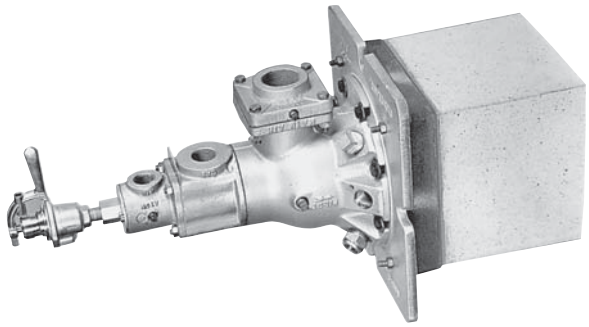
North American Fire•All™ Dual-Fuel™ Burners

Bulletin 6422

6422 Fire·All Dual-Fuel Burners are widely used on heat treat and non-ferrous melting furnaces, kilns, ovens, air heaters, dryers, chemical process equipment, and other applications where superior temperature uniformity is required. (For higher temperature service, specify 6425 Burners.)

These sealed-in, nozzle-mix burners for gas and/or distillate oil are stable on stoichiometric ratio, with large amounts of excess air, or with up to 50% excess fuel (provided additional air for combustion is in the furnace near the burner).



6422 Burner Complete shown with optional (recommended) Sensitrol Oil Valve.

OPERATION

Burners can be lighted at rich, lean, or correct air/fuel ratio, then immediately turned to high fire.

Required gas pressures are low: 1 osi at the burner for coke oven gas, less for natural gas. Required oil pressure at the burner is nearly zero, but a pressure drop of about 10 psi should be taken across the 1813 Sensitrol™ Valve.

The most common ratio control system for 6422 Burners uses a cross-connected regulator and Ratiotrol™. When appropriate for the application, flow balancing systems or fuel only control (see "Excess Air" paragraph) are very satisfactory.

If furnace temperatures after shutdown rise above 1900° F, pass some air through burner to prevent overheating. During gas operation, use at least 4 osi atomizing air to cool atomizer; or for extended periods of operation on gas, atomizer can be withdrawn and stored: Use a backplate and gasket to seal rear of burner (see Dimensions & Parts List 4422-2).

LIGHTING/FLAME SUPERVISION

A 4011-12 pilot set is recommended for individual burner ignition. When multiple burners share a single pilot pre-mix header, a 4021-12 pilot tip per burner with an appropriately sized air/gas mixer is recommended. On gas, direct spark ignition of the burner is available--see Sheet 4055. A manual torch can be used in some applications.

Burners accept ultraviolet (UV) scanners for monitoring pilot or main flame. A flame rod can be used to monitor pilot or main **gas** fire. Adapters are listed in Bulletin 8832.

When using flame supervision, an **interrupted** pilot is required--do not use constant or intermittent pilots. If using direct spark ignition, turn off spark after burner lights.

An observation port is furnished with all burners. Positions of pilot, flame detector, and observation port are interchangeable, as long as pilot and flame detector are mounted in adjacent holes.

STANDARD CONSTRUCTION

Burner bodies are heat resistant cast iron with Inconel air tubes. Mounting plate and tile assembly can be separated from the burner body for installation convenience. Air and gas connection orientation can be rotated in 90° intervals, but air and gas pipes should be brought in from the top or side to prevent oil dripping into them. When reassembling the burner, the pilot and flame detector notches in the tile and mounting must be in proper alignment with the pilot and flame detector connections on the burner body (applies to 6422-2 through 6422-6 sizes). Burner is complete with cast iron mounting plate and 9" long 3200 F castable burner tile which must be supported and sealed in a hard refractory furnace wall. (See page 2 of Dimensions 6422 for optional construction suitable for fiber lined furnaces.) When the furnace wall is thicker than the tile length, the tunnel beyond the end of the burner tile should be flared at a 30° or greater included angle, starting at the OD of the tile. Extension tiles are not recommended. (See Supplement DF-M1 for detailed tile installation recommendations.

TILE SUPPORT JACKETS (6422- -LC, 6422- -L4, 6422- -L9)

6422 Burners with the standard 9" long square tiles are also available with support jackets for applications such as air heaters where frequently the tile is not supported by refractory. They also can be mounted in furnaces when desired. Jackets are available in three different metals and maximum temperature ratings. They must be protected with sufficient insulation so as not to exceed rated temperature. Maximum temperature rating for jacket metals depends upon frequency of heat-up/cool-down cycles. As an example, batch annealing furnaces that are heated and cooled every day should use the "intermittent exposure" ratings. Burners in a continuous annealing furnace that remain at the same temperature for months at a time, can use the higher "continuous" rating.

Designation	Jacket Metal	Continuous max.temp.	Intermittent exposure
6422- -LC	carbon steel	700 F	700 F
6422- -L4	304 SST	1600 F	1500 F
6422- -L9	309 SST	1900 F	1800 F

EXCESS AIR

Excess air can improve temperature uniformity by avoiding hot spots in front of burners, by churning furnace atmosphere to reduce stratification, and by creating positive furnace pressure to eliminate cold air infiltration.

Excess air can give very high effective burner turndown. Thus a furnace used for high temperature work (such as heat treating at 1900º F) with burners firing on stoichiometric air/fuel ratio can also be used for low temperature jobs (such as drawing or drying at 600 F) with burners firing on lean ratio.

