VR8405 High Capacity Direct Ignition Combination Gas Control

Application

This high capacity direct ignition combination gas control is used in gas-fired appliances with capacities up to 500 feet³/hour at 1 inch wc pressure drop [14.2 meters³/hour at 0.25 kPa] on natural gas. This entire gas control consists of two valves assembled in parallel on a die-cast manifold to provide high capacity. Each valve includes a manual valve and two automatic operators. A nonremovable electrical harness connects both valves. Do not alter or remove this harness. Two pigtail leads (with 1/4-inch quick connects) provide for field connection. Gas controls are available for natural gas and LP; they are not convertible from one gas to another. Bushings are available to reduce the inlet and outlet of the entire gas control.

Models are available with slow-opening (VR8405H), standard (VR8405M) and step-opening (VR8405P) regulators. Valves have fixed pressure regulation and are not adjustable. It is recommended that an appliance shutoff valve be installed upstream of the VR8405.

BODY PATTERN: Straight-through body pattern.

INLET/OUTLET SIZES: 3/4 x 3/4 inch, 3/4 x 1 inch, 1 x 1 inch.

CAPACITY:

<table>
<thead>
<tr>
<th>Size</th>
<th>Capacity (at 1 inch wc pressure drop)</th>
<th>Minimum Regulated Capacity</th>
<th>Maximum Regulated Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 x 1</td>
<td>450 feet³/hour [12.7 meter³/hour]</td>
<td>200 feet³/hour [5.7 meter³/hour]</td>
<td>625 feet³/hour [17.7 meter³/hour]</td>
</tr>
<tr>
<td>1 x 1</td>
<td>500 feet³/hour [14.1 meter³/hour]</td>
<td>200 feet³/hour [5.7 meter³/hour]</td>
<td>720 feet³/hour [20.3 meter³/hour]</td>
</tr>
</tbody>
</table>

*Capacity based on 1000 Btu/feet³, 0.64 specific gravity natural gas at 1 inch wc pressure drop [37.3 MJ/meter³, 0.64 specific gravity natural gas at 0.25 kPa pressure drop].

Use conversion factors in Table 1 to convert capacities for other gases.

<table>
<thead>
<tr>
<th>Gas</th>
<th>Specific Gravity</th>
<th>Multiply Listed Capacity By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufactured</td>
<td>0.60</td>
<td>0.516</td>
</tr>
<tr>
<td>Mixed</td>
<td>0.70</td>
<td>0.765</td>
</tr>
<tr>
<td>Propane</td>
<td>1.53</td>
<td>1.62</td>
</tr>
</tbody>
</table>

APPROVALS:
- American Gas Association design certificate: L2025009.
- Canadian Gas Association design certificate: L2025009.
- Underwriters Laboratories Inc.: MH8191

Installation

WHEN INSTALLING THIS PRODUCT...
1. Read these instructions carefully. Failure to follow them could 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. The installer must be a trained, experienced service technician.
4. After installation is complete, use these instructions to check out product operation.

ELECTRICAL RATINGS:
- Voltage and Frequency: 24 Vac, 60 Hz. (50/60 Hz models available on request.)
- Current Draw: 1.4A.
- Thermostat Heat Anticipator Setting: 1.4A.

TEMPERATURE RATING:
- VR8405H: -0° F to 175° F [-18° C to +79° C].
- VR8405M,P: -40° F to +175° F [-40° C to +79° C].

ACCESSORY:
- Part no. 390427H 3/4 in. x 1 in. Bushing
WARNING
FIRE OR EXPLOSION HAZARD
CAN CAUSE PROPERTY DAMAGE,
SEVERE INJURY, OR DEATH.
Follow these warnings exactly:
1. Disconnect power supply before wiring to pre-
   vent electrical shock or equipment damage.
2. To avoid dangerous accumulation of fuel gas,
   turn off gas supply at the appliance service
   valve before starting installation, and perform
   the Gas Leak Test after completion of installa-
   tion.
3. Always install sediment trap in gas supply line
   to prevent contamination of gas control.
4. Do not force the gas control knobs. Use only
   your hand to turn the gas control knobs. Never
   use any tools. If the gas control knobs will not
   operate by hand, call a qualified service techni-
   cian to replace the entire gas control. Force or
   attempted repair can result in fire or explosion.
5. Replace entire VR8405 when doing a product
   replacement. Do not replace individual valve
   components.
6. For complete device shutoff, both gas control
   knobs must be in the OFF position. For com-
   plete appliance shutoff, turn off the upstream
   appliance valve and disconnect the power sup-
   ply.
7. Use the wiring harness for connecting the en-
   tire gas control to the ignition control module.
   Do not remove the harness or modify the wires
   in the harness.

