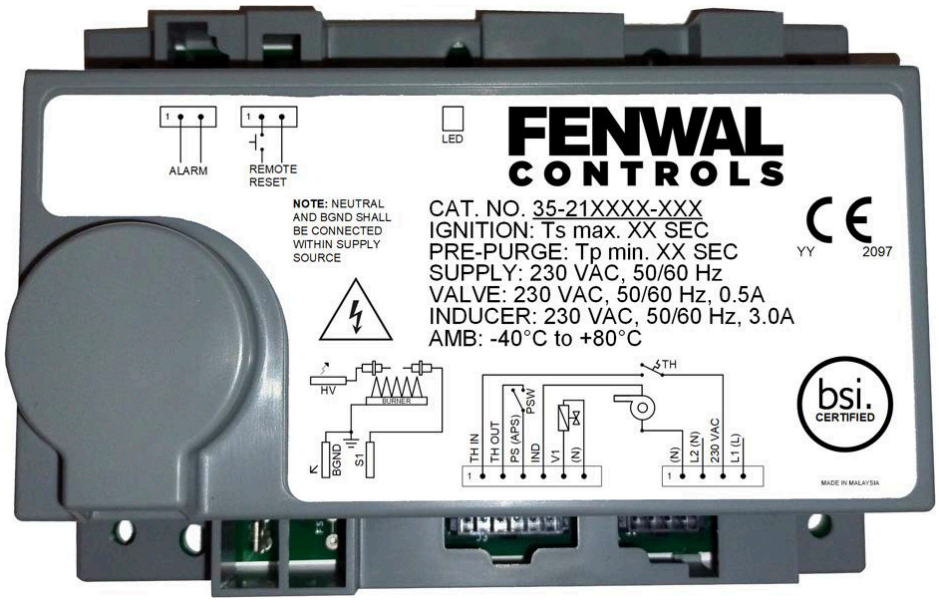
SERIES 35-21

230 VAC Microprocessor-Based Direct Spark Ignition Control with Inducer Blower Relay



Features

- Safe start with DETECT-A-FLAME® flame sensing technology
- Custom pre-purge and inter-purge timings[1]
- Inducer blower control and airflow switch monitoring
- Single or three trials for ignition
- System diagnostic LED
- Flame current test points
- Local or remote flame sensing
- Automatic reset[2]
- Alarm output (normally closed contact)

Applications

- Gas furnaces
- Boilers
- Commercial cooking
- Water heaters
- Other gas-fired appliances

Description

The 35-21 is a 230 VAC direct spark ignition (DSI) control designed for use in all types of gas-fired appliances. The control uses a microprocessor to continually and safely monitor, analyze and control the proper operation of a gas burner and inducer blower. On-board diagnostics with LED output makes troubleshooting easy and ensures safe and efficient operation.

Export Information (USA)

Jurisdiction: EAR
ECCN: EAR99

Agency Certifications

CE YY 2797 CE Approved to EN 298:2022[3,4]

bsi. CERTIFIED Australian Gas Safety certification to EN 298:2022 & AS 4625-2008

NOTE:
1 - Pre-purge time cannot exceed inter-purge time on CE Approved models.
2 - Automatic reset is not allowed for CE Approved models.
3 - EMC emission requirements shall be verified after incorporation of the burner control system into the end use appliance.
4 - Acceptance in the United Kingdom is based on CE marking.

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Specifications

Input Power	187V to 264V at 50/60Hz
Line Voltage	187V to 264V at 50/60Hz (L1 & IND contacts only)
Input Current	0.25 A maximum @ 230VAC 50Hz, 25°C
Gas Valve	1.0A, 230VAC, LRA, 0.6pf 0.5A, 230VAC, FLA
Inducer Blower	12.0A, 230VAC, LRA, 0.6pf 3.0A, 230VAC, FLA
Operating Temperature	-40°F to +176°F (-40°C to +80°C)
Storage Temperature	-40°F to +185°F (-40°C to +85°C)
Flame Sensitivity	0.7 µA minimum
Flame Failure Response	0.8 seconds maximum
Flame Detector Self-check Rate	Once per second minimum
Gas Types	Natural, LP, or manufactured
Spark Rate	25 sparks/sec
Size (LxWxH) with enclosure	5.69 x 3.94 x 1.87 inches (14.45 x 10.01 x 4.75 cm)
Moisture Resistance	Conformal coated to operate noncondensing to 95% R.H. Module should not be exposed to water
Ingress Protection	IP-20 (with cover)
Tries for Ignition	One or three try versions available
Trial for Ignition Periods	4, 7, 10, 15 seconds available
Pre-purge and Inter-purge Timings	0, 15 or 30 seconds available
Post-purge Time	0, 30 or 60 seconds available
Alarm	Dry Contact Programmable 1A at 24VAC - 230VAC / 30VDC
Fuse	Non-replaceable
Reset	Volatile & Non-Volatile lockout with manual reset (optional)

