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## LMV – Innovative electronic air-fuel ratio control

Control Products & Systems OEM



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# Complete solutions from a single source

Economical operation and environmental protection are important criteria with plant for large building complexes and in industrial process heat generation. With large burner and boiler capacities, efficiency becomes a major cost factor. Also, high emission levels can cause problems to plant operators. Up to now, burners have been equipped with mechanical air-gas ratio control (cam with mechanical linkage between air and gas damper or oil controller). A complicated mechanical system, poor repetition accuracy and difficult and time-consuming settings were the rule, leading to inadequate efficiency, considerable strain on the environment and a reduced modulation range.

Here, electronic air-fuel ratio control can bring into play a number of benefits: Simpler burner design and greater precision ensure higher efficiency levels while reducing emissions. So, all in all, it's a more economical and more environment-friendly solution.

# Safety, efficiency and user-friendliness

## Future-oriented burner management from Siemens

In addition to products for floor-standing and wall-hung boilers, Siemens develops, produces and supplies components for use with forced draft standard burners and industrial burners.

The comprehensive range of products includes burner controls, actuators, sensors and flame detectors, control systems, valves, test equipment and integrated system solutions.

These products and systems enable us to offer optimum solutions for our customers' market segments. They include single- and multi-family houses (residential buildings), commercial buildings and complex firing systems for industrial processes.

## Interplay of a special class

This is the compact LMV burner management system for the control and supervision of single- or dual-fuel forced draft burners of medium or large capacity.

All system components used are matched to the microprocessor-based LMV burner controls.

This approach ensures a perfect combination of all devices, eliminating the need for making nuisance adjustments.

The extensive range of standard components, such as temperature and pressure sensors, boiler controllers, process automation systems and gas valves, round off our product portfolio and give consideration to almost any kind of requirement.

The VGD40 double gas valves, which have been specially designed for larger capacities with a particularly compact and flexible structure and flow-optimized valves, are just one example.

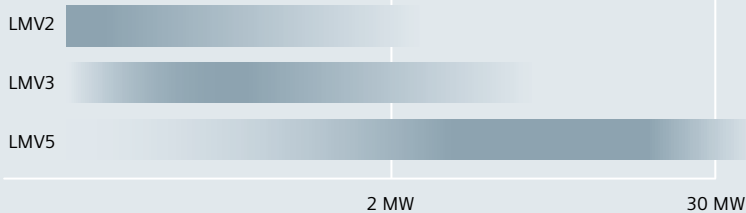
## Safety and security

Siemens also sets new standards in terms of safety and security: The LMV uses 2 powerful microprocessors to ensure parallel handling of all signals via 2 channels. The signals are continuously compared with one another. So we are fully aware of our responsibility as market leader and system provider for burner control equipment.

## HIGHLIGHTS

- Broad range of products
- Optimum systems for demand-related solutions
- Global approvals (CE, UL, CSA, FM, AGA)
- Ship approvals (Lloyds, DNV-Gl)

### Fields of use





LMV2/3-  
peripherals



Universal controller



Operating unit



Damper  
actuator



Flame detector



Interface  
module

## LMV2/3 – Flexibility in standard applications

### Application areas

The LMV2/3 air-fuel ratio control system is used for the control of modulating or multi-stage oil or gas burners of medium capacity.

A simple user and service friendly interface with LCD enables the LMV2/3 to be commissioned quickly and ensures efficient and cost-saving maintenance of the entire system.

The benefits offered by electronic air-fuel ratio control are independent ratio curve settings and flexibility in terms of burner design. Fuel and air actuators can be fitted anywhere without having to give consideration to mechanical linkage.

### Optimum conditions

Key components of the LMV2/3 system are the SQM3 and SQN1 actuators. They ensure accurate positioning of the air and fuel dampers, thus warranting optimum combustion with low emission levels. Variable actuator running times provide for quick start up when there is a request for heat, and good control performance in modulating mode.

### Simplified design

The burner management system brings its benefits into play not only in operation but also during the development and design phase of new generations of burner: The LMV2/3 has the burner control, electronic ratio control and gas valve proving integrated in its basic unit.

