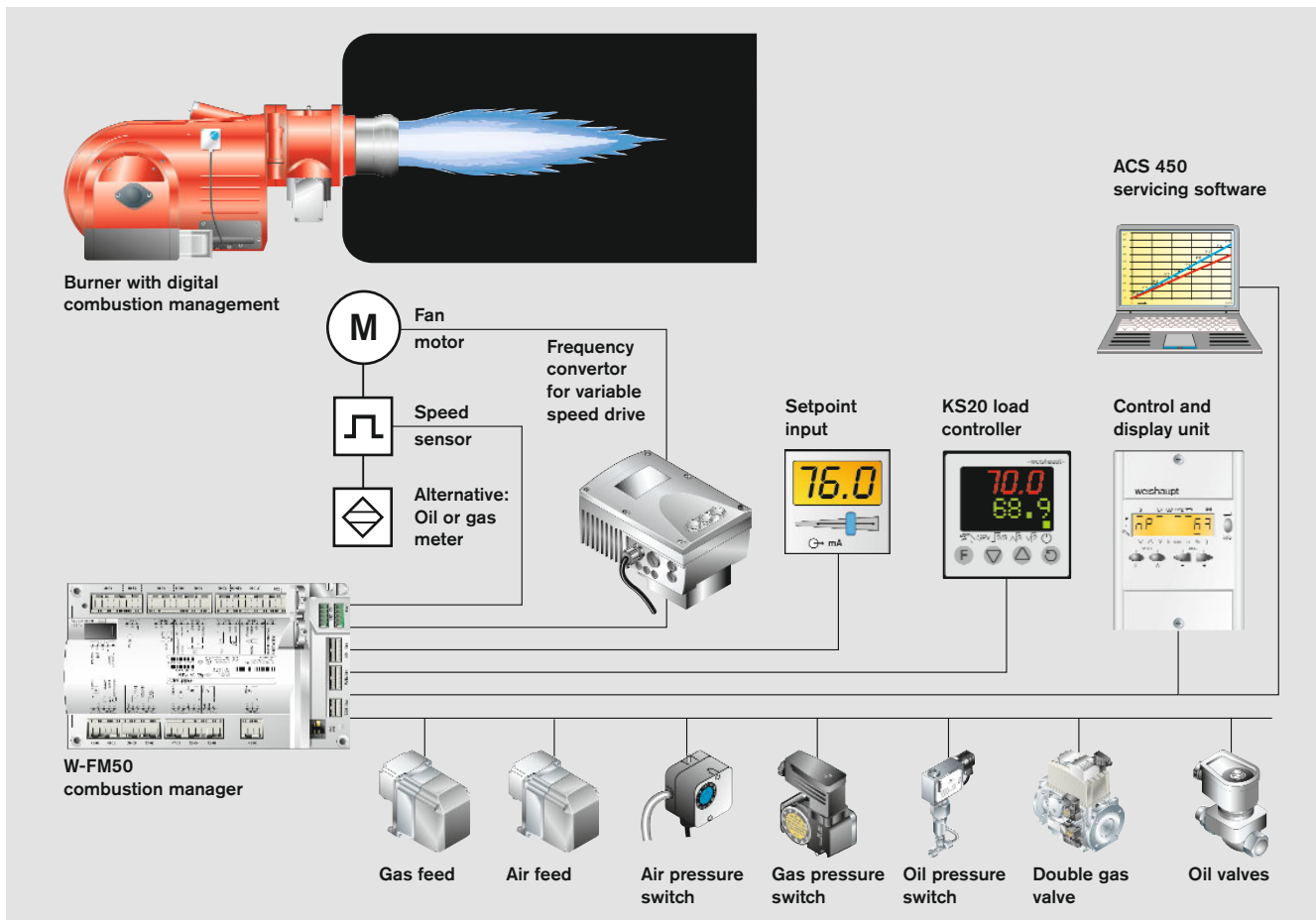
Combustion managers incorporate efficiency-increasing and emissions-reducing technologies, as well as connections for external control systems.

Weishaupt's range also covers the whole gamut of modern control technology, including fully comprehensive solutions for complex building automation projects; future-oriented, cost-effective, and flexible.

The W-FM50 digital combustion managers



W-FM50 system with optional components



Schematic representation with W-FM50

Digital combustion management has been an innovative and fundamental component of Weishaupt gas, oil, and dual-fuel burners for more than a decade.

The W-FM50 combustion manager has earned a secure place on WM10 to WM30 monarch® burners. Their ease of use, stability and operational reliability is compelling.

Electronic compound regulation

ECR, one of the combustion manager's systems, guarantees the precise and continually reproducible dosing of the burner's fuel and combustion air. Particular attention is given to the combustion air.

Variable speed drive

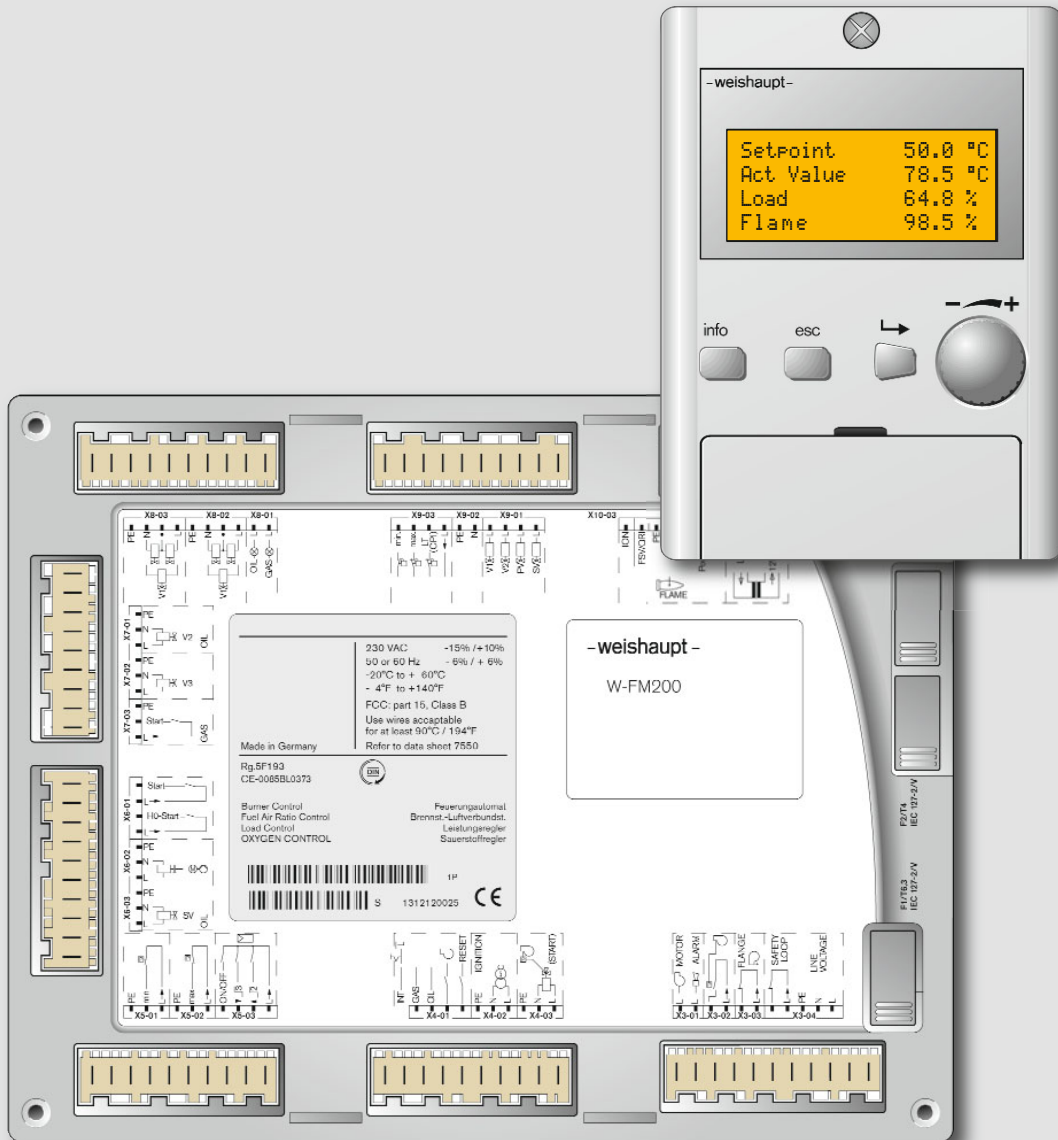
The W-FM50 is VSD ready. Opt for a frequency converter and benefit from all the advantages that variable speed drive provides. The high potential for energy savings and the reduction of noise emissions are two known benefits. Less well known, but significant nevertheless,

is the minimisation of the starting current, which helps to reduce peak load. What is more, a frequency converter provides optimal motor protection.

