

# BURNERS EXCESS AIR SINGLE TUNNEL "COOL FLAME"

MODEL: 3502-XNM

Revision: 0

BULLETIN  
3502

## DESCRIPTION

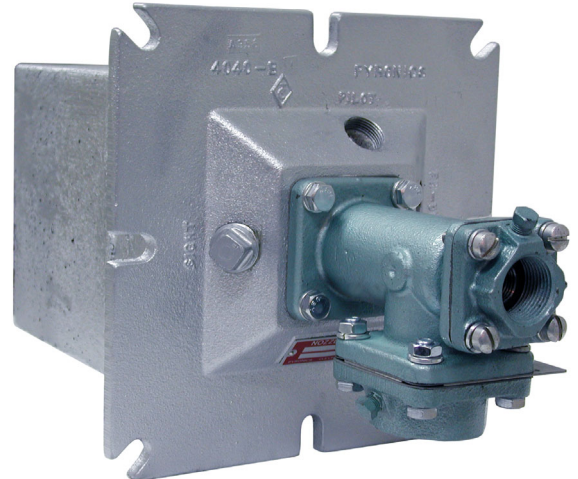
The XNM Series Excess Air Burners are intermediate flame length, nozzle mixing types designed for 800% excess air. A unique design and stepped tunnel burner blocks produce excellent flame stability at all firing rates.

New air-gas mixing principles produce very high excess air combustion without appreciable fumes at lower equipment costs.

All sizes develop maximum ratings with 6 oz. air pressure and 2.5 oz. gas pressure at the burners.

All XNM burners have inconel flame distributors and high temperature refractory blocks. Gas adjuster and flanged connections are standard. Pipe unions are not normally required.

The integral mounting flange is designed for sealed firing in positive, neutral, or negative combustion chambers.



## FEATURES

- 500% - 800% excess air
- Preheated air up to 750°F
- Excellent flame stability with:
  - Excess Air
  - Excess Gas
  - On Ratio Firing
- Instant lighting at all firing ranges
- High discharge velocities
- Low air and gas pressures required
- Unique stepped tunnel design
- Operation to 2500°F
- Rugged, heavy-duty industrial construction
- Burner ports for pilot, flame monitoring, and sighting (sight glass not included)
- Intermediate flame length
- Max. capacities: 200,000 to 6,000,000 BTU/hr

## APPLICATIONS

- Annealing Furnaces
- Air Heaters
- Heat Treat Furnaces
- Spheroidizing Units
- Metal Melters
- Incinerators
- Stress Relieving Furnaces
- Brick Kilns
- Plate Heating
- Sand Drying
- Pebble Heaters
- Crucible Heating
- Multiple Purpose Furnaces

CAUTION: Operation of combustion equipment can be hazardous resulting in bodily injury or equipment damage. Each burner should be supervised by a combustion safeguard and only qualified personnel should install, make system adjustments and perform any required service.



**pyronics inc.**

COMBUSTION FOR INDUSTRY

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# BURNERS EXCESS AIR SINGLE TUNNEL

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## DESCRIPTION

High speed heat transfer will occur in convection systems with maximum turbulence and scrubbing action of the hot gasses against the work pieces. High discharge velocities from burners increase furnace hot gas circulation and promote rapid heat transfer.

Shorter firing cycles and lower fuel consumption result from better temperature uniformity requiring less soak time.

“On ratio” firing systems can produce the required velocities at high fire but drop to 10% to 15% of this velocity at low fire.