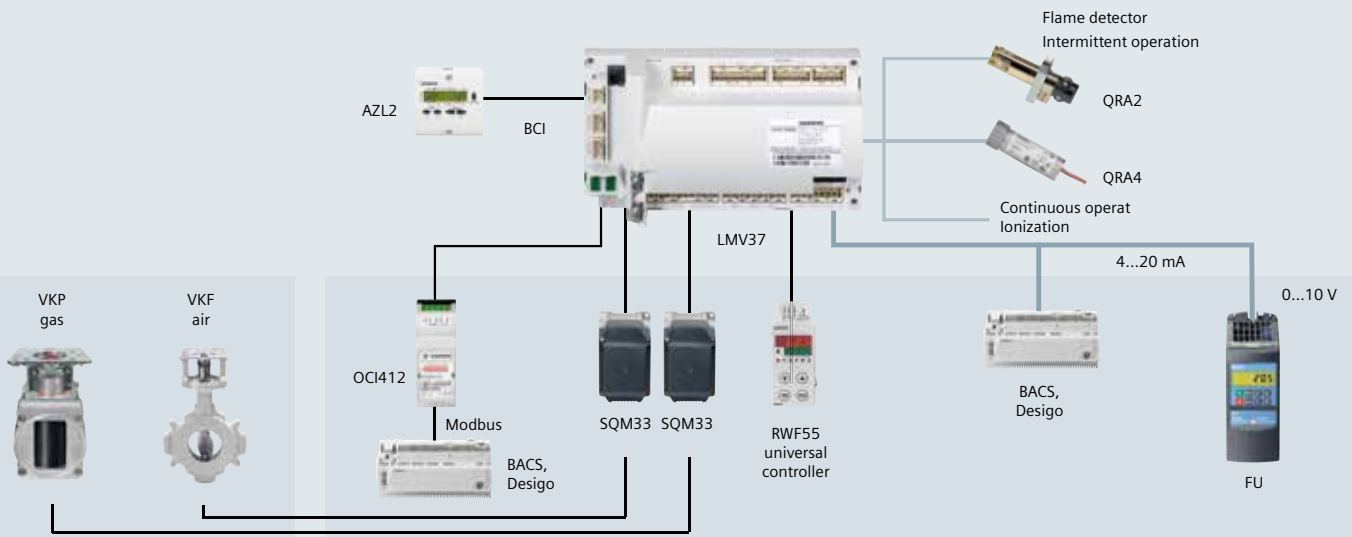
### HIGHLIGHTS

- Straightforward commissioning
- Integrated air-fuel ratio control
- Integrierte Verbundsteuerung
- One unit for oil- and gas-fired operation
- Integrated gas valve proving



	LMV2	LMV3	LMV50/51	LMV52
Torque of actuators				
Dual-fuel operation				
Integrated load controller				
VSD control				
O <sub>2</sub> combustion optimization				

Summary of key  
features



Burner management system LMV2/3

## LMV2/3 – Ease of use and extensive functionality

### Extremely straightforward

The LMV2/3 burner management system not only simplifies burner design but also makes the production process, mounting and service work more efficient: The complex linkage required with mechanical air-fuel ratio control is no longer needed and flexibility is increased considerably when using the basic unit.

Depending on the individual unit versions, the LMV2/3 burner management system provides a number of variable program sequences for control of the burner. There is a choice of gas and oil programs, with or without pilot burner, depending on the application and the basic unit version. Even dual-fuel applications with the AGM60 fuel changeover unit are possible.

### Extra functions

For a quick burner commissioning, the gas valve proving can be optionally activated during post purging. Operation with only one actuator for pneumatic air-fuel ratio control is possible also. Furthermore, the extensive choice of configurations and parameter settings enables the LMV2/ LMV3 to be matched to almost any type of medium-capacity burner – easily and efficiently.

The LMV3 is approved for continuous operation with ionization probe, enabling it to be used also in connection with steam boilers or in plants for generating process heat.

The LMV2/3 system is designed for mounting on the burner itself or adjacent to the burner components.

### HIGHLIGHTS

- Modbus communication
- Analog 4...20 mA input for load controller
- Continuous operation with ionization current supervision
- Simple dual-fuel operation
- Variable actuator running times

