

Low NO_x Flat Flame™ Gas Burners

Instructions 4832-2

ROOF MOUNTING INSTRUCTIONS

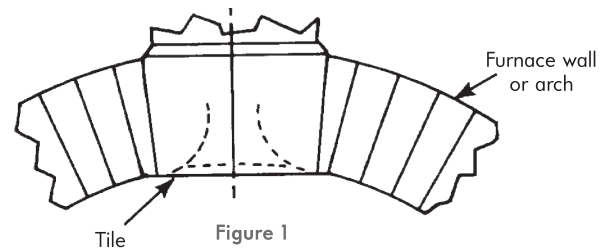
HANDLE WITH CARE--refractories are brittle and fragile. Always set tiles on corrugated cardboard--gently.

FLEXIBLE AIR AND GAS CONNECTIONS are recommended for all installations to avoid strain on tile.

For good Flat Flame burner operation, **it is essential that hot face of burner tile be flush with surrounding refractory.** In curved wall or arch, part of burner tile will project through as shown in Figure 1.

In roofs more than 13" thick, where air pipe to 4832 Burner with a 9" deep tile will not clear outside face, a recess must be left to accommodate piping. Such recess is not required for 4831 Burners, since air pipe enters from rear.

Flat Flame burner cover plates run hotter than conventional burner mountings, but their heat-resisting cast iron construction can withstand it. To avoid excessive heat buildup, insulating material debris should not be allowed to overlap cover plate.



SUPPORTING BURNERS*

- A. Tapered tiles provide a simple means for supporting flat flame burners in arched roofs per Figure 1.
- B. 4832 Burners with conventional flangeless wall mountings can be suspended in the roof with a 4832BR (round) or 4832BS (square) suspension adapter set (see Figure 2). Fabricated steel strap supports are suitable for 4831 Burners. Do not remove nuts that hold mounting plate to tile. Threaded shanks are long enough to permit use of a support strap and extra nut.
- C. An alternate method for 4832 Burners, suitable under certain conditions, is shown in Figure 3. Channels direct from the buckstays to the cover plate are usable **only** where they will not be subjected to excessive furnace heat of flue gases passing around edges of burner tile. This imposes two limitations:
 1. Furnace pressure must be zero or negative at burner tile.
 2. Furnace roof must be thin enough to permit pouring a 1½" or 2" layer of lightweight castable over the step in the tile but not over the cover plate.

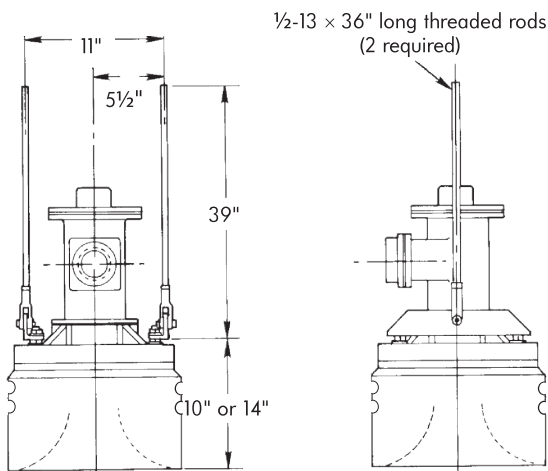


Figure 2

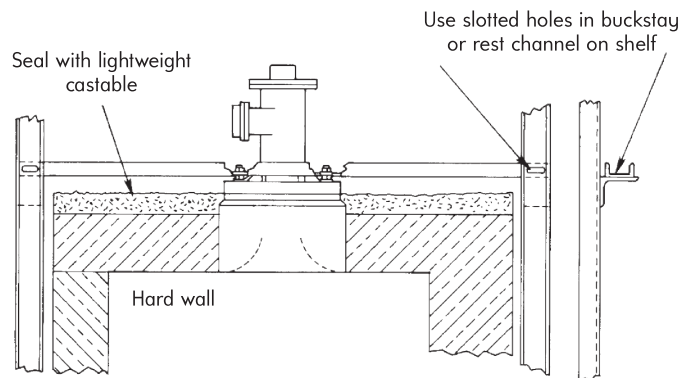


Figure 3

* See "Special Mountings" on Sheet 4832-6.

SEALING AROUND BURNER TILES

Tile life will be greatly improved if compression can be maintained all around the perimeter. It is most important to prevent fluing of hot gases between tile and adjacent refractory. In a sprung arch, use a tapered tile (and flexible air and gas connections). If this cannot be done, a matrix should be cast or rammed all around each tile (see Figure 4).