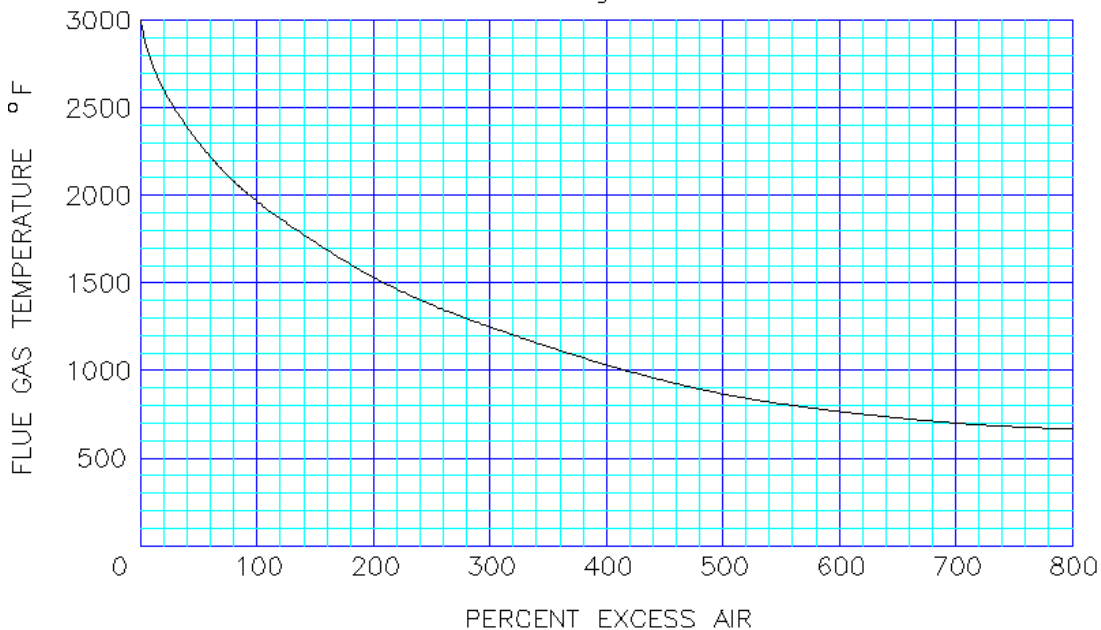
Excess air systems use a constant air flow and “on-ratio” combustion at high fire. Only the gas flow is reduced for fuel input turndown. The total volume of hot gases and velocity remains nearly constant at all firing rates. Furnace pressures, turbulence, and heat transfer rates are uniform.

Excess Air Burners are variable temperature air heaters. At high fire flame temperatures may be 2500°F or higher. As fuel only is decreased, exit gas temperatures drop to as low as 600°F with 800% excess air.

This wide range of constant volume, precisely controlled temperatures is used in dual purpose furnaces for annealing or stress relieving at high temperature as will as drawing or tempering at lower temperature.

Ceramic kilns use this system for the drying, oxidizing, and vitrification zones with excellent results.

Fig. 1



Model No.	Excess Air Operation			On Ratio Operation				
	Air Flow SCFH	Gas Flow SCFH		1000's BTU/hr @ Various Air Pressures				
		Max.	Min.	1/4 oz.	3/4 oz.	2.5 oz.	4 oz.	6 oz.
10XNM	2,500	250	28	55	80	160	210	250
12XNM	3,500	350	39	80	110	220	290	350
16XNM	7,000	700	78	150	220	440	570	700
20XNM	10,000	1000	110	220	320	630	830	1000
24XNM	15,000	1500	167	330	480	960	1250	1500
32XNM	30,000	3000	333	660	960	1920	2500	3000
48XNM	60,000	6000	667	1320	1920	3840	5000	6000

Note: Air pressure of burner 6 oz. and gas pressure 2.5 oz. to develop maximum ratings either excess air or “on-ratio.”

# BURNERS EXCESS AIR SINGLE TUNNEL

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## OPERATION

Maximum burner temperatures are obtained at high fire with proper air to gas ratio. As gas flow only is reduced burner output temperature lowers approximately as shown in curve (see Fig. 1).

With constant air flow, total volume of combustion products and discharge velocities will remain nearly constant. This produces extremely wide effective turndown ratios. Transmission of heat throughout a work load remains uniform.

