



Part No: 500-0036-00
Model: - DSI230-1-LVS -B

CUSTOMER SPECIFICATION

Direct Spark Igniter -Single Channel model for gas appliances

Single channel 230V Direct Spark Ignition System with gas valve control for use with Natural, mixed and LP gas- air mixtures for application in Domestic Gas Ovens with atmospheric burners.



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Product Description

The DSI230-1-LVS-B is a one channel, 230V Direct Spark gas ignition control with low voltage solenoid drive, specifically designed for ignition and control of gas in domestic cooking ovens with atmospheric burners. The DSI uses a common flame sense and igniter rod. This unit is one variant of the DSI controller family. See appendix for part specific functional parameters.

- *Failsafe Gas Valve Control*

- *Drives low voltage gas valves direct from high voltage mains*

- *Standalone operation*

Subject to change: -

Last Change:- Add Flame Proof Timer in softw.

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Standards Compliance:

EN298:2003 - Automatic Gas Burner Control Systems for gas burners and gas burning appliances with and without fans.

EN 60730-2-5:2003 - Specification for automatic electrical controls for household and similar use.
Particular requirements for automatic electrical burner control systems

Operating Principles:

1. The module operates 1 burner in typical oven/grill application in conjunction with:
 - Common Spark/Flame electrode connected to the high voltage output coil
 - Heat Request switch.
 - Solenoid valve
2. A thermostat or switch individually controls the burner. The thermostat energises line voltage to the DSI heat request channel while heat is required, and de-energises the heat request channel when heat is not required.
3. The high voltage output coil generates sufficient voltage and energy to initiate a spark from the electrode across the spark gap to the earthed burner. A Spark is guaranteed, provided the gap is within specifications and provided the electrode and cable meet the maximum loading specifications. A spark earth return is provided.
4. Sparks are generated at all the burner when the Heat Request Input is on provided no flame is detected at the burner. Sparking will continue at the nominal rate until either flame is detected or the *Flame Establishment Time* (or *Safety Time*) is exceeded.
5. If no flame is detected by the end of the period of the *Flame Establishment Time*, the gas valve drive is removed, stopping gas flow and sparking. If the number of *Ignition Attempts* has not been exceeded then the module will wait for the *Purge Time* and then make another attempt at ignition. If the number of *Ignition Attempts* has been exceeded then the module will go into Ignition Lockout.
6. Flame detection utilises the flame rectification principle, primarily due to its ability to tolerate leakage currents to earth significantly larger than the flame current itself. The circuit passes a current through the electrode, flame, and burner to earth. The power to provide the current flow is derived from the mains line voltage.
7. The module detects flame under all flame conditions provided the electrode is positioned such that the detected flame current exceeds the minimum specified flame current across the range of gas flow rates available. A continuous detected flame must remain for the *Flame Proving Time* to be considered valid flame.
8. The actual flame current should exceed the typical specified flame current detection specification to allow tolerance to fluctuations in the flame before a loss of flame is detected and lockout results (to avoid nuisance lockouts)
9. The response time of the circuitry to detection and loss of flame is dependent primarily on the magnitude of the flame, and meets the requirements as detailed within the technical specifications
10. In case of flame failure, the module commences a re-ignition attempt. If the flame is not re-established within the *Flame Establishment Time*, sparking stops and the gas valve drive is de-energised. If the number of *Re-ignition Attempts* has not been exceeded then the module will wait for

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the *Purge Time* and then make another attempt at ignition. If the number of *Re-ignition Attempts* has been exceeded then the module will go into Ignition Lockout

11. The re-ignition attempt(s) is performed if flame is lost at the burner, while the Heat Request is on.
12. For reliable and effective operation, careful design of the burners and positioning of the spark electrodes is necessary. The spark electrode also detects the flame and therefore must be positioned within the flame across the range of gas flow rates available.
13. The housing (if supplied) for this ignition system is not fully sealed and dangerous conditions can arise if water is allowed to enter the module.
14. This unit must only be used in a manner that meets all the relevant requirements of the Electrical and Gas Authorities.

