



**neptronic®**

# **Gas Fired Humidifier**

SKG4 Series

## **Combustion Field Adjustment Instructions**





## Standard Combustion Adjustment



All installation work must be carried out by suitably qualified personnel and must conform to local codes and regulations.

### SKG4 Humidifier Operation Overview

- The gas burner blower and the combination gas valve are factory calibrated and pre-adjusted for optimum humidifier performance at all firing rates through a non-mechanical, pneumatic modulating link between combustion air and gas flows.
- Blower speed is automatically increased or decreased based on heat demand thereby regulating the amount of combustion air drawn.
- The pneumatic modulating link between air and gas introduces the required amount of gas for correct combustion to meet the current humidity demand, based on a linear relationship between  $\Delta P$  air and  $\Delta P$  gas.

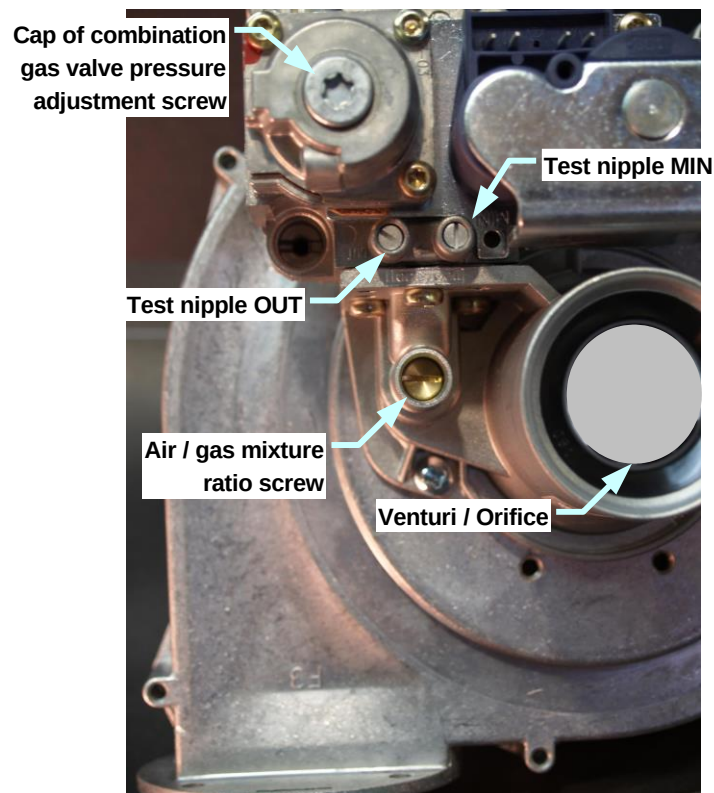


Illustration 1 - Combination Gas Valve, Venturi & Burner Blower

## Pressure Verification



*Note: For SKG4 gas fired humidifiers with multiple modules, the following pressure verifications have to be done for each module separately. It is advised to start verifying the last module first. See the Multiple Module Adjustment section for more details.*

### Measuring Static Pressure

1. Close the external gas shutoff valve (not supplied).
2. Loosen the screw in test nipple “MIN” on the gas combination valve, do not remove completely. Connect a manometer.
3. Open the external gas shutoff valve.
4. Measure the static pressure. The values must be as per the following table:

| <i>Natural Gas</i>                               | <i>Propane Gas</i>                               |
|--------------------------------------------------|--------------------------------------------------|
| <b>3.0 kPa (30 mbar)</b><br><b>[12”w.c.] MAX</b> | <b>6.0 kPa (60 mbar)</b><br><b>[24”w.c.] MAX</b> |

5. If the value is correct, start up the humidifier.  
If the value is not correct, verify gas installation (regulator) and/or call gas utility.

### Measuring Running Pressure

6. Start-up the humidifier, using the  (On/Off) push button located on the control panel.
7. Measure the running pressure, after ignition of burner.  
*Use suitable measuring instruments calibrated with a minimum resolution of 10.0 Pa [0.04”w.c.].*

| <i>Natural Gas</i>                                 | <i>Propane Gas</i>                                   | <i>Action</i>                                                                                           |
|----------------------------------------------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Under 1.5 kPa</b><br><b>[6.0”w.c.]</b>          | <b>Under 3.2 kPa</b><br><b>[12.8”w.c.]</b>           | Do not attempt adjustment. Verify gas installation (regulator) or call gas utility to increase pressure |
| <b>1.5 to 2.0 kPa</b><br><b>[6.0” to 8.0”w.c.]</b> | <b>3.2 to 3.7 kPa</b><br><b>[12.8” to 14.8”w.c.]</b> | Let the humidifier operate. Proceed to the next step.                                                   |
| <b>Over 2.0 kPa</b><br><b>[8.0”w.c.]</b>           | <b>Over 3.7 kPa</b><br><b>[14.8”w.c.]</b>            | Do not attempt adjustment. Verify gas installation (regulator) or call gas utility to decrease pressure |