CAUTION
Never apply a jumper across or short the valve
leadwires. This can burn out the heat anticipator
in the thermostat or damage the electronic direct
ignition (DI) module.

IMPORTANT: This entire gas control is shipped with
protective seals over inlet and outlet tappings. Do
not remove seals until ready to connect piping.

Follow the appliance manufacturer instructions if available;
otherwise, use the instructions provided below.

INSTALL BUSHINGS ON ENTIRE GAS
CONTROL
1. Remove seals over gas control inlet or outlet.
2. Apply moderate amount of good quality pipe com-
   pound to bushing, leaving two end threads bare. On an LP
   gas installation, use compound resistant to LP gas. See
   Fig. 2. Do not use Teflon tape.
3. Insert bushing in entire gas control and thread pipe
carefully into bushing until tight.

CHOOSE GAS CONTROL LOCATION
Locate the gas control in the appliance vestibule on the
gas manifold. In replacement applications, locate the entire
gas control in the same location as the old gas control.
Do not locate the entire gas control where it can be
affected by steam cleaning, high humidity, dripping water,
Install Gas Control

1. This gas control can be mounted from 0 to 90 degrees in any direction from the vertical position of the gas control knobs.
2. Mount the gas control so gas flow is in the direction of the arrows on the bottom of the controls.
3. Thread pipe for insertion into the gas control manifold. Do not thread pipe too far. Manifold distortion or malfunction can result if the pipe is inserted too deeply into the gas control. Refer to Table 2.

TABLE 2—NPT PIPE THREAD LENGTH IN (IN.)

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Thread Pipe This Amount</th>
<th>Maximum Depth Pipe Can Be Inserted Into Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4</td>
<td>13/16</td>
<td>3/4</td>
</tr>
<tr>
<td>1</td>
<td>1-1/16</td>
<td>1</td>
</tr>
</tbody>
</table>

4. Apply a moderate amount of good quality pipe compound (do not use Teflon tape) to pipe only, leaving two end threads bare. On LP installations, use compound resistant to LP gas. Refer to Fig. 2.
5. Remove seals over gas control inlet and outlet if necessary.
6. Connect pipe to gas control inlet and outlet. Use a wrench on the manifold rather than on the gas control. Refer to Figs. 5 and 6.

WIRING

Follow the wiring instructions furnished by the appliance manufacturer, if available, or use the general instructions provided below.
All wiring including insulated quick connect terminals must comply with applicable electrical codes and ordinances.
Disconnect power supply before making wiring connections to prevent electrical shock or equipment damage.
1. Check the power supply rating on the gas control and make sure it matches the available supply. Install transformer, thermostat, and other controls as required.
2. Connect control circuit to gas control terminals. See Figs. 3 and 4.
3. Adjust thermostat heat anticipator to 1.4A rating stamped on gas control.

Fig. 2—Use moderate amount of pipe compound.

Fig. 3—VR8405 wiring connections in S87 Direct Ignition System.
Startup and Checkout

**WARNING**

FIRE OR EXPLOSION HAZARD CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY, OR DEATH.

1. Do not force the gas control knobs. Use only your hand to turn the gas control knobs. Never use any tools.
2. If the gas control knobs will not operate by hand, call a qualified service technician to replace the entire gas control.
3. Both knobs must be in the same position for operation or shutoff.

**GAS CONTROL KNOBS SETTINGS**
The gas control knobs have two settings:

**OFF:** Prevents main burner gas flow.

**ON:** Permits gas to flow into the control body. Under control of the thermostat and direct ignition module, gas can flow to the main burner.

**NOTE:** Gas controls are shipped with the gas control knobs in the **ON** position.

PERFORM GAS LEAK TEST

**WARNING**

FIRE OR EXPLOSION HAZARD CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY, OR DEATH.

Check for gas leaks with a rich soap and water solution any time work is done on a gas control.

**GAS LEAK TEST**

1. Paint all pipe connections upstream of the gas control with a rich soap and water solution. Bubbles indicate a gas leak.
2. If a gas leak is detected, tighten the pipe connection.
3. Stand clear while lighting main burner to prevent injury caused from hidden gas leaks that could cause flashback in the appliance vestibule. Turn on the entire gas control and light the main burner as described below.
4. With the main burner in operation, paint all pipe joints and gas control inlet and outlet with a rich soap and water solution.
5. If another gas leak is detected, tighten pipe connections.
6. Replace the part if gas leak cannot be stopped.

**TURN ON GAS CONTROL**

Rotate the gas control knobs counterclockwise to **ON**.

