

North American Fire•All™ Dual-Fuel™ Burners

Instructions 6422

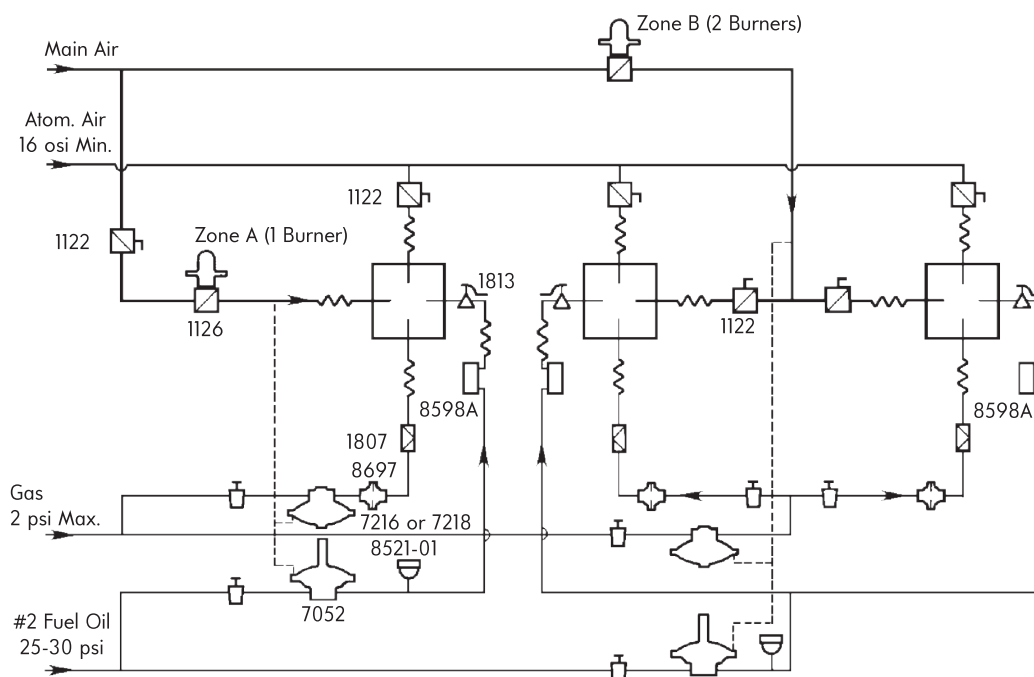


Figure 1. Suggested piping arrangement for 6422 and 6514 Burners for gas and/or light oil.

INSTALLATION

1.Requirements:

- Maximum allowable inlet pressure to the air/gas ratio regulator (Bul. 7216 or 7218) is 32 osi. If greater than 32 osi, an upstream pressure regulator (not shown) must be used.
- Gas supply pressure to the air/gas ratio regulator should be at least 2 osi greater than the high fire burner air pressure. If less, a bleeder (Bul. 8654/8655) must be installed in the impulse line. See Figure 2.
- Fuel oil must be supplied to the air/oil Ratiotrol™ (Bul. 7052) at 25-30 psi. Oil should be supplied from a circulating system controlled by a diaphragm relief valve.
- Atomizing air pressure at burner must be at least 14 osi.
- Consult your insurer or your local Fives North American Combustion, Inc. field engineer for automatic shutoff and flame supervision requirements.

2.Burner Mounting:

- Burners should be mounted with air, gas, pilot, and UV connections on the top or side to prevent oil dripping into them.
- WARNING:** Burners cannot be rotated with respect to the mounting plate as the pilot and flame detector ports must align with notches in the plate.

- To minimize leaks around the tile and to prevent tile damage from thermal expansion of the wall, follow the instructions on Supplements DF-M1 and DF-M2.

