

## Fire•All™ Gas Burner North American 4422



### Low NO<sub>x</sub> Nozzle Mix Gas Burners

- Used for kilns, ovens, air heaters, dryers, chemical process equipment
- Chamber temperatures up to 2000°F
- Burner bodies are heat resistant cast iron with Inconel air tubes

# Product Overview | 4422 Fire•All™

4422 Fire•All™ burners are widely used on heat treat and nonferrous melting furnaces, kilns, ovens, air heaters, dryers, chemical process equipment, and other applications where superior temperature uniformity is required.

## OPERATION FROM FUEL RICH TO EXCESS AIR WITH LOW NO<sub>x</sub> EMISSIONS

These sealed-in, nozzle-mix burners are stable over a wide range of air/gas ratios from large amounts of excess air, to stoichiometric (chemically correct air/gas ratio), up to 50% excess fuel (provided additional air for combustion is supplied to the furnace near the burners). Burners can be ignited at rich, lean, or correct air/gas ratio, then immediately turned to high fire. NO<sub>x</sub> emissions are low for all air/gas ratios.

The most common ratio control system for 4422 Fire•All™ burners uses a cross-connected regulator. When appropriate for the application, fully metered flow systems and fuel only control are very satisfactory. Required gas pressures are low: 1 psi at burner for coke oven gas, less for natural gas (approximately 0.3 psi).

## BENEFITS OF 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 1900°F) with burners firing on stoichiometric air/gas ratio can also be used for low temperature jobs (such as drawing or drying at 600°F) with burners firing on lean (excess air) air/gas ratio.

There is a potential increase in fuel consumption because of heating extra air. The benefits, such as better products from improved heating, far outweigh the small increase in fuel costs. Consult your Fives North American Combustion, Inc. field engineer for an analysis of your application.

## APPLICATION TEMPERATURES

The 4422 Fire•All™ burners can be used with chamber temperatures up to 2000°F. If furnace temperature could rise above 1900°F after shutdown, some air should be maintained through the burner to prevent overheating. For higher temperature service (>2000°F), see Bulletin 4425.

## 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. 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 4422-2 through 4422-6 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 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.

Burner designation	Combustion Air Capacities, scfh (for Btu/hr, multiply by 100) air pressure drop across the burner in psi						Approx. flame length with 16 psi main air (in open furnace)	Maximum percent excess air* (at 16 psi & direct spark)
	0.2	1.0	4.0	8.0	12.0	16.0		
4422-2	200	420	910	1270	1500	1920	1½ feet	300
4422-3	360	810	1800	2450	3100	3600	2	450
4422-4	560	1320	2600	3820	4500	5500	2½	450
4422-5	750	2050	4350	6300	7650	9050	3	500
4422-6	1600	3100	7200	10300	12700	14750	4	500
4422-6-B	1900	3400	8100	12100	15000	17300	5	600
4422-7-A	3100	7250	14000	20200	23100	27000	5	2000
4422-7-B	3650	8150	16600	23550	28000	32500	6	2000
4422-8-A	4800	11000	22600	31500	37700	43500	7	2000

\* Excess air rates are improved with constant pilot air.

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## OPTIONAL CONSTRUCTIONS

Burner connections are provided for mounting pilot or direct spark igniter, and flame detector. Burners are shipped with pipe plugs in the openings. Burner flame may be seen through the rear observation port. (Observation port is not to be used for mounting of flame detector.) Burner air pressure can be measured at the tap location provided. For additional construction information refer to Dimensions & Parts List 4422-2.

## LIGHTING AND 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. A manual torch can be used in some applications. The burner can be direct spark ignited with either the 4055 Direct Spark Igniter (4055-D for 4422-2 through -6-B and 4055-B for 4422-7 and -8 sizes) or the 4051-D Air Assisted Igniter. The 4051 Air Assisted Igniter is recommended because it ignites the burners over a wider operating range. If using direct spark ignition of main flame, use standard 6000 volt transformer. Half-wave ignition transformers can be used only with the 4055.