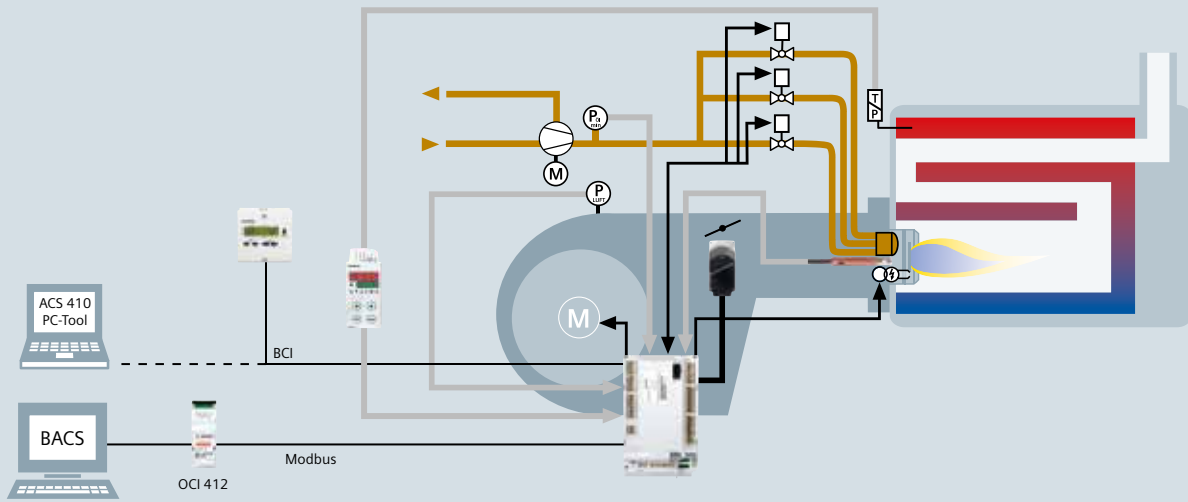
# LMV2/3 – the maximum of options



## Perfectly equipped

The inputs and outputs can be used for both oil and gas burners. Actuators with torques up to 10 Nm can be connected via an integrated power pack.

A connection facility is available for fuel meters. The LMV3 ensures trouble-free continuous operation when used in connection with an ionization probe.



## The LMV2/3 and its uses

LMV2/3, oil, 3-stage with universal controller and Modbus connection

### Perfectly matched to the type of burner

The LMV2/3 is the ideal basic unit for any type of burner of medium capacity, be it oil, gas or even dual-fuel burner (modulating or multi-stage) – a solution is always at hand. By selecting the type of fuel train, the required parameters, such as type of flame detector, are automatically preset. This simplifies the configuration and saves commissioning time.

You can choose whether you want to use the LMV2/3 as a proper burner control for pneumatic or electronic air-fuel ratio control.

In the case of LMV26 dual-fuel burner controls for Europe, or LMV36 for North America, any 2 fuel trains can be combined.

The most important are gas modulating and oil multi-stage, with or without gas pilot.

LMV2/3, gas, modulating with universal controller and Modbus connection

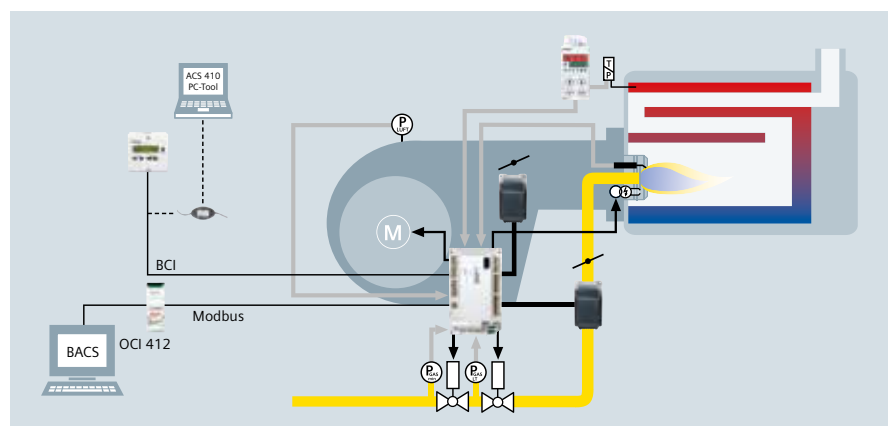
### Straightforward service and clear diagnostics

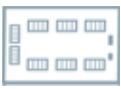
Parameters and air-fuel ratio curves ascertained in the customer's laboratory can be stored with the PC software tool ACS410 to be transferred to new units. This also facilitates straightforward documentation of the delivered burners.

The parameters stored in the LMV2/3 are also stored in the AZL2 display and operating unit. When service work is due, the parameters can be transferred to a new unit. In addition to output via display or ACS410, diagnostics can be made via Modbus and remote maintenance.

### HIGHLIGHTS

- Predefined fuel trains
- Integrated electronic air-fuel ratio control
- Pneumatic air-fuel ratio control with only one actuator
- 3 fuel valves
- Service-friendly thanks to backup/restore facility with AZL2 display





## LMV5- peripherals



Universal  
controllers



Operating units



Damper  
actuators



Flame detectors



O<sub>2</sub> sensor

# LMV5 – Assistant for heavy duties

## Application areas

The LMV5 burner management system has the burner control, electronic air-fuel ratio control and gas valve proving integrated in its basic unit. Optionally, the system can be equipped with a load controller, VSD control and O<sub>2</sub> combustion optimization. The load controller features an electronic safety limit thermostat.

Type LMV52.4 also offers a temperature-compensated flue gas recirculation function for "super" low NO<sub>x</sub> applications, along with specific O<sub>2</sub> control functions for fiber mesh burners.

## Everlasting operation

The optional integrated load control is in the form of a PID temperature/pressure controller featuring an algorithm for cold start of hot water or steam boilers, thus ensuring low wear and tear. Furthermore is the load controller equipped with an electronic safety limit thermostat. Continuous operation poses no problem to the

LMV5 when used in connection with universal infrared flame detectors, UV flame detectors or ionization probes. Separate inputs and outputs for oil- or gas-fired operation deliver accurate diagnostics of the connected components and facilitate dual-fuel operation with no need for additional relay changeover.

