

## Measuring SmartValve® System Flame Current

### CHECKOUT AND TEST

### GENERAL

This Honeywell SmartValve® System flame current kit allows the trained service technician to determine the flame current levels being generated in a SmartValve System-equipped gas-fired appliance. Knowing the strength and stability of the flame current signal being generated by the appliance can help the technician diagnose intermittent appliance operation and predict future appliance problems.

Many factors influence the flame current being generated by an installed appliance. The ignition control generates an ac voltage potential between the flame sense rod and the burner ground area. When flame is present, the geometry of the flame rod/ground area combines with the voltage potential present to generate a low-level (microamperes) rectified dc current. The ignition control monitors this current to determine if sufficient flame is present to operate the appliance. If the appliance does not generate sufficient flame current, the main burner will not operate and the appliance will not deliver heat. If the flame current generated is unstable and fluctuates, there is high likelihood for inconsistent appliance operation. The service technician must insure that the appliance generates a strong and steady flame current well above the minimum threshold to assure reliable appliance operation.

Honeywell SmartValve Systems are available with two types of ignition sequences:

- Intermittent pilot models use a low voltage hot surface ignition (HSI) element to light the pilot gas; main burner gas flows and the main burner lights when the pilot flame is sensed.
- Direct hot surface ignition models use a 120 volt hot surface ignition element to directly light main burner gas; if the main flame is sensed at the end of the trial for ignition, the main burner continues to fire.

This kit is suitable for measuring flame current on both types of systems. Select the proper procedure, below, based on the type of SmartValve System in the appliance.

### KIT CONTENTS

#### This kit contains:

1. Test harness to be inserted between the SmartValve valve and the pilot burner or HSI element/flame rod harness.
2. Signal converter to allow measurement of the flame current in dc millivolts using a digital multimeter set to the dc millivolt scale.
3. These instructions showing how to use the kit and what flame currents are appropriate for appliances using specific SmartValve System models.

#### Additional Equipment Needed:

1. Analog dc microammeter, 0 to 10 microampere range, resolution to 0.01 microampere.

OR

2. Digital volt-ohmmeter with dc millivolt scale.



# MEASURING PILOT BURNER FLAME CURRENT ON INTERMITTENT PILOT SMARTVALVE® SYSTEMS

## Models Included

Intermittent Pilot SmartValve Systems include: SV9401, SV9402, SV9403, SV9501, SV9502, SV9503, SV9601, SV9602, SV9440, SV9540, SV9541 and SV9640.

## When Testing with this Kit...

1. Read these instructions carefully. Failure to follow the instructions can damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Troubleshooter must be a trained, experienced service technician.
4. After completing the measurements, use the appliance instructions to check the product operation.

### IMPORTANT

*Accurate Flame current measurement can be performed only with the pilot flame lit and the main flame not lit. When measuring with this kit, the appliance main burner orifices should be temporarily plugged while measuring system flame current. Be sure to remove the temporary plug and check the appliance for proper operation after completing the test.*

## Direct Measurement

NOTE: Direct measurement requires an analog dc micro-ammeter capable of reading to 0.01 microampere accuracy. No signal converter required.

1. Disconnect all power to the appliance.
2. Connect the test harness between the valve control and the pilot burner.
  - a. Insert the banana plug connected to the valve side of the test harness into the positive (+) jack on the dc micro-ammeter as shown in Fig. 1.
  - b. Insert the other banana plug connected to the pilot burner side of the test harness into the negative (-) jack on the dc micro-ammeter as shown in Fig. 1.
3. Reconnect power to the appliance.
4. Generate a call for heat.
5. Make sure the pilot flame lights and the main burner does not light.
6. After the pilot flame is on for ten seconds, read the dc micro-ammeter. The readings must be steady.
7. Take the action recommended in Table 1.

## Millivolt Measurement

NOTE: Millivolt measurement requires a digital voltmeter capable of reading dc millivolts. Use the signal converter included with this kit. See Fig. 2.

1. Disconnect all power to the appliance.
2. Connect the signal converter to the voltmeter.
3. Set the voltmeter to read dc millivolts.