8. Switch off the humidifier. Close the external gas shutoff valve, remove the manometer and re-tighten the test nipple “MIN” with the screw.
9. Check the proper action of the gas combination valve:
  - Loosen the screw in test nipple “OUT”, do not remove completely. Connect the manometer.
  - Start up the humidifier.
  - After opening the valve (ignition of the burner), verify that the manometer indicates **0.0 kPa [0.0”w.c.]** of pressure.
  - Turn off the humidifier.
  - The orifice pressure (negative pressure) will drop to a **negative pressure within 1 second**.

If the orifice pressure drops **more slowly than the specified 1 second**, or if **pressure at opening of the valve is different from 0** replace the combination gas valve.



10. Switch off the humidifier. Close the external gas shutoff valve, remove the manometer and re-tighten the test nipple “OUT” with the screw.
11. Open the external gas shutoff valve and check that the test nipple “MIN” and “OUT”, as well as all gas connections are gas tight.

**i** Note: The burner is automatically ignited and starts operation after a safety time has elapsed. This time corresponds to a pre-purge of combustion chamber and flue venting.

## Combustion Analysis

### Overview

The SKG4 gas fired humidifier is factory preset for operation with natural gas or propane. A O<sub>2</sub> or CO<sub>2</sub> check must be performed at the humidifier vent pipe as part of the initial start-up / maintenance procedure.

Combustion analysis must be performed by using an electronic flue gases analyser. Flue gases analyser probe must be installed through the flue pipe as close as possible from the humidifier.

For units with multiple modules, it may be necessary to verify and adjust combustion for each module separately. See the Multiple Module Adjustment section for more details.

O<sub>2</sub> or CO<sub>2</sub>, as well as CO and NO<sub>x</sub>, values measured must be compared with the following applicable tables.

**i** Note: A CO measurement must be taken before and after working on gas appliances to eliminate risks to health and to guarantee the satisfactory condition of the system.

### Flue Gases Composition

Table 1 - Flue Gases Composition for SKG4 (European Models)

| Humidifier Model | No of Modules | Module Model Number & Quantity |      |         |      |             |      |         |      |
|------------------|---------------|--------------------------------|------|---------|------|-------------|------|---------|------|
|                  |               | SKG100                         |      | SKG150  |      | SKG180      |      | SKG200  |      |
| SKG4-E0501 N/P   | 1             | x1                             |      |         |      |             |      |         |      |
| SKG4-E0701 N/P   | 1             |                                |      | x1      |      |             |      |         |      |
| SKG4-E0801 N/P   | 1             |                                |      |         |      | x1          |      |         |      |
| SKG4-E1001 N/P   | 1             |                                |      |         |      |             |      | x1      |      |
| SKG4-E1202 N/P   | 2             | x1                             |      | x1      |      |             |      |         |      |
| SKG4-E1502 N/P   | 2             |                                |      | x2      |      |             |      |         |      |
| SKG4-E1702 N/P   | 2             |                                |      | x1      |      |             |      | x1      |      |
| SKG4-E2002 N/P   | 2             |                                |      |         |      |             |      | x2      |      |
| SKG4-E2503 N/P   | 3             |                                |      | x1      |      | x1          |      | x1      |      |
| SKG4-E2703 N/P   | 3             |                                |      | x1      |      |             |      | x2      |      |
| SKG4-E3003 N/P   | 3             |                                |      |         |      |             |      | x3      |      |
| SKG4 E3504 N/P   | 4             |                                |      | x1      |      | x1          |      | x2      |      |
| SKG4-E3704 N/P   | 4             |                                |      | x1      |      |             |      | x3      |      |
| SKG4-E4004 N/P   | 4             |                                |      |         |      |             |      | x4      |      |
| Flue Gases       | Unit (Limits) | Natural Gas                    |      | Propane |      | Natural Gas |      | Propane |      |
| CO <sub>2</sub>  | %<br>(+/-0.3) | 9.6                            | 10.6 | 9.6     | 10.6 | 9.6         | 10.6 | 9.6     | 10.6 |
| O <sub>2</sub>   | %<br>(+/-0.3) | 4.2                            | 4.6  | 4.2     | 4.6  | 4.2         | 4.6  | 4.2     | 4.6  |
| CO               | ppm<br>(max)  | 35                             | 25   | 35      | 25   | 35          | 25   | 35      | 25   |
| NO <sub>x</sub>  | ppm<br>(max)  | 45                             | 45   | 45      | 45   | 45          | 45   | 45      | 45   |