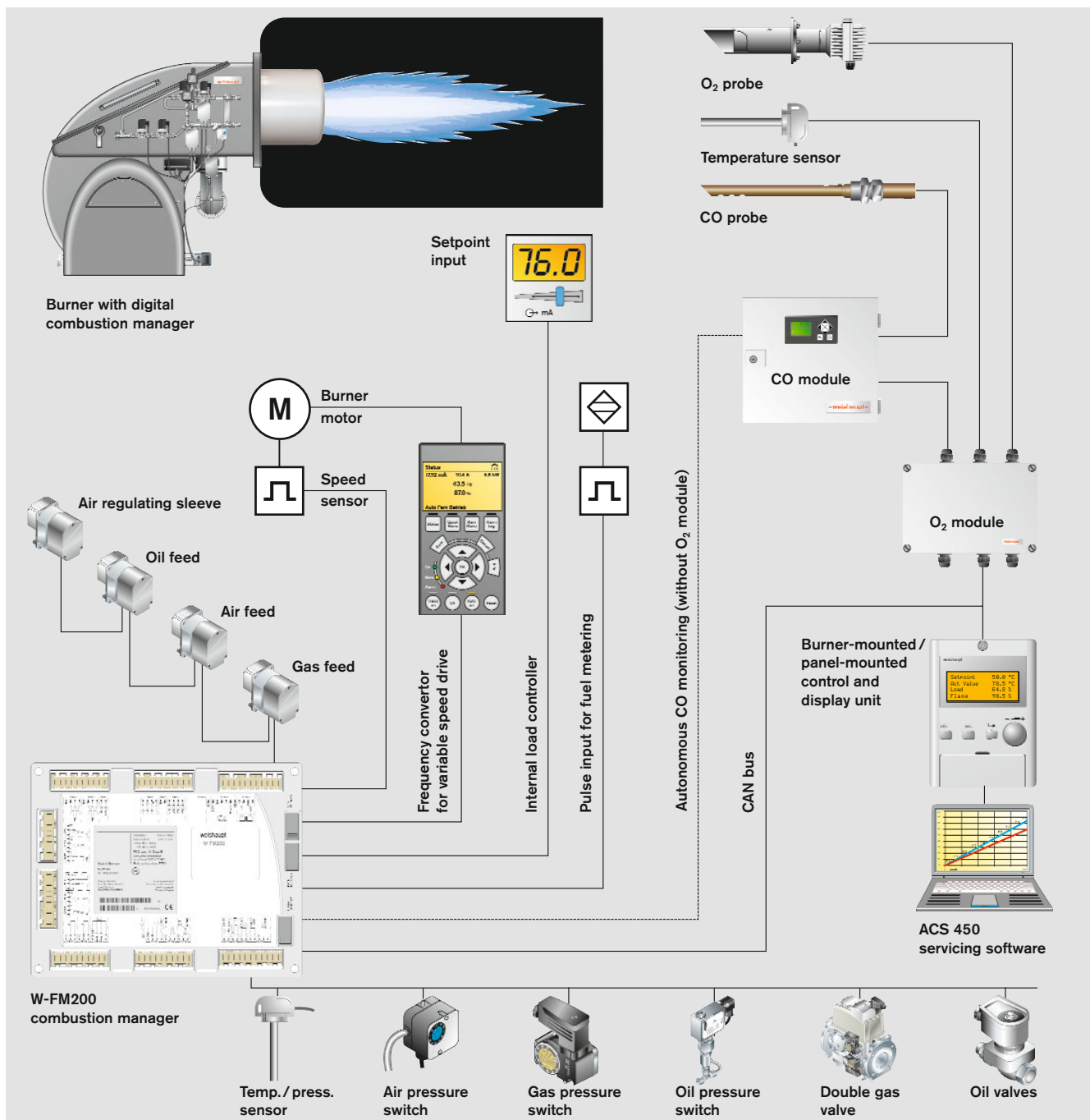
Yet today's combustion manager systems offer even more: digital and analogue input to the optional load controller, control of external fuel safety valves, communication with superordinate control systems, and the integration of sitespecific parameters such as, for example, adjustable pre- and post-purge times.

It sounds good, and it is.

The W-FM100 and W-FM200 digital combustion managers



W-FM100 / 200 system components



Schematic representation with W-FM200

The W-FM100 and W-FM200 digital combustion managers

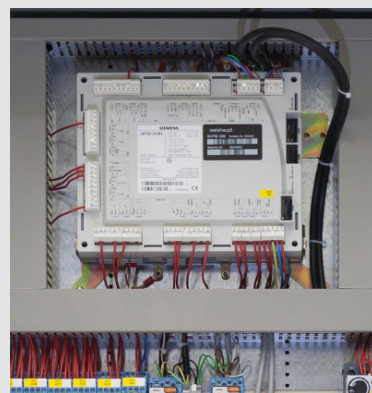


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Spanish
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Slovenian
Hungarian
Czech
Croatian
Dutch
Swedish
Danish
Norwegian
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Russian
Turkish
Bulgarian
Romanian
Chinese

Control and display unit with clear text display



Burner-mounted W-FM100 or W-FM200 combustion manager



Mounted in a control panel

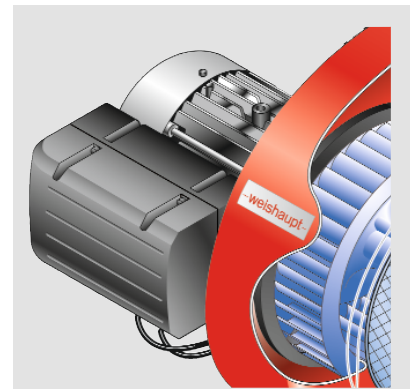
Variable systems technology

The W-FM100 and W-FM200 combustion managers utilise CAN bus technology and can be mounted neatly onboard the burner or in a separate control panel as required. The system's control and display unit, which is also connected by CAN bus, can be installed in any suitable location. The control and display unit also houses a jack for interfacing with a BMS via Modbus RTU or eBus, and a port for connecting to a windows PC running ACS450 servicing software.

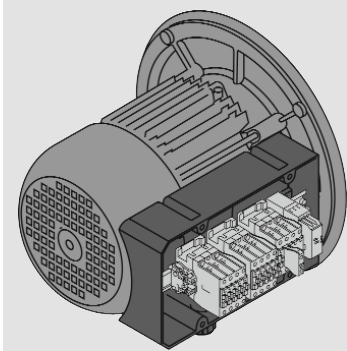
Compact and capable

An analogue burner control box and a digital combustion manager are as different from one another as a typewriter and a PC. A combustion manager unifies diverse, conventional burner control systems within a very small amount of space. That provides all kinds of benefits. Switching contacts and connecting lines reduce mechanical sources of error to a minimum. New monitoring systems, such as the contact feedback network, increase reliability by recognising improper voltage signals and reacting accordingly to them.

There are external benefits too. A smaller equipment footprint, faster installation, and computer-assisted system checks both reduce costs and increase quality; a win-win situation for the customer and the manufacturer.