NOTE: The signal converter is not polarity sensitive.

4. Connect the test harness between the valve control and the pilot burner.
  - a. Insert the valve side of the test harness through the female end of the signal converter connector and into the positive (+) jack of the digital voltmeter, as shown in Fig. 2.
  - b. Insert the pilot burner side of the test harness through the female end of the signal converter connector and into the negative (-) jack of the digital voltmeter, as also shown in Fig. 2.
5. Reconnect power to the appliance.
6. Generate a call for heat.
7. Make sure the pilot flame lights and the main burner does not light.
8. After the pilot flame is on for ten seconds, read the digital voltmeter. The readings must be steady.
9. Take the action recommended in Table 1.

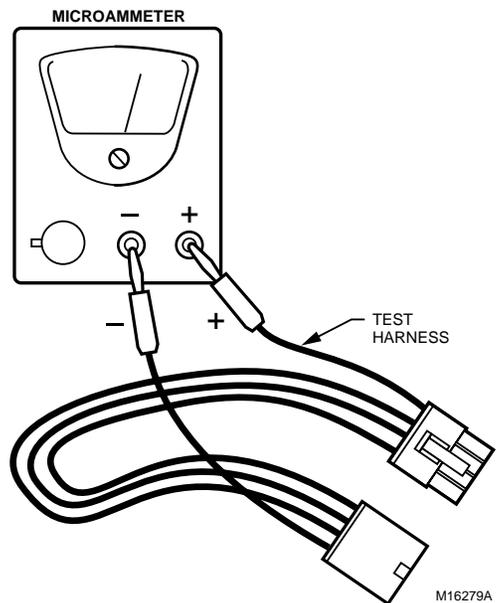


Fig. 1. Test Harness connected to microammeter.

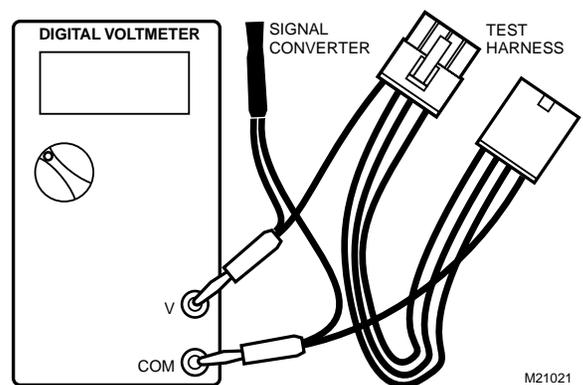


Fig. 2. Test harness connected to adapter and digital voltmeter.

Table 1. SmartValve Intermittent Pilot Flame Current.

SmartValve Model	Meter Reading	System Status	Recommended Action
SV9500/SV9600	Less than 0.12 uA or less than 12 mV.	Pilot lit, main valve not pulled in (listen for click when pilot lights).	Check for the following: <ul style="list-style-type: none"> <li>• Low gas pressure.</li> <li>• Flame rod contamination.</li> <li>• Poor flame current path (including pilot tubing).</li> <li>• Pilot flame blown away from rod.</li> </ul> See footnote <sup>a</sup> .
	More than 0.12 uA or more than 12 mV.	Pilot lit, main valve not pulled in (listen for click when pilot lights).	Replace SV9500 or SV9600 control.
	More than 0.12 uA or more than 12 mV.	Pilot lit, main valve pulled in (listen for click when pilot lights).	See footnote <sup>b</sup> .
SV9401/SV9402/ SV9403  SV9501/SV9502/ SV9503/  SV9601/SV9602	Less than 1.3 uA or less than 130 mV.	Pilot lit, main valve not pulled in (listen for click when pilot lights).	Check for the following: <ul style="list-style-type: none"> <li>• Low gas pressure.</li> <li>• Flame rod contamination.</li> <li>• Poor flame current path (including pilot tubing).</li> <li>• Pilot flame blown away from rod.</li> </ul> See footnote <sup>b</sup> .
	More than 1.3 uA or more than 130 mV.	Pilot lit, main valve not pulled in (listen for click when pilot lights)	Replace the SV9401, SV9402, SV9403, SV9501, SV9502, SV9503, SV9601, or SV9602 control.
	More than 1.3 uA or more than 130 mV.	Pilot lit, main valve pulled in (listen for click when pilot lights)	See footnote <sup>a</sup> .
SV9440 SV9540 SV9640 SV9541	Less than 0.8 uA or less than 80 mV.	Pilot lit, main valve not pulled in (listen for click when pilot lights).	Check for the following: <ul style="list-style-type: none"> <li>• Low gas pressure.</li> <li>• Flame rod contamination.</li> <li>• Poor flame current path (including pilot tubing).</li> <li>• Pilot flame blown away from rod.</li> </ul> See footnote <sup>b</sup> .
	More than 0.8 uA or more than 80 mV.	Pilot lit, main valve not pulled in (listen for click when pilot lights)	Replace the SV9440, SV9540 or SV9640 control.
	More than 0.8 uA or more than 80 mV.	Pilot lit, main valve not pulled in (listen for click when pilot lights)	See footnote <sup>a</sup> .