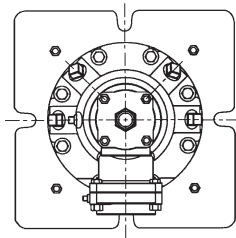
A flame rod or ultraviolet (UV) detector can be installed in one of three holes in the body, using an adapter listed in Bulletin 8832. UV scanners allow igniting with up to 14 psi main air. If flame rods are used, 4422-2 through -6 Burners must be ignited at 1 psi or more main air. Do not apply flame rods to -7 and -8 size burners. When using flame supervision, an interrupted pilot is required--do not use constant or intermittent pilots.

Startup and Adjustment: Refer to Bulletin GB-M1 for startup and adjustment of a nozzle-mix burner with ratio regulator air/fuel ratio control.

## EQUIPMENT OPTIONS

The 4422 Fire•All™ is offered in many physical arrangements to accommodate installation and operating requirements.

## DOUBLE PILOT AND FLAME SUPERVISORY CONNECTION (4422D)

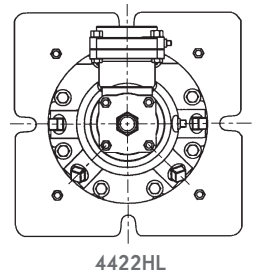


This special burner body has two sets of connections for mounting pilot or spark igniter and flame detector. This permits a variety of piping arrangements or redundant pilots and flame detectors. It is available only in -2 through -6-B burner sizes and is otherwise identical to a standard burner. For dimension information refer to Dimensions & Parts List 4422-5.

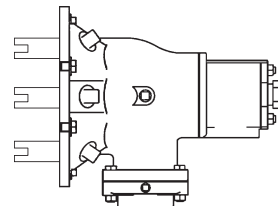
## HINGED BURNER BODY (4422HR OR 4422HL)

There is a hinge between the cast mounting plate and burner body. The hinge provides easy access to the burner tunnel for cleaning deposits that may result from the process (incineration is an example). During operation, a latch firmly holds the burner body against the mounting plate. The burner is available with the hinge on either the right or left side. Pilot and flame detector connections are located opposite the hinge.

**To specify hinge location:** When looking at the rear of the burner with the air pipe entering from above (12 o'clock position) "HL" specifies the hinge on the left side (shown in drawing) while "HR" specifies the hinge on the right side. For dimension information refer to Dimensions & Parts List 4422-6.

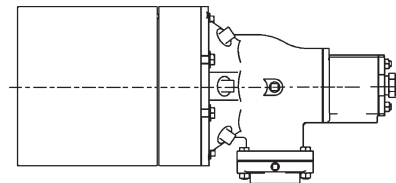


## BURNER ONLY (4422-BO)



The burner can be ordered without the tile and mounting plate. This is useful where a mounting plate and tile already exist or for special construction furnaces. Refer to Dimensions & Parts List 4422-2.

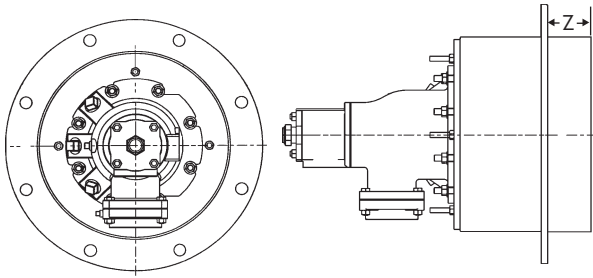
## FLANGELESS MOUNTING (4422-FM)



Used in furnace construction where there is no steel shell, only refractory. Identical to standard burners except no mounting flange. For dimension information refer to Dimensions & Parts List 4422-4. Only available with the standard burner or double boss option.

# Options | 4422 Fire•All™

## FIBER WALL MOUNTING (4422- -Z)



This construction can be used to locate the tile face flush with your furnace wall. Because the round tile is encased in RA330 expanded metal for all but 2" of its length, it is particularly suitable for fiber-lined furnaces or other applications where the tile is not supported and contained. The tile should be insulated to prevent temperature over 1800 F from reaching the metal. Specify the mounting flange "Z" dimension between 2" and 9" to the nearest 0.5" to locate the tile face flush with your inside furnace wall. For dimension information refer to Dimensions & Parts List 4422-7.

