# Power Flame Incorporated

# SUGGESTED SPECIFICATION
# FOR MODEL
# NVC
# ULTRA LOW NOx
# GAS BURNERS
# SUB 9 PPM NOx

***THE POWER TO MANAGE ENERGY***

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**NVC0803**
**Rev. 0406**

**Suggested Specification for Power Flame NCV**
Gas Burners to 42,000 MBtu/hr)

A. General Requirements

1. Furnish and install NVC14-G-30 Low NOx natural gas burners. The burner and burner installation shall meet all applicable code requirements.

B. Low-NOx Burner Description

1. The burners shall be Power Flame NVC forced draft surface stabilized burners with a removable gas head for rapid switch over to fuel oil operation. Each burner shall have a maximum fired duty of 42,200 MBTU/hr. Gas pressure at the burner gas train supply connection shall be a minimum of 5.0 PSI

2. NOx emissions shall be guaranteed to be less than or equal to (9) ppm, corrected to 3% $O_2$, and CO emissions shall be guaranteed to be less than or equal to 50 ppm, over the full range of burner operation.

3. The burner shall operate with flue gas recirculation (FGR) with natural gas as fuel maintain combustion a 4 - 4 1/2 % $0_2$

4. Burner turndown from maximum heat input shall be a minimum of 3.0:1.

5. Combustion head shall be of high temperature stainless steel all metal construction. Surface stabilized combustion head and be provide with refractory blanket boiler mounting plate.

6. All combustion air shall be supplied by a blower mounted integral to the burner. The blower wheel shall be of the forward curved centrifugal design and shall be directly driven by a 40 hp 3450 RPM 460 volt, 60 Hz, 3 phase motor. A dual blade damper assembly located on the inlet side of the blower wheel shall meter the combustion air flow. Design shall permit disconnecting and locking of either damper if firing rate is near minimum burner input rating.

7. The burner assembly shall be of welded steel construction and have a baked on powder coat finish.

C. Approval Codes

1. Each burner shall adhere to UL NFPA-85-01 design guidelines. Each burner shall be designed and constructed as an integrated combustion system package and shall be factory fire tested.

D. Ignition System

1. The burner ignition system shall utilize either natural gas as the fuel source. The gas pilot system components shall include spark ignited pilot assembly, 6000 volt ignition transformer, Dual pilot solenoid valve, pilot gas pressure regulator, pilot normally open vent valve with locking shutoff cock, pilot gas strainer, gas pressure gauge and manual gas shutoff valve. The flame proving system shall incorporate a Ultra-Violet flame detector which will monitor both the pilot and main flames. The pilot assembly shall fit within the confines of the burner/pilot assembly front mounting plate.

E. Fuel/Air Control System

1. Main on-off gas supply shall be controlled by a motorized gas valve.

2. A modulating motor shall control the positioning of the air inlet dampers. Gas flow control shall be achieved by use of a proportional fuel-air ratio controller referenced to combustion air flow (Siemens or equivalent). The position of the modulating motor shall be controlled by a 135 Ohm, or 4-20 milli-

amp, or 0-10 VDC, modulating type (temperature) (pressure) controller. When the operating control is satisfied the burner shall shutoff and return to the low fire start position. The modulating motor shall provide and electrical interlock to insure a guaranteed low fire start position prior to the pilot trial for ignition sequence.

F. Gas Control Trains

1. The gas train shall contain the following:
   a. Manual pressure lubricated shutoff cock
   b. Main gas pressure regulator
   c. Automatically operated main motorized gas valve with proof of closure interlock switch
   d. Automatically operated auxiliary gas valve with proof of closure interlock switch
   e. Normally open vent valve with locking shut off gas cock
   f. Manual reset Low and High gas pressure switches
   g. Manual pressure lubricated leakage test cock.
   h. Burner manifold gas pressure gauge
   i. (2) ¼" leak test cocks
   j. Main gas line strainer

G. Burner Operating Controls

1. The On-Off operation of the burner shall be controlled by a (pressure) (temperature) control. System (pressure) (temperature) shall be _____ (PSIG) (Degrees F). A safety manual reset type limit control shall be provided to shut the burner down in the event of excessive (pressure) (temperature). The position of the modulating motor and other fuel/air components shall be controlled by a 135 ohm, or 4-20 milliamp, or 0-10 volt DC (pressure)(temperature) control in addition to the On-Off operating control.