<sup>a</sup> The SmartValve control is not likely to be the cause of low readings. Investigate the pilot burner location and gas supply. Also check for contamination on the flame sensing rod or ground strap, an obstructed or damaged pilot orifice, improper combustion air flow, poor electrical connections, loose or corroded pilot tubing, and damaged wiring.

<sup>b</sup> A steady flame current reading at the required minimum levels mean there is enough flame current to open the main burner valve. A typical appliance, even under less than optimum operating conditions, should readily generate at least twice the required minimum flame current levels. If the pilot flame current generated by the appliance is less than twice the minimum reading, investigate further and take any necessary action.

# MEASURING MAIN BURNER FLAME CURRENT ON 120 VOLT HOT SURFACE IGNITION SMARTVALVE® SYSTEMS

## Models Included

120 Volt Hot Surface Ignition (HSI) SmartValve® systems include:

SV9410, SV9420, SV9510, SV9520, SV9610, SV9620.

**NOTE:** Before measure the flame current, check the appliance installation carefully to make sure that the 120 volt line input voltage polarity to the appliance control system is correct. Also, confirm that the appliance chassis is properly earth grounded and that the line voltage neutral wire is reliable connected to earth ground at the circuit box. The appliance will not operate properly if the electrical supply and earth ground are not correct.

## When Testing with this Kit...

1. Read these instructions carefully. Failure to follow the instructions can damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Troubleshooter must be a trained, experienced service technician.
4. After completing the measurements, use the appliance instructions to check the product operation.

### IMPORTANT

*Accurate flame measurement can be performed only with the main burner flame lit after the ignition system trial for ignition has been completed. The trial for ignition is the time that the main gas flows while the HSI element is hot. Typical trial for ignition times are five to nine seconds. The appliance will then move to the Run mode. If the main burner fails to light, flame current is not the problem. If the main burner lights but goes out at the end of the trial for ignition, recheck appliance power supply and earth ground. Then check for other potential problems as directed in Table 2.*

## Direct Measurement

**NOTE:** Direct measurement requires an analog dc micro-ammeter capable of reading to 0.01 microampere accuracy. No signal converter required.

## WARNING

### Electrical Shock Hazard.

**Can cause serious injury, death or property damage.**

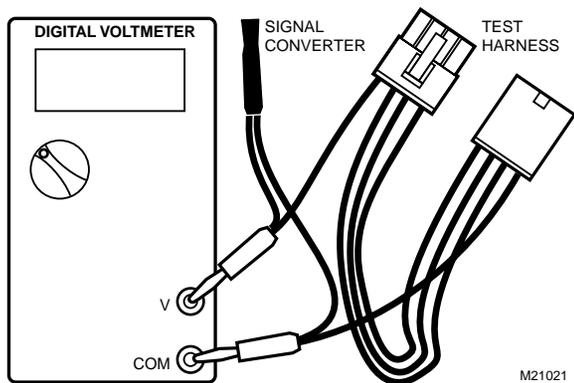
All direct ignition, hot surface ignition (HSI) SmartValve Systems have line voltage (120 Vac) present while the hot surface element is powered. Use extreme caution when the HSI element is energized.