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Sequence of operation / flame recovery / safety lockout

Power Up - Stand By

35-21 has the option for full time power or powered when 230Vac is applied to TH. Upon applying power or TH, the control will reset, perform a self- check routine, flash the diagnostic LED and enter the thermostat scan state.

Start Up - Heat Mode

When a call for heat is received from the thermostat supplying 230 VAC to TH/W, the control will check the pressure switch for normally open contacts. The inducer blower is then energized. Once the pressure switch contacts close, a pre-purge delay begins. Following the prepurge period, the gas valve is energized and sparking commences for the Trial for Ignition (TFI) period. When flame is detected during the TFI, the sparking process is terminated and the gas valve and inducer blower remain energized. The thermostat, pressure switch and burner flame are constantly monitored to assure proper system operation. When the thermostat is satisfied and the demand for heat terminates, the gas valve is immediately de-energized. The control verifies the loss of flame signal and initiates an optional post-purge period before de-energizing the inducer blower.

Failure to Light - Lockout

Single trial model

Should the burner fail to light, or a flame is not detected during the TFI period, the gas valve will de-energize and the control will go into lockout. The inducer blower will turn off following the optional postpurge period. The LED will indicate the fault code for ignition lockout.

Multi trial model

Should the burner fail to light or the flame is not detected during the TFI period, the gas valve will de-energize. The control will then go through an inter-purge delay before an additional ignition attempt. The control attempts two additional ignition trials before de-energizing the gas valve and entering lockout.
The inducer blower will turn off following the optional post-purge period.
The LED will indicate the fault code for ignition lockout.

Flame Failure

Flame failure - re-ignition mode

If the established flame signal is lost while the burner is operating, the control will respond within 0.8 seconds by immediately energizing the H.V. spark for the TFI period in an attempt to relight the flame. If the burner does not light within the TFI, the gas valve will immediately deenergize and single try models will enter lockout. On multi-try models, a new TFI sequence will begin after an inter-purge delay. Multi-try models perform two additional attempts to light the burner. If the burner relights, normal operation resumes. If the burner does not relight, the control will enter lockout and the inducer blower will turn off following the optional post-purge period.

Flame failure - recycle mode

With the "Recycle After Loss of Flame" option, upon loss of flame, the gas valve is de-energized and the control proceeds to inter-purge before attempting to relight the flame. Multi-try models permit three tries for ignition including inter-purges. If the burner relights, normal operation resumes. If the burner does not relight, the control will enter lockout.

Lockout Recovery

Recovery from lockout requires a manual reset by either resetting the thermostat, or removing 230 VAC. On models with automatic reset, if the thermostat is still calling for heat after one hour, then the control will automatically reset and attempt to ignite the burner.

Combustion Airflow Fault

Combustion airflow is continually monitored during an ignition sequence by the pressure switch (PSW). If during the initial call for heat, the switch contacts are in the closed position for 30 seconds, without the inducer blower being energized, the LED will indicate an airflow fault and remain in this mode with the inducer blower off. If the pressure switch contacts later open while there is still a call for heat, the control will begin the pre-purge period followed by a normal ignition sequence.
If the pressure switch remains open for more than 30 seconds after the inducer blower output (L1 & IND) is energized, the LED will indicate an airflow fault and the control will remain in this mode with the inducer blower on, waiting for the pressure switch to close. When proper airflow is detected at the pressure switch input (PSW) the control will begin the pre-purge period followed by a normal ignition sequence.
If the airflow signal is lost while the burner is firing, the control will immediately de-energize the gas valve and the inducer blower will remain on. If the call for heat remains, the control will wait until proper airflow returns. If proper airflow is not detected after 30 seconds, the LED will indicate the fault code for an airflow fault. If proper airflow is detected at any time, a normal ignition sequence will begin with the pre-purge period.