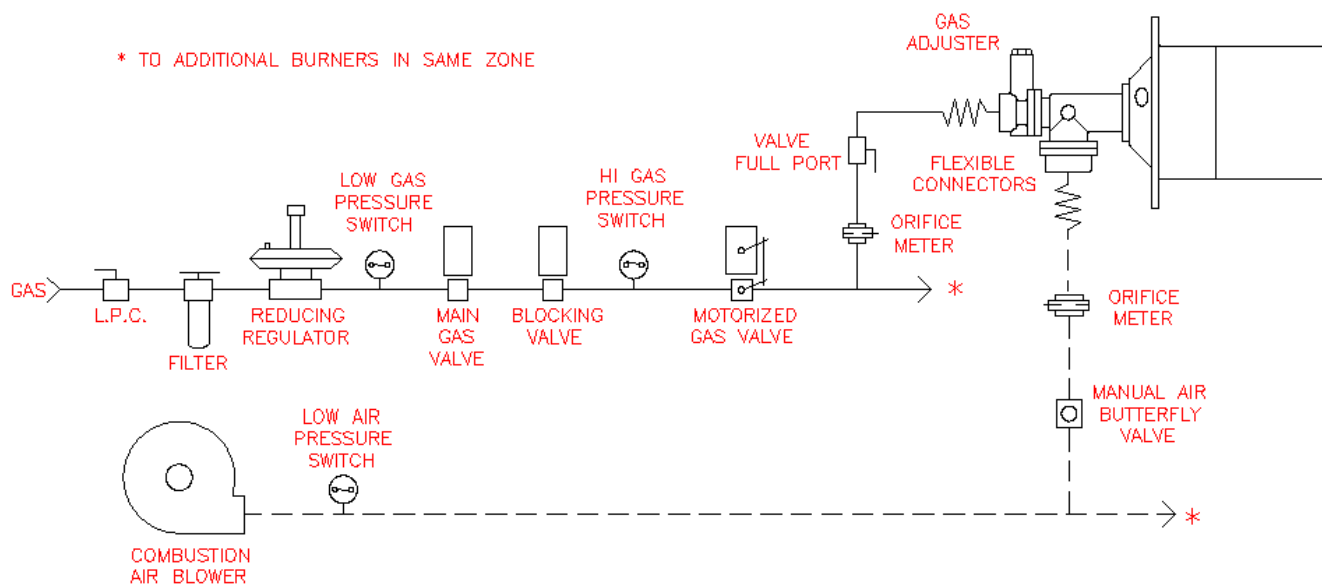


Fig. 2

A typical recommended piping arrangement for a constant air flow system is shown in Fig. 2. Each burner is adjusted for "on-ratio" combustion at maximum air flow.

Turndown is obtained from the master gas flow control valve for the system or zone. Air butterfly valves at each burner are used to balance the heat patterns on multiple burner systems.

Orifice flow meters (see Bulletin 5720) are suggested to measure gas and air flows.

Electronic flame detection systems are usually required on all units. For multiple burner flame protection, see Sens-A-Flame Bulletin 7112. For a single burner, see Bulletin 7131.

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## OPERATION CONT.