3.Piping:

- Minimize piping pressure losses. Use a minimum of elbows. Substitute 45 elbows for 90 elbows when possible. Do not use street elbows. Use pipe (not tubing) for pilot air and gas lines. $\frac{3}{8}$ " tubing may be used for impulse lines up to 8' long, $\frac{1}{2}$ " tubing or larger for longer runs.
- Pipe air and fuel lines in a manner similar to that shown in Figure 1. Flexible connections (Bul. 8770) are recommended in air and fuel lines to minimize strain from piping and thermal expansion.
- Pilot air, pilot gas, and atomizing air supply connections must be made upstream of primary burner controls so they are not affected by the zone air control and gas shutoff valves.
- Connect impulse piping as shown in Figure 1 (or as in Figure 2 if a bleeder is used). These piping arrangements are designed to keep air and gas flows on desired ratio at all firing rates. (Ref: Bulletin 7216, Instructions 7218 and Bul. 8654/8655.)
- Ratio regulator impulse line connections must be located between the zone control air valve and the manual burner air valve for multiple burner zones and downstream of the manual burner air valve for single burners.

LIGHTING AND ADJUSTMENT

1. Basic:

- All manual and automatic fuel valves (gas and oil) must be closed.
- Open all furnace doors and flue dampers. Lock all burner air valves in full open position.
- Start combustion air blower and check rotation.
- Adjust control motor/air valve linkage(s) for low and high fire.
- Set atomizing air pressure at 14-16 osi. NOTE: Atom-izing air can be set at 4 osi for gas firing, but must be returned to 14-16 osi for oil firing.
- Set control motor(s) at high fire allowing furnace to purge for several minutes prior to lighting. Check motor amps with all burners at high fire. If in overload, adjust the linkage to reduce the high fire air flow.
- Return the control motor to low fire. Linkage must not bind.

- Light the pilots in accordance with the pilot instruction sheet.

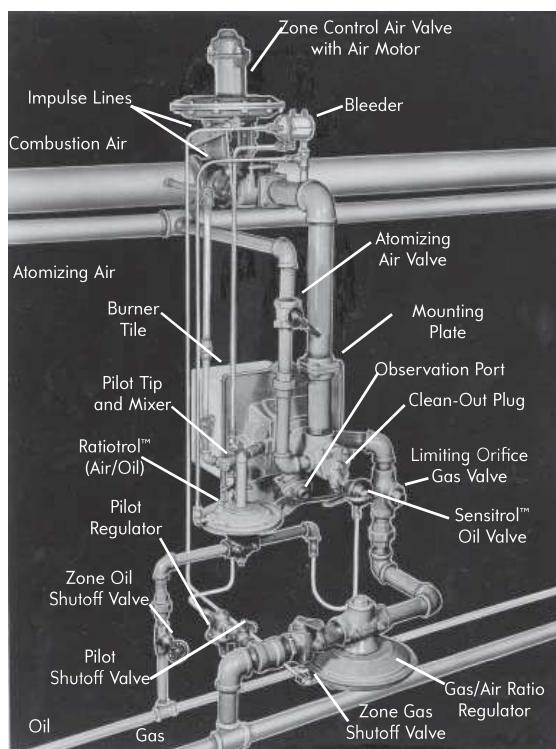


Figure 2. Piping arrangement for gas pressure less than air pressure (bleeder required).

3A. Gas Firing:

- Open limiting orifice valve five turns (ccw) from full closed position.
- Open gas shutoff valve(s). If burner does not light within a few seconds, close gas shutoff valve and open limiting orifice valve one more turn; then open gas shutoff valve. Repeat as necessary until burner lights.

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- Slowly open main air valve to high fire position, adjusting limiting orifice valve as necessary.
- Return control valve to low fire position. Adjust air/gas ratio regulator for desired flame.
- Repeat Steps (c) and (d) if necessary. Replace cover on limiting orifice valve.
- For multiple burner zones, approximate limiting orifice valve settings can be made by counting the number of turns open on the first valve.

3B. Oil Firing:

- Set atomizing air at 14-16 osi for light oil (see Bulletin 6514 for heavy oils).
- Open oil shutoff valve. Purge air from line by breaking oil line at Sensitrol™ or running oil out of the bottom of the Ratiotrol™, collecting oil in a bucket or other container until flow is free of air.
- Adjust oil supply for 30 psi at Ratiotrol inlet.
- Open Sensitrol valve until burner lights.
- Slowly open main air valve to high fire position. Adjust Sensitrol valve as necessary.
- Return control valve to low fire position. Adjust the air/oil Ratio-trol for desired flame.
- Repeat Steps (e) and (f) if necessary. Set Sensitrol detent at high fire setpoint.
- When shutting down, turn off oil valve upstream of Ratiotrol. Allow to purge, then shut the Sensitrol valve. If oil in the line will expand from furnace heat, expansion chambers (Bul. 7052) should be used to prevent Ratiotrol damage.

