SCC Inc.

Specifications

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LMV52 Control

Product Description

The LMV52 is a microprocessor-based burner management system with matching system components for the control and supervision of forced draft burners. Functionality includes primary flame safety control, integral parallel positioning, O_2 trim, and Variable Speed Drive (VSD) control.

Sample Specification

1. The burner management system (BMS) shall be UL listed, FM approved, CSA listed, and SIL3 certified.
2. The major components of the BMS shall consist of:
   - LMV52 controller
   - AZL52 operator interface display
   - SQM4 actuators for gas, oil, air, and up to three (3) auxiliary actuators
   - Factory assembled gas and/or oil valve assemblies
   - Flame supervision with 1 or 2 of the following:
     - QRI infrared scanner
     - QRA UV scanner
     - Flame rod
   - Pressure and/or temperature sensors for process control and thermal shock protection
3. The following components shall be optional for the BMS:
   - VSD with safety rated speed feedback, and control of closed loop combustion air blower
   - Zirconium oxide oxygen sensor with mounting kit, collector, and electronics module
   - Exhaust stack and ambient air temperature sensors
   - 6 or 10 inch touchscreen interface
4. All safety and combustion control related components including the controller, remote display, actuators, valve assemblies, flame scanner(s), all temperature, pressure, oxygen trim, stack, and ambient sensors shall be from the same manufacturer. Non-safety related items, such as a PLC or touchscreen, can be from various manufacturers.
5. All actuators shall utilize non-contact shaft position sensing for safety related feedback.
6. The BMS shall have the following safety functions:
   - Primary burner flame safeguard control
   - Parallel positioning fuel-to-air ratio control
   - Gas valve proving and leak detection via a pressure switch between the main gas safety shutoff valves
   - Gas valve proving on startup, shutdown, or both

- Independent inputs for proof of closure (POC) switches on the main gas and main oil safety shutoff valves
- Adjustable pre-purge and post-purge timing between 1 second and 63 minutes, without requiring a separate purge timer card
- Password protection for Service and OEM accessible configuration parameters including:
  - Programmable pre-purge time after an alarm
  - Programmable overlap time of the ignition spark and the pilot valve
  - Programmable overlap time of the pilot valve and the main gas safety shutoff valves
  - Programmable time for pilot trial for ignition, and main flame trial for ignition
- Programmable sequence stops for the following phases:
  - Pre-purge
  - Pre-ignition
  - Pilot ignition
  - Main flame
  - Post-purge
- Independent programmable actuator positions for pre-purge, ignition, post-purge, and standby conditions
- A constant, algorithm-based check of each actuator's position that evaluates the following:
  - Deviation from the required position on the fuel-to-air ratio curve
  - Maximum time allowed at the deviated position
- Low voltage actuators utilizing digital CANbus communications
- Adjustable alarms points for high boiler water temperature
- Optional flame supervision on two separate channels via an optical flame detector (OFD), flame rod (FR), or approved UV flame detector. The following options are available for pilot ignition, normal operation, and post-main valve closure:
  - Single flame detector operation
  - Dual flame detector operation, where if either the OFD or FR reads a flame, then a flame signal is recognized by the unit
  - Dual flame detector operation, where the OFD alone must read a flame to have a flame signal recognized by the unit. If the OFD and FR both read a flame, then no flame signal is recognized
  - Dual flame detector operation, where the OFD reads a flame and the FR is not evaluated
  - Dual flame detector operation, where the FR alone must read a flame to have a flame signal recognized by the unit. If the OFD and FR both read a flame, then no flame signal is recognized
  - Dual flame detector operation, where the FR reads a flame and the OFD is not evaluated
  - Dual flame detector operation, where both OFD and FR must read a flame for a flame signal to be recognized
- The flame failure response time shall be password protected, and adjustable between 1 and 4 seconds