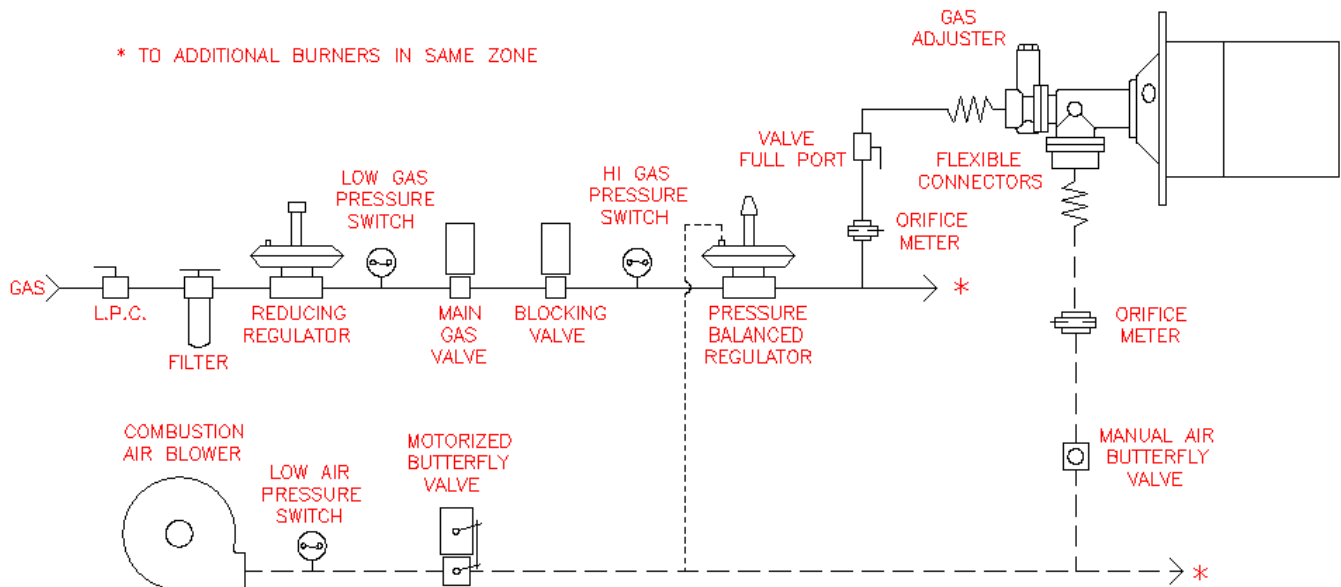


Fig. 3

“On-ratio” piping for XNM burners is shown in Fig. 3.

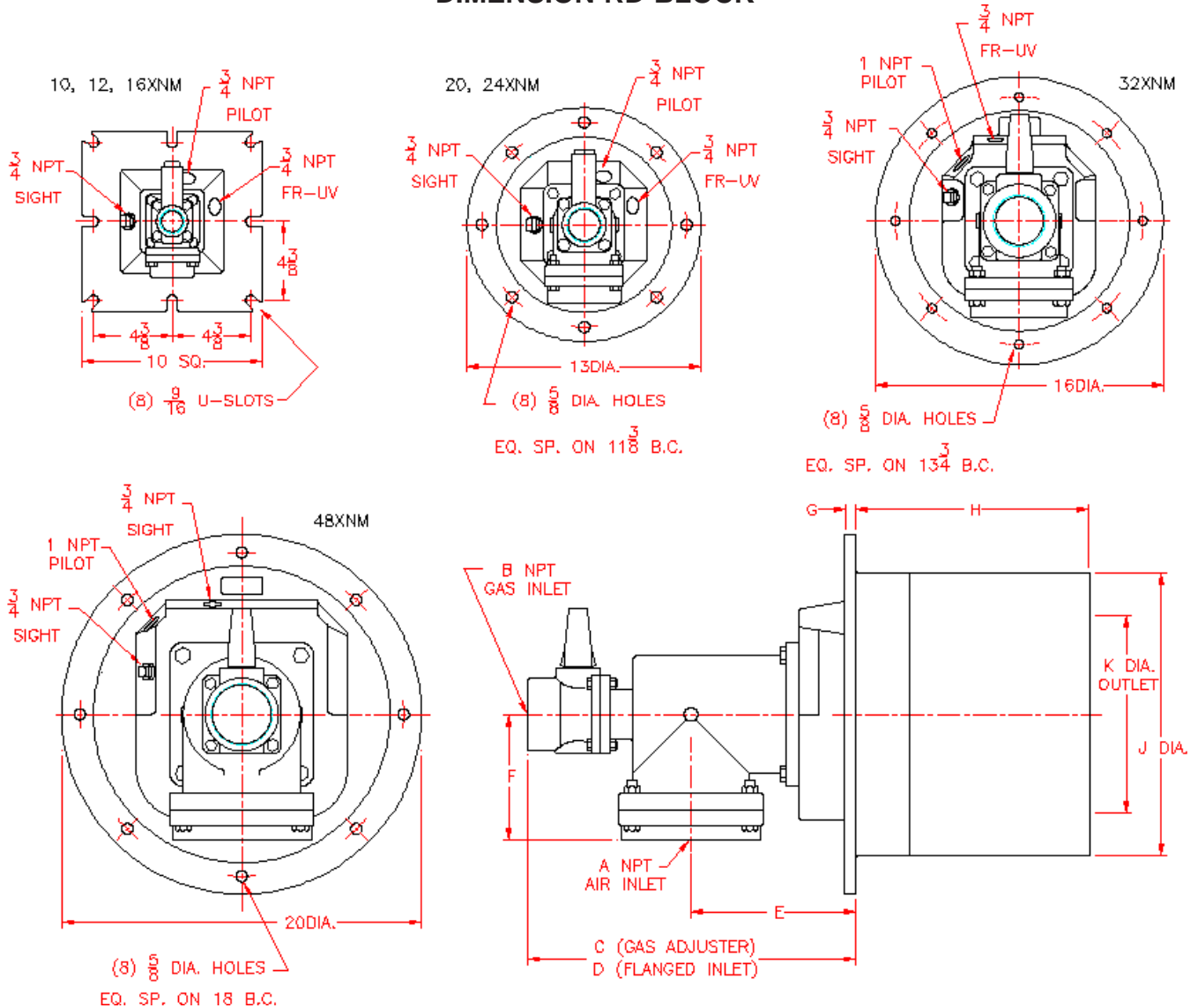
Modulation of the main air valve changes the inlet pressure and air flow to each burner. The air impulse to the Balanced Zero Regulator will modulate the gas outlet pressure to always equal the air pressure.