Table I. TOTAL AIR CAPACITIES*
scfh
(for Btu/hr, multiply by 100)

Burner designation	16 osi air at burner
6422-2	2 600
6422-3	4 100
6422-4	6 300
6422-5	10 300
6422-6	15 700
6422-7-A	27 000
6422-7-B	33 500
6422-8-A	44 800

* Includes combustion and atomizing air.

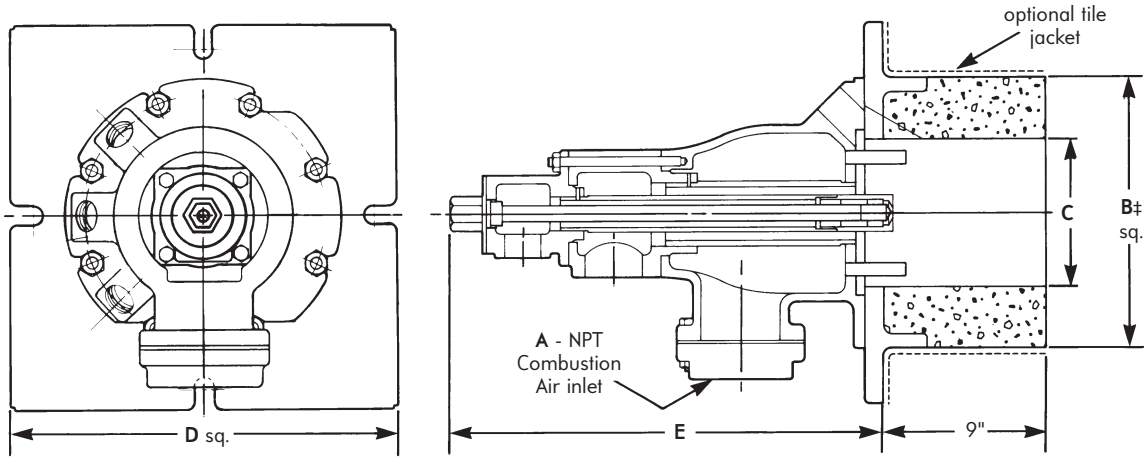
Table II. ATOMIZING AIR CAPACITIES in scfh

Burner designation	air pressure drop across burner in osi					
	14	16	18	20	22	24
6422-2, -3, -4	500	520	560	600	620	650
6422-5	640	690	720	760	800	840
6422-6	800	850	910	950	1000	1050
6422-7-A,-7-B	870	930	990	1040	1100	1150
6422-8-A	2650	2840	3000	3170	3320	3480

Table III. COMBUSTION AIR CAPACITIES in scfh

(not including atomizing air)

Burner designation	air pressure drop across burner in osi							approx. flame lengths with 16 osi Main Air (in open furnace)	
	0.1	1	5	6	8	12	16	gas	oil
6422-2	160	520	1 160	1 270	1 470	1 800	2 100	½′	1½′
6422-3	280	890	1 980	2 160	2 500	3 050	3 550	1½′	2′
6422-4	460	1 450	3 240	3 540	4 100	5 000	5 800	2′	2½′
6422-5	750	2 370	5 300	5 800	6 700	8 150	9 450	2½′	2½′
6422-6	1180	3 700	8 300	9 100	10 500	12 900	14 800	3′	4′
6422-7-A	2070	6 550	14 600	16 000	18 500	22 700	26 200	6′	6′
6422-7-B	2580	8 150	18 200	19 900	23 000	28 200	32 600	6′	5′
6422-8-A	3320	10 500	23 500	25 800	29 700	36 400	42 000	7′	6′



NOTE: For 6422-8-A, air and gas connections cannot be piped in the same plane because the "flower pot" type air connection flange would interfere with the 2½" gas line.

CLEARANCE DIMENSIONS
(for details, see Dimensions 6422)

Burner designation	dimensions in inches				
	A	B‡	C	D	E
6422-2	1¼	8½	5	12	13⅝
6422-3	1½	8½	5	12	13⅝
6422-4	2	8½	5	12	13⅝
6422-5	2½	8½	5	12	13⅝
6422-6	3	8½	5	12	13⅝
6422-7-A	4	10	7	13½	17⅞
6422-7-B	4	10	7	13½	17⅞
6422-8-A	6	10	7	13½	17⅞

‡ 6422- -L_ metal jackets add about 1" to tile OD.

Table IV. MAXIMUM EXCESS AIR RATES in %

(without pilot)

Burner designation	GAS② Combustion Air pressure			OIL① Combustion Air pressure		
	1 osi	8 osi	14 osi	1 osi	8 osi	14 osi
6422-2	—	380	500	—	380	500
6422-3	330	1000	1300	210	480	670
6422-4	560	1560	1560	480	800	900
6422-5	1070	1440	1150	50	250	400
6422-6	380	1000	1400	140	560	610
6422-7-A	3200	4900	1000	160	330	450
6422-7-B	900	1450	1600	150	700	830
6422-8-A	460	660	400	200	280	350

① 14 osi atomizing air.
② It may be necessary to reduce atomizing air pressure to obtain maximum excess air.

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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