4. Maintenance:

- Shut all air and fuel valves.
- Disconnect oil and atomizing air lines.
- Remove and clean atomizer. Clean burner body and gas tube.

5. Troubleshooting:

A. Gas Operation

- Gas supply pressure too high or too low (see appropriate regulator literature).
- Impulse pressure too low to ratio regulator--check for dirt in line or connections; check method of connecting impulse line to air pipe (see regulator literature).
- Regulator not controlling--check method of connecting impulse line to air pipe; check regulator diaphragms (see regulator literature); if bleeder is used, check orifices for dirt.

B. Oil Operation

- If fire is "sloppy," check atomizing air pressure: at least 14 osi for light oil; at least 22 osi for heavy oil.
- If fire "spits" or tends to be unstable, check for air in oil line (a suction line leak, usually at the pump) or water or dirt in the oil lines (check filters, oil tank, atomizer, etc.)

CONTACT

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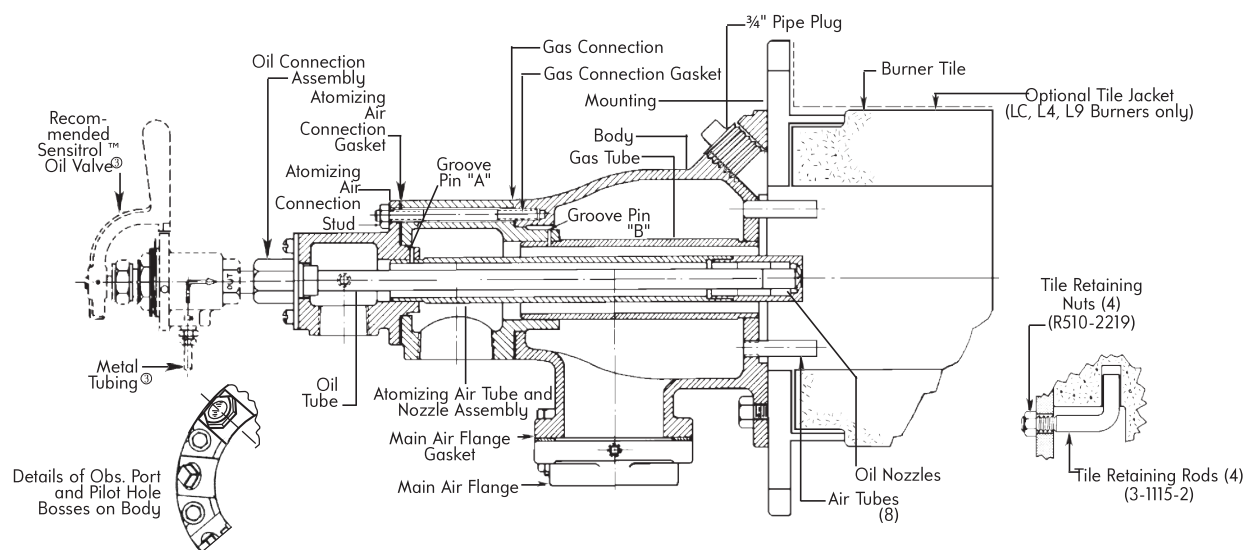
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North American 6422 Dual-Fuel™ Burners