Burner motor junction box

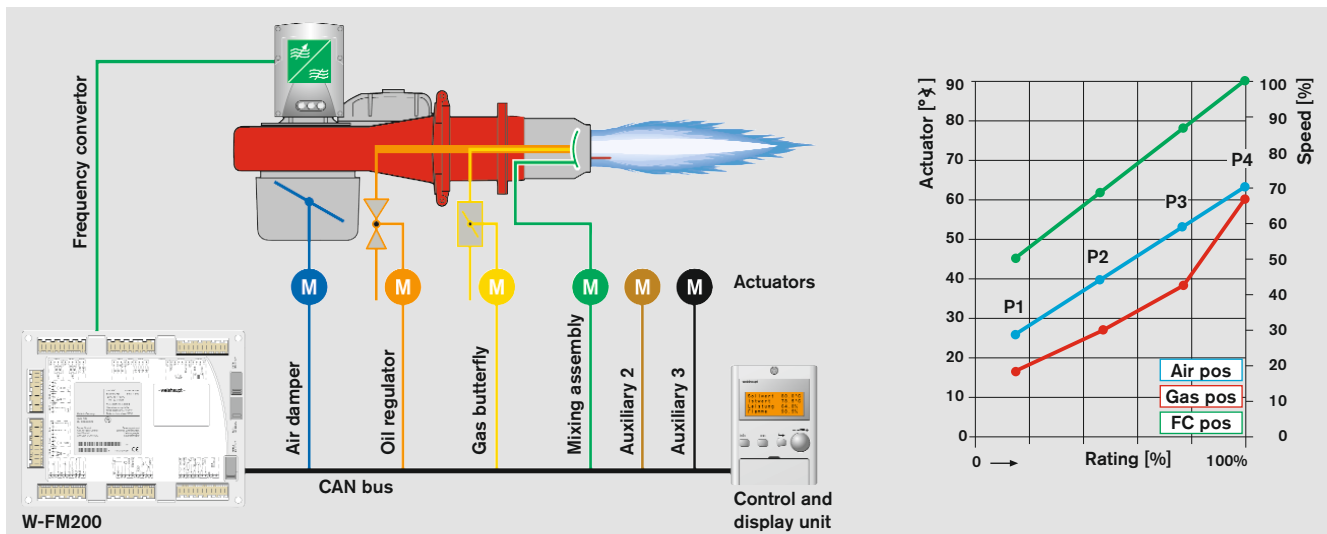


Integrated star-delta switching with optional motor protection switch



Optional burner-mounted frequency converter

Extreme precision with electronic compound regulation



Maintaining the ideal mixing ratio of fuel to air through a burner's entire turndown range can only be achieved with a state-of-the-art combustion management system.

Such a system is limited not just to the combustion manager, it incorporates all of the controls. Electronic and mechanical parts have to be equally accurate in order for the necessary degree of precision to be realised. Equally accurate, however, does not mean equally extensive.

It is not what has been added that is the crucial factor, but rather what has been left out. If you look at a Weishaupt burner today, you will notice that the mechanical components have been reduced to a minimum. In their place are stepping motors, which are precise to 0.1° at the shaft and have torsionally resistant connecting pieces. These ensure that positioning is both exact

and reproducible; a prerequisite for the constantly precise proportioning of every individual component and, by extension, the electronic compound regulation system.

This provides key benefits when making adjustments for flame geometry and different damper characteristics. Up to 15 load points per curve, which are positioned differently dependent on the load, enable optimal adjustments to be made.

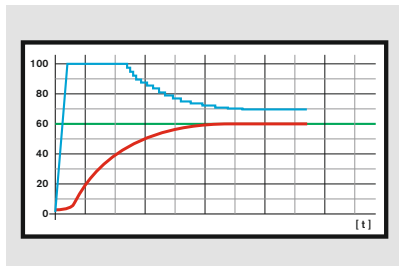
Similarly worth mentioning is the ease of load apportionment. One throughput measurement per load point, and the capacity percentage, are all that have to be entered in order for an automatic apportionment of the load points from partial to full load to take place. Each control signal from the load controller will then result in the same change in load. Optimisation of the load controller becomes simpler, the system operates more stably, and efficiency is further increased.

How does an electronic compound regulation system work?

When the burner is adjusted, flue gas measurements are used to create a curve for each of the correcting elements that are working in compound. The necessary amount of excess air from partial to full load is established at the same time. This has to be kept constant throughout the whole capacity range during burner operation.

As can be seen illustrated above, the curves differ from one another: one is steeper, one is shallower, and one is curved. To compensate for these characteristics, the combustion manager makes use of the variable runtimes of the stepping motors. It calculates the exact runtime for each actuator, based on the change in load to be effected. Only in this way is it possible for the damper settings and the speed to follow the curves exactly – monitoring included.

Optimal matching: the little things that matter

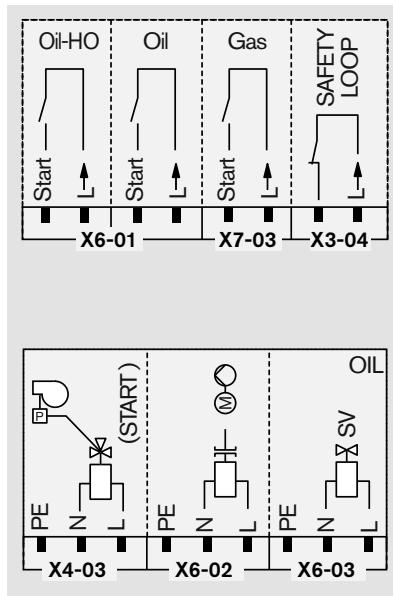


The optimal matching of burner load to the heat demand of a plant helps to ensure the efficient operation of the entire system.

Responsibility for this key operational aspect lies with a system component that, alongside big features like O₂ trim, CO control, and variable speed drive, is often given too little attention – the load controller. It makes sure that the burner converts only as much fuel into heat as is actually needed at that moment. It stops the burner from continually switching on and off and thus avoids unnecessary startup emissions. The load controller is the crucial component when it comes to improving annual efficiency and saving fuel.

Weishaupt has a highly adaptable integral load controller for its W-FM100 and W-FM200 combustion managers. In the foreground is the automatic adaption of the PID control parameters. Behind that is hidden a measurement process, which determines the dynamics of the system and calculates control values from them – and always especially for that particular system.

Savings are good, but only in the right places. Therefore, it is also important to bear the heat generator in mind. Heating up too rapidly, or operating at too low a temperature, can damage an appliance. Parameters such as minimum boiler temperature, or thermal shock protection, help protect against this.

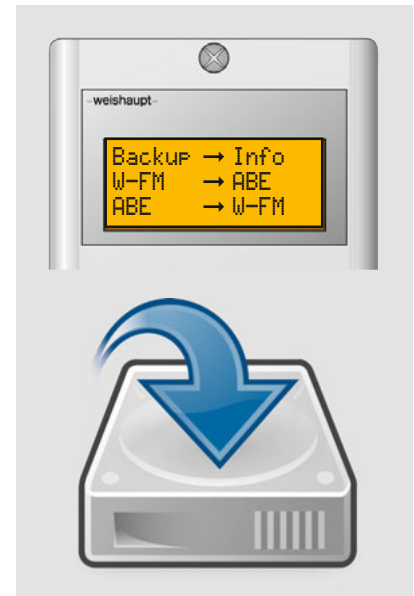


Interlocking

External electrical signals cannot always be incorporated into a control system as a matter of course and their inclusion can require additional effort and expenditure.

Weishaupt's W-FM100 and W-FM200 combustion managers, however, have separated inputs for their control and safety loops. Furthermore, there are fuel-dependent start releases for gas, light oil, and HFO for a wide variety of applications. So it is possible, for example, to monitor whether fresh air and flue gas dampers are open, or to provide switching signals for the fuel feed.

It all sounds rather unspectacular, but these are the very things that increase operational readiness and safety.



