

LMV51™ Electronic Linkageless Burner Management System

ENGINEERING SPECIFICATION

Product Overview

The LMV51 is an electronic linkageless, microprocessor-based unit for the control and supervision of a single or dual-fuel forced draft burner with; modulating gas, modulating oil, or multistage oil. When used with matching system components, it becomes an easy to use burner management system that delivers superior control, performance and diagnostics.

The LMV51 burner management system accomplishes burner control, utilizing an integrated configurable gas valve proving system, electronic fuel/air ratio control (FARC) with up to four actuators, adjusting, air, gas, oil, and FGR, and has provisions for an optional PID temperature / pressure control function (load controller).

All of the burner management system's major components, specifically the base unit (LMV51), the display and operating unit (AZL) and the actuators (SQM4) communicate over a reliable safety bus.

Major Functions

1. The LMV51 employs two microprocessors that offer a very high level of safety and reliability for monitoring the software, the program, and the control sequences.
2. The burner control shall also employ ultra-accurate SQM4 actuators with the following features:
 - Characteristics and settings defined by the LMV51
 - Shall be controlled by digital signals on a safety bus from the LMV51
 - Shall be driven by stepper motors
 - Shall have a resolution of 1/10 of a degree, or 900 repeatable positions, within 90 deg of rotation
 - Shall be equipped with two factory calibrated feedback potentiometers
 - Shall be capable of clock-wise or counter clock-wise rotation
 - Available in at least 3 torque ranges including, 30, 180, and 300 in/lbs (3, 20, 35 Nm)
 - Shall not require any field adjustment
 - Shall not require any switch wiring
 - Shall not require any switch setting
3. All safety-related digital outputs of the LMV51 shall be permanently monitored via a contact feedback network.
4. The LMV51 shall provide burner-flame safeguard control approved for continuous duty applications, using optical solid state IR flame sensor technology including:
 - Provisions for flame supervision using flickering infrared flame detectors (QRI)
 - Provisions for flame supervision using ionization probes
 - The flame detector or probe shall also house the flame amplifier, eliminating reliability issues associated with remote amplifier flame sensor wiring.
 - Shall provide immunity to glowing refractory and 50-60 HZ lighting.

- The QRI IR flame sensor shall incorporate self-checking features and be specified for continuous duty.
5. Manufacturer shall be able to select from a total of seven fuel valve configurations.
 6. A large number of individual parameterization choices (program times, configuration of inputs / outputs, etc.) shall allow optimum adaptations to the specific fuel train configurations.
 7. A burner switch shall be provided for a standard low fire shutdown.
 8. An emergency stop switch shall be provided, for an immediate shutdown, which is wired directly in the fuel valve circuit.
 9. The LMV51 can be replaced, and then be re-commissioned by downloading the commissioning parameters from a backup in the AZL programming and display unit, or a PC, and shall not require re-programming.
 10. The LMV51 shall provide electronic fuel / air ratio control (FARC) with 15 points that can be added, deleted, or adjusted while running or in standby.
 11. A separate display and operating unit (AZL), shall be provided with an LCD display and four buttons.
 - Designed for front panel mounting
 - Display shall have a 4 line by 16 character LCD display with menu driven text that is available in most standard languages including English, German, French, Spanish and Italian.
 - Shall provide straightforward operation, and continuously show the process variable, current setpoint, load and flame signal.
 - Shall have a real time clock
 12. The AZL shall afford a convenient readout of:
 - Burner settings
 - Operating state
 - Parameters of the burner control
 13. The AZL display and operating unit interfaces through three ports:
 - Safety bus (terminal X70) Modbus connection to the LMV51 burner control base unit
 - COM1 (terminal X70) optional connection to a PC with ACS450 software
 - COM2 (terminal X72) optional connection to a BMS using and external e-bus interface
 14. The parameter setting levels for the burner / boiler manufacturer and heating engineer, shall be password-protected to prevent unauthorized access.
 15. The plant operator shall be able to adjust user level settings, such as setpoints on site, shall not demand a password.
 16. When performing diagnostics, the AZL shall show at least 21 faults, and the last 9 lockouts, with the following information:
 - Fault code number
 - English word message (or other language)
 - Operating state
 - Point in time the fault occurred
 17. The AZL is connected to the safety network, using a 9-pin sub-D type port, allowing you to:
 - Select a language for the AZL
 - Commission the LMV51 burner control
 - Convenient programming of burner settings
 - Process visualization
 - Choose which additional COM port you wish to use
 - Provides power to the AZL
 18. The AZL will permit one additional port, COM1 or COM2 to be used, at the same time.