1. Disconnect all power to the appliance.
2. Connect the test harness between the valve control and the HSI element/flame rod.
  - a. Insert the banana plug connected to the valve side of the test harness into the positive (+) jack on the dc micro-ammeter as shown in Fig. 1.
  - b. Insert the other banana plug connected to the HSI element/flame rod side of the test harness into the negative (-) jack on the dc micro-ammeter as shown in Fig. 1.
3. Reconnect power to the appliance.
4. Generate a call for heat.
5. Make sure the main burner lights and stays on after the trial for ignition ends.
6. After the main flame is on for ten seconds, read the dc micro-ammeter. The readings must be steady.
7. Take the action recommended in Table 2.

## Millivolt Measurement

**NOTE:** Millivolt measurement requires a digital voltmeter capable of reading dc millivolts. Use the signal converter included with this kit. See Fig. 3.

1. Disconnect all power to the appliance.
2. Connect the signal converter to the voltmeter.
3. Set the voltmeter to read dc millivolts.
4. Connect the test harness between the valve control and the HSI element/flame rod.
  - a. Insert the valve side of the test harness through the female end of the signal converter connector and into the positive (+) jack of the digital voltmeter, as shown in Fig. 3.
  - b. Insert the HSI element/flame rod side of the test harness through the female end of the signal converter connector and into the negative (-) jack of the digital voltmeter, as also shown in Fig. 3.
5. Reconnect power to the appliance.
6. Generate a call for heat.
7. Make sure the main burner lights and stays lighted.
8. After the main flame is on for ten seconds, read the digital voltmeter. The readings must be steady.
9. Take the action recommended in Table 2.



**Fig. 3. Test harness connected to adapter and digital voltmeter.**

**Table 2. Hot Surface Ignition (HSI) SmartValve System Flame Current.**

SmartValve Model	Meter Reading (10 seconds after main flame lights)	System Status	Recommended Action
SV9410, SV9420, SV9510, SV9520, SV9610, SV9620	None	Main flame does not light during trial for ignition.	Check for the following: <ul style="list-style-type: none"> <li>• Gas supply off or low inlet gas pressure.</li> <li>• Excessive inlet gas pressure that keeps valve from opening.</li> <li>• HSI element damaged or broken.</li> <li>• HSI element out of position.</li> <li>• Main burner orifices incorrect.</li> </ul>
	None	Main flame lights but goes out at the end of trial for ignition.	Check for the following: <ul style="list-style-type: none"> <li>• Line voltage supply polarity incorrect.</li> <li>• Appliance not properly earth-grounded.</li> <li>• Low inlet gas pressure.</li> <li>• Flame rod contamination.</li> <li>• Flame rod out of position.</li> <li>• Flame sense wiring damaged.</li> <li>• Replace control if all other factors are good.</li> </ul>
	Less than 1.1 microampere or less than 110 mV	Main flame stays on after trial for ignition.	Check for the following: <ul style="list-style-type: none"> <li>• Low inlet gas pressure.</li> <li>• Flame rod contamination.</li> <li>• Flame rod out of position.</li> <li>• See footnote <sup>b</sup>.</li> </ul>
	More than 1.1 microampere or more than 110 mV.	Main flame stays on after trial for ignition.	See footnote <sup>a</sup> .

<sup>a</sup> The SmartValve® control is not likely to be the cause of low readings. Investigate the flame rod location and gas supply. Also check for contamination on the flame rod, obstructed or damaged orifices, improper combustion air flow, poor electrical connections and damaged wiring.

<sup>b</sup> A steady flame current reading at the required minimum levels means there is enough flame current to maintain the main flame. A typical appliance, even under less than optimum operating conditions, should readily generate at least twice the required minimum levels. If the flame current generated by the appliance is less than twice the minimum reading, investigate further and take any necessary action.





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