The Tempest High Velocity Gas Burner continues to be one of the world’s most widely used burners. Its high velocity jet action and superior recirculation promoting capabilities have brought both the quality benefit of close temperature uniformity and the productivity benefit of safe higher heating rates to a wide variety of applications up to 3000 F. Common applications include: periodic and tunnel kilns in the ceramics and refractory industries, forge furnaces, heat treat furnaces, galvanizing baths, scrap preheaters, carbon baking furnaces, cupolas, pipe coaters, portable refractory dryout and preheat equipment, and many more.

The 4441 Tempest retains all the best features of the 4442: low NOx emissions, high excess air and excess fuel, direct spark ignition, integral air and gas meters, and sturdy cast construction, while improving stability range, maintainability, and stabilizer durability. New tile material and outlet shape choices provide greater flexibility in installation and “flame fitting.” Wider operating limits and expanded ignition and flame supervision capabilities make the 4441 ideal for use with StepFire™ or any pulse fired control system, as well as thermal turndown and cross-connected systems. All these improvements were made while preserving the original 4442 “footprint” including air and gas connections, so retrofitting is easy.

**FEATURES**

**Flexible operating capabilities**
- Wide operating range -- from 30% excess fuel to 6000% excess air
- Flame stability across full range to suit continuous and StepFire (pulse firing) control
- Direct spark ignited with wide operating window
- Low NOx emissions -- less than 60 ppm typical in 2000 F applications

**Choice of flame supervision systems**
- Flame rod or UV detector

**Tile options to fit the application**
- Material: dense refractory or light weight alumina/mullite
- Exit shape: round or slotted
- Alloy tile - See Aardvark bulletin 4441A

**Dependable, long lasting cast construction**
- Design allows full access to internals
- Alloy stabilizer bolted to main body
- Built in air purge for observation port and UV scanner

**Preheated air versions available upon request**
GENERAL OPERATION and CONTROL

— **Capacity:** 125,000 to 5,400,000 Btu/hr with 16 osig air pressure.
— **Combustion Air:** 0.2-24 osig air pressure (max 350 F).
— **Fuel:** Natural gas with propane gas versions available in the
-1 thru -4-B sizes. Gas pressure varies per size but 11 osig is
maximum required at design capacity, for 16 osig combustion
air pressure, stoich ratio.
— **Flame Supervision:** Flame rod or UV detector. Consult
National Safety Standards and insurance underwriters for
specific flame supervision requirements. Flame supervisory
components must be ordered separately. See Dimensions
and Part List 4441-1 for correct flame rod part number.
— **Ignition:** Direct spark (no pilot) with 6000 V transformer. A
halfwave transformer prevents UV sensing of the spark dur-
ing trial for ignition. Lighting not recommended above 16 osig
main air pressure. Excess air required for ignition.

— **Control:** Excellent performance with all control systems;
StepFire™, on-ratio and thermal turndown. A limiting orifice
valve must be installed in gas supply line within 1ft. of
burner. A ratio regulator should be within 4 ft. of burner.
— **Relight:** Tempest™ burners require spark for re-ignition. They
will not relight from a hot tile or furnace.
— **Piping:** For cross-connected systems, maximum gas pressure
at the burner can be adversely impacted by excessive
pressure drop in the gas line between the ratio regulator
and the burner. The design, selection, and installation of
these systems must take into account the gas pressure
required at the burner to achieve the desired heat release
(i.e. gas flow). For more detailed information on cross-con-
nected control systems, see Sheet 4441-3.

