4762 HI-CAPACITY Immersion Tube Gas Burners give unsurpassed performance in applications where liquids are heated by direct-fired tubes. Features:

- very high heat releases.
- quieter, sealed-in operation.
- easily lighted flames.
- stability over wide ratio ranges.
- reliable premix pilot.
- provision for optional flame supervision.
- observation port.

Large tanks of liquids are commonly heated by immersion tubes through which burners fire. Flames and flue products scrub inside tube surfaces, rapidly releasing heat to the liquid. This arrangement provides more efficient and economical heating than remote, separately-fired heat sources.

4762 Burners allow high heat releases within confined tubes—higher firing rates in smaller diameter tubes than previously possible, resulting in lower tube costs and smaller tanks. They are sealed-in for full control of air/gas ratio and to permit firing into high backpressure. No refractory tile is used.

Flames are extremely stable and quiet burning, operating over a wide range of air/gas ratios. Burners include a primary air adjustment to correct for unusual tube conditions, and an observation port for easy viewing of pilot and main flame. 4762-4 and -6 Burners have a built-in gas adjustment. A separate 1807 Limiting Orifice Gas Valve is used with -7-A, -7-B, and -8 sizes.

OPERATION

Accurate air/gas ratio can be obtained by using metering orifices in air and fuel lines, or by analysis of flue products.

Although 4762 Burners have wide turndown with normal air/gas ratios, additional turndown is possible by using excess air at low fire.

Control: High-low, high-low-off, modulating or modulating-off (not on-off) control can be used. Easy lighting and smooth operation give safe operation with minimum attention.

Pressure Drop in Tubes. High heat releases in small diameter tubes require careful calculation of pressure drops within the tubes to ensure satisfactory operation. Adequate air and gas pressures must be available. Engineering and application information are presented in Tables I, II, III, and IV, together with a sample calculation to illustrate equipment selection. For special conditions, consult Fives North American.

PILOTS/FLAME SUPERVISION

A 4021-12 Pilot Tip and 4031 Mixer should be used. A manually lit pilot is not recommended. Pilot regulator must be cross-connected to pilot air line.

Flame Supervision: Use flame rod or UV detector. Flame rod should extend 4" beyond outer surface of mounting boss.
### SAMPLE SELECTION PROCEDURE

#### Information Required to Select Equipment:

Heat transfer rate to liquid, load and losses*--for example, 550 000 Btu/hr. Available tank space--for example, enough for 25' of tube with 4 mitered elbows. Fuel--for example, natural gas.

#### Step 1--Effective Tube Length for Heat Transfer.

- Each elbow or return bend adds 1.1' of effective heat transfer length to the total centerline length (including bends); so
- Total Effective Length = 25' + (4 × 1.1') = 25' + 4.4' = 29.4'

#### Step 2--Firing Rate.

At 550 000 Btu/hr in Table I, the next smallest tube length is 26'.

This tube length and heat transfer rate result in a required firing rate of 786 000 Btu/hr and 70% tube efficiency.① (From Table I.)

Then only 28' – 4.4' = 23.6' of tube is needed.

#### Step 3--Burner Size, Tube Diameter.

Remembering that the blower will have to supply some extra pressure to overcome tube back pressure, use Table II and the square root law of proportions. Add tube backpressure to get required gas pressure. Consult Fives North American Combustion Handbook.

*Losses from vats may be substantial. See pages 125-126, Volume I of the North American Combustion Handbook.

#### Step 4--Equivalent Tube Length for Pressure Drop.

- Burner gas pressure = 2.42 + 2.28 = 4.70 osi.
- Adding the tube back pressure, Burner gas pressure = 2.42 + 2.28 = 4.70 osi.
- Burner air pressure = 12.7 + 2.28 = 14.98 osi.

#### Step 5--Air Pressure.

- Burner air pressure = 12.7 + 2.28 = 14.98 osi.

#### Step 6--Gas Pressure.

- Burner gas pressure = 2.42 + 2.28 = 4.70 osi.

* Multiply air pressure factor by burner air pressure drop to obtain gas pressure drop across the burner.