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Functional Description:

The DSI230-1-LVS-B is an electronic gas ignition system (DSI or Direct Spark Ignition) specifically designed for ignition and control of gas in domestic cooking ovens with atmospheric burners. Any use of this module in other applications should be checked with the approval authorities or Tytronics.

Used in conjunction with a single low voltage 10VDC Solenoid Gas Valve and a combined Spark and Flame Sense Electrode the unit provides DSI of a single gas burner.

The operation cycle commences when power is applied to the heat request input. After Safe Start Checks are completed, the gas valve is opened and sparking commences at the nominal rate. Sparking will continue until the end of the flame establishment period, or until the gas ignites. If flame is established at the electrode, sparking stops and the unit continues to monitor the flame until power to the heat input is removed, causing the gas valve output to shut off.

An optional LED indicator output for the user will indicate when the heat request is ON as well as providing fault indication. User fault will result in the user LED flashing at the rate of one second ON followed by one second OFF repeatedly. An on board LED is able to provide more detailed fault code information (see DSI fault code list in appendix).

The DSI230-1-LVS-B utilises an open drain PWM DC drive system, for control of the gas solenoid valve. The valve is opened by a 50mS duration pull-in pulse, then held open by a variable duty cycle PWM that maintains a consistent voltage across the solenoid valve for varying supply mains and temperature conditions.

The valve drive typically delivers an average of 30VDC over the duration of the 50mS pull in pulse, followed by a 15.6kHz modulated 10VDC to hold the solenoid valve open. Under worst case conditions the hold voltage can drop to 4VDC, requiring a solenoid valve with a hold voltage less than 3V to ensure consistent operation.

Functional Parameters and Sequences:

There are options available to tailor the unit for different applications. Both channels will operate with the same parameters. These relate to the behaviour of inputs, lockouts and ignition procedure and are as follows:

PwrUpLock: If a heat request is ON at power up, the DSI may:

Lockout, or –

Proceed to ignite the relevant channel(s)

Normally the unit would be set to lockout; this safeguards the possibility of power failure while a flame is lit. If a channel is on the unit locks out when the power returns, this prevents a start up when the appliance may be unattended. If the appliance is wired with the DSI unit powered up by the burner channel switch, the unit would be programmed not to lockout.

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NI: Limited repeat of ignition attempts (including safe start checks). If the number of Ignition attempts is programmed = 1 the unit will lockout immediately after a failed ignition attempt. If the number of Ignition attempts is programmed > 1 the unit will cycle through Safe Start, Flame Establishment and Purge/Waiting states, with all respective timers enforced, until either flame is detected or there are no further first-ignition attempts available. In the latter case the unit will lockout either one or both channels according to options set above, the operator must clear the lockout and all purge and safety times will be observed before the unit can restart. Once the circuit has been re-set in this manner a new ignition cycle can again be initiated by applying power to the corresponding call for heat input(s).

NR: Once flame has been established, operation on subsequent flame failure is dependent on the number of re-ignition attempts programmed. If the number of re-ignition attempts is programmed = 0 the unit will lockout immediately after flame failure. . If the number of re-ignition attempts is programmed > 0 there will be limited re-ignition attempts. Failure to restore flame within the flame establishment period results in immediate lockout of one or both channels.

RelgMethod: There are two options for re-ignition behaviour:

Standard – shuts down the valve when flame is lost, purge and waiting times are observed before the valve is re-energised with spark for the programmed safety time or until the flame relights.

Spark Restoration - spark starts as soon as flame is lost, the valve and spark remain energised, if the flame does not light, the valve and spark shutdown after the safety time period, the unit must now purge before any further restarts. This method gives the quickest relight time.

The spark output energy is relatively constant across the specified supply voltage range, at the specified minimum spark dwell, but reduces at lower supply voltages. Minimum specified dwell of 300mS achieves consistent spark voltage across rated supply voltage range. Consult factory if this value is to be changed.