## TILE SUPPORT JACKETS (4422- -LC, 4422- -L4, 4422- -L9)

4422 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
4422- -LC	carbon steel	700°F	700°F
4422- -L4	304 SST	1600°F	1500°F
4422- -L9	309 SST	1900°F	1800°F

For additional construction information refer to Dimensions & Parts List 4422-2.

## OTHER EQUIPMENT OPTIONS

For application of burners to chamber temperature over 2000°F, see Bulletin 4425.

For 4422/25 burners with slotted discharge tiles that produce a fishtail shape flame, see Sheet 4425-2.

For application of 4422/25 burners to high combustion chamber pressures (up to 15 psi), contact your Fives North American Combustion, Inc. office.

For use with preheated combustion air systems, refer to Bulletins 4824 (up to 1000°F air) and 4825 (up to 1200°F air).

For burners with larger heating capacity, refer to Bulletin 4545 or 4514 or consult your North American field office.

For firing oil and/or gas (dual fuel) refer to Bulletins 5422 and 6422/25.



## Example 4422 Catalog Numbers

examples are given from smallest to largest available burner sizes

### Standard Burner

4422-2-BO	through	4422-8-ABO	burner only
4422-2	through	4422-8-A	burner complete w/9" tile

### Standard Burner With Tile Jacket

4422-2-LC	through	4422-8-ALC	burner complete w/9" tile and steel jacket
4422-2-L4	through	4422-8-AL4	burner complete w/9" tile and 304 SST jacket
4422-2-L9	through	4422-8-AL9	burner complete w/9" tile and 309 SST jacket

### Burner With Double-Boss Body

4422D-2-BO	through	4422D-6-BBO	burner only w/double-boss body
4422D-2	through	4422D-6-B	burner complete w/9" tile and double boss body
4422D-2-LC	through	4422D-6-BLC	burner complete w/9" tile, double-boss body and steel jacket
4422D-2-L4	through	4422D-6-BL4	burner complete w/9" tile, double-boss body and 304 SST jacket
4422D-2-L9	through	4422D-6-BL9	burner complete w/9" tile, double-boss body and 309 SST jacket

### Burner With Hinged Burner Body

4422HR-2-BO	through	4422HR-8-ABO	burner only w/right-hand hinged body when main air is at 12 o'clock
4422HL-2-BO	through	4422HL-8-ABO	burner only w/left-hand hinged body when main air is at 12 o'clock
4422HR-2	through	4422HR-8-A	burner complete w/9" tile and right-hand hinged body when main air is at 12 o'clock
4422HL-2	through	4422HL-8-A	burner complete w/9" tile and left-hand hinged body when main air is at 12 o'clock
4422HR-2-LC	through	4422HR-8-ALC	burner complete w/9" tile and steel jacket with right-hand hinged body when main air is at 12 o'clock
4422HL-2-LC	through	4422HL-8-ALC	burner complete w/9" tile and steel jacket with left-hand hinged body when main air is at 12 o'clock
4422HR-2-L4	through	4422HR-8-AL4	burner complete w/9" tile and 304 SST jacket with right-hand hinged body when main air is at 12 o'clock
4422HL-2-L4	through	4422HL-8-AL4	burner complete w/9" tile and 304 SST jacket with left-hand hinged body when main air is at 12 o'clock
4422HR-2-L9	through	4422HR-2-AL9	burner complete w/9" tile and 309 SST jacket with right-hand hinged body when main air is at 12 o'clock
4422HL-2-L9	through	4422HL-2-AL9	burner complete w/9" tile and 309 SST jacket with left-hand hinged body when main air is at 12 o'clock

### Fiber Wall Mounting Burners

4422-2-Z	through	4422-8-AZ	burner complete w/"Z" dimension (2" to 9" round)
4422D-2-Z	through	4422D-6-BZ	burner complete w/double-boss body and "Z" dimension (2" to 9" round)

### Flangeless Burners

4422-2-FM	through	4422-8-AFM	burner complete w/9" tile and flangeless mounting
4422D-2-FM	through	4422D-6-BFM	burner complete w/9" tile, double-boss body and flangeless 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. Components in combustion systems may exceed 160°F (71°C) surface temperatures and present hot surface contact hazard. Fives North American Combustion, Inc. suggests the use of combustion systems that are in compliance with all Safety Codes, Standards, Regulations and Directives; and care in operation.

#### CONTACT

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