### Table 1. 4441 Natural Gas Performance Data

(Performance for 16 osi main air pressure operating at stoichiometric ratio unless stated otherwise)

<table>
<thead>
<tr>
<th>Burner Size</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
<th>-4</th>
<th>-5</th>
<th>-6</th>
<th>-7</th>
<th>-8</th>
<th>-9</th>
<th>-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Flow, not burning (scfh)</td>
<td>1600</td>
<td>2700</td>
<td>4000</td>
<td>6100</td>
<td>8200</td>
<td>11000</td>
<td>19000</td>
<td>26000</td>
<td>36000</td>
<td>50000</td>
</tr>
<tr>
<td>Air Flow,scfh*</td>
<td>1250</td>
<td>2200</td>
<td>3300</td>
<td>5250</td>
<td>6900</td>
<td>9500</td>
<td>15000</td>
<td>22000</td>
<td>31000</td>
<td>42000</td>
</tr>
<tr>
<td>Air Orifice, ΔP,UA-DA (in.wc)</td>
<td>15.6/13.2</td>
<td>14.6/16.6</td>
<td>14.1/17.4</td>
<td>12.8/16.4</td>
<td>13.5/16.5</td>
<td>15.5</td>
<td>7.3</td>
<td>7.1</td>
<td>13.8</td>
<td>11.9</td>
</tr>
<tr>
<td>Gas Orifice, ΔP,UG-DG (in wc)</td>
<td>3.0/3.9</td>
<td>3.1/6.7</td>
<td>3.4/8.5</td>
<td>8.8/7.9</td>
<td>10.1/8.5</td>
<td>2.9</td>
<td>2.6</td>
<td>2.5</td>
<td>3.8</td>
<td>2.5</td>
</tr>
<tr>
<td>Gas Pressure UG (osig)</td>
<td>8.3/10.4</td>
<td>8.2/9.5</td>
<td>8.0/9.9</td>
<td>10.8/8.8</td>
<td>9.6/9.1</td>
<td>7.2</td>
<td>9.0</td>
<td>7.0</td>
<td>5.8</td>
<td>7.7</td>
</tr>
<tr>
<td>Gas Pressure UG (osig), 30% XSF</td>
<td>9.4/12.0</td>
<td>9.3/14.0</td>
<td>9.3/13.5</td>
<td>14.2/11.9</td>
<td>13.3/12.7</td>
<td>8.0</td>
<td>9.9</td>
<td>7.7</td>
<td>7.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Max. % XSA, (ignition and flame signal limit)**</td>
<td>3000/2000</td>
<td>5000/3000</td>
<td>5000/4000</td>
<td>6000</td>
<td>6000</td>
<td>6000</td>
<td>6000</td>
<td>3000</td>
<td>3000</td>
<td>3000</td>
</tr>
<tr>
<td>Max. % XSF, (ignition and flame signal limit)</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Flame Length (in.)</td>
<td>11/10</td>
<td>11/10</td>
<td>13/12</td>
<td>20/20</td>
<td>24/26</td>
<td>28</td>
<td>36</td>
<td>45</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Flame Diameter (in.)</td>
<td>2/1</td>
<td>2</td>
<td>3/2</td>
<td>3/3</td>
<td>5/4</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>12</td>
<td>14</td>
</tr>
</tbody>
</table>

*Nominal capacities. Actual capacities may vary based on tile selection
** Limits may vary depending on flame supervisory equipment used.
† For sales orders below 2214482 use data on left side of column, above 2214482 use data on right side of column. Sales order 2214482 booked 12/4/2012.
‡ For sales orders below 2249794 use data on left side of column, above 2249794 use data on right side of column. Sales order 2249794 booked 4/30/2015.
†† See Bulletin 4441-4 for additional information.

### Table 2. 4441 Propane Gas Performance Data

(Performance for 16 osi main air pressure operating at stoichiometric ratio unless stated otherwise)