Parts List 6422



| Part Name | 6422-2 | 6422-3 | 6422-4 | 6422-5 | 6422-6 | 6422-7-A | 6422-7-B | 6422-8-A |
|---------------------------------------|-----------------------|-----------------------|-----------|----------|-----------|--------------|--------------|--------------|
| Air Tubes (8req'd), Inconel | 3-3643-1 ^① | 3-3643-2 ^① | 3-3640-2 | 3-3639-2 | 3-3554-2 | 3-3273-3 | 3-3273-4 | 4-3684-2 |
| Atom. Air Tube & Nozzle Assy | | 3-2887-3 | | 3-2887-2 | 3-2887-2 | 3-2887-4 | 3-2887-4 | 3-6076-2 |
| Atomizing Air Connection | | 3-2474-1 | | 3-2474-2 | 3-2474-2 | 3-3324-1 | 3-3324-1 | 3-6081-1 |
| Atomizing Air Conn. Gasket | | | 3-3343-1 | | | 3-3326-2 | 3-3326-2 | 3-3326-2 |
| Body | | 3-2466-9 | | | 3-2466-10 | 3-3267-3 | 3-3267-3 | 3-3267-4 |
| Burner Tile (9") | | | 4-2121-2 | | | 4-2142-2 | 4-2142-2 | 4-2142-2 |
| Gas Connection | 3-2465-4 | 3-2465-4 | 3-2465-5 | 3-2465-6 | 3-2465-6 | 3-3268-2 | 3-3268-2 | 3-6073-1 |
| Gas Connection Gasket | | | 3-2473-1 | | | 3-3272-1 | 3-3272-1 | 3-3272-1 |
| Gas Tube | | | 3-2468-2 | | | ^② | ^② | ^② |
| Groove Pin "A" | | | R570-2277 | | | R570-2310 | R570-2310 | R570-2310 |
| Groove Pin "B" | | | R570-2300 | | | — | — | — |
| Main Air Flange | 3-2544-2 | 3-2544-1 | 4-1695-2 | 4-1695-3 | 4-1695-9 | 4-1695-5 | 4-1695-5 | 8765-8x7-D |
| Main Air Flange Gasket | | | 4-5371-2 | | | 4-5371-3 | 4-5371-3 | 4-5371-3 |
| Metal Tubing ^③ | | | | | 3-0310-7 | | | |
| Mounting (Cast) | | | 3-3257-1 | | | 3-3270-1 | 3-3270-1 | 3-3270-1 |
| Observation Port | | | | | 8790-0 | | | |
| Oil Connection Assembly | | | | 3-2391-1 | | | | 3-2519-2 |
| Oil Tube | | 3-2470-1 | | | 3-2470-2 | 3-2470-8 | 3-2470-8 | 3-2515-1 |
| Oil Nozzle | | 3-2541-1 | | | 3-1056-4 | 3-2541-1 | 3-2541-1 | 3-6077-1 |
| Rec. Sensitrol Oil Valve ^⑤ | | 1813-02-A | | | 1813-02-B | 1813-02-C | 1813-02-C | 1813-02-D |
| Studs (4 req'd) | | 3-2584-1 | | | | 3-3325-1 | 3-3325-1 | 3-3325-1 |

① Includes 3-3638-1 Adapter

② Gas Tube and Gas Connection are integral on 6422-7-A, -7-B, and -8-A

③ Extra cost option--not part of standard burner assembly, and must be ordered separately.

④ Includes complete mounting, tile, jacket and retainer assembly.

⑤ Includes tile and jacket only.

| Mounting & Tile Assemblies Standard | for Burner Complete w/9" Tile | | | | | | | |
|-------------------------------------|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Mounting & Tile Assy. ④ | 3-6668-1 | 3-6668-1 | 3-6668-1 | 3-6668-1 | 3-6668-1 | 3-6668-2 | 3-6668-2 | 3-6668-2 |
| LC Series | for Burner Complete w/9" Tile and Steel Jacket | | | | | | | |
| Mounting & Tile Assy.④ | 3-6668-3 | 3-6668-3 | 3-6668-3 | 3-6668-3 | 3-6668-3 | 3-6668-4 | 3-6668-4 | 3-6668-4 |
| Tile & Jacket Assembly⑤ | 4-21583-1 | 4-21583-1 | 4-21583-1 | 4-21583-1 | 4-21583-1 | 4-21583-2 | 4-21583-2 | 4-21583-2 |
| Jacket | 4-5377-3 | 4-5377-3 | 4-5377-3 | 4-5377-3 | 4-5377-3 | 4-5378-3 | 4-5378-3 | 4-5378-3 |
| L4 Series | for Burner Complete w/9" Tile and 304 SST Jacket | | | | | | | |
| Mounting & Tile Assy.④ | 3-6668-5 | 3-6668-5 | 3-6668-5 | 3-6668-5 | 3-6668-5 | 3-6668-6 | 3-6668-6 | 3-6668-6 |
| Tile & Jacket Assembly⑤ | 4-21583-3 | 4-21583-3 | 4-21583-3 | 4-21583-3 | 4-21583-3 | 4-21583-4 | 4-21583-4 | 4-21583-4 |
| Jacket | 4-5377-4 | 4-5377-4 | 4-5377-4 | 4-5377-4 | 4-5377-4 | 4-5378-4 | 4-5378-4 | 4-5378-4 |
| L9 Series | for Burner Complete w/9" Tile and 309 SST Jacket | | | | | | | |
| Mounting & Tile Assy.④ | 3-6668-7 | 3-6668-7 | 3-6668-7 | 3-6668-7 | 3-6668-7 | 3-6668-8 | 3-6668-8 | 3-6668-8 |
| Tile & Jacket Assembly⑤ | 4-21583-5 | 4-21583-5 | 4-21583-5 | 4-21583-5 | 4-21583-5 | 4-21583-6 | 4-21583-6 | 4-21583-6 |
| Jacket | 4-5377-6 | 4-5377-6 | 4-5377-6 | 4-5377-6 | 4-5377-6 | 4-5378-5 | 4-5378-5 | 4-5378-5 |