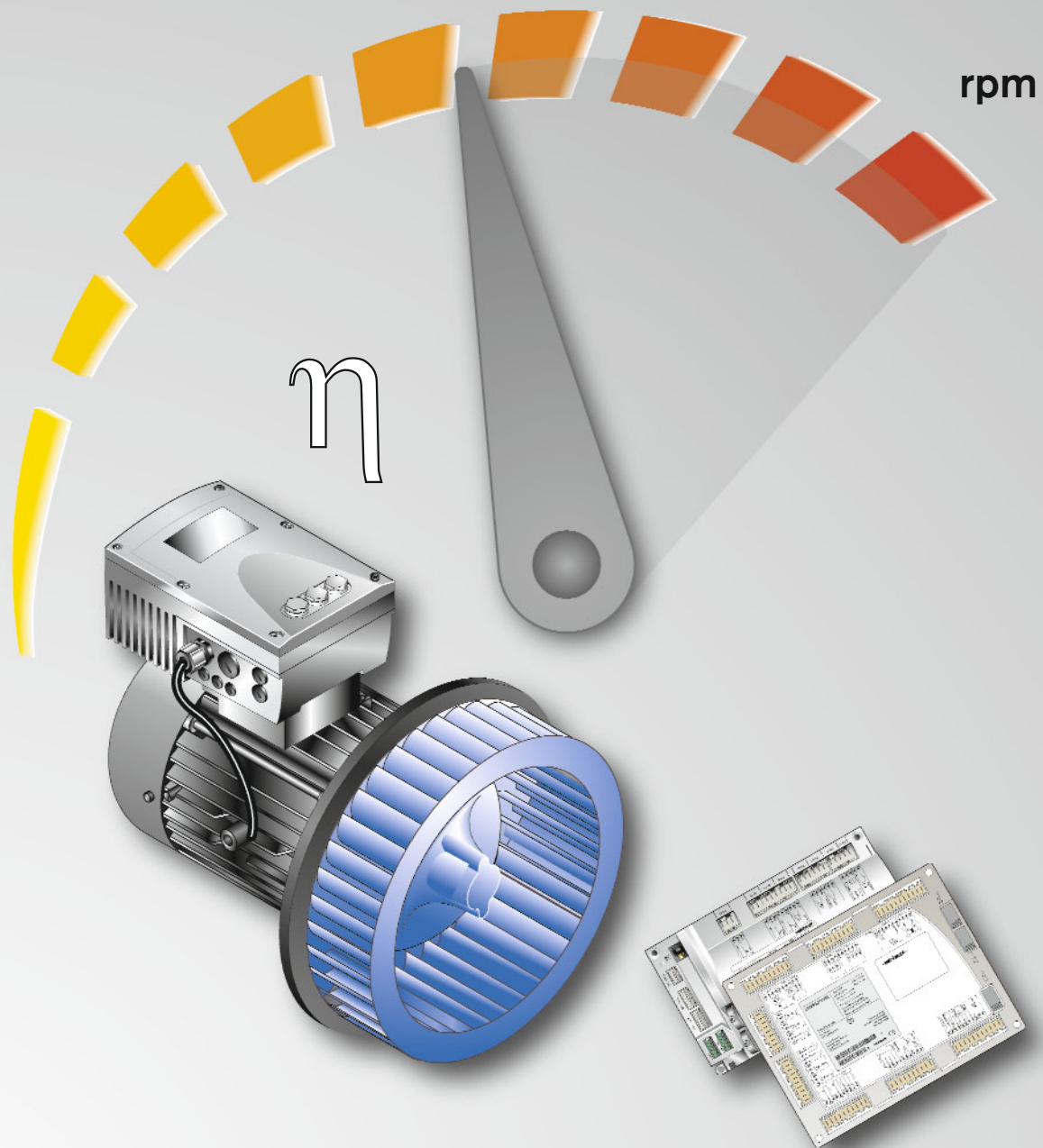
Data backup

Everybody knows that nothing lasts forever, yet not everybody thinks about the necessary precautions. So it is good to know that all the control and display units of Weishaupt combustion managers have separate memory modules that are protected against loss of data.

If, for whatever reason, it becomes necessary at some point to replace the combustion manager, the entire data set can be copied over to the new unit, quickly, easily, and without error. And for anyone who prefers to be doubly sure, the ACS450 software can make an additional copy of the data on a PC or external data storage medium.

Just getting to site quickly is not enough. Getting everything working again as quickly as possible is just as important.

Optimising efficiency and emissions



Variable speed drive (VSD)



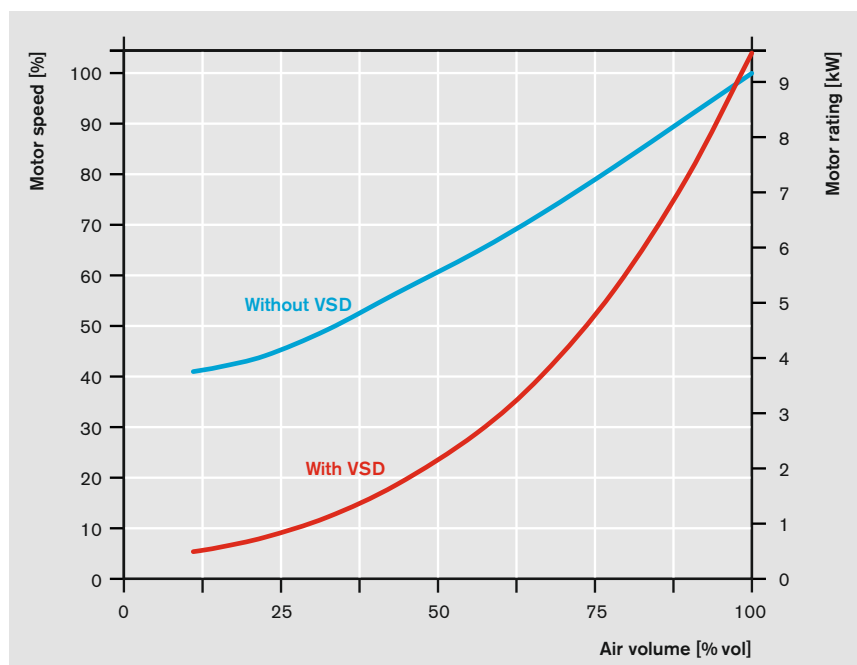
WM-GL 30 dual-fuel monarch® with CO/FGR-version W-FM200 and frequency convertor

The W-FM200 combustion manager has a very considerable range of capabilities.

The system contains no fewer than 13 different software components. Many of these are directly connected with one another. VSD is always an element of the compound regulation, which in turn is the basis for O₂ trim and CO control.

These interlocked technologies are controlled by intelligent software, which automates, calculates, and adjusts many things in the background. Alongside that are clearly structured control levels with text displays that allow for fine adjustments to be made, with the aim of saving energy while achieving environmentally friendly combustion and optimal performance.

Reduced electrical consumption for a WM-G30/1-A ZM-3LN



Curves based on measurements on aerodynamic equipment

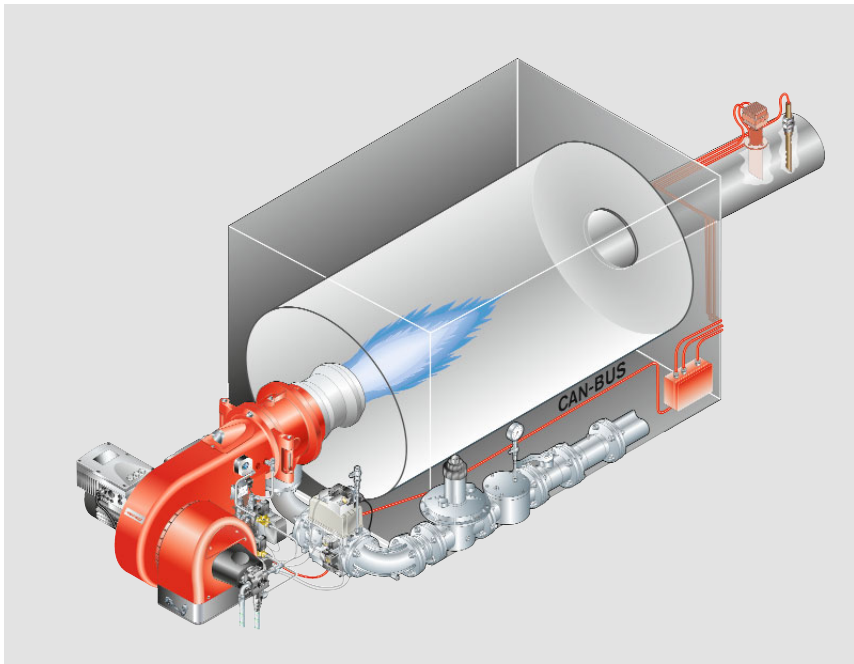
How does VSD save energy, and what other benefits does it offer?

Burners with modulating load control have a variable rate of fuel throughput for which the corresponding volume of combustion air is required.

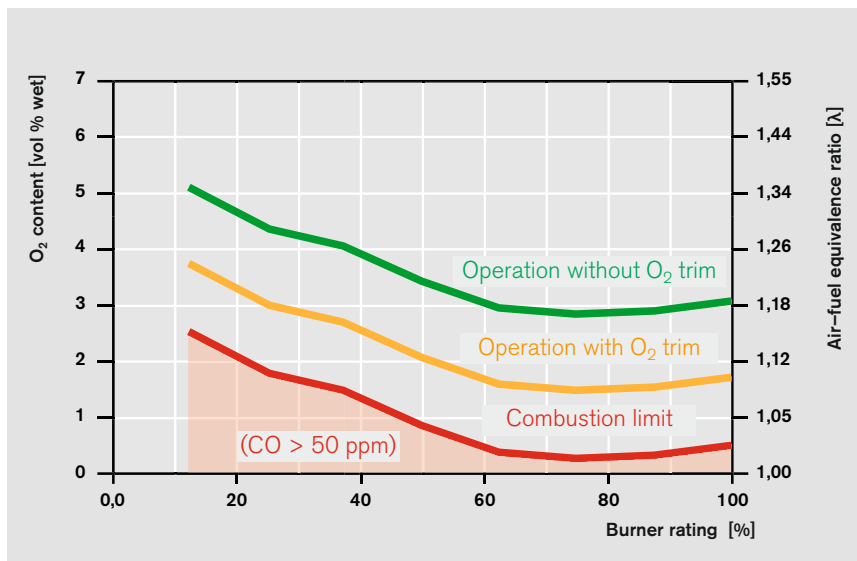
Combustion air volume is usually controlled mechanically by an air damper while the burner motor runs at a constant speed. Running the motor at 100 % capacity when only 50 % is required is a waste of energy, which the use of VSD could have saved.