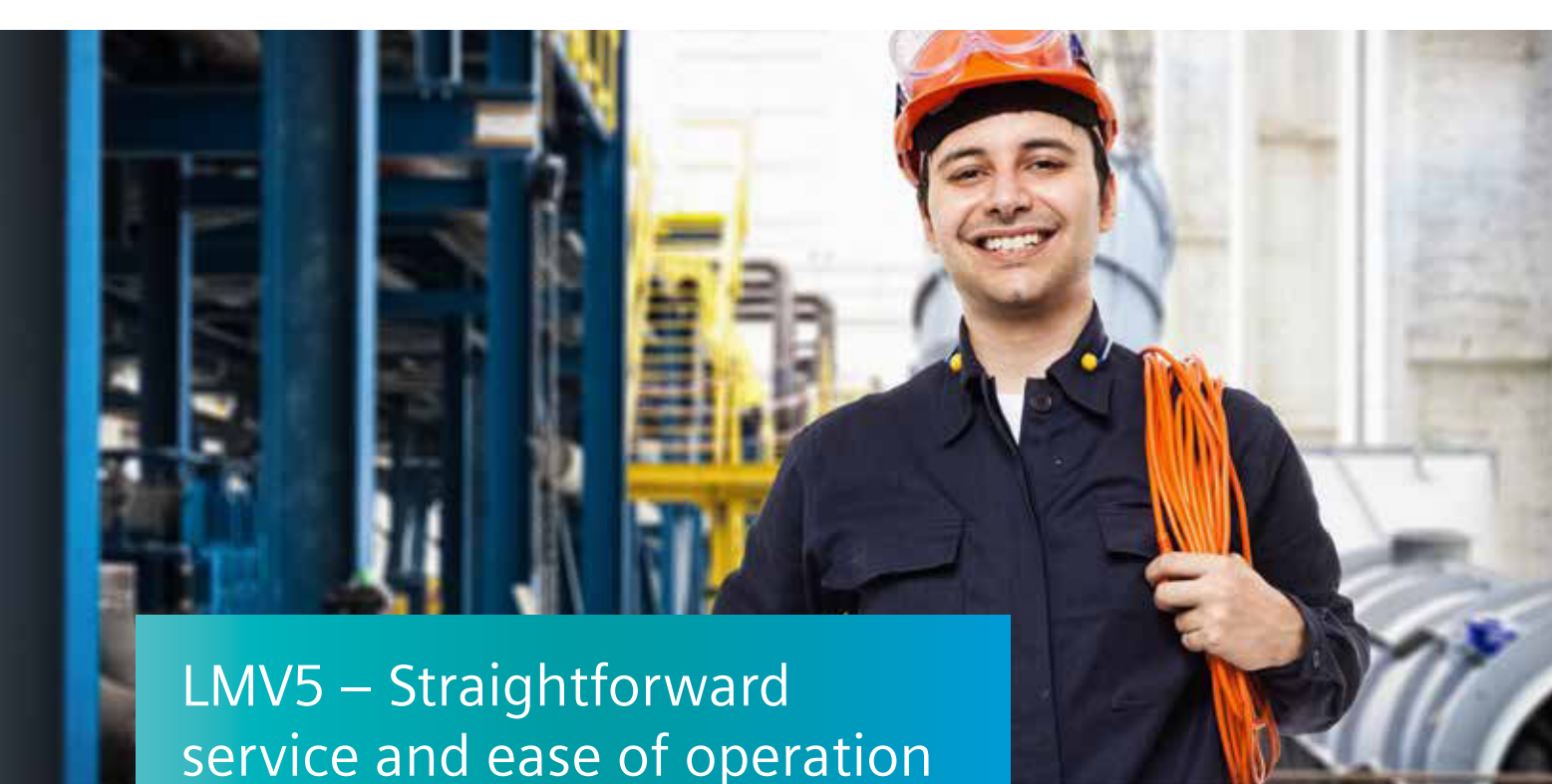
Economical operation and environmental protection are important issues, especially in connection with technical systems for large building complexes and in industrial process heat generation. Together with the excellent price-performance ratio, the LMV5 burner management system now offers the opportunity to switch from mechanical to electronic air-fuel ratio control.

## HIGHLIGHTS

- Gas valve proving
- Optional load controller
- Modbus communication
- Super-Low-NO<sub>x</sub>- Application
- Excellent price-performance ratio
- Combustion optimization via O<sub>2</sub> trim control







# LMV5 – Straightforward service and ease of operation

### Extremely straightforward

The LMV5 burner management system not only simplifies burner design but also makes the production process, mounting and service work more efficient: The complex linkage required with mechanical air-fuel ratio control is no longer needed and flexibility in terms of mounting is considerably increased.