7. The BMS fuel-to-air ratio control shall have the following functionality:
   - Independent gas and oil fuel-to-air ratio curves
   - Capability of positioning five (5) actuators and one VSD simultaneously on their programmed fuel-to-air ratio curves with an accuracy of 0.1 degree for actuators, and 0.5% for the VSD
   - Capability of fifteen (15) programmable points for each fuel-to-air ratio curve

- Capability of programming four (4) independent positions for each fuel, including pre-purge, ignition, post-purge, and standby conditions
- Programmable timing to set the ramp speed of the actuators and VSD during normal operation, pre-purge, and post-purge conditions
- Independent, programmable actuator positions for ignition and low-fire
- Capability to use one or two fuel actuators for dual fuel burners

8. The BMS load controller shall have the following functions:
   - Internal load control (ILC) that adjusts the load according to setpoint by monitoring temperature or pressure directly. The ILC shall also feature:
     - Modulation control via a PID loop algorithm
     - Automatic PID loop adaptation
     - Independent, programmable operating setpoints to cycle the burner on and off
   - External load control, utilizing an analog input signal, that will directly control the burner load
   - External load control, via Modbus communication, that will directly control the burner load
   - Remote setpoint via Modbus communication
   - Remote setpoint via analog input
   - Programmable high and low limits on remote setpoint
   - Internal setpoint switchover by dry contact closure
   - Changeover to internal load control, from any load control mode, by dry contact closure
   - Cold start thermal shock protection (CSTP) with the following features:
     - Programmable activation and deactivation values
     - Load ramping based on pressure, temperature, and/or time
     - True low fire hold, with release based on programmable pressure or temperature settings
   - Retransmission of the burner load as an analog output signal
9. The BMS shall have the following communication capabilities:
   - Modbus RTU serial communication via an RJ45 jack
     - Loss of Modbus communication, based upon a programmable watchdog timer, results in “revert to internal PID control and local setpoint”
   - Internal registers having both read and write capabilities
   - Separate nine (9) pin serial connection available for downloading software updates and configuring the unit with a PC/laptop
   - Ability to integrate with any BMS communication via a protocol translator
10. The BMS shall have the following annunciation capabilities:
    - Plain text and error code annunciation of every digital input
    - A time stamped log of the last 9 lockouts
    - Log of the last 21 faults
    - Plain text warnings for non-lockout events that may disrupt normal operation
11. The oxygen trim and monitoring (OTM) feature of the BMS shall have the following functions:
    - The ability to set a minimum O_2 percent at every point on the O_2 alarm curve
    - The ability to set a target O_2 percent at every point on the O_2 trim curve, except for point 1
    - The ability to select which actuators will be used for O_2 trim, including the VSD

- The ability to apply O_2 trim with the following fuels:
  - Natural gas
  - Light oil
  - Propane
  - User-defined fuel
- The ability to operate the burner on the default ratio curve in the event that the O_2 sensor has not reached operating temperature, or if there is a problem with the O_2 sensor
- The ability to lockout the burner in the event that the O_2 sensor has not reached operating temperature, or if there is a problem with the O_2 sensor
- During low O_2 conditions, the OTM will deactivate and/or lockout the controller, requiring manual reactivation and/or controller reset
- The ability to monitor O_2 percent when O_2 trim isn't activated
- The ability to completely deactivate the OTM with components still attached
- The ability to conduct a self-test of the O_2 sensor during startup and normal operation
- The O_2 sensor shall have no moving parts that are immersed in the flue gas stream (in-situ), and operates without a filter or pump
- The OTM system shall be capable of multiple ambient air temperature compensation functions, including activation of the OTM on start-up based upon ambient air temperature readings, compared to commissioned values