VSD offers other benefits too. Reduced motor speed results in quieter operation, smoother running, and perfect starting behaviour.

O₂ trim and CO control



WM-GL 30 dual-fuel monarch® with CO/FGR-version W-FM200 and frequency convertor



Example: Combustion limit trend across the entire operating range of a gas burner and the associated air settings with and without O₂ trim

The availability of well-proven technology to combat increasing energy prices means that it is always beneficial to change over to the latest equipment

With amortisation periods of just a few years, operating costs will be reduced on a continuing basis thereafter. And that is not all. Continuous monitoring and control to ensure combustion is CO free means increased operational safety.

Two independent measurement systems feed into the combustion manager's compound regulation system, allowing continual real-time adjustments to be made without affecting operational availability or safety.

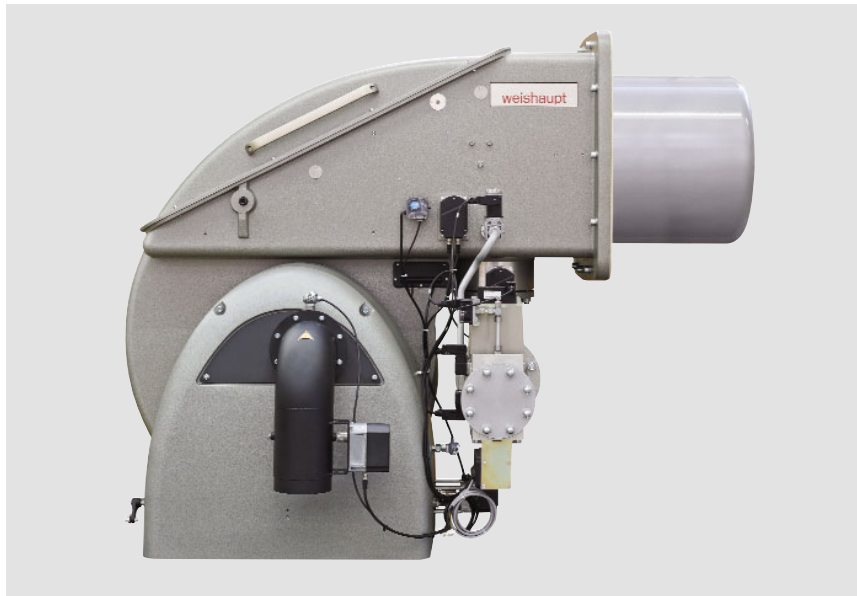
How does O₂ trim increase efficiency?

The task of a burner is to mix air and fuel as homogeneously as possible, in the right proportions, so that optimal combustion can follow.

Combustion quality, in other words, how close one can get to stoichiometric combustion with almost no CO, is one sign of the quality of a mixing assembly. This point is known as the combustion limit and it ultimately determines the amount of excess air with which the burner must be operated in order to counter-balance environmental influences, variations in fuel quality, pollution, and so on. Therefore excess air is ballast that increases the flue gas volume, causing the flow rate to increase. This results in reduced heat transfer and thus a reduction in efficiency.

O₂ trim can't improve a mixing assembly, but it can have an influence on the amount of excess air. By continually measuring the O₂ content of the flue gas, the amount of excess air can be reduced to a minimum. Then, the flue gas volume decreases, the flow rate reduces, heat transfer improves, and the efficiency increases.

Reducing NO_x with flue gas recirculation



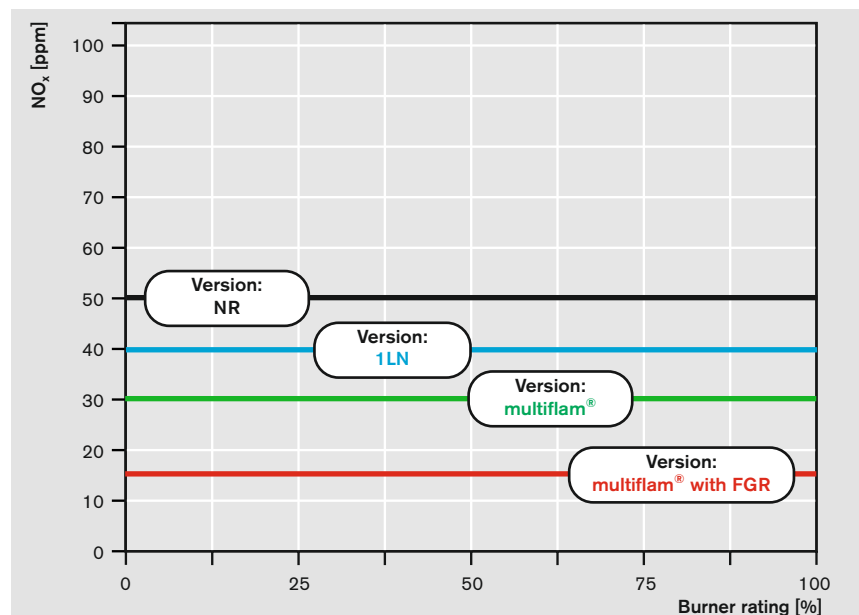
WKmono G80 with flue gas recirculation

Flue gas recirculation – Weishaupt's answer to ultra-low NO_x limits.

It sounds so simple – you connect the burner's air inlet to the flue of the boiler with a hose, draw the flue gas off with the burner fan, and feed it back into the flame with the combustion air. The result: extremely low NO_x emissions.

As we said, it sounds easy. However, the critical factor is the precise dosing of the recirculated flue gas. The W-FM200 combustion manager is best placed to control this. With just two additional components – a flue gas temperature sensor and a butterfly valve – and some additional software, the W-FM200 can control the flow of flue gas so that the correct amount is fed into the combustion air under all operating conditions, providing reliable startup and operational behaviour – just as you would expect.

NO_x emissions achievable when firing natural gas



The values are for the stated burner versions on three-pass combustion chambers with medium temperatures ≤ 110 °C. Weishaupt constraints based on the requirements of EN 676.

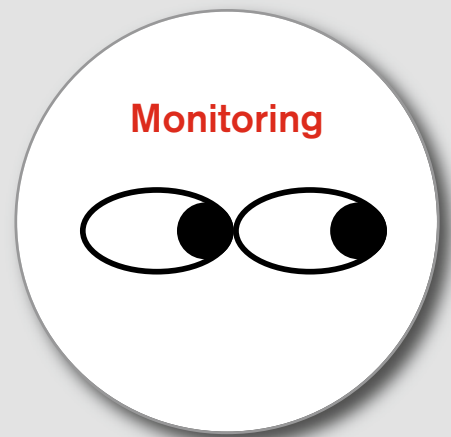
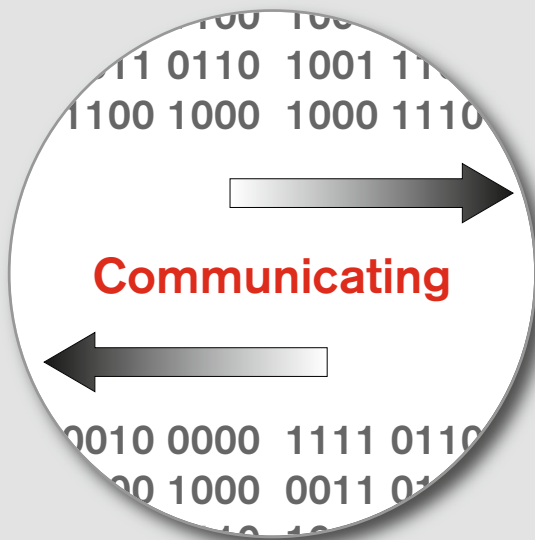
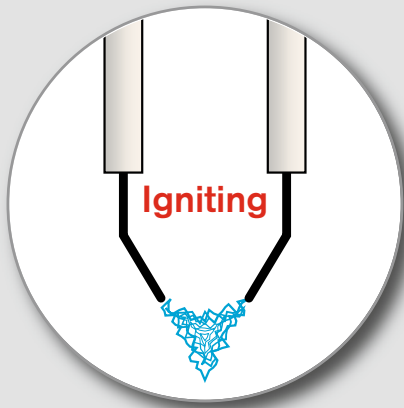
A heat generator's NO_x emissions depend on a lot of different factors.