The compact basic unit can be fitted directly in or on the burner or, using a powerful data bus, in a control panel. Since mechanical linkage is no longer required, electronic air-fuel ratio control offers a new kind of flexibility when it comes to adjusting the actuators. Also, system integration of functions cuts mounting and commissioning costs.

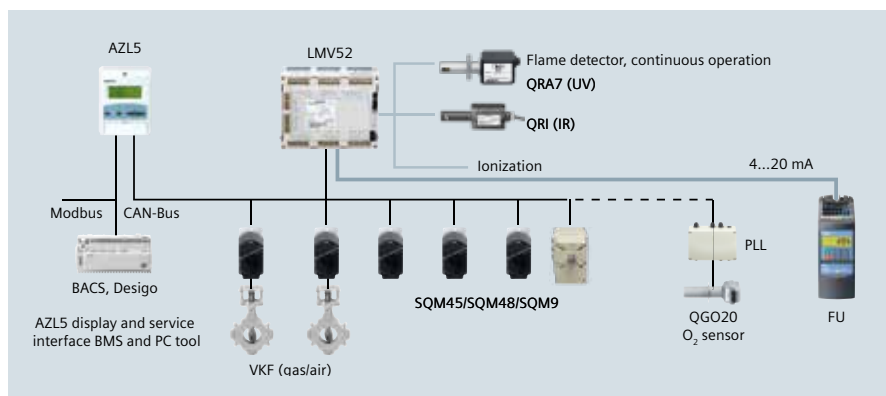
### Clear conditions

The new burner management system talks clear-text – in 20 different languages. The system can be configured and parameterized in accordance with the user-oriented, password-protected access level: Plant operator, service engineer or burner manufacturer. An extra software tool offers even more convenience. It is designed for setting the parameters on the production line and for commissioning the system in the field: It affords excellent process observation, graphic curve presentations based on the drag-and-drop method, plus trend recordings.