Table 2 - Flue Gases Composition for SKG4 (North American Models)

| Humidifier Model | No of Modules | Module Model Number & Quantity |         |             |         |             |         |             |         |
|------------------|---------------|--------------------------------|---------|-------------|---------|-------------|---------|-------------|---------|
|                  |               | SKG100                         | SKG150  | SKG180      | SKG200  |             |         |             |         |
| SKG4-N1101 N/P   | 1             | x1                             |         |             |         |             |         |             |         |
| SKG4-N1551 N/P   | 1             |                                | x1      |             |         |             |         |             |         |
| SKG4-N1801 N/P   | 1             |                                |         | x1          |         |             |         |             |         |
| SKG4-N2101 N/P   | 1             |                                |         |             | x1      |             |         |             |         |
| SKG4-N2652 N/P   | 2             | x1                             | x1      |             |         |             |         |             |         |
| SKG4-N3102 N/P   | 2             |                                | x2      |             |         |             |         |             |         |
| SKG4-N3502 N/P   | 2             |                                | x1      |             | x1      |             |         |             |         |
| SKG4-N4052 N/P   | 2             |                                |         |             | x2      |             |         |             |         |
| SKG4-N5053 N/P   | 3             |                                | x1      | x1          | x1      |             |         |             |         |
| SKG4-N5603 N/P   | 3             |                                | x1      |             | x2      |             |         |             |         |
| SKG4-N6103 N/P   | 3             |                                |         |             | x3      |             |         |             |         |
| SKG4-N7104 N/P   | 4             |                                | x1      | x1          | x2      |             |         |             |         |
| SKG4-N7654 N/P   | 4             |                                | x1      |             | x3      |             |         |             |         |
| SKG4-N8104 N/P   | 4             |                                |         |             | x4      |             |         |             |         |
| Flue Gases       | Unit (Limits) | Natural Gas                    | Propane | Natural Gas | Propane | Natural Gas | Propane | Natural Gas | Propane |
| CO <sub>2</sub>  | %<br>(+/-0.3) | 9.6                            | 10.6    | 9.6         | 10.6    | 9.6         | 10.6    | 9.6         | 10.6    |
| O <sub>2</sub>   | %<br>(+/-0.3) | 4.2                            | 4.6     | 4.2         | 4.6     | 4.2         | 4.6     | 4.2         | 4.6     |
| CO               | ppm<br>(max)  | 35                             | 25      | 35          | 25      | 35          | 25      | 35          | 25      |
| NO <sub>x</sub>  | ppm<br>(max)  | 45                             | 45      | 45          | 45      | 45          | 45      | 45          | 45      |

## Checking CO<sub>2</sub> Setting at Full Output (100% Demand)

1. Connect the flue gas analyser to the humidifier flue vent pipe.
2. Open the external gas shutoff valve, start-up the humidifier, and trigger a call for humidity. To set the demand to 100%, using the controller, navigate to the *Installation* → *Command* menu, then set the value of the *Balancing* setting to *On*, and the value of the *BalanceDem* setting to *Max*.
3. When the flue temperature is stabilized (after at least 15 minutes of operation), take a measurement of the flue gases.
4. Compare the reading to the ones indicated on the above tables.
5. If the O<sub>2</sub> or CO<sub>2</sub> value readings are within 1% of the value indicated in the above table, the humidifier module does not require any adjustment.  
 If the O<sub>2</sub> or CO<sub>2</sub> value readings are more than 1% outside of the value indicated in the above table, the humidifier module does require adjustment.
  - If the O<sub>2</sub> value is too low (CO<sub>2</sub> too high), mixture is gas rich, then turn the air/gas mixture ratio screw clockwise.
  - If the O<sub>2</sub> value is too high (CO<sub>2</sub> too low), mixture is gas lean, then turn the air/gas mixture ratio screw counter clockwise.