The design of the appliance alone – its combustion chamber dimensions, the thermal load, and the temperature of the heat exchange medium – has a very large effect on NO_x formation.

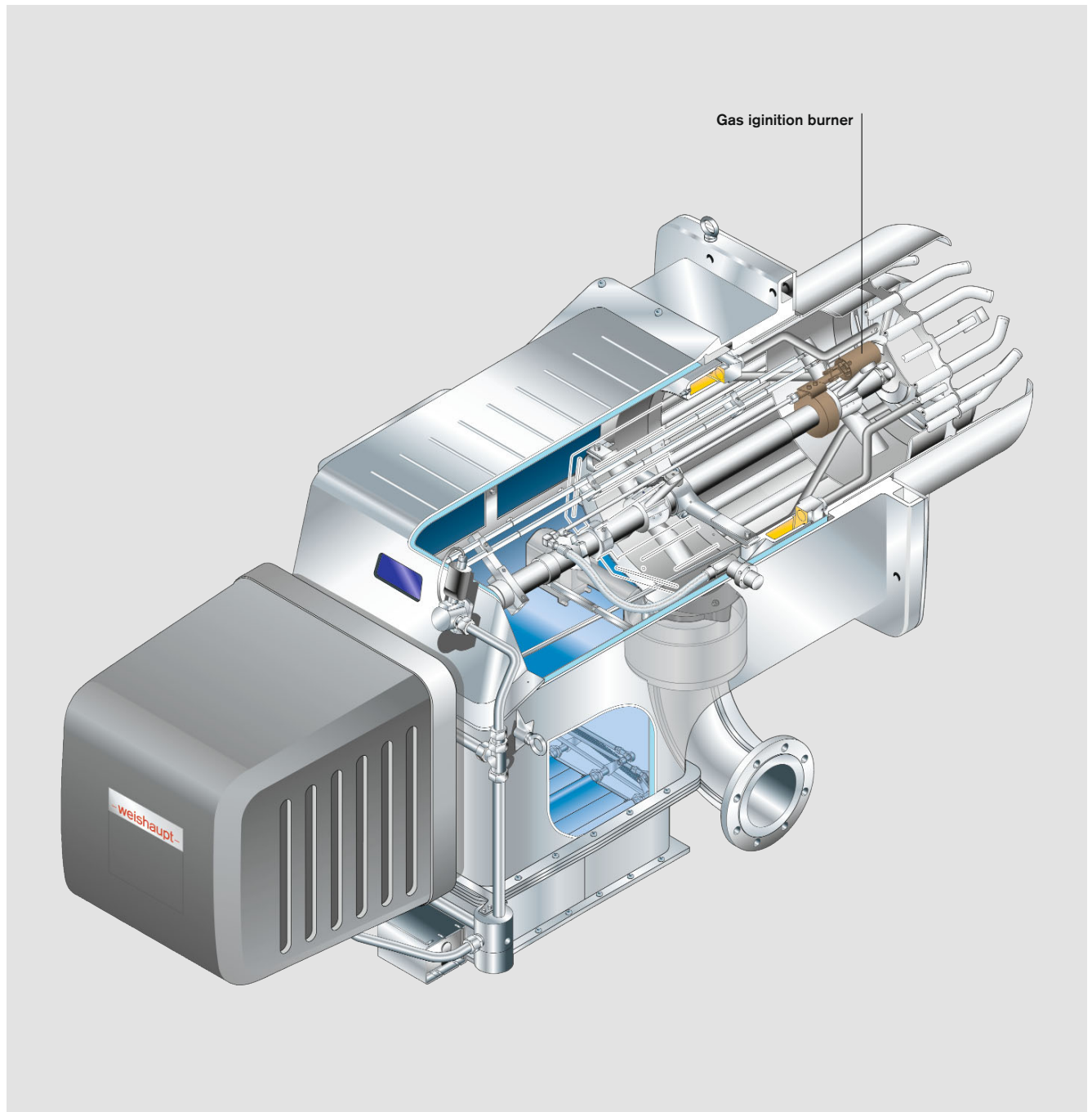
Take into account even more factors, such as air humidity and temperature, excess air, and the type of fuel, and it is clear that reducing NO_x emissions to the lowest possible level does not solely depend on the burner.

Nevertheless, having developed different burner versions and systems, Weishaupt is in the position of being able to meet the most stringent of emission limits.

Compelling solutions



Perfect ignition
Helping safety and environmental protection



WK-series burner in hot-air execution with gas ignition burner

Flame monitoring for demanding safety requirements



Testing and optimisation using a software tool

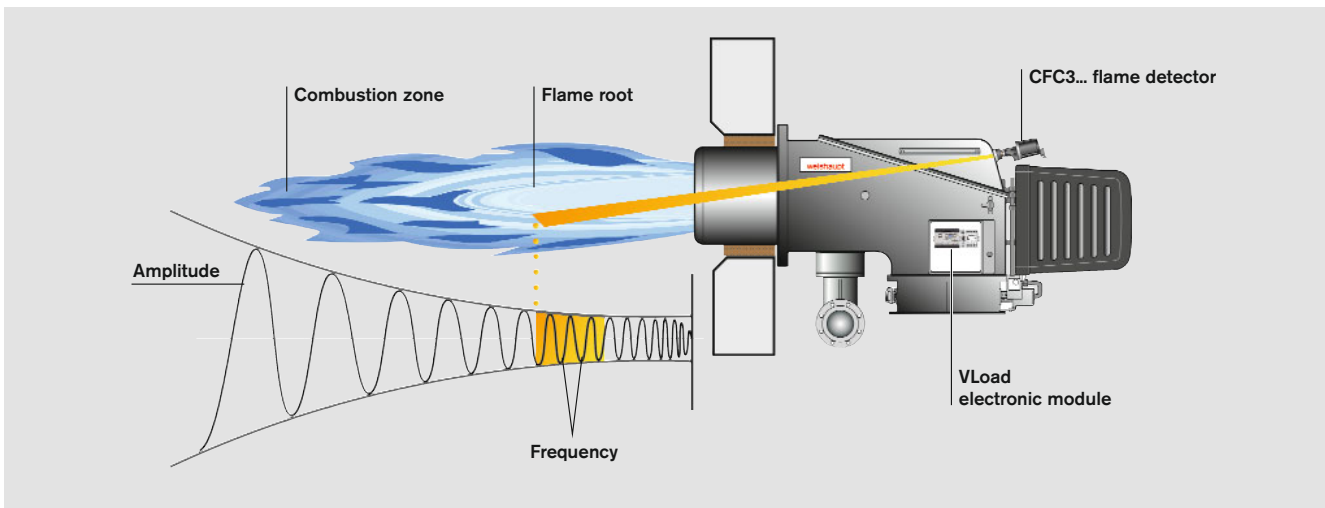
Flame monitoring plays a crucial role when it comes to reliability and safety.

Determination of the best method of flame monitoring takes into account not only the burner and the fuel to be combusted, but also how the system operates and the conditions inside the combustion chamber.

Heat generators with one flame per combustion chamber are easier to monitor than those with multiple flames. In the latter case, it also depends whether the flames are firing into the combustion chamber from the same or opposing directions.

Biomass plant and waste incinerators need a flame monitoring system that is not affected by extraneous flames.

Weishaupt offers flame monitoring systems for gas, oil, and dual-fuel burners operating under the widest range of conditions.



The constructive alignment of the CFC3.. allows the detection range to be optimised

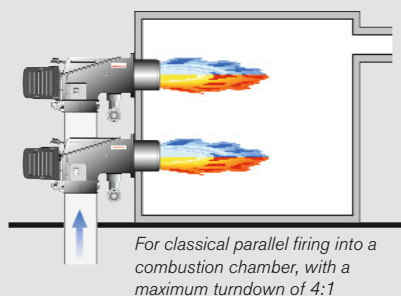
W-FC: Weishaupt Flame Control

Weishaupt Flame Control (W-FC) is a reliable flame monitoring system designed to meet demanding safety requirements and comply with the

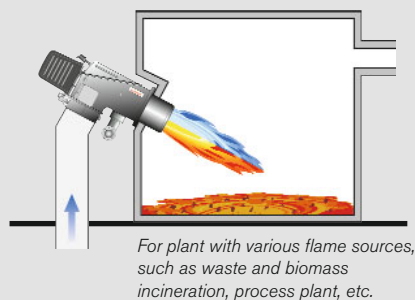
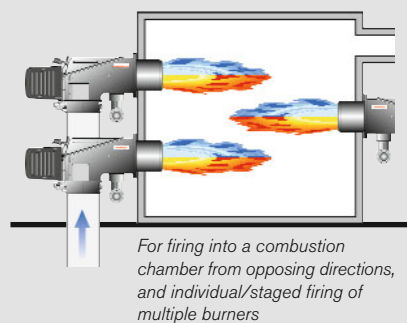
EN 298 standard for continuous operation.