**TURN ON MAIN BURNER**

Follow instructions provided by appliance manufacturer or turn up thermostat to call for heat.
CHECK GAS INPUT TO MAIN BURNER

⚠️ CAUTION ⚠️

1. Do not exceed the input rating stamped on the appliance nameplate, or manufacturer recommended burner orifice pressure for the size orifice(s) used. Make certain the primary air supply to the main burner is properly adjusted for complete combustion (refer to the appliance manufacturer instructions).

2. WHEN CHECKING GAS INPUT BY CLOCKING THE GAS METER:
   • Make sure that the only gas flow through the meter is that of the appliance being checked.
   • Make certain that other appliances are turned off with pilot burners extinguished (or deduct that gas consumption from the meter reading).
   • Convert the flow rate to Btuh as described in the Gas Controls Handbook, form 70-2602, and compare to the Btuh input rating on the appliance nameplate.

Standard-Opening and Slow-Opening Pressure Regulator

1. The gas control outlet pressure should match the manifold pressure listed on the appliance nameplate.

2. With the main burner operating, check the gas control flow rate using the meter clocking method.

3. If the desired gas flow rate is not as stamped on the control, check the gas control inlet pressure using a manometer at the inlet pressure tap. Regulators are fixed. They are not adjustable. If the inlet pressure is in the normal range (refer to Table 3), replace the entire gas control. Otherwise, take the necessary steps to provide proper gas pressure to the gas control.

4. Carefully check main burner lightoff at the step pressure. Make sure the main burner lights smoothly and without flashback to the orifice and that all ports remain lit. Cycle the main burner several times, allowing at least 30 seconds between cycles for the regulator to resume the step function. Repeat after allowing main burner to cool.

CHECK SAFETY SHUTDOWN PERFORMANCE

⚠️ WARNING ⚠️

FIRE OR EXPLOSION HAZARD CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY, OR DEATH.
Perform the safety shutdown test any time work is done on a gas system.

NOTE: Read steps 1 through 7 below before starting, and compare to the safety shutdown or safety lockout tests recommended for the direct ignition (DI) module. Where they differ, use the procedure recommended for the module.

1. Turn off knobs on entire gas control.
2. Set thermostat or controller above room temperature to call for heat.
3. Watch for ignition spark or glow at hot surface igniter either immediately or following prepurge. See DI Module specifications.
4. Time the length of the igniter operation. See DI Module specifications.
5. After the module locks out, open gas control knobs and make sure there is no gas flow to the main burner.
6. Set thermostat below room temperature and wait one minute.
7. Operate system through one complete cycle to make sure all controls operate properly.

### TABLE 3—PRESSURE REGULATOR SPECIFICATION PRESSURES IN IN. WC [kPa].

<table>
<thead>
<tr>
<th>Model</th>
<th>Type of Gas</th>
<th>Nominal Inlet Pressure</th>
<th>Factory Set Outlet Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Step</td>
</tr>
<tr>
<td>H (Slow-opening)</td>
<td>Natural</td>
<td>7.0 [1.7]</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>LP</td>
<td>14.0 [3.9]</td>
<td>—</td>
</tr>
<tr>
<td>M (Standard)</td>
<td>Natural</td>
<td>7.0 [1.7]</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>LP</td>
<td>14.0 [3.9]</td>
<td>—</td>
</tr>
<tr>
<td>P (Step-opening)</td>
<td>Natural</td>
<td>7.0 [1.7]</td>
<td>0.7, 0.9, 1.2, 1.7, [0.17, 0.22, 0.30, 0.42]</td>
</tr>
<tr>
<td></td>
<td>LP</td>
<td>14.0 [3.9]</td>
<td>1.4, 2.5, 4.0, 5.5 [0.35, 0.62, 1.0, 1.4]</td>
</tr>
</tbody>
</table>

NOTE: Factory set outlet pressure is not field adjustable.
**WARNING**

FIRE OR EXPLOSION HAZARD
CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY, OR DEATH.

Do not disassemble the gas control or either valve. They contain no replaceable components. Attempted disassembly or repair can damage the gas control.

Regular preventive maintenance is important in applications such as commercial cooking, agricultural and industrial operations that place a heavy load on system controls because:

- In many such applications, particularly commercial cooking, the equipment operates 100,000 to 200,000 cycles per year. Such heavy cycling can wear out the gas control in one to two years.
- Exposure to water, dirt, chemicals and heat can damage the gas control and shut down the control system.