*Note: A large blade short flat screwdriver is required to gain access to air / gas mixture ratio adjustment screw. CW turn will lean the air / gas mixture. CCW turn will enrich the air / gas mixture. 1 complete turn will modify the O<sub>2</sub> value by 0.5%.*

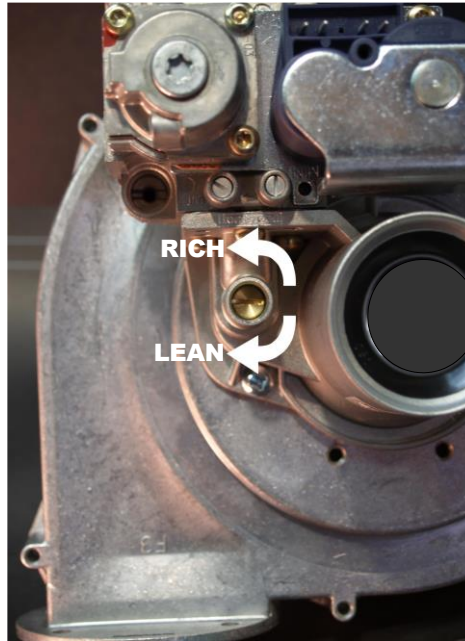


Illustration 2 - Air/Gas Mixture Ratio Screw

## Checking CO<sub>2</sub> Setting at Minimum Output (10% Demand)

1. When the air / gas mixture is properly adjusted at full load (100%), lower the humidity demand (and the output) to its minimum: 10%. To set the demand to 10%, using the controller, navigate to the *Installation* → *Command* menu and ensure that the value of *Balancing* is set to *On*, then set the value of the *BalanceDem* setting to *Min*.
2. After stabilization (at least after 10 minutes), take a reading of the flue gases composition. The CO<sub>2</sub> readings must be the same as the reading at full output.  
If this is not the case:
  - Remove the cap of the combination gas valve adjustment screw.
  - Carefully adjust the combination gas valve adjustment screw, in order to obtain the same CO<sub>2</sub> reading as the one obtained at full output.
  - The adjustment must be done 1/8th of a turn at a time.

**Pressure adjustment  
screw of combination  
gas valve  
(cap removed)**

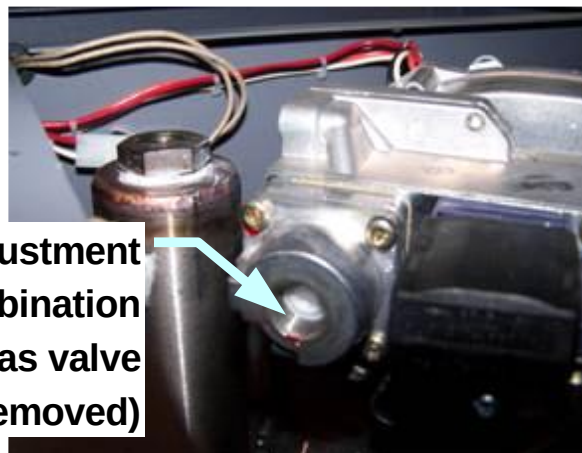


Illustration 3 - Gas Valve Adjustment Screw

## Multiple Module Adjustment

When adjusting the combustion of a multi-module gas fired humidifier, each module needs to be adjusted individually, before adjusting the whole system together. For full steps and additional details, see the Standard Combustion Adjustment section.

By default, the SKG4 humidifier is factory preset and each module comes pre-adjusted. When adjusting the combustion of a new unit, the individual combustion adjustment steps can be skipped. In such cases, proceed directly to the Combined Module Combustion Adjustment section.

## Individual Module Combustion Adjustment



**CAUTION: Risk of electric shock. The electric supply of the humidifier must be shut down. Disconnect the power at the External Breaker/Fused Disconnect before commencing.**

1. Turn off the electric power to the humidifier.
2. Disconnect the power supply wire from the blower for all modules except the one that will be adjusted and ensure that they are positioned safely and correctly.

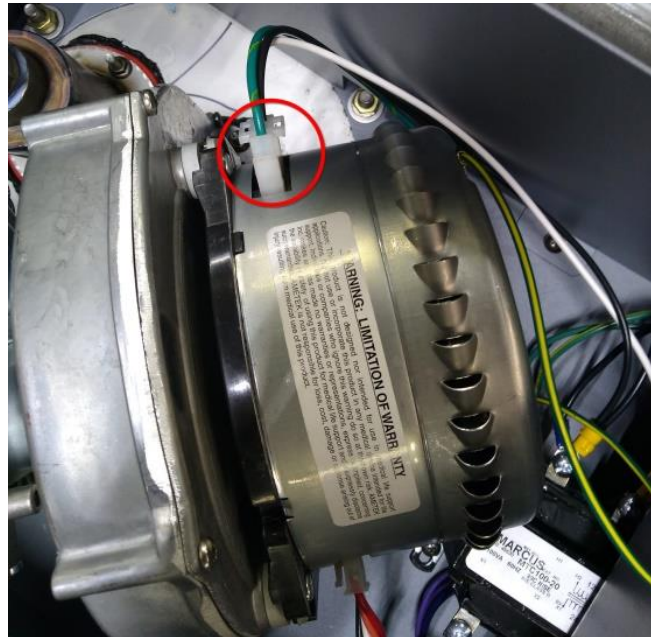


Illustration 4 - Blower Power Supply Wire

3. Cover the inlets of all the disconnected blowers using a plastic cap or tape, in order to ensure that flue gas is not coming out of the other modules' inlets while testing the module currently being adjusted.