① Includes 3-3638-1 Adapter

② Gas Tube and Gas Connection are integral on 6422-7-A, -7-B, and -8-A

③ Extra cost option--not part of standard burner assembly, and must be ordered separately.

④ Includes complete mounting, tile, jacket and retainer assembly.

⑤ Includes tile and jacket only.

Order Must Specify: 1-Part Number 2-Part Name 3-Burner Designation

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North American Dual-Fuel™ Conversion Kits for 4422 and 5422

Sheet 6422-4

To convert 4422 Gas Burners or 5422 Oil Burners to Dual-Fuel models, North American offers preassembled conversion kits.

6422CK-4422 GAS-TO-DUAL-FUEL CONVERSION KITS include the following parts:

| | |
|---------------------------------|-------------------------|
| Atomizing Air Connection | Oil Connection Assembly |
| Atomizing Air Connection Gasket | Oil Tube and Nozzle |
| Atomizing Air Tube and Nozzle | All Necessary Hardware |

Note: Kits do not include the recommended Sensitrol™ Oil Valve as part of the assembly. They must be ordered separately. (See table on Dimensions 6422 for proper Sensitrol Oil Valve size.)

6422CK-5422 OIL-TO-DUAL-FUEL CONVERSION KITS include the following parts:

| | |
|---------------------------------|-------------------------|
| Atomizing Air Connection | Gas Tube |
| Atomizing Air Connection Gasket | Oil Connection Assembly |
| Atomizing Air Tube and Nozzle | Oil Tube and Nozzle |
| Gas Connection | Threaded Studs |
| Gas Connection Gasket | All Necessary Hardware |

The Sensitrol Oil Valve and tubing from the oil burner can be used with the new atomizer assembly.

To order, specify:

6422CK - - 4422, or -5422

(Burner Size)

Examples: 6422CK-3-4422 = Gas to Dual-Fuel™ conversion kit for a 4422-3 Burner.

6422CK-7-B5422 = Oil to Dual-Fuel™ conversion kit for a 5422-7-B Burner.

Note: Conversion kits can also be used on 4425 and 5425 burners to convert to dual-fuel models.

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North American Flangeless Mountings for 4422/6422 Burners

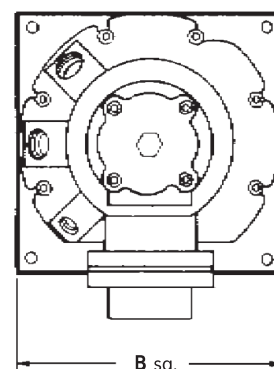
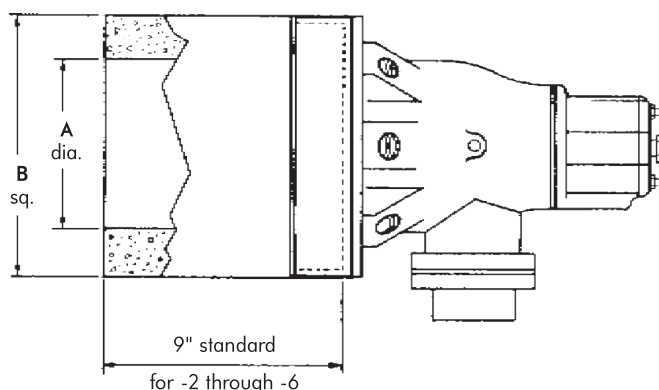
Sheet 6422-5