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MOUNTING AND WIRING

The Series 35-21 control is not position sensitive and can be mounted vertically or horizontally. The case may be mounted on any surface with #6 sheet metal screws. The control also supports direct mounting to a standard NEC 4-in. junction box.

CAUTION	All wiring must be performed in accordance with both local and national electrical codes.
CAUTION	Label all wires prior to disconnection when servicing controls. Wiring errors may cause improper and dangerous operation. A functional checkout of a replacement control should always be performed.
WARNING	This product uses voltages of shock hazard potential. Wiring and initial operation must be performed by a qualified service technician.
WARNING	Operation outside specifications could result in failure of the Fenwal product and other equipment with potential for injury to people and property.

Terminal Designations

0.25 in. Quick Connect	I/O	Description
J1	Pin 1: N	4-Pin Molex Microfit Mate-n-Lok Connector P/N 43650-0418
	Pin 2: L2 (N)	
	Pin 3: PS(APS)	
	Pin 4: L1 (L)	
J3	Pin 1: TH In	6-Pin Molex Microfit Mate-n-Lok Connector P/N 43650-0618
	Pin 2: TH Out	
	Pin 3: PS(APS)	
	Pin 4: IND	
	Pin 5: V1	
	Pin 6: L2 (N)	
J2 (Optional)	Pin 1: Alarm Mains	2-Pin Molex Microfit Mate-n-Lok Connector P/N 43650-0218
	Pin 2: Alarm Load	
J4 (Optional)	Pin 1 & 2: Manual Reset	2-Pin Molex Header 0.025 Square, 0.1 Center P/N: 22-23-2021
HV	Hi-Voltage	0.25 in. Quick Connect
FS	Remote-Sense	0.25 in. Quick Connect
GND	Ground	0.25 in. Quick Connect

WIRING DIAGRAMS - 35-21

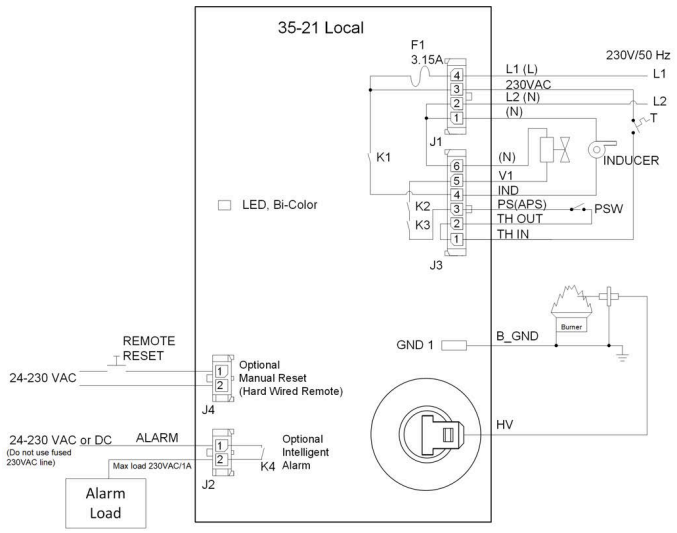

Figure 1 - Local Sense

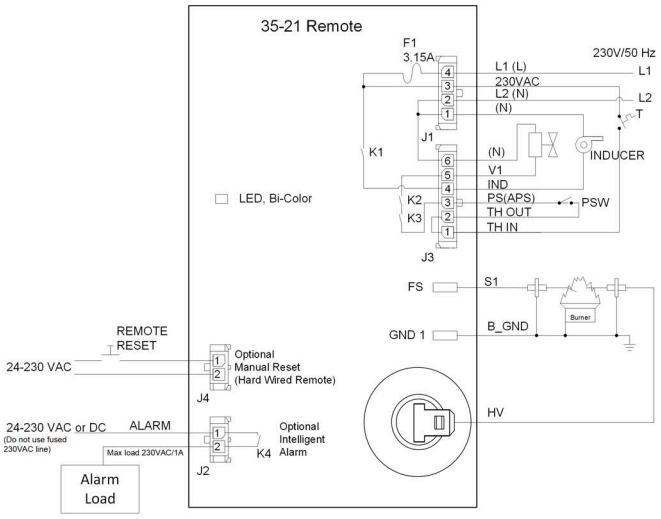

Figure 2 - Remote Sense

Note: L2 must be connected to ground within the service panel.