<table>
<thead>
<tr>
<th>Burner Size</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
<th>-4</th>
<th>-5</th>
<th>-6</th>
<th>-7</th>
<th>-8</th>
<th>-9</th>
<th>-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Flow, not burning (scfh)</td>
<td>1700</td>
<td>2700</td>
<td>3850</td>
<td>6200</td>
<td>8600</td>
<td>11000</td>
<td>19000</td>
<td>26000</td>
<td>36000</td>
<td>50000</td>
</tr>
<tr>
<td>Air Flow,scfh*</td>
<td>1350</td>
<td>2200</td>
<td>3450</td>
<td>5350</td>
<td>7600</td>
<td>11000</td>
<td>19000</td>
<td>26000</td>
<td>36000</td>
<td>50000</td>
</tr>
<tr>
<td>Air Orifice, ΔP,UA-DA (in.wc)</td>
<td>13.2</td>
<td>15.3</td>
<td>18.7</td>
<td>16.5</td>
<td>15.9</td>
<td>15.9</td>
<td>15.9</td>
<td>15.9</td>
<td>15.9</td>
<td>15.9</td>
</tr>
<tr>
<td>Gas Orifice, ΔP,UG-DG (in wc)</td>
<td>1.9</td>
<td>3.2</td>
<td>8.3</td>
<td>3.2</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Gas Pressure UG (osig)</td>
<td>9.2</td>
<td>8.3</td>
<td>9.2</td>
<td>6.6</td>
<td>7.0</td>
<td>7.0</td>
<td>7.0</td>
<td>7.0</td>
<td>7.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Gas Pressure UG (osig), 30% XSF</td>
<td>9.6</td>
<td>8.7</td>
<td>14</td>
<td>7.8</td>
<td>8.7</td>
<td>8.7</td>
<td>8.7</td>
<td>8.7</td>
<td>8.7</td>
<td>8.7</td>
</tr>
<tr>
<td>Max. % XSA, (ignition and flame signal limit)**</td>
<td>1000</td>
<td>2000</td>
<td>3300</td>
<td>1750</td>
<td>2800</td>
<td>2800</td>
<td>2800</td>
<td>2800</td>
<td>2800</td>
<td>2800</td>
</tr>
<tr>
<td>Max. % XSF, (ignition and flame signal limit)</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Flame Length (in.)</td>
<td>8</td>
<td>15</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Flame Diameter (in.)</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

*Nominal capacities. Actual capacities may vary based on tile selection
** Limits may vary depending on flame supervisory equipment used.

Note: Refer to Sheet 4441-2 for notes regarding use of integral orifices.
**TILE and MOUNTING OPTIONS**

Tile materials and shapes to suit your specific needs.

**Tile Materials/ Mountings**

"R" Tile — Traditional square refractory block for applications to 3000 F. **Note:** Recommended only for installation in solid wall construction furnaces/kilns. Available with either flanged or eared mounting.

"J" Tile — Traditional square refractory block with metal jacket for applications to 1800 F. **Note:** Recommended for installation of a square refractory block tile in soft wall.

"A" Tile — Alumina/Mullite tile for fiber wall and most applications up to 3000 F. Available with flanged mounting only.

Alloy Tile — The Aardvark’s threaded snout can be screwed directly into a fitting. Good for applications up to 2000 F. See Bulletin 4441A for more information.

Consult North American for other tile options.

**Exit Shapes**

"R" Round — for high penetration and maximum "drive".

"S" Slotted — for narrow lane firing and better temperature uniformity (available with "A" tile only).

**Installation**

For tile installation, see 4441 suppl for more information.

**ORDERING INFORMATION**

![Diagram](image_url)  

**Examples:**

4441-4-AASH/F = -4-A Capacity 4441 Burner with an Alumina/Mullite slotted high velocity tile, with flanged mounting.  
4441-2-RRH/E = -2 Capacity 4441 Burner with a square refractory high velocity tile, with eared mounting.  
4441-7-ARH/F = -7 Capacity 4441 Burner with an Alumina/Mullite round high velocity tile, with flanged mounting.

**WARNING:** Situations dangerous to personnel and property may exist with the operation and maintenance of any combustion equipment. The presence of fuels, oxidants, hot and cold combustion products, hot surfaces, electrical power in control and ignition circuits, etc., are inherent with any combustion application. Parts of this product may exceed 160°F in operation and present a contact hazard. Fives North American Combustion, Inc. urges compliance with National Safety Standards and insurance Underwriters recommendations, and care in operation.

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