Flangeless mountings are available for 4422, 5422, and 6422 Fire-All burners (and their 4425, etc. high temperature counterparts). They are used on tunnel kilns and other installations where it is desirable to insert the burner into a thick furnace wall.

Specify:

- 3-3459-1 mounting for -7 and -8-A sizes
3-4928-1 mounting for -2 through -6 sizes

Flangeless mounting prices are the same as standard mountings.



| Mounting designation | dimensions in inches | |
|-------------------------|----------------------|--------|
| | A dia. | B* sq. |
| 3-4928-1 | 5 | 8½ |
| 3-3459-1 | 7 | 10 |

* Opening in furnace should be about ½" larger than dimension "B" to allow for fillets and draft on mounting plate.

For other dimensions refer to the appropriate bulletin.

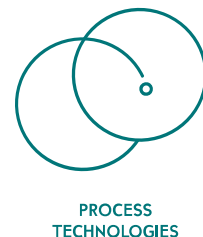
DIMENSIONS SHOWN ARE SUBJECT TO CHANGE. PLEASE OBTAIN CERTIFIED PRINTS FROM FIVES NORTH AMERICAN COMBUSTION, INC.
IF SPACE LIMITATIONS OR OTHER CONSIDERATIONS MAKE EXACT DIMENSION(S) CRITICAL.

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North American 6423 Dual-Fuel™ Fire•All Burners

Sheet 6423

Light oil can be burned as standby or primary fuel in the larger sizes of 4423 Gas Burners by adding a 5423 Atomizer to an existing burner or by specifying a 6423 Dual-Fuel Burner for a new installation.

6423 Burners have the same 4423 "Fire•All" suitability for a wide variety of industrial furnaces, from low temperature ovens to high temperature forge, heat treat, etc. applications. When burning oil, these burners are not as flexible re air/fuel ratio as they are on gas. But oil operations with 200% excess air can be realized at 12-16 osi main air, somewhat less XSA at lower inputs.

Gas goes through the atomizer in a 6423 Burner, so atomizing air is not available when burning gas: Thus, total air capacity is greater when burning oil (by the amount of the atomizing air

-- see tables below). An approved 3-way valve must be installed in the line feeding the gas/atomizing air connection to assure that the non-used medium is completely shut off. Gas pressure requirements at the burner are higher than they are for a 4423 Burner, but a standard cross-connected regulator system is satisfactory.

PILOT, FLAME SUPERVISION

A 4021-12 pilot tip lights the burner satisfactorily with 8-22 osi pilot air pressure (3-10"w.c. mixture pressure.) Use a UV flame detector -- flame rods are not satisfactory.

See Bulletin 4423/4424 for construction and other characteristics.

Table 1. CAPACITIES, FLAME LENGTHS

| Burner designation | burning oil ① | | burning gas ② | | flame length, in. | |
|--------------------|---------------|----------|---------------|---------|-------------------|-----|
| | Btu/h HHV | oil, gph | Btu/h HHV | gas,cfh | oil | gas |
| 6423-2 | 277,000 | 2.1 | 234,000 | 234 | 13 | 8 |
| 6423-3-A | 396,000 | 3.0 | 354,000 | 354 | 16 | 17 |
| 6423-3-B | 475,000 | 3.6 | 432,000 | 432 | 18 | 17 |