### Table I. Effective Tube Lengths and Firing Rates

When Heating 180° F Water

<table>
<thead>
<tr>
<th>Burner</th>
<th>Air pressure drop across burner, osi</th>
<th>Tube Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>4762-4</td>
<td>2 120</td>
<td>4&quot;</td>
</tr>
<tr>
<td>4762-6</td>
<td>4 570</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4762-7-A</td>
<td>5 250</td>
<td>8&quot;</td>
</tr>
<tr>
<td>4762-7-B</td>
<td>8 000</td>
<td>8&quot;</td>
</tr>
<tr>
<td>4762-8</td>
<td>10 500</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>

#### Table II. Burner Capacities, in scfh air Multiply by 100 to obtain Btu/hr

<table>
<thead>
<tr>
<th>Burner No.</th>
<th>Air pressure drop across burner, osi</th>
<th>Tube Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>200</td>
<td>4&quot;</td>
</tr>
<tr>
<td>5</td>
<td>600</td>
<td>6&quot;</td>
</tr>
<tr>
<td>8</td>
<td>1200</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>

#### Table III. Equivalent Lengths of Fittings (welded), for pressure drop calculations①

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Mitered</th>
<th>Short Sweep Elbow</th>
<th>Long Sweep Elbow</th>
</tr>
</thead>
<tbody>
<tr>
<td>90°</td>
<td>20°</td>
<td>35°</td>
<td>5°</td>
</tr>
<tr>
<td>180°</td>
<td>60°</td>
<td>11°</td>
<td>14°</td>
</tr>
</tbody>
</table>

① Do not use this table for heat transfer calculations.

#### Table IV. Air and Gas Pressure Factors

<table>
<thead>
<tr>
<th>Burner</th>
<th>Tube Size</th>
<th>Air Pressure Factors②</th>
</tr>
</thead>
<tbody>
<tr>
<td>4762-4</td>
<td>4&quot;</td>
<td>0.022</td>
</tr>
<tr>
<td>4762-6</td>
<td>6&quot;</td>
<td>0.012</td>
</tr>
<tr>
<td>4762-7-A</td>
<td>8&quot;</td>
<td>0.004</td>
</tr>
<tr>
<td>4762-7-B</td>
<td>8&quot;</td>
<td>0.010</td>
</tr>
<tr>
<td>4762-8</td>
<td>8&quot;</td>
<td>0.013</td>
</tr>
</tbody>
</table>

① Multiply air pressure factor by burner air pressure to obtain pressure drop in each 10 feet equivalent length of tube.

② Multiply natural gas factor by burner air pressure drop to obtain gas pressure drop across burner. Add tube backpressure to get required gas pressure. Consult Fives North American for other gases. These factors are based on the primary air setting as shipped. They will be proportionally higher if the percent primary air is increased.

③ "% tube efficiency" is really % available heat, which is the best possible fuel efficiency (with no wall or surface losses).

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INSTALLATION

1. Bolt the burner flange to a matching flange welded to the immersion tube. Bolt these together tightly to prevent flue gas leakage. Leakage can cause instability and excessive noise under some conditions. (An optional mounting gasket is offered—see Parts List & Instr. 4762-1.) The burner should be as close as possible to the tank, because heat is released very close to the burner. Tank insulation, if any, should be removed to provide clearance around the tube to prevent overheating.

2. Connect the main gas regulator and valves, the pilot accessories, and a spark-ignited pilot as shown in the typical piping diagram below. A separate regulator must be used for each burner. For 4762-7-A, -7-B, and -8 Burners, add an 1807 Limiting Orifice Valve in the gas line as close as possible to the burner.

3. If the gas pressure does not exceed air pressure by at least 2 osi, use an 8654 Bleeder, piping the "M" connection to the hole provided for that purpose in the burner mounting plate. (Subtract the tube backpressure from both the gas and air pressure before figuring the % bleed.)

4. It is often difficult to set the air/fuel ratio by sight or sound; so use of a metering orifice or flue gas analyzer is strongly recommended.