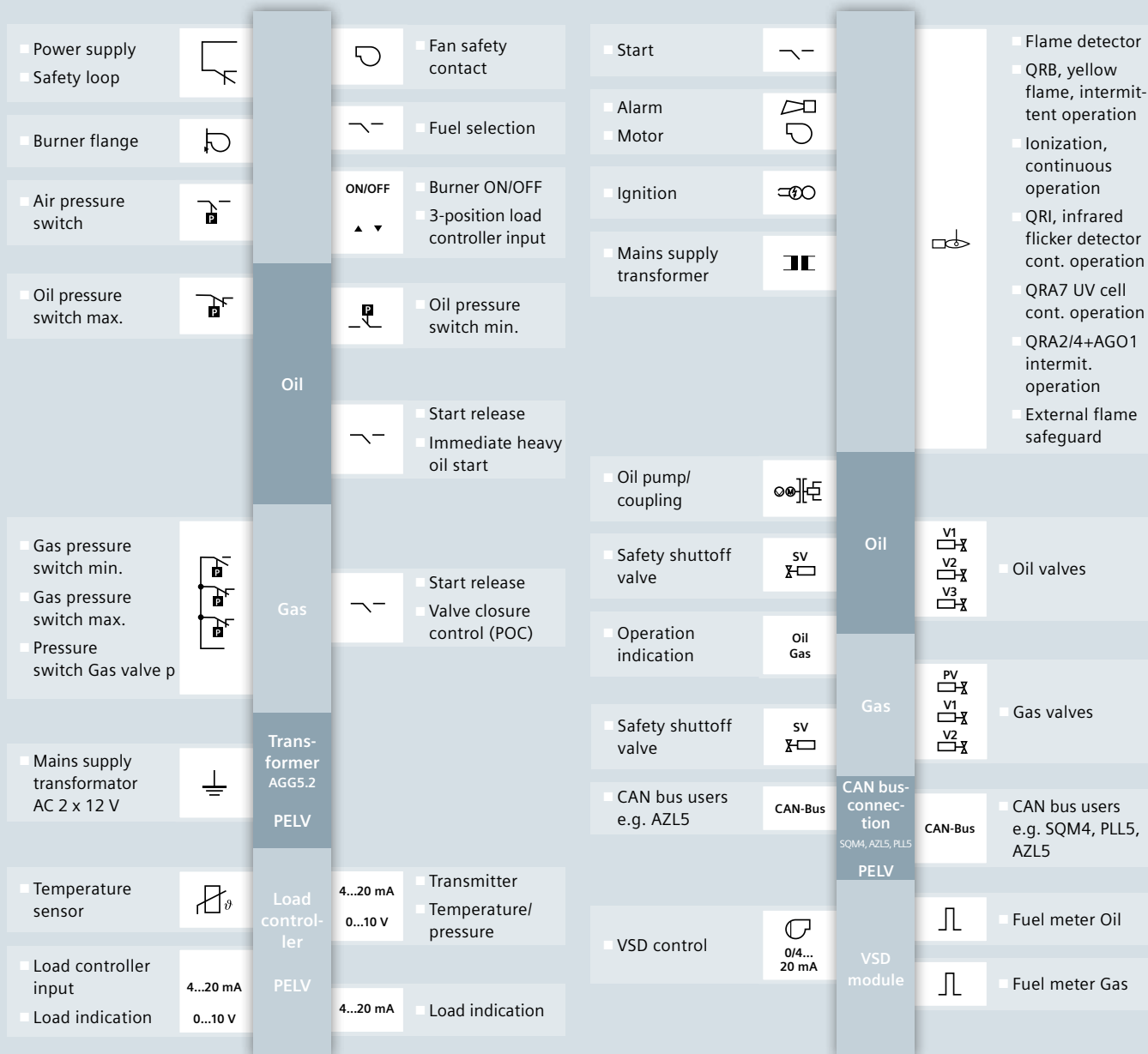
### HIGHLIGHTS

- Total of 20 languages available
- Optimized configuration by the user
- Straightforward installation and maintenance
- Service friendly backup/restore function with display AZL5

Burner management system LMV52 system with O<sub>2</sub> trim control



# LMV5 – the maximum of options



## Variable program sequences for existing fuel trains

Optimized for the requirements placed on large burners, the LMV5 is equipped with terminals for dual-fuel operation, enabling the system to cover a host of applications. Standard applications include burners for hot water boilers, steam boilers or thermo oil.

The LMV51 basic version is available with or without built-in load controller. The LMV52 also has connection facilities for VSD control, combustion optimization via O<sub>2</sub> trim control, and up to 6 actuators. Low emission levels and high efficiency are ensured, especially by the

accurately working actuators in combination with combustion optimization and VSD control.



# LMV51/52 – ensuring excellent performance

## LMV5- load control

An important aspect is integration of the LMV5 burner management system into an existing PLC system. After replacement of the former plant, the LMV5 system can directly provide control of the existing PLC system.

Thanks to the configuration choices (3-position, 4...20 mA, DC 0...10 V, or digital via Modbus), load control of the LMV5 adapts easily to existing plant. The internal load controller or various external load controllers can be connected – or a load controller via process automation.

In the event of a process control failure or communication breakdown, the system automatically reverts to internal load control.

## Choice of operating modes

A total of 3 load control operating modes are available: An external load controller can control the LMV5 via the 3-position contact inputs. In that case, the internal control algorithm is deactivated. The connected sensors can be

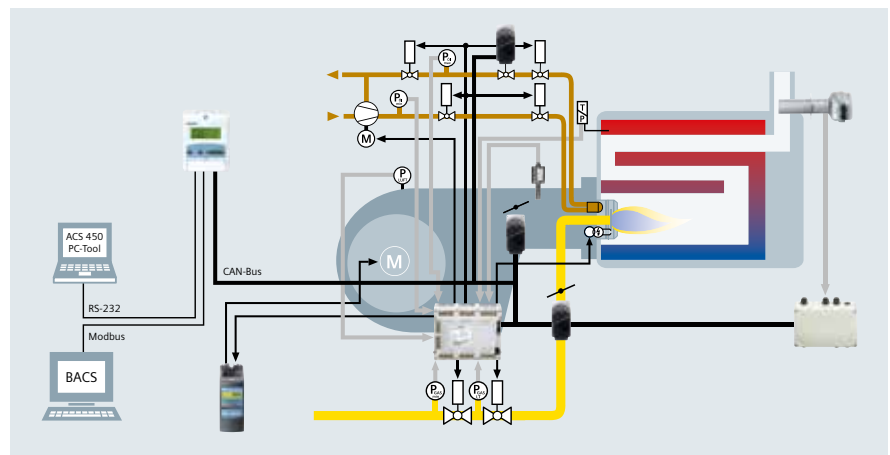
used for control via the internal load controller. Also, the load can be preset via an analogue signal. If process automation is used, the load can be digitally set via Modbus.

It can handle light oil, heavy oil and gas, and has plug-in spaces for parallel connection of 2 fuel valves. Also possible are variants with or without gas pilot ignition, including permanent pilot in connection with light oil or heavy oil. Pilot and main flame can be monitored separately.

## HIGHLIGHTS

- Total of 20 languages available
- Optimized configuration by the user
- Straightforward installation and maintenance

LMV5, oil modulating, dual fuel, CAN bus, Modbus via AZL5



# LMV50 – an optional extra for heavy-duty applications

## Industrial and process applications

The LMV50 variant is ideal for use in industrial process plants. It was developed specifically to meet the needs of users at industrial thermal processing plants. Many of its functions have been adapted to fulfill the requirements of the EN746-2 standard.