When tile is smaller than roof opening, gap can be filled by one of the following methods:

- A. Fill areas up to 6" wide with castable refractory, which should be keyed into brick work for support. Wider areas should have anchors cast into them with overhead steel work supporting the mass. When pouring or ramming against existing refractory, wet the refractory surface so it will not absorb water from the new material.
- B. To fill larger gaps (6" or more in width), it is suggested (a) that a monolithic roof be cast or rammed around the positioned burner tiles, or (b) that a suspended roof of fired shapes (such as made by Detrick) be installed in accord with manufacturer's recommendations.

In all cases, cast refractory should overlap the angled step at the top of the burner tile (Figure 4).

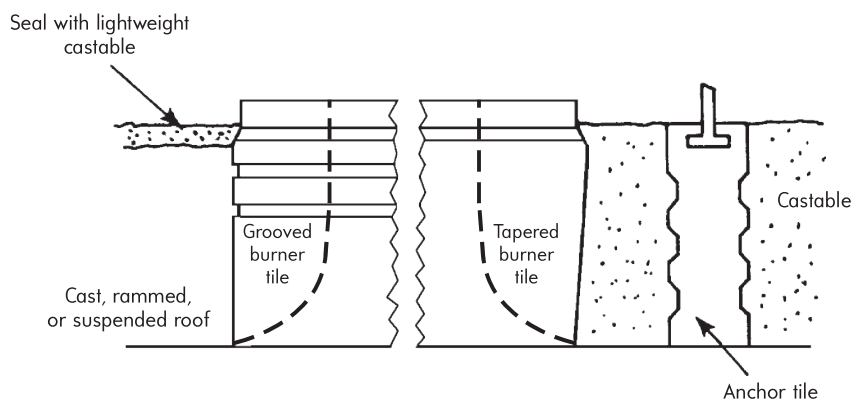


Figure 4

REPLACING TILES

Handle with care. Unmounted tiles are even more fragile than mounted ones.

Remove cast iron burner cover plate from furnace and clean thoroughly. Butter entire top surface of replacement tile with a $\frac{3}{8}$ " to $\frac{1}{2}$ " thick layer of air setting high temperature refractory cement. Tiles come notched for pilot and flame supervision. Line up with cover plate.

Gently press cover plate onto tile. Place washers and nuts on the four anchor bolts and tighten them evenly by hand. Then tighten evenly with a wrench (leaving $\frac{1}{8}$ " or less cement between cover plate and tile at tile throat).

Loosen nuts $\frac{1}{4}$ turn. Remove excess mortar and form a smooth throat at junction between metal cover plate and refractory tile. Repeat last step after several hours if necessary: Mortar may ooze out of junction for some time after mounting is pressed on.

On some burner sizes, top of tile may intrude in cover plate pilot and flame supervision holes. If pilot and/or flame supervision are to be used, ream out tile through these holes to provide an unobstructed view.

IMPORTANT: After installing new tiles, bring furnace up to temperature slowly.

FLAT FLAME™ PATTERNS SUGGESTED BURNER SPACING

4832 Flat Flame Patterns. The following data is based on Flat Flame Burners operating on correct air/fuel ratio in an open cold furnace.

Table 1. MAXIMUM FORWARD FLAME TRAVEL, from tile face, inches (cold air).

Burner	air pressure drop across burner		
	1 osi	4 osi	16 osi
-0 (¾")	†	2½	1
-1 (1")	†	2	1
-2 (1¼")	6	4-5	3-4
-3 (1½")	4-5	3-4	2-3
-4 (2")	4-5	4	3-4
-5 (2½")	4-5	4	3-4
-6 (3")	6	4-5	3-4
-7 (4")	6	4-5	3-4
-8-A (6")	3	3	3
-8-B (6")	4	4	4

Table 2. FLAT FLAME DIAMETERS, inches (cold air).

Burner	air pressure drop across burner		
	1 osi	4 osi	16 osi
-0 (¾")	†	6	8
-1 (1")	†	8	12
-2 (1¼")	6-7	10-12	13-15
-3 (1½")	6-8	13-15	15-17
-4 (2")	13-15	19-21	22-24
-5 (2½")	10-12	20-22	24-26
-6 (3")	10-12	18-22	28-32
-7 (4")	10-12	20-24	32-36
-8-A (6")	28	28	30
-8-B (6")	24	30	36

Suggested Flat Flame Burner Spacings and Burner-to-Load Distances. The burner spacing will depend to a great extent on the desired firing rate and the shape of area to be heated, but the following general guides are suggested. CONSULT A FIVES NORTH AMERICAN ENGINEER FOR ASSISTANCE IN LOCATING BURNERS.

Table 3. BURNER SPACING and BURNER-TO-LOAD DISTANCES.