With equal pressure drops across both orifices the gas and air flows will always maintain the same proportional relationship. The adjustable gas orifice is set at high fire for proper flame and locked. Once set, the fuel to air ratio will remain constant at all firing rates.

# BURNERS EXCESS AIR SINGLE TUNNEL

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## DIMENSION RD BLOCK



Model No.	A NPT	B NPT	C (GA)	D (FLG)	E	F	G	H	J DIA.	K DIA.	LBS
10 XNM-R	1-1/4	1	8-3/8	4-3/4	4-3/4	3-1/4	3/8	9	7	4-1/4	45
12 XNM-R	1-1/2	1	8-3/8	4-3/4	4-3/4	3-1/8	3/8	9	7	4-1/4	45
16 XNM-R	2	1	9-3/8	5-1/4	5-1/4	3-3/8	3/8	9	7	4-1/2	45
20 XNM-R	2-1/2	1-1/2	11-3/8	6-1/8	6-1/8	4-3/8	1/2	10	8	5	70
24 XNM-R	3	1-1/2	11-3/8	6-1/8	6-1/8	4-1/4	1/2	10	8	5	70
32 XNM-R	4	2-1/2	16-5/8	14-1/8	8-5/8	5-1/2	1/2	12	11-3/4	7-1/2	155
48 XNM-R	6	3	18-1/4	15-3/4	9-1/4	7	5/8	13	15-3/4	11	260

Note: All dimensions are in inches ± 1/8.

Shipping weights are approx. and will vary ± 5% due to block style.