### Examples of LMV50 functions:

- High-temperature supervision in conjunction with a safety temperature switching device instead of the traditional flame supervision
- Adjustable safety times according to EN746
- Repetition if there is no flame at the end of the safety time
- Cooling function in standby mode
- Very long postpurge times

With the LMV50, it is possible to integrate external flame safeguards too.

This ensures that the burner operates correctly in the event of unfavorable flame ratios.

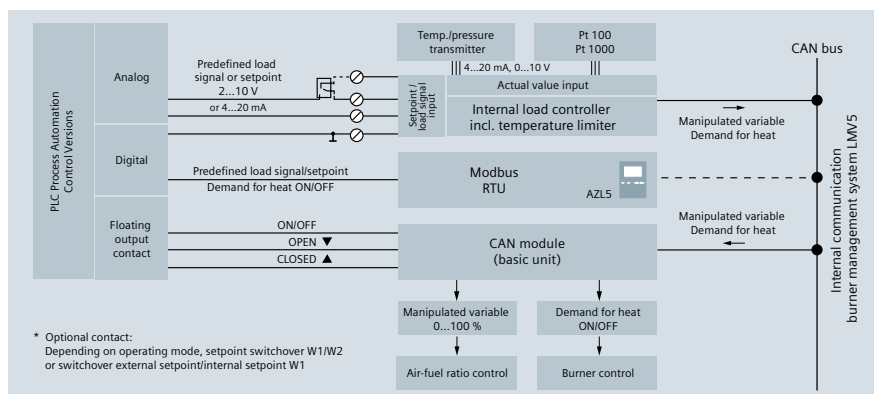
The new functions that have been added to the LMV50 system are particularly useful in applications involving regenerative and thermal exhaust air purification.

The electronic fuel/air ratio control system replaces pneumatic gas/air control systems here. This ensures an independent ignition position and safe operation across all capacity ranges.

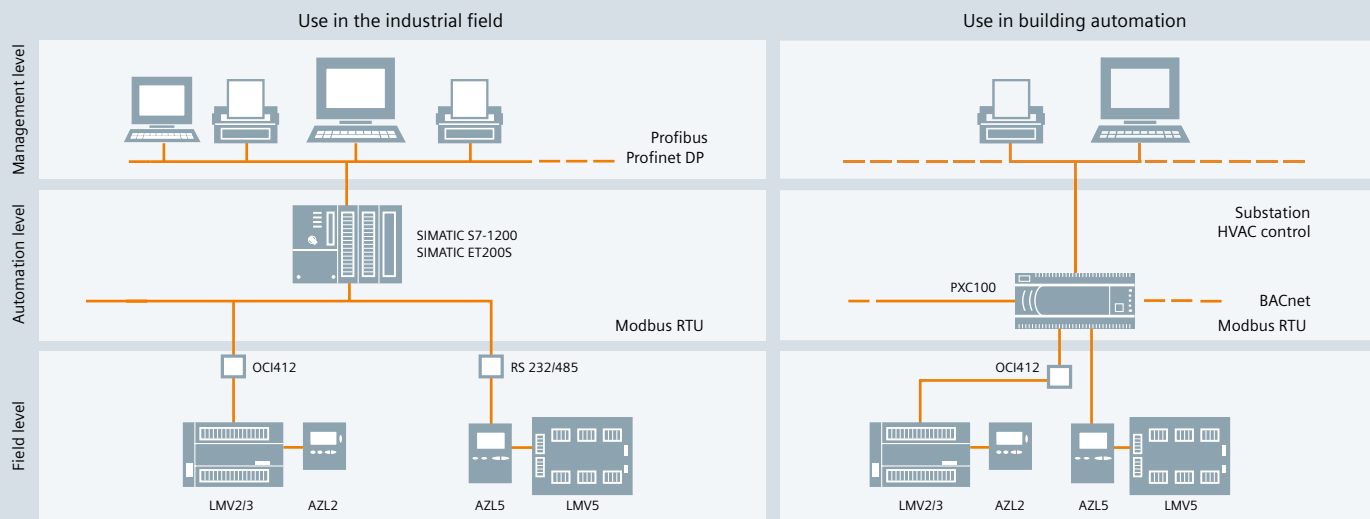
Together with the VGD/SKP gas valves, the LMV5 system is suited to use in safety-related systems up to SIL3. It can be integrated into the process control technology using digital bus technology or in parallel using standard signals. There are verified modules available for the SIMATIC products.

## HIGHLIGHTS

- Adjustable safety times according to EN746
- Extremely versatile for a wide range of industrial applications
- Connection of external flame safeguards
- LMV5 system suitable up to SIL3



Output modulation and integration into LMV5 process automation



## Communication in almost any language

### Communication between systems

Communication is becoming more and more important. For this reason – using an open, standardized communication interface – the LMV burner management system can be integrated into the most diverse types of higher level process management systems. The Modbus RTU protocol facilitates efficient and affordably priced integration.