Burner size	Suggested tile face to load*	Suggested burner C _L to C _L	
		minimum	maximum
-0 (¾")	7"	7½"	16"
-1 (1")	7"	7½"	20"
-2 (1¼")	9"	13½"	30"
-3 (1½")	9"	16"	36"
-4 (2")	9"	18"	48"
-5 (2½")	11"	24"	62"
-6 (3")	12"	27"	77"
-7 (4")	14"	33"	100"
-8-A (6")	15"	35"	120"
-8-B (6")	15"	40"	140"

The minimum center-to-center spacing will give a very high firing rate. The dimensions for maximum centers may be exceeded if desired, but no performance data is available. As burners are spaced farther apart, the burner-to-load distance should be increased accordingly, up to 18" or 24" depending on size.

*Minimum to avoid flame impingement. In some cases better results may be attained by greater distances.

†Flame is entirely within tile.

FLAT FLAME™ BURNERS
ORIFICE PLATE INSTRUCTIONS

All 4832 Burners have an orifice plate in their main air connection. Plates are mounted as shown in Figure 5 to give flame clockwise spin (viewed from rear of burner).

4832-2 thru -7

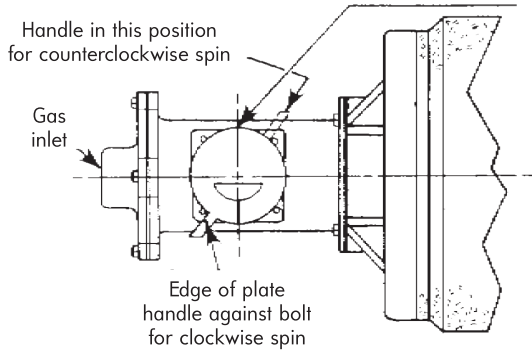


Figure 5. Standard Orifice position

Pressure tap on main air flange must be on side opposite plate handle, as indicated by arrows. If necessary, rotate main air flange to achieve this.

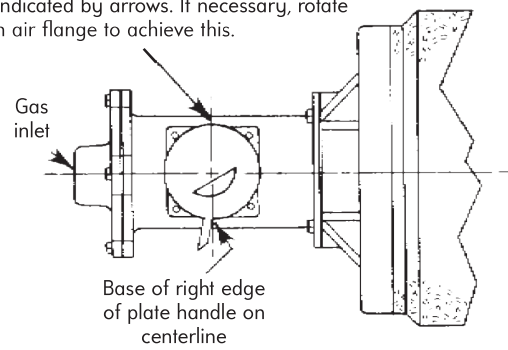


Figure 6. Orifice Position for Dual-Fuel Conversion
(See Sheet 6832-1)

Spin can be reversed by removing two flange bolts and rotating the orifice plate 180°.

For field conversion of -5 and -6 sizes from gas to dual-fuel, position orifice as shown in Figure 6. For conversion of other sizes, orifice is positioned per Figure 5.

Pilot and flame detector must be installed so spin carries pilot flame toward the flame detector (Figure 7). If spin is counterclockwise, reverse pilot and flame detector positions.

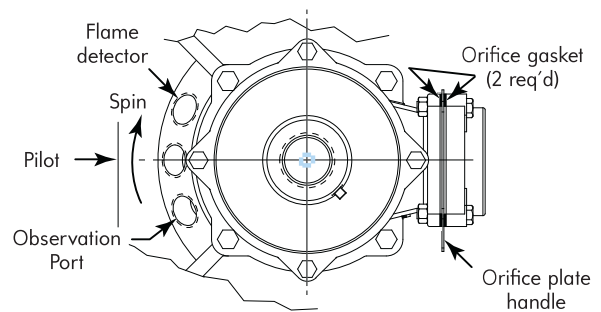
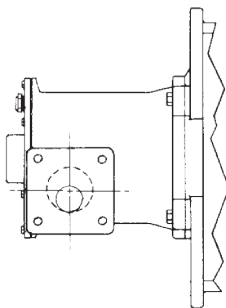
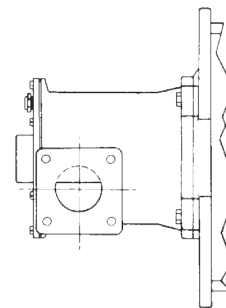


Figure 7. Pilot/Flame Detector positions

4832-8-A/-8-B
(Formerly 4836-8-A and -8-B)



4832-8-A orifice plate is positioned as shown at left. Position for 4832-8-B orifice plate is shown at right. Plates should not be repositioned.



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

fna.sales@fivesgroup.com
T +1 800 626 3477 - F +1 216 373 4237

Fives North American Combustion, Inc.
4455 East 71st Street - Cleveland, OH 44105 - USA
www.fivesgroup.com



fives
Industry can do it