W-FC 4.0 is for plant with multiple burners firing from the same direction into a single combustion chamber. The W-FC assembly utilises flame frequency to monitor each flame separately via a load-independent on and off threshold for each fuel. The CFC3... flame detector functions in series with the QRA73 flame sensor on the W-FM100 or W-FM200 combustion manager.

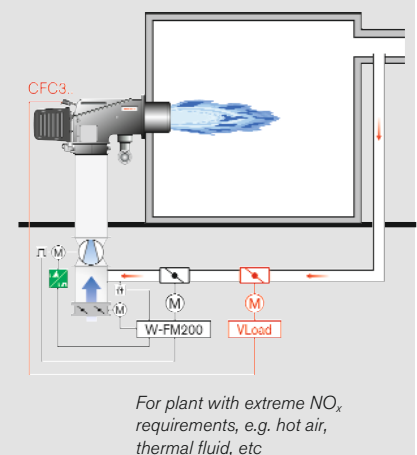
Note: If a turndown in excess of 4:1 or single-burner operation is required, the higher-specification W-FC 5.0 must be selected.



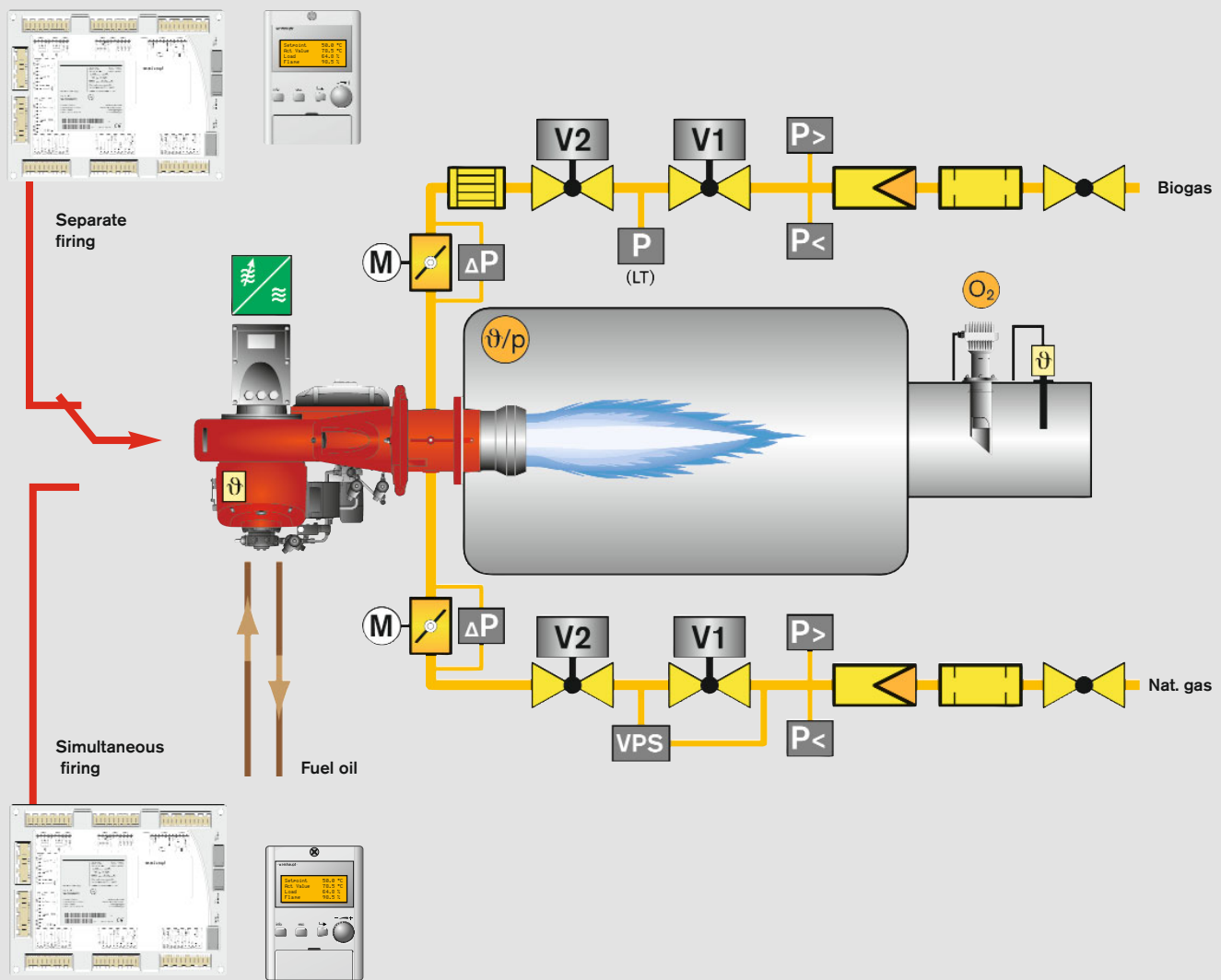
is for plant with multiple burners firing from different directions into a single combustion chamber, and for process plant with various flame sources. The W-FC assembly monitors each flame separately via up to ten load-dependent switching thresholds for each fuel. The VLoad electronic module and its user-friendly software establishes a distinct differentiation from extraneous light sources specific to that plant. The CFC3... flame detector functions in parallel with the QRA73 flame sensor on the W-FM200 combustion manager.



W-FC 6.0 is required for plant with flue gas recirculation and a high recirculation rate. This variant checks not only for the presence of a flame, but also for its stability. Flame stability is monitored via an additional system comprising a CFC3... flame detector, a VLoad electronic module, and a flue gas damper. Optimal detection of the flame throughout the entire load range is facilitated by load-dependent setting points. If any flame irregularities occur, the flue gas damper is adjusted to restore stability.



Special application: Simultaneous combustion



One of many solutions: Burner system with two W-FM200 combustion managers for separate or simultaneous combustion

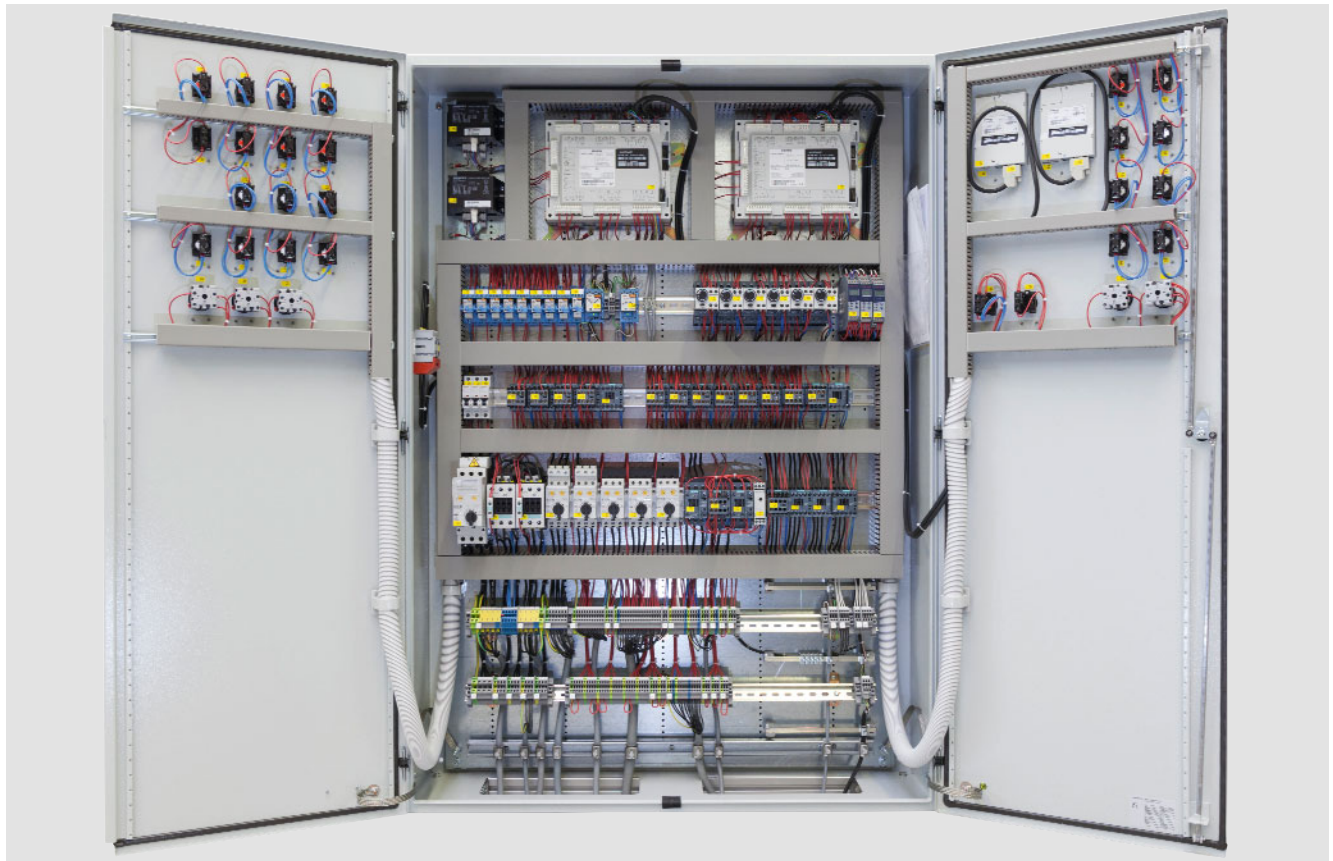
The use of renewable fuels demands the implementation of increasingly specialised solutions.