START-UP and ADJUSTMENT

1. Purge the gas supply line.

2. Close all gas valves.

3. Set the main air control valve for about 2 osi pressure at the burner or about ¼ open.

4. Open the pilot air valve. Energize the ignition transformer and open the pilot gas valve. The pilot should light in a few seconds. (See Pilot Bulletin.)

5. Remove the protective cap, and open the limiting orifice gas valve (built into the back of 4762-4 and -6 Burners, separate on larger sizes) a few turns counterclockwise from the closed position. Open the main gas valve. If no main flame appears in 10 seconds, close the main gas valve and allow a few minutes for purging before trying again.

6. The flame should not start in the burner gas tube at any time. If this occurs at the low firing rate, turn the regulator’s spring adjusting plug clockwise until the flame moves out of the gas tube. (See Regulator Bulletin.)

7. Ignition should always take place at low firing rate (2 osi or less). High fire lighting or extinguishing may accidentally put out the pilot.

8. Adjust the high and low fire linkage settings (firing ratios) as desired. These can range from ½ osi (1”wc) to 16 osi.

WARNING: Startup and adjustment of combustion equipment should only be done by trained personnel familiar with combustion technology, combustion equipment, and with the particular burner system, equipment, and controls.

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 160F 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.
### DIMENSIONS

**in inches**

<table>
<thead>
<tr>
<th>Burner designation</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>N</th>
<th>P</th>
<th>R</th>
<th>recommended Pilot Tip</th>
<th>wt, lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>4762-4</td>
<td>2</td>
<td>1½</td>
<td>7⅛</td>
<td>5⅛</td>
<td>8⅛</td>
<td>14⅛</td>
<td>4</td>
<td>4⅛</td>
<td>½</td>
<td>⅛</td>
<td>8⅛</td>
<td>1⅛</td>
<td>1½</td>
<td>⅛</td>
<td>4021-12</td>
<td>46</td>
</tr>
<tr>
<td>4762-6</td>
<td>3</td>
<td>2</td>
<td>9⅛</td>
<td>5⅛</td>
<td>9⅛</td>
<td>17⅛</td>
<td>5</td>
<td>6⅛</td>
<td>½</td>
<td>⅛</td>
<td>8⅛</td>
<td>1⅛</td>
<td>1½</td>
<td>⅛</td>
<td>4021-12</td>
<td>46</td>
</tr>
<tr>
<td>4762-7-A</td>
<td>4</td>
<td>2</td>
<td>7¼</td>
<td>5⅛</td>
<td>8⅛</td>
<td>12⅛</td>
<td>8</td>
<td>8⅛</td>
<td>¾</td>
<td>⅛</td>
<td>9⅛</td>
<td>Closed — —</td>
<td>4021-12</td>
<td>54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4762-7-B</td>
<td>4</td>
<td>2</td>
<td>7¼</td>
<td>5⅛</td>
<td>8⅛</td>
<td>12⅛</td>
<td>8</td>
<td>8⅛</td>
<td>¾</td>
<td>⅛</td>
<td>9⅛</td>
<td>⅝</td>
<td>— —</td>
<td>— —</td>
<td>4021-12</td>
<td>54</td>
</tr>
<tr>
<td>4762-8</td>
<td>6</td>
<td>2</td>
<td>7¼</td>
<td>5⅛</td>
<td>12</td>
<td>12⅛</td>
<td>8</td>
<td>8⅛</td>
<td>¾</td>
<td>⅛</td>
<td>9⅛</td>
<td>1½</td>
<td>— —</td>
<td>— —</td>
<td>4021-12</td>
<td>67⅓</td>
</tr>
</tbody>
</table>

If used, flame rod length should be 4" from outer surface of mounting boss.

**DIMENSIONS SHOWN ARE SUBJECT TO CHANGE. PLEASE OBTAIN CERTIFIED PRINTS FROM FIVES NORTH AMERICAN COMBUSTION, INC. IF SPACE LIMITATIONS OR OTHER CONSIDERATIONS MAKE EXACT DIMENSION(S) CRITICAL.**

If space limitations or other considerations make exact dimension(s) critical.