With SIMATIC S7, ET200S or Desigo PX, Siemens offers a complete automation concept of modular design. In this way, we can safeguard process chains and provide a standardized, comprehensive architecture in order to automate your entire production process to maximum effect.

Important actual values and setpoints can be constantly monitored, and information, such as fuel meter or hours run readings and parameter settings, can be displayed and assessed directly on the burner management system. This makes it possible, for instance, that predefined combustion efficiency levels of the burner will be adhered to.

### Quick diagnostics

To facilitate quick and targeted diagnostics in the event of a fault, burner service staff can be supplied with all diagnostics data plus the history of the last faults.

Internal communication with safety-related components, such as actuators, the O<sub>2</sub> module and the display and operating unit, is effected via the safety-related CAN system bus. The integrated Modbus interface affords touchpanel operation and remote maintenance of plant. In the event of plant malfunction, this facility can also be used to send an autonomous alarm report to burner service staff.

### HIGHLIGHTS

- Total of 20 languages available
- Optimized configuration by the user
- Straightforward installation and maintenance





## Tools for simple and efficient working

### AZL2 – Small but efficient assistants

The AZL2 display and operating units are used in connection with the LMV2/LMV3 burner controls, either directly by the burner or in control panels close to the burner. They afford display, operation and the setting of specific safety and non safety related burner functions. The most important plant data and fault codes can be interrogated and displayed. In connection with the LMV2/LMV3, the ACS410 PC tool facilitates parameter settings and the display and storage of plant data.

### Big brother with excellent performance

The LMV5 burner management system is operated and programmed via the AZL5 display and operating unit or the ACS410 PC tool. Using the Modbus of the AZL5, the LMV5 system can be integrated into a complex data network (e.g. for process control). This means that functions, such as visualization of plant states, plant control and reporting, can be implemented.

The ACS450 tool required for that purpose is connected directly to the AZL5 and serves for the display and storage of LMV5 data plus parameter settings.

### Compatible Valves and Actuators

Thanks to their modular design, the gas valves are compatible with all types of valve actuator, thus ensuring maximum flexibility. They are extremely compact and excel in robustness – even under extreme conditions.

The double gas valves of the VGD40 line offer unique, patented technology, meaning that each of the 2 valve seats has its own closing spring. Valves and valve actuators are separate components. Hence, it is not only possible to combine any type of actuator with any type of our valves, but the actuators can be fitted in different positions: Left or right, vertically or horizontally.

The double gas valves of the VGD line are specifically suited for use on plants firing on gas. Thanks to their extremely high flow rates and operating pressures, capacities up to 30 MW can be handled. Depending on type, the combination of actuator and valve provides the functions of safety shut-off valve only, or safety shut-off valve with gas pressure governor. The valves open slowly and close rapidly. With the hydraulic SKP gas valve actuators, the required control function is integrated, so that the entire force of the actuator is available for the control process.

From operating units, sensor technology, and valves right up to complete architectures in cooperation with our solution partners – we offer you the full scope of our ability.



Siemens supplies the whole package of burner management systems and matching accessories.

Depending on the requirements and applications you can choose suitable products out of our comprehensive portfolio.

### Flame detectors for perfect combustion

For monitoring oil flames, QRB yellow flame sensors are available. The range of flame detectors also includes UV detectors of the QRA line, highly sensitive infrared detectors of the QRI line, and use of the ionization current principle for intermittent or continuous operation. The range of sensors and flame detectors is rounded off by the QGO oxygen sensor which acquires the residual oxygen content of flue gases.

### Versatile damper actuators

The SQN1 and SQM33 actuator series for LMV2/3 as well as the SQM45/48/91 for LMV5 are robust versions for controlling the gas/air volumes in medium to large-capacity burners. The construction with stepper motors enables exact positioning and makes it possible to reproduce the set positions accurately. Our VKF10/11 (DN32...DN200) dampers and the Siemens VKP40 (1 1/2" ...2") proportional controlling elements are ideally suited for fitting to autonomous quantity-controlling elements. The system is controlled by the burner controls. Position feedback is provided by a double potentiometer for the LMV5 actuators, and by a forked light barrier for the LMV2/3 actuators.

### Connection to PLC architectures

In close cooperation with our solution partners, we also make certain that our systems can be connected to the Siemens PLC of the S7 line. This way, we can ensure closed process loops and a uniform and comprehensive architecture, aimed at optimally automating your entire production.

### Complementing the product range

As an addition to the gas train, the QPL pressure switches, as well as pressure loss switches, can be used to detect excessively high pressure in cooperation with the valve check integrated in the LMV. For the control of temperature and pressure in processes, the versatile RWF55 universal controllers are at your disposal.

### HIGHLIGHTS

- Total of 20 languages available
- Optimized configuration by the user
- Straightforward installation and maintenance



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