12. The BMS shall have a Variable Frequency Drive (VFD) feature with the following capabilities:
    - The system shall utilize an asymmetrical speed wheel and an inductance sensor mounted to the blower motor shaft for closed loop feedback of the combustion air fan speed
    - The asymmetrical speed wheel shall also allow the LMV52 to determine the direction of rotation of the blower motor
    - The system shall provide a pulse feedback that will constantly monitor the speed of the blower motor
    - The speed shall be corrected if a small deviation from the programmed curve occurs:
      - Deviation above a maximum limit on the programmed combustion curve shall result in a lockout
    - The BMS shall transmit a 0-20mA or 4-20mA analog signal to the VSD:
      - The VSD increases or decreases speed in accordance with the analog signal
13. The BMS shall have burner/boiler efficiency monitoring with the following capabilities:
    - An efficiency calculation using an oxygen sensor, stack temperature sensor, and ambient air temperature sensor
    - A flue gas temperature high warning, with separate settings for gas and oil
14. The BMS shall have capabilities to interface externally via Modbus RTU. Devices include touchscreen HMI, building management systems, PLCs, or chart recorders that are capable of acting as a Modbus Master. The Modbus interface allows monitoring and adjustment of all non-password, non-safety related, user-adjustable parameters such as:
    - Burner status
    - Hours run on a specific fuel, and the number of starts for each fuel
    - Load, boiler pressure/temperature, stack temperature, and ambient temperature
    - Percent O_2, boiler efficiency, and actuator position
    - Flame signal
    - Remote setpoints
    - Fuel flow for gas or oil, if flow meters are connected

- Alarm status
- Fault history
- Lockout history

15. The actuators used with the BMS shall have the following features:
    - Actuators shall utilize a Hall Effect Sensor for non-contact based positioning of actuators. The Hall Effect Sensor shall not be affected by small amplitude or high frequency torsional vibrations caused by air turbulence
    - Internal protection from over-torque and over-temperature conditions
    - Digital CANbus communications
    - High accuracy stepper motor with 900 motor positions through 90 degrees of rotation
    - Direction of rotation is electronically selected and does not require re-wiring to change directions
    - Actuators are factory calibrated and do not require on-site calibration
    - Daisy chain communications to minimize electrical wiring and simplify installation
    - Low voltage 24VAC power
16. The BMS shall have the following special features:
    - Programmable high/low gas and high/low oil pressure switch time buffer to allow pressure shocks to be ignored for a specified, short period of time
    - Quick start capability if there is a demand for heat during post-purge. The unit will begin pre-purge without de-energizing the fan motor starter/VSD
    - Blower air pressure switch evaluation, before each pre-purge, without de-energizing the fan motor starter/VSD
    - Gas pilot valve proving for double pilot valve applications
    - The ability to run full modulation on gas, full modulation on oil, or multi-stage on oil
    - Masking of a specified programmable load range of the burner to assist in minimizing the potential for burner combustion harmonics at certain firing rates, should they exist
    - The ability to backup the entire commissioned parameter set, and store it in the local operator interface display, AZL52, for future downloading
    - A laptop computer shall not be required to commission the LMV52 controller. However, utilizing the ACS450 software, the complete parameter set can be saved to a PC for future downloading. The software also provides the ability to generate a startup report detailing all components and parameter settings of the controller
    - The flue gas recirculation control actuator can be held closed on startup based upon stack temperature setpoint or a pre-configured delay time
    - The fuel-to-air ratio curve can be easily adjusted at any point in the firing rate. Any point can be deleted as necessary, and additional points, if available, can be added at any time

Environmental Conditions

Storage DIN EN 60721-3-1	Climatic conditions	Class 1K3
	Mechanical conditions	Class 1M2
	Temperature range	-20 - 60 °C (-4 - 140 °F)
	Humidity	<95% r.h.
Transport DIN EN 60721-3-2	Climatic conditions	Class 2K2
	Mechanical conditions	Class 2M2
	Temperature range	-20 - 60 °C (-4 - 140 °F)
	Humidity	<95% r.h.
Operation DIN EN 60721-3-3	Climatic conditions	Class 3K3
	Mechanical conditions	Class 3M3
	Temperature range	-20 - 60 °C (-4 - 140 °F)
	Humidity	<95% r.h.

Dimensions

Dimensions in inches; millimeters in brackets

For other major component dimensions, please see the corresponding data sheet.