19. COM1 is a sub-D 9-pin RS-232 serial port, designed to communicate with PC commissioning software ACS450 the following operating functions are provided:
 - Readout of settings, operating states, error types, and point in time the errors occur (from the LMV51)
 - Graphical presentation of diagnostic data
 - Parameterization of the LMV51
 - Trend/data recording
 - Printout functions for documenting the plant settings
 - Program update of the AZL
20. COM2 is an RJ45 socket, modbus port, on the AZL, and is capable of being used as a digital interface, for building management systems (BMS) or touch screen displays.
21. The external modbus interface must provide electrical isolation and include a power supply, and be designed to provide the following functions:
 - Hours of operation
 - Operating display
 - Current fuel type
 - Current operating phase
 - Input states (if available)
 - Output states including alarms (if available)
 - Actual value of the temperature or pressure
 - Temperature or pressure setpoint
 - Contents of lockout and error storages
 - Select the type of fuel
 - Set the date and the time of day
 - Only non-safety-related data may be changed via the BMS
22. Burner control shall be able to accept an analog setpoint from a BMS, and settings shall be password protected to prevent unauthorized access.

Basic unit LMV51

Main voltage	120 V -15 % / +10 %
Transformer Secondary side	AC 12 V
Main frequency	50...60 Hz ±6 %
Power consumption (typically)	< 30 W
Degree of protection of housing	IP00, IEC 529
Temperature range	-4 to +140 °F
Humidity	< 95 % r.h. Condensation, formation of ice and ingress of water are not permitted!

SQM4 actuator type summary

	SQM45295A9	SQM48497A9	SQM48697A9
Drive shaft, steel, ready fitted to the front of the geartrain, please see dimension diagram	D-shaft black-finished	Parallel key hardened	Parallel key hardened
Geartrain, spur gears, with small backlash and permanent lubrication	plastic	steel	steel
Minimum 90° running time (selectable on the LMV51)	10 sec	30 sec	60 sec
Maximum rotation (selectable on the LMV51)	90°	90°	90°
Nominal torque (maximum) normal			
Extreme, above +50 °C, below -15 °C torque is about 15 % lower	30 lb in (3 Nm)	180 lb in (20 Nm)	300 lb in (35 Nm)
Maximum holding torque (with operating voltage applied)	130 lb in	175 lb in	300 lb in
Maximum radial bearing force	43 lb	420	800
Approximate weight	2.2 lb	3.5 lb	3.5 lb
Typical load changes with continuous heavy loads	500,000	500,000	300,000
Power consumption	915 VA	2634 VA	2634 VA

SQM4 actuator technical data

Operating voltage	AC 2 x 12 V via bus cable from LMV51, a separate transformer
Safety class	Extra low-voltage with safe isolation from main voltage
On time	50 %, maximum 3 minutes continuously
Degree of protection	to EN 60 529, IP 54, provided adequate cable entries are used
Cable entry	Insertable threaded cable glands for 2 x Pg11
Electrical connections	RAST35 terminals (for details, refer to the basic unit)
Ferrules	Matching the dia of the stranded wire
Reproducibility	02° when used with the LMV51
Direction of rotation, when facing the shaft	Standard clockwise can be selected on LMV51 Reverse counterclockwise can be selected on LMV51
Operating Environment	DIN EN 60 721-3-3
Climatic conditions	class 3K5
Mechanical conditions	class 3M2
Temperature range	-20+60 °C
Humidity	< 95 % relative humidity, Condensation, formation of ice, and ingress of water are not permitted
Mechanical design	
Housing	Die-cast aluminum
Cover	Impact-proof and heat-resistant black plastic
Actuator	Stepper motor
Switch point adjustments	In connection with the LMV51,
Position indication	Via the AZL (refer to AZL Documentation)
Electrical connections	RAST35 terminals (supplied together with the AGG5720 / AGG5721)
Mounting	The front of the geartrain is used as the mounting surface The actuator has four mounting holes, and one elongated hole for the positioning pin Alternatively, the actuator can be secured from the side with three self-tapping screws