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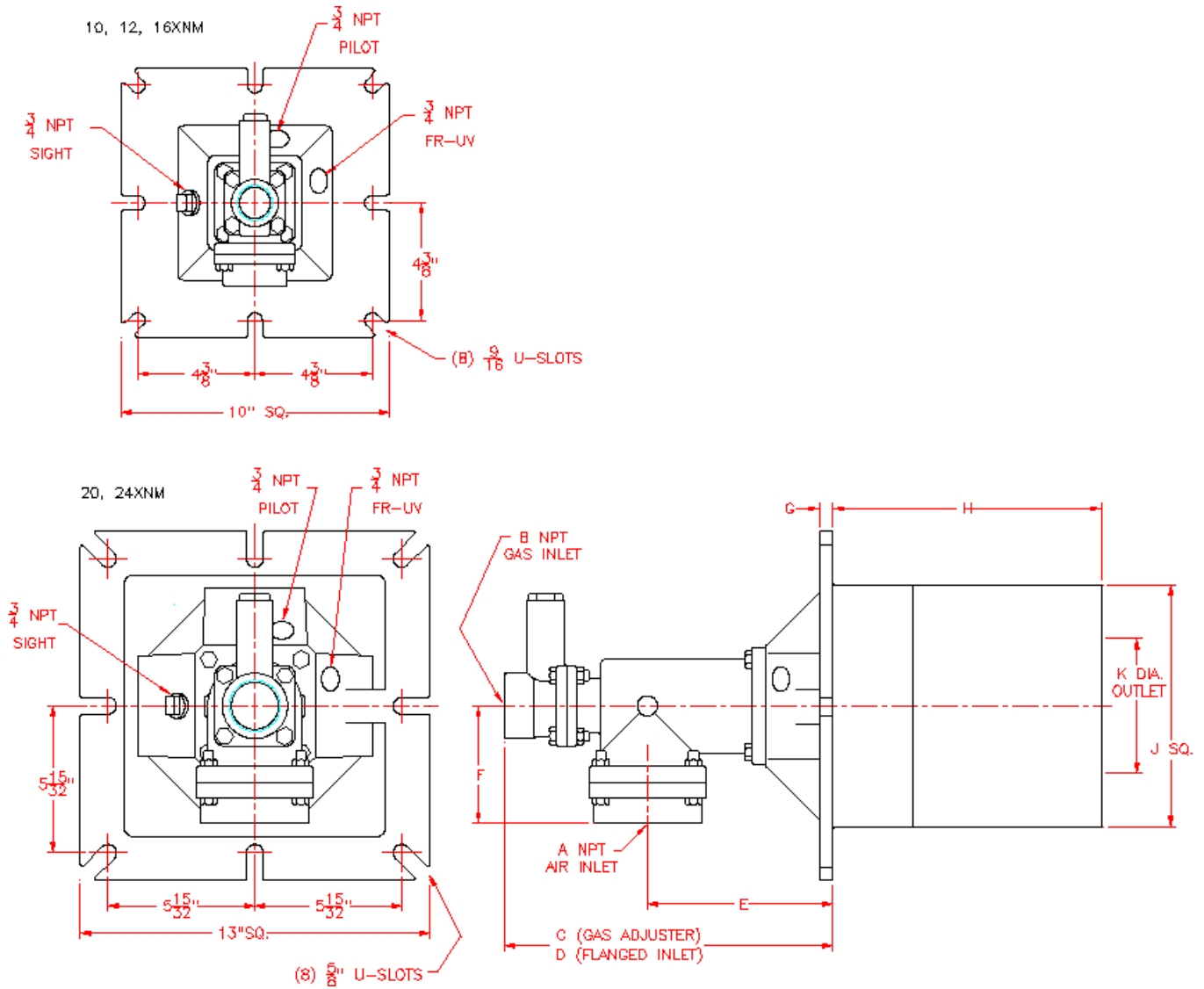
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# BURNERS EXCESS AIR SINGLE TUNNEL

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## DIMENSION SQ BLOCK



Model No.	A NPT	B NPT	C (GA)	D (FLG)	E	F	G	H	J SQ	K DIA
10 XNM-S	1-1/4	1	8-3/8	7-3/8	4-3/4	3-1/4	3/8	9	7	4-1/4
12 XNM-S	1-1/2	1	8-3/8	7-3/8	4-3/4	3-1/8	3/8	9	7	4-1/4
16 XNM-S	2	1	9-3/8	8-3/8	5-1/4	3-3/8	3/8	9	7	4-1/2
20 XNM-S	2-1/2	1-1/2	12-1/4	11-1/8	7	4-3/8	1/2	10	9	5
24 XNM-S	3	1-1/2	12-1/4	11-1/8	7	4-1/4	1/2	10	9	5

Note: All dimensions are in inches  $\pm$  1/8.

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## ORDERING INFORMATION

1. Select the number and sizes of Excess Air Nozzle Mix Burners based on total heat input and heat pattern required.
2. Specify quantity and model numbers of burners.
3. Add a subscript to number to indicate type of burner block holder and refractory required.

- 1 With Std. Refractory less Jacket 3000°F.
- 2 With Hi-Temp. Refractory less Jacket 3300°F.
- C With Alloy Jacket & Std. Refractory 3000°F.
- D With Alloy Jacket & Hi-Temp. Refractory 3300°F.
- E With Short Alloy Jacket & Standard Refractory 3000°F.
- F With Short Alloy Jacket & Hi-Temp. Refractory 3300°F.

4. Specify pilots or direct spark required.

#62 or 64PBST for 10, 12, 16, 20, and 24 XNM ----- DSE-1  
#84 or 86PBST for 32 and 48 XNM ----- DSE-11

5. Specify accessory equipment such as blowers, gas and air regulators, manual reset safety shut-off valves, orifice flow meters, gas cocks, air valves, controllers, etc.

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