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**Maintenance**

- **Fig. 5**—Proper use of wrench on gas control manifold.
- **Fig. 6**—Top view of gas control.
The maintenance program should include regular check-out of the entire gas control; see Startup and Checkout section. To check out the control system, see the appliance manufacturer literature. Maintenance frequency must be determined individually for each application. Some considerations are:

- **Cycling frequency.** Appliances that may cycle 100,000 times annually should be checked monthly.
- **Intermittent use.** Appliances that are used seasonally should be checked before shutdown and again before the next use.
- **Consequence of unexpected shutdown.** Where the cost of an unexpected shutdown would be high, the system should be checked more often.
- **Dusty, wet, or corrosive environment.** Since these environments can cause the gas control to deteriorate more rapidly, the system should be checked more often.

If the gas controls will be exposed to high ammonia conditions; e.g., those used in greenhouses or animal barns, contact your Honeywell sales representative to request a gas control with corrosion resistant construction.

The entire gas control should be replaced if:

- It does not perform properly during checkout or troubleshooting.
- The gas control knobs are hard to turn.
- The gas control is likely to have operated for more than 200,000 cycles.

**Service**

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**WARNING**

**FIRE OR EXPLOSION HAZARD**

Do not disassemble the gas control or either valve. They contain no replaceable components. Attempted disassembly or repair will damage the gas control.

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**CAUTION**

Do not apply a jumper across or short the valve leadwires. Doing so can burn out the heat anticipator in the thermostat or damage the DI module.

**IMPORTANT:** Allow 60 seconds after shutdown before re-energizing step-opening model to assure lightoff at step pressure.

**IF MAIN BURNER WILL NOT COME ON WITH CALL FOR HEAT**

1. Make sure gas control knobs are in the ON position.
2. Adjust thermostat several degrees above room temperature.
3. Using an ac voltmeter, measure voltage across MV leadwires at the gas valve.
4. If no voltage is present, check control circuit for proper operation.
5. If 24V is present, replace the entire gas control.

**INSTRUCTIONS TO THE USER FOR YOUR SAFETY, READ BEFORE LIGHTING**

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**WARNING**

**IF YOU DO NOT FOLLOW THE WARNINGS BELOW AND THE LIGHTING INSTRUCTIONS EXACTLY, A FIRE OR EXPLOSION CAN RESULT WITH PROPERTY DAMAGE, PERSONAL INJURY OR LOSS OF LIFE.**

Follow these warnings exactly:

1. Before lighting, smell around the appliance for gas. Be sure to smell next to the floor because LP gas is heavier than air.
2. IF YOU SMELL GAS:
   - Turn off the gas supply at the appliance service valve. On LP gas systems, turn off gas supply at the gas tank.
   - Do not light any appliances.
   - Do not touch electrical switches or use the phone.
   - Leave the building and use a neighbor’s phone to call your gas supplier.
   - If you can not reach your gas supplier, call the fire department.
3. Do not force the gas control knob. Use only your hand to push down or turn the gas control knob. Never use any tools. If the gas control knob will not operate by hand, call a qualified service technician to replace the entire gas control. Force or attempted repair can result in a fire or explosion.
4. Call a qualified service technician to replace the entire gas control if it has been flooded with water.
5. Replace the entire gas control in the event of any physical damage, tampering, bent terminals, missing or broken parts, stripped threads, or evidence of exposure to heat.
IMPORTANT: Follow the operating instructions provided by the manufacturer of your heating appliance. The information below will be of assistance in a typical control application, but the specific controls used and the procedures outlined by the manufacturer of your appliance may differ, and require special instructions.

TO TURN ON THE APPLIANCE

STOP: READ THE WARNING ABOVE

The lighting sequence of this appliance is automatic. Do not attempt to manually light the main burner. If the appliance does not turn on when the thermostat is set several degrees above room temperature, follow these instructions:
1. Set the thermostat to its lowest setting to reset the safety control.
2. Disconnect all electric power to the appliance.
3. Remove the gas control access panel.
4. Turn both of the gas control knobs clockwise to OFF.
5. Wait five minutes to clear any unburned gas. If you then smell gas, STOP! Follow step 2 in the Warning in the Instructions To The User section. If you do not smell gas, continue with the next step.
6. Turn both of the gas control knobs counterclockwise to ON.
7. Replace the gas control access panel.
8. Reconnect all electric power to the appliance.
9. Set the thermostat to the desired setting.
10. If the appliance does not turn on, set the gas control knobs to OFF, turn off the upstream appliance valve, and contact a qualified service technician for assistance.

TURNING OFF THE APPLIANCE

VACATION SHUTDOWN: Set the thermostat to the desired room temperature while you are away.

COMPLETE APPLIANCE SHUTDOWN: Turn both gas control knobs clockwise to OFF. Do not force. Turn off the upstream appliance valve and disconnect the power supply. Appliance will be completely shut off.

To resume normal operation, turn on the upstream appliance valve and connect the power supply; then follow the procedure above.

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