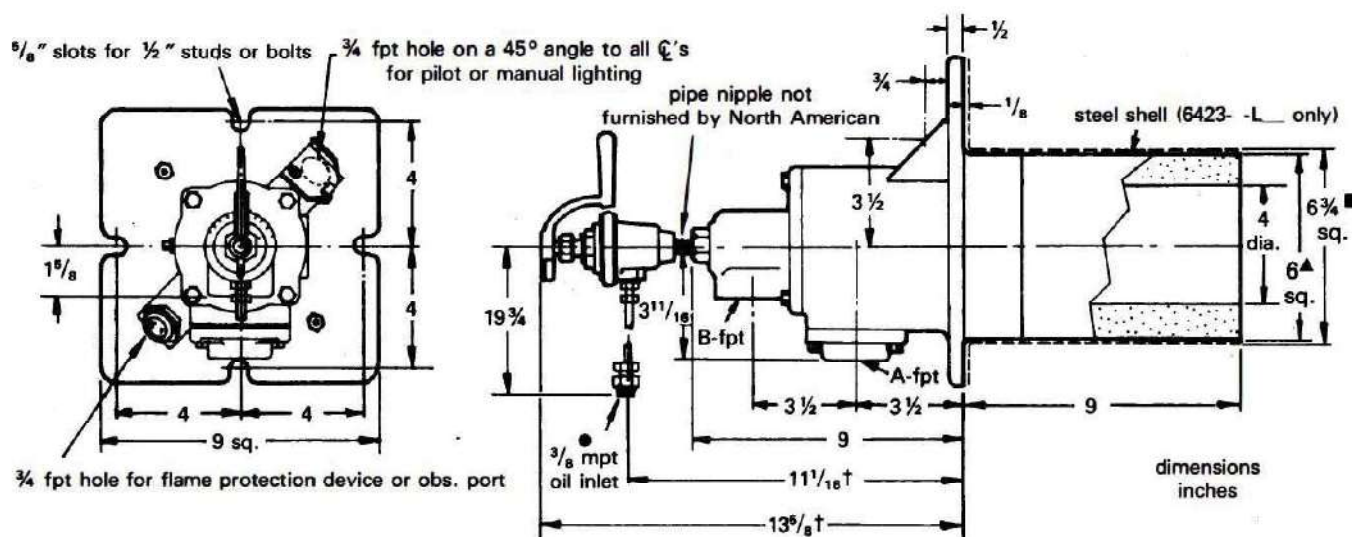
① based on 132,000 Btu/gallon oil with 16 osi main and atomizing air at the burner.

② based on 1,000 Btu/cf natural gas with 16 osi main air at the burner (atomizing air not available with burning gas).

Table 2. MAIN AND ATOMIZING AIR CAPACITIES

| Burner designation | main air, cfh pressure at burner, osi | | | | | | atomizing air, cfh pressure at burner, osi | | | | |
|--------------------|--|------|------|------|------|------|---|-----|-----|-----|-----|
| | 1 | 5 | 6 | 8 | 12 | 16 | 14 | 16 | 20 | 22 | 24 |
| 6423-2 | 585 | 1300 | 1430 | 1650 | 2010 | 2340 | 440 | 470 | 525 | 550 | 575 |
| 6423-3-A | 885 | 1980 | 2160 | 2500 | 3050 | 3540 | 440 | 470 | 525 | 550 | 575 |
| 6423-3-B | 1080 | 2410 | 2640 | 3050 | 3720 | 4320 | 440 | 470 | 525 | 550 | 575 |

DIMENSIONS OF 6423 BURNERS



Dimensions marked † assume use of a 3/8" mpt close nipple between burner and Sensitrol Oil Valve.

▲ Opening in furnace shell or outer wall must be 1/2" larger than dimension shown to allow for mounting plate fillet and draft.

■ Opening in furnace shell or outer wall must be 1/4" larger than dimension shown.

● Oil tubing is an extra cost option.

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| Burner designation | dimensions in inches | | Sensitrol Oil Valve | recommended pilot size | wt. lb |
|--------------------|----------------------|--------------------|---------------------|------------------------|--------|
| | A main air | B atom. air or gas | | | |
| 6423-2 | 1 1/4 | 1 | 1813-02-A | 4021-12 | 51 |
| 6423-3-A | 1 1/2 | 1 | 1813-02-A | | 51 |
| 6423-3-B | 1 1/2 | 1 | 1813-02-A | | 51 |

Sample Specification

for burner: 6423-3-A Burner complete with 1816-02-A Valve.

for conversion atomizer only: 5423-AC Atomizer assembly complete with 1816-02-A Valve for 6423,
or
5423-AO Atomizer assembly only for 6423.

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