**CAUTION: All modules are connected to the same chimney. Cover unused blowers to ensure that flue gas is not escaping from other modules while adjustment is being made.**

4. Using the controller, navigate to the *Installation* → *Command* menu, then set the value of the *Balancing* setting to *On*.
5. Set the value of the *Module1* to *Module4* settings to *Off* for all the modules except the one being adjusted.
6. Turn the electrical power on. Ensure that there are no alarm messages displayed and that the humidifier is only controlling the single module being adjusted.
7. Check the value of the "static" gas pressure (2.5-2.7 kPa [10-11" w.c.] for natural gas), and ensure that it is below 3 kPa [12" w.c.]. Adjust the value if necessary.





8. Turn on the humidifier while leaving the humidity demand at 0%, by modifying the value of *BalanceDem* to *Off*. The blower fan of the module that is being adjusted will turn on, while the other modules will stay off.
9. Set the humidity demand of the humidifier to 100%, by modifying the value of *BalanceDem* to *Max*.
10. With the humidifier operating at 100% output, ensure that the “operating” gas pressure is always of  $1.7 \pm 0.2$  kPa ( $7 \pm 1$ ”w.c.) for natural gas.



*Note: Larger capacity humidifiers can generate greater pressure variations as more modules are turned on. For 3 and 4 module humidifiers, it is recommended to perform individual module adjustment at 100% output in the higher pressure range (1.9-2.0 kPa [7.5-8”w.c.]). The resulting combined operating pressure of the 3 or 4 modules together at 100% must be around 1.5-1.6 kPa [6-6.5”w.c.].*

11. Analyze the flue combustion gas and adjust the air/gas mixture with the ratio screw. As turning the air/gas mixture ratio screw can impact the operating gas pressure, ensure that the operating pressure is maintained within the ranges described in the step above. The gas composition information for the module being adjusted can be found behind the blower.
12. Turn off the humidifier. This will cause the gas valve to close, but the blower will keep operating to evacuate flue gas.
13. Wait 5 minutes to let the blower evacuate the remaining flue gas, then turn off the electric power.

Repeat the above steps for each module individually, as necessary.

## Combined Module Combustion Adjustment

1. If each module was adjusted individually, turn off the electric power to the humidifier and revert the humidifier back to its original configuration:
  - Reconnect all the disconnected blower fans by re-attaching the blower power supply wire.
  - Remove the covers from each module combustion air intake.
  - In the *Installation* → *Command* menu, reset the values of the *Module1* to *Module4* settings to *On* and set the value of *BalanceDem* to *NotUsed*. Once this is done, the *Balancing* setting can also be set to *Off*.

Once this has been done, turn the electrical power back on. Ensure that there are no alarm messages displayed and that the humidifier is now controlling every module.

2. Turn on the humidifier. Observe the pressure variation as the modules turn on (to view which gas valves are open, use the controller to view the *GasValve* and *IgnitionCtrl* settings located in the *General* → *Physical IO* → *Module1 to 4* menus). Examples of pressure readings:
  - Static pressure: 2.7 kPa [10.5”w.c.]
  - 1 module on at 100% output: 1.94 kPa [7.8”w.c.]
  - 2 modules on at 100% output: 1.81 kPa [7.3”w.c.]
  - 3 modules on at 100% output: 1.69 kPa [6.6”w.c.]
  - 4 modules on at 100% output: 1.57 kPa [6.2”w.c.]

The pressure in every case must always be around  $1.7 \pm 0.2$  kPa [ $7 \pm 1$ ”w.c.].

If necessary, with every module operating at 100%, adjust the gas pressure to be within  $1.7 \pm 0.2$  kPa [ $7 \pm 1$ ”w.c.].

3. Analyze the flue combustion gas and adjust the air/gas mixture with the ratio screws of every module. Turn the screws of each module by 1/8th or 1/4th of a turn in the same direction to adjust every module together.