H. Interlocks

1. The modulating motor shall be sequenced to allow for four (4) complete air changes of the combustion chamber and breaching, and through an integral end switch be electrically interlocked with the control burner circuit to insure the air linkage is in the low fire start position before the burner ignition sequence can begin.

I. Flame Safeguard Control

1. The flame safeguard control shall include lead sulfide sensor for flame detection and provide fully automatic sequencing of pre-purge and post-purge, blower motor, interrupted ignition system, and fuel/air flow components. Burner shall purge with full open air louver at not less than 60% of high fire air flow rate for a minimum of four (4) air changes and not less than 60 seconds. Flame safeguard shall provide safety shutdown with manual reset on air flow failure. The flame safeguard control shall be Siemens LMV52 with $O_2$ trim

The LMV52 is an electronic linkage less, microprocessor-based unit for the control and supervision of a single forced draft burner with; modulating gas, When used with matching system components, it becomes an easy to use burner management system that delivers superior control, performance and diagnostics.

The LMV52 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, and FGR, and has PID temperature / pressure control function (load controller).

All of the burner management system's major components, specifically the base unit (LMV52), the display and operating unit (AZL) and the actuators (SQM4) communicate over a reliable safety bus.

## Major Functions

1. The LMV52 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 LMV52
    - Shall be controlled by digital signals on a safety bus from the LMV52
    - 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 LMV52 shall be permanently monitored via a contact feedback network.
4. The LMV52 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 LMV52 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 LMV52 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 LMV52 burner control base unit
    - COM1 (terminal X70) optional connection to a PC with ACS450 software
    - COM2 interface (terminal X72) optional connection to a BMS using and external e-bus
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 LMV52 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 LMV52)
    - Graphical presentation of diagnostic data
    - Parameterization of the LMV52
    - 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.

23. LMV52 will control the $O_2$ by continuously monitoring the exhaust gas and adjusting the fuel and air controls to maintain combustion settings programmed in to the systems. Include $O_2$ sensor, $O_2$ module and flue gas collector.

J. Control Panel

1. Each burner shall be complete with a remote control panel which shall house all required operating electrical components. All wiring for remote panel electrical components shall be factory pre-wired to a terminal strip mounted within the control panel. A junction box pre-wired to the burner components shall be mounted on the burner. It shall have a terminal strip which shall match a terminal strip in the remote panel. Field wiring shall be required between the burner mounted junction box and the remote control panel.

2. Appropriate electrical knockouts shall be provided on both sides of the panel to allow for necessary power and limit control wiring. The control panel shall be constructed of 14 gauge steel and shall be complete with a top switch and control section which shall be hinged to allow for full access to all panel mounted components. The control panel shall be painted in a color and finish identical to the burner being supplied.

3. The control panel shall include a step-down control circuit transformer fused on both the primary and secondary windings to power 120 V components.

4. The control panel shall have the following status indicators: Power On –Green; Limit Circuit Closed – Green; Main gas – Blue, Flame Failure – Red. High water and low water – Red

5. Provide an alarm buzzer and auto reset alarm silencing switch to signal any failure status.

K. Product Liability Insurance

The burner manufacturer will provide an Insurance Certificate documenting his current coverage of Product Liability Insurance.

L. Burner Start-up Information and Test Data

On completion of the burner system start up, the installing contractor shall complete a Burner Startup Information Sheet and a Control Setting Sheet and deliver to the Specifying Engineer.