HIGH VOLTAGE AND REMOTE SENSE CABLE REQUIREMENTS

The HV Ignition Cable must meet a voltage rating of 25 KV and an insulation rating of 200 °C. Recommend length of 3ft (.9m) or less.
Consult factory for longer lengths.
Remote flame sense cable must meet a voltage rating of 250V and an insulation rating of 200 °C. Recommended length of 10ft (3m) or less.
Consult Factory for longer lengths.

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TROUBLESHOOTING

Troubleshooting Guide

Symptom	Recommended Actions
1. Control does not start	A. Miswired B. Fuse circuit breaker fault C. Faulty control, check LED for fault codes
2. Thermostat on - no spark	A. Miswired B. Faulty thermostat, no voltage at thermostat terminal TH/W C. Faulty control, check LED for fault codes
3. Blower on - no TFI after purge delay	A. Miswired B. Flame fault C. Airflow fault (check voltage at PSW) D. Faulty control (check voltage between L1 & IND)
4. Valve on - no spark during TFI	A. Shorted electrode - establish 1/8th inch gap B. Check high voltage cable C. Miswired
5. Spark on - valve off	A. Valve coil open B. Valve wire disconnected C. Faulty control, check voltage at gas valve terminal V1
6. Flame okay during TFI - no flame sense after TFI	A. Check electrode position B. Check high voltage wire C. Poor ground at burner D. Poor flame, check flame current

BI-COLOR LED CODES

Red LED Fault Conditions

LED Indication	Fault Mode
Steady On	Internal Control Failure
1 Flash	Airflow Fault
2 Flashes	Flame without call for heat
3 Flashes	Ignition Lockout

Green LED Diagnostics

LED Indication	Fault Mode
Steady On	Idle Mode
Slow Flash	Call for Heat
Fast Flash	Burn Mode

Note: During a fault condition, the LED will flash on for 1/4 second and off for 1/4 second as needed to indicate the fault code. The code will repeat every 3 seconds. Removing power from the control will clear the fault code.

INTERNAL CONTROL FAILURE

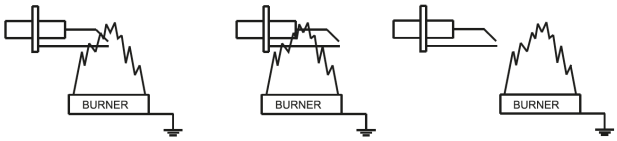
If the control detects a software or hardware error, all outputs are turned off and the LED displays a Steady On condition. If this condition persists after an attempt to restart, then the control must be replaced.

FLAME FAULT

If at any time the gas valve fails to completely close and maintains a flame, the flame sense circuit will detect it and energize the inducer blower. Should the valve later close completely removing the flame signal, the inducer blower will be turned off following the optional post purge period.

PROPER ELECTRODE LOCATION

Proper location of electrode assembly is important for optimum system performance. The electrode assembly should be located so that the tips are inside the flame envelope and about 1/2-inch (1.2 cm) above the base of the flame as shown:



YES NO NO

Notes:

- Ceramic insulators must not be in or close to the flame.
- Electrode assemblies must not be adjusted or disassembled. Electrodes are NOT field adjustable.
- Electrodes should have a gap spacing of 0.125± 0.031 in (3.12± 0.81 mm), unless otherwise specified by the appliance manufacturer. If spacing is not correct, the assembly must be replaced.
- Exceeding temperature limits can cause nuisance lockouts and premature electrode failure.
- Electrodes must be located where they are not exposed during normal operation.