TR: The Flame Fail Response Time is the period of continuous flame outage to cause a shutdown, this is fixed by the speed of the response of the flame detector.

Functional Parameter Setting Ranges:

The function of the DSI is dependent on requested software version.
The options and range of settings for DSI230-1-LVS-B are:

Note: For product specific settings see appendix; Optional Settings

Table 1:

| Parameter | Description | Min | Max |
|-----------|---|-----|-----|
| PwrUpLock | Off: If a channel heat request is detected on at power up, the unit commences trial for ignition for the relevant channel(s). On: Unit locks out if any channel heat requests are detected on at power up. | | |

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| Parameter | Description | Min | Max |
|----------------|--|-----|-------|
| N _I | The maximum number of unsuccessful Safe-Start / Flame Establishment attempts, prior to first flame, before proceeding to Lockout. Disabled once flame is detected (ie first-ignition NOT re-ignition attempts). Required in applications where fuel takes longer than FETtime to reach burner after periods of dormancy. 1 = Immediate lockout after first attempt | 1 | 255 |
| N _R | The number of re-ignition attempts before proceeding to Lockout for each channel. Active for each flame failure while channel heat request remains ON. Required in applications where flame can be de-stabilised eg by opening oven door. | 0 | 255 |
| T _W | The waiting time for each channel. Allows time for start up checks to complete and delays response to the channel-input signal to avoid nuisance start-ups. Trial for ignition will not commence until the waiting time completes. (Time in seconds) | 2.8 | 655.3 |
| T _P | The post purge time for each channel. Post purge allows unburnt fuel to disperse. Occurs after a heat cycle or a failure to ignite. On lockout, channel Heat request is ignored for this duration. (Time in seconds) | 2 | 655.3 |
| T _F | The Flame Proofing time is the period of continuous flame before being considered a valid flame. On detection of a valid flame the system is considered to be in the Heat cycle. (Time in seconds) | 0 | 255 |
| T _S | The Flame Establishment Time (or Safety time) is the ignition time available before proceeding to safe shutdown or lockout. (Time in seconds) | 2 | 60.0 |
| T _D | Response delay time runs from the end of a heat request and delays response to a new request until completion of the timeout. (Time in seconds) | 0 | 655.3 |

Notes:

1. In event of failure of the ignition (safety) timer a backup circuit ensures lockout and solenoid closure if a flame is not established.
2. On lockout the solenoid is closed and sparking ceases. The system remains in lockout until the heat request is turned off. Power failure does not clear the lockout unless the heat request is off when power resumes.
3. The burner channel will always lockout if a safety fault is detected.

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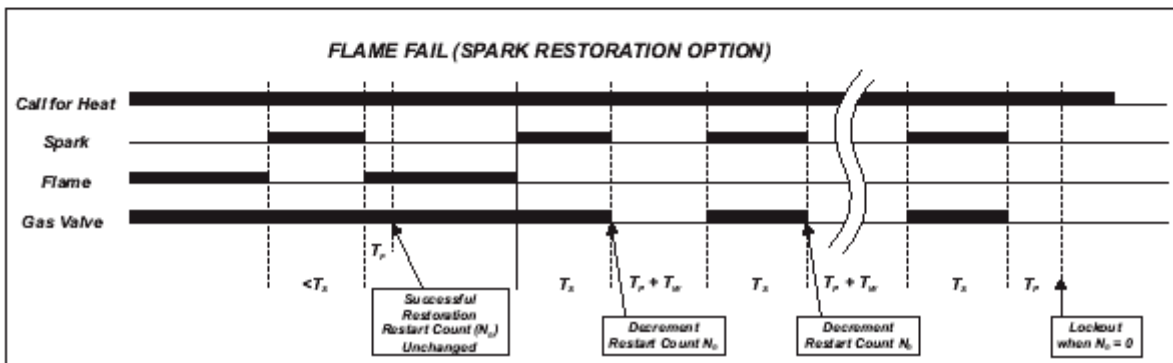
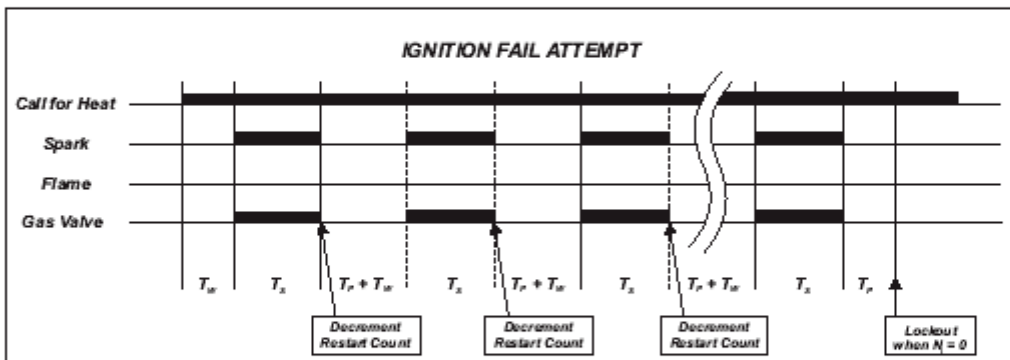
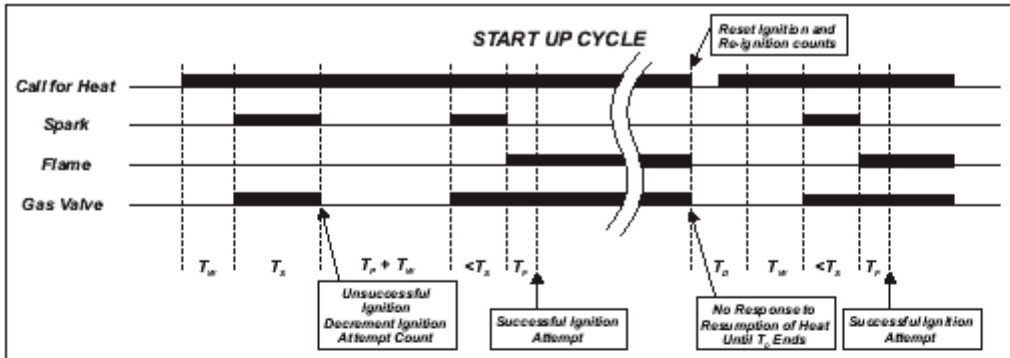




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Functional Sequences:



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Technical Specifications:

| PARAMETERS @ 25°C | Min | Typ | Max | Units |
|--|------------------|--------------------|------------------|---------|
| Supply Voltage ^{*1} | 196 | 230 | 264 | Vac |
| Supply Frequency ^{*5} | 47 | 50/60 | 63 | Hz |
| Supply Power | | 27 | | VA |
| Flame Detection Method: Flame rectification | | | | |
| Flame Current ^{*2} | 0.4 | 1.0 | | uA |
| SPARK PARAMETERS | | | | |
| Spark Voltage peak @ max load, nom input | 12 | 16 | | kV |
| Spark Rate | | 200 | | /minute |
| Recommended Spark Gap @ max load | 2.5 | | 4.5 | mm |
| Electrode & Cable Load to earth | | | 40 | pF |
| Spark Cable Length - Floating | | | 100 | cm |
| - Clamped to chassis | | | 85 | cm |
| SOLENOID GAS VALVE & DRIVE | | | | |
| Type | | Invensys FJT-02 | | |
| Pull In Voltage (50mS pulse) @ nominal load | 24.5 | 35 | 52.5 | VDC |
| Hold Voltage @ nominal load | 4 | 10 | 13 | VDC |
| Static Drop Out Voltage | | | 2.3 | VDC |
| Hold Current for Solenoid valve | 34 ^{*3} | 50 | 61 ^{*4} | mA DC |
| Drive PWM frequency | | 15.6 | | kHz |
| Coil Resistance | | 210 | | Ohm |
| Coil Inductance | | 467 | | mH |
| ENVIRONMENTAL | | | | |
| Operating Temperature (Continuous) | 0 | | 100 | °C |
| Max. Operating Temp. (1000 hours total) | | | 105 | °C |
| Relative Humidity (at 40°C – non condensing) | | | 95 | % |

^{*1} The electrical supply must be maintained with one terminal at or near to Earth potential. An isolated supply without an Earth connection will result in failure to detect the flame. The Burner must be effectively earthed to the mains supply.

^{*2} Flame current Detection Limit. The electrode must be positioned so that adequate detection current will flow on flame presence. This should be verified under all operating conditions. It is recommended that systems be designed to maintain the average flame current above 0.8 uA. This ensures the module does not spark due to drafts blowing flame away from the electrode.

^{*3} At conditions 180Vac 50Hz supply, one solenoid operating, hold voltage 7.2V, 250mW total

^{*4} At conditions 264Vac 60Hz supply, one solenoid operating, hold voltage 12.6V, 760mW total

^{*5} Models Auto-detect frequency for 50/60Hz operation

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Mechanical Requirements:

Mating Terminations

Spark Terminals:

2.8 x 0.8mm (0.11x0.032") HV terminal
QC recepticle

6.35 x 0.8mm (0.25x0.032") HV Earth
QC recepticle

Control Connector 10Way:

| | |
|-----------------------------------|---------------------|
| Centre Crimp Terminal Housing | 10 – Active Supply |
| 0.156" (3.96mm) Pitch to suit | 9 - Unused |
| 0.045" Square Pin. Pins 1,5,6,8,9 | 8 – Unused |
| not loaded | 7 – Heat Request 1 |
| TYCO SL-156 Style 1-770894-0 | 6 – Unused |
| or equivalent | 5 – Unused |
| | 4 – Neutral Supply |
| | 3 – Solenoid 1 |
| | 2 – Solenoid Common |
| | 1 – Unused |

LED Connector Type:

2 way single row * 0.100" pitch
Mating housing Molex style 70066G,
Part no. 50-57-9402 or equivalent

LED Connector Pins:

1 – LED Anode (+ve)
2 – LED Cathode (-ve)

Note - For safety and operational reasons an earth connection **must** be provided to the unit and the burners **must be earthed**. Failure to do so could result in erratic behaviour.

Housing Detail

Housing None
IP Rating IP 00

Mounting Method

Recommended 4 x standoffs, non metallic or Tytronics approved
Mounting Holes 4 x 4.0mm
Hole Centres Rectangular grid 78.0 x 94.0mm

Physical Dimensions

Board Dimensions L x W x H - 110.7 x 85.6 x 44 mm
Note: Customer's spark cable connector will increase the installed height

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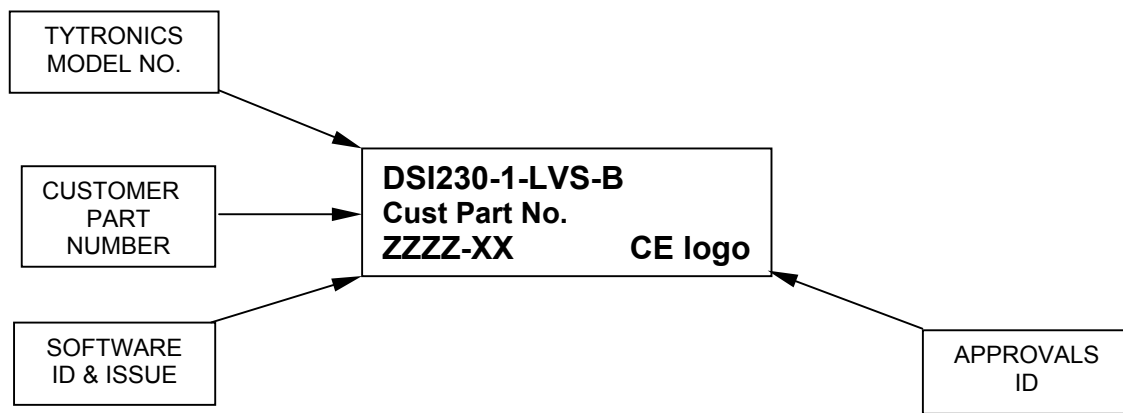
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Labeling :

Labeling

1. Combined product/model number, customer part number and issue, and software number with issue label fixed on component side of PCB.

Current Software Issue : 500-0036-SM01-02



2. Date Code label identifies batch manufacture YYWW : YY-Last 2 digits of Year, WW-Week number

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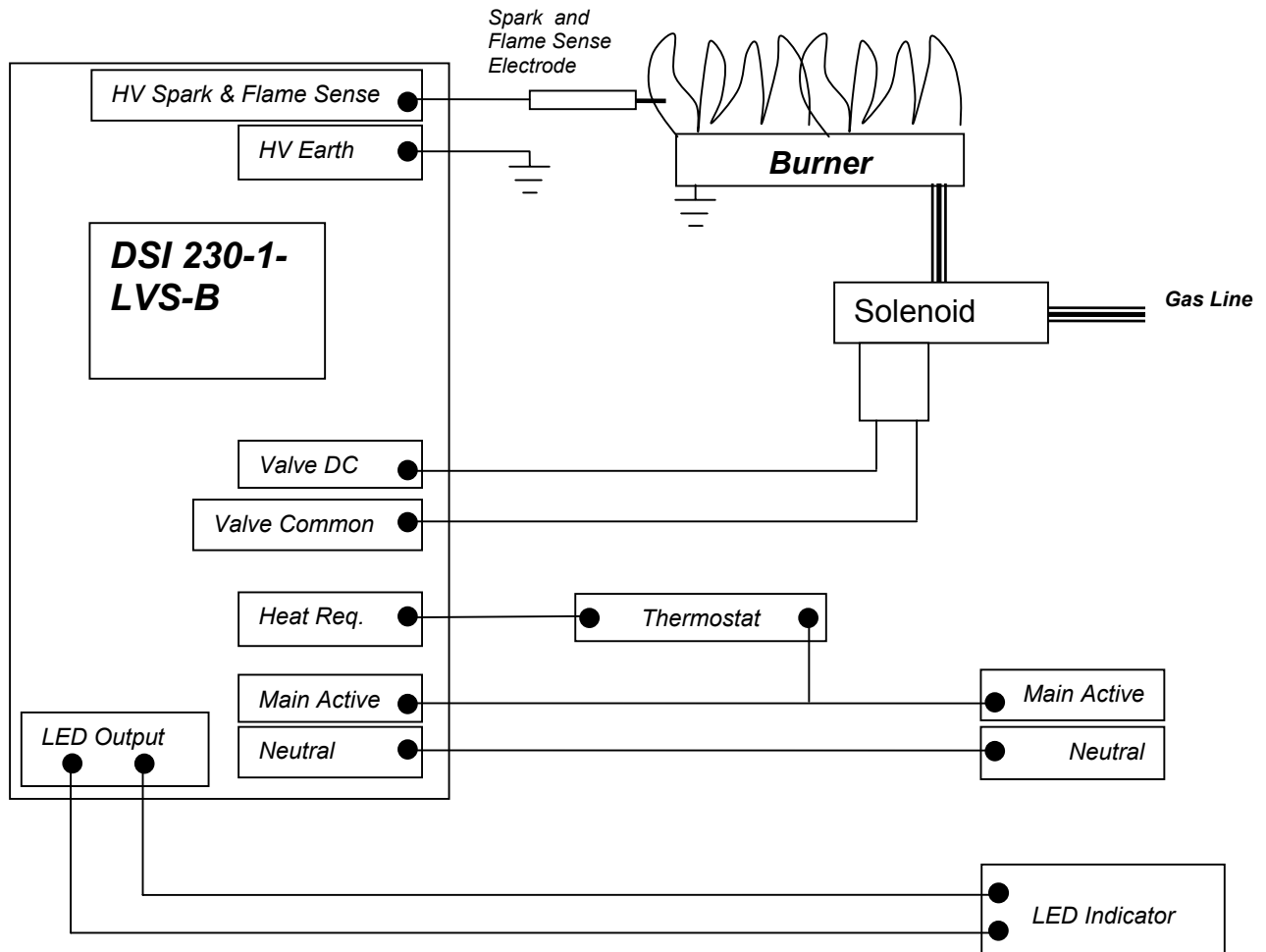




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Wiring Installation Diagram:



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Appendix 1:

PCB Status Indicator Codes:

The DSI PCB indicates the current status of the unit via an LED that flashes regularly with predefined sequences indicating various operational conditions. The flash sequence repeats every 4 seconds.

| No. of Flashes in sequence | Status | Description |
|----------------------------|----------------------------------|--|
| 1 | Gas OK | No faults and unit is functioning |
| 2 | Safeguard Fault | Locked out, safeguard check fail or safeguard timeout |
| 3 | Ignition Lockout | Locked out, failed tries/retries |
| 4 | Valve Drive Fault | Locked out, illegal drive detected or drive monitor stuck off. |
| 5 | Independent Heat Request Lockout | Locked out, heat requests are not independent for dual channel models, the other channel must go off to reset the lockout. |
| 5 | Frequency Fault | Locked out, discrepancy between mains freq and timer tick |
| 7 | Power Up Lockout | Locked out, power up with channel ON and PwrUpLock is set to ON. |

Note: For single channel DSI models only one heat request is possible.

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Appendix 2:

Functional Parameters for DSI230-1-LVS-B Part No : 500-0036-00

Table 2:

| Parameter | Description | Setting |
|----------------|--|------------|
| PwrUpLock | Off: If a channel heat request is detected on at power up, the unit commences trial for ignition for the relevant channel(s). On: Unit locks out if any channel heat requests are detected on at power up. | On |
| N _I | The maximum number of unsuccessful Safe-Start / Flame Establishment attempts, prior to first flame, before proceeding to Lockout. Disabled once flame is detected (ie first-ignition NOT re-ignition attempts). Required in applications where fuel takes longer than FETtime to reach burner after periods of dormancy. 1 = Immediate lockout after first attempt | 5 |
| N _R | The number of re-ignition attempts before proceeding to Lockout for each channel. Active for each flame failure while channel heat request remains ON. Required in applications where flame can be de-stabilised eg by opening oven door. | 1 |
| T _W | The waiting time for each channel. Allows time for start up checks to complete and delays response to the channel-input signal to avoid nuisance start-ups. Trial for ignition will not commence until the waiting time completes. (Time in seconds) | 3.0 |
| T _P | The post purge time for each channel. Post purge allows unburnt fuel to disperse. Occurs after a heat cycle or a failure to ignite. On lockout, channel Heat request is ignored for this duration. (Time in seconds) | 2.0 |
| T _S | The Flame Establishment Time (or Safety time) is the ignition time available before proceeding to safe shutdown or lockout. (Time in seconds) | 4.0 |
| T _F | The Flame Proofing time is the period of continuous flame before being considered a valid flame. On detection of a valid flame the system is considered to be in the Heat cycle. (Time in seconds) | 2.0 |
| T _D | Response delay time runs from the end of a heat request and delays response to a new request until completion of the timeout. (Time in seconds) | 2.0 |

Notes:

1. In event of failure of the ignition (safety) timer a backup circuit ensures lockout and solenoid closure if a flame is not established.
2. On lockout the solenoid is closed and sparking ceases. The system remains in lockout until the heat request is turned off. Power failure does not clear the lockout unless the heat request is off when power resumes.
3. The burner channel will always lockout if a safety fault is detected.
4. The Purge Period (TP + TW) is 3 seconds typically

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