Weishaupt has long been able to combust two or more fuels simultaneously. Depending on the particular arrangement of the fuel supply system, executions with one or more combustion managers

are possible. One such variant with two W-FM200s makes it possible for optimal adjustments to be made for each fuel, both when firing individually and during simultaneous combustion with another fuel.

Weishaupt can offer even more, such as "on-the-fly" fuel changeover. For biogas

in particular, which may not always be available in sufficient volume, a method of changing over to natural gas without a pause in firing has been established. This presents several advantages, such as fewer burner starts, reduced start-up emissions, and more stable operating temperatures.



Weishaupt control panel with two W-FM200 combustion managers



Special burner for the simultaneous combustion of two gas types

Special applications, like simultaneous combustion, call for bespoke control panels.

Weishaupt, with its own in-house control panel design, production, and testing departments, can provide a full service. What is more, it can all be commissioned and serviced by Weishaupt's very own experienced technicians.

A worry-free package from a single supplier. It doesn't get better than that.

Digital combustion managers: The differences

Combustion manager	W-FM50	W-FM100	W-FM200
Fuels			
Gaseous	●	●	●
Liquid	●	●	●
Gaseous / liquid	–	●	●
Gaseous / gaseous	–	–	● ²⁾
Gaseous / gaseous / liquid	–	–	● ²⁾
Gaseous / liquid / liquid	–	● ²⁾	● ²⁾
Other fuel combinations available	–	–	–
Simultaneous combustion			
With fixed fuel volume ratio	–	● ³⁾	●
With fixed fuel volume ratio + independent combustion	–	● ^{3) 4)}	● ⁴⁾
With multiple fuel volume ratios + independent combustion	–	–	–
On-the-fly fuel changeover			
Gaseous ⇔ gaseous	–	–	–
Gaseous ⇔ liquid	–	--	–
Features			
Continuous operation > 24 h	● ⁵⁾	●	●
Integrated gas valve proving	●	●	●
Maximum number of actuators	2	4	6
Maximum number of frequency convertors	1	–	1
Maximum number of compound adjustments	1	2	2
Multiple combustion managers can be networked	–	–	–
Language-neutral control and display unit	●	–	–
Multi-language control and display unit, clear text	–	●	●
Multi-language control and display unit, colour graphics	–	–	–
Removable control and display unit, max length of connecting line to W-FM	20 m	< 100 m	< 100 m
Data backup on control and display unit / servicing software	● / ●	● / ●	● / ●

¹⁾ Low-viscosity liquid fuels only

²⁾ External control required

³⁾ Only with free AUX 1 output

⁴⁾ Second W-FM required

⁵⁾ Gaseous fuels only

Combustion manager	W-FM50	W-FM100	W-FM200
Efficiency and emission optimisations			
Variable speed drive	●	–	●
O ₂ trim	–	–	●
CO monitoring	–	–	○
O ₂ trim and CO control	–	–	○
Flue gas recirculation	–	–	○
Non-system-specific sensors	–	–	–
Fuel consumption meter (switchable)	● ⁶⁾	–	●
Combustion efficiency display available	–	–	●
Flame monitoring			
Duplicate flame monitoring –	–	● ²⁾	●
Extraneous light suppression – unidirectional flames + turndown ≤ 4:1	–	●	●
Extraneous light suppression – unidirectional flames + turndown > 4:1	–	–	● ²⁾
Extraneous light suppression – opposing flames	–	–	● ²⁾
Extraneous light suppression – Biomass (ignition and ancillary burners)	–	–	● ²⁾
Flame monitoring systems for heightened requirements	–	–	–
Ignition systems			
Electrical ignition unit	●	●	●
Gas pilot ignition	–	●	●
Gas ignition burner	–	–	●
Light-oil ignition burner	–	–	●
Control and regulation			
Three-term switching signal input	●	○	●
Analogue signal input (0 / 4–20 mA / 0 / 2–10 V)	● / –	○ / ○	● / ●
Setpoint input (temperature / pressure)	–	○	●
Load signal output (0 / 4–20 mA / 0 / 2–10 V)	– / ● ⁶⁾	○ / ○	● / ●
Integrated load controller	–	○	●
Control of multiple burners on a single combustion chamber	–	● ²⁾	● ²⁾

²⁾ External control required

○ Optional

⁶⁾ In lieu of variable speed drive

Digital combustion managers: The differences

Combustion manager	W-FM50	W-FM100	W-FM200
Bus systems			
eBus	●	●	●
Modbus RTU	●		●
Modbus TCP/IP	Gateway	Gateway	Gateway
Profibus DP	Gateway	Gateway	Gateway
Mounting position			
Burner-mounted combustion manager	●	● ⁷⁾	● ⁷⁾
Panel-mounted combustion manager available	–	●	●
Power supply			
24 V, DC	–	–	–
120 V, 50 Hz / 60 Hz	●	●	●
230 V, 50 Hz / 60 Hz	●	●	●
Approvals			
Europe	CE (230 V / 50 Hz)	●	●
Australia	AGA (240 V / 50 Hz)	●	●
USA / Canada	CSA (120 V / 60 Hz)	●	●
USA / Canada	ETL (120 V / 60 Hz)	●	●
Maritime applications			
Lloyd's Register	–	●	●
DNV-GL	–	●	●
Integration of customer-specific controls			
Boiler controls (steam and HTHW)	–	–	–
Burner sequencing	–	–	–
Time-dependent pump switching	–	–	–
Control of the fuel supply –	–	–	–
Trace heating control	–	–	–
Switchable safety loops (fail-safe)	–	–	–
Customer-specific control and regulation processes	–	–	–

⁷⁾ Panel-mounted combustion manager required with preheated combustion air

The Weishaupt group stands for reliability



Heating system production Facility in Sennwald, Switzerland



Neuberger Building automation in Rothenburg o.d.T.



Ground drilling with BauGrund Süd

The Weishaupt group with 3400 employees belongs to leading companies for condensing technology, heat pumps, solar, burner and building automation.

The group which established in 1932 consists of three sub-companies which operates in the field of energy technology, energy recovery and energy management.

The core business unit is Max Weishaupt GmbH (energy technology) which located in Upper Swabian town of Schwendi, where all burners are manufactured, the main administration is located and where the research and development institute can be found.

In the sister company, Pyropac, located in Swiss Sennwald, heating systems are manufactured.

Neuberger building automation (energy management), located in Rothenburg ob der Tauber, belongs to the group since 1995.

The BauGrund Sued Geothermal (energy recovery) in Bad Wurzach, responsible for drilling of ground sensors and wells, joined the group in 2009.



– weishaupt –

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Regular maintenance reduces heating costs and environmental pollution. Only a properly adjusted burner can save energy and be environmentally friendly. Behind each Weishaupt burner stands the whole Weishaupt customer service organization. The outstanding efforts made in maintenance and service justify the enormous trust placed in Weishaupt's burners, for at Weishaupt, product and customer service belong together.

Weishaupt customer service is there for you all year round. Whenever you need help, be it the supply of spare parts, technical advice or a site visit. We are there when you need us.