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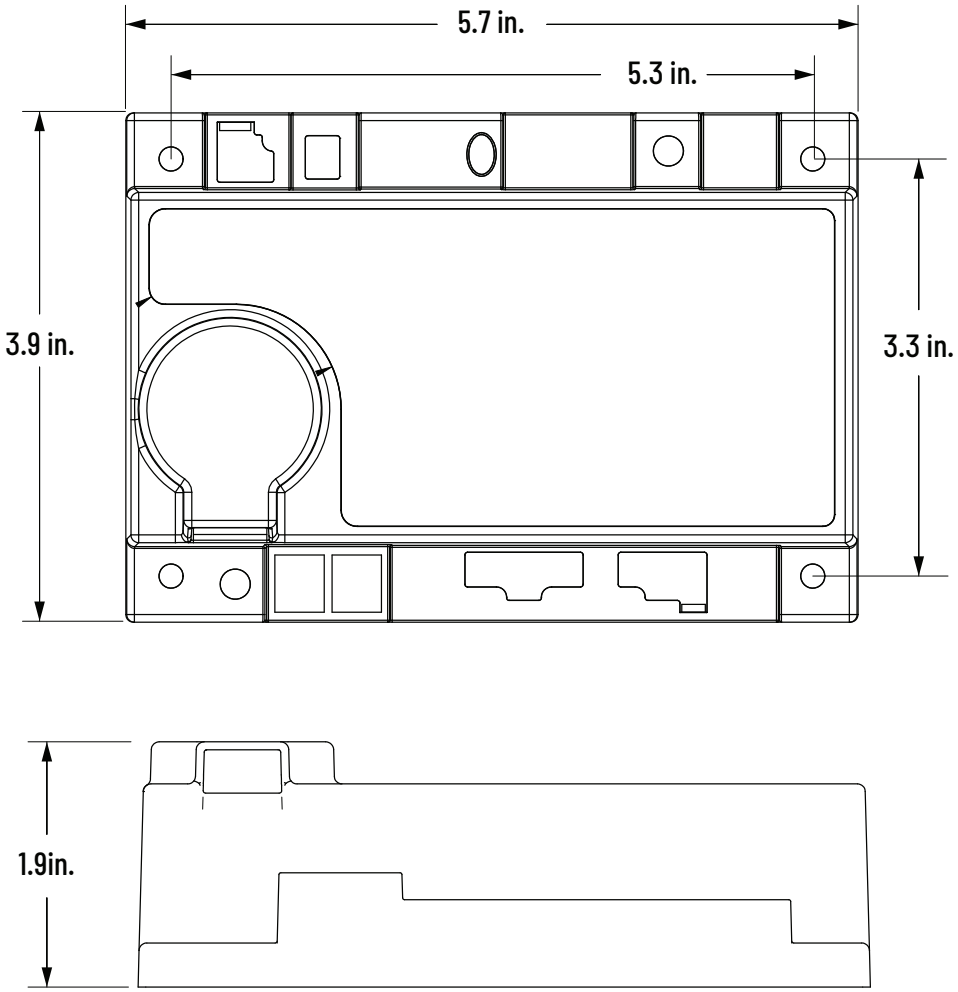
DIMENSIONS
Quick Connect Models



NOTES: All dimensions are in inches.

Figure 3 - Standard Enclosure

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Part number configuration

SERIES 35-2 X X X X X - X X X Description

Trial for Ignition
0 = None
1 = 4 Seconds
2 = 5 Seconds
3 = 7 Seconds
4 = 10 Seconds
5 = 15 Seconds
6 = 30 Seconds
7 = 60 Seconds
8 = 90 Seconds

Post-Purge
0 = None
1 = 15 Seconds
2 = 30 Seconds
3 = 60 Seconds
4 = 90 Seconds
5 = 4 Minutes
9 = Special, advanced option ID

Inter-Purge
0 = None
1 = 15 Seconds
2 = 30 Seconds
3 = 45 Seconds
4 = 4 Minutes

Communications
0 = None
9 = Special, advanced option ID

Pre-Purge
0 = None
1 = 15 Seconds
2 = 30 Seconds
3 = 45 Seconds
4 = 4 Minutes

Enclosure & HV Transformer
0 = Noryl Enclosure Horizontal QC (IP20)
1 = Integral Stand offs, Horizontal or Vertical QC (IP00)
2 = Integral Stand offs, Raja (IP00)

Try for Ignition & Flame Sense
0 = Single Try, Local Sense
1 = Single Try, Remote Sense
2 = Three Try, Local Sense
3 = Three Try, Remote Sense
4 = Single Try, Local Sense - Manual Reset
5 = Single Try, Remote Sense - Manual Reset
6 = Three Try, Local Sense - Manual Reset
7 = Three Try, Remote Sense - Manual Reset
9 = Special, Asdvanced option ID

Series & Field Terminals
0 = Direct Spark
1 = Direct Spark W/Forced draft
3 = Direct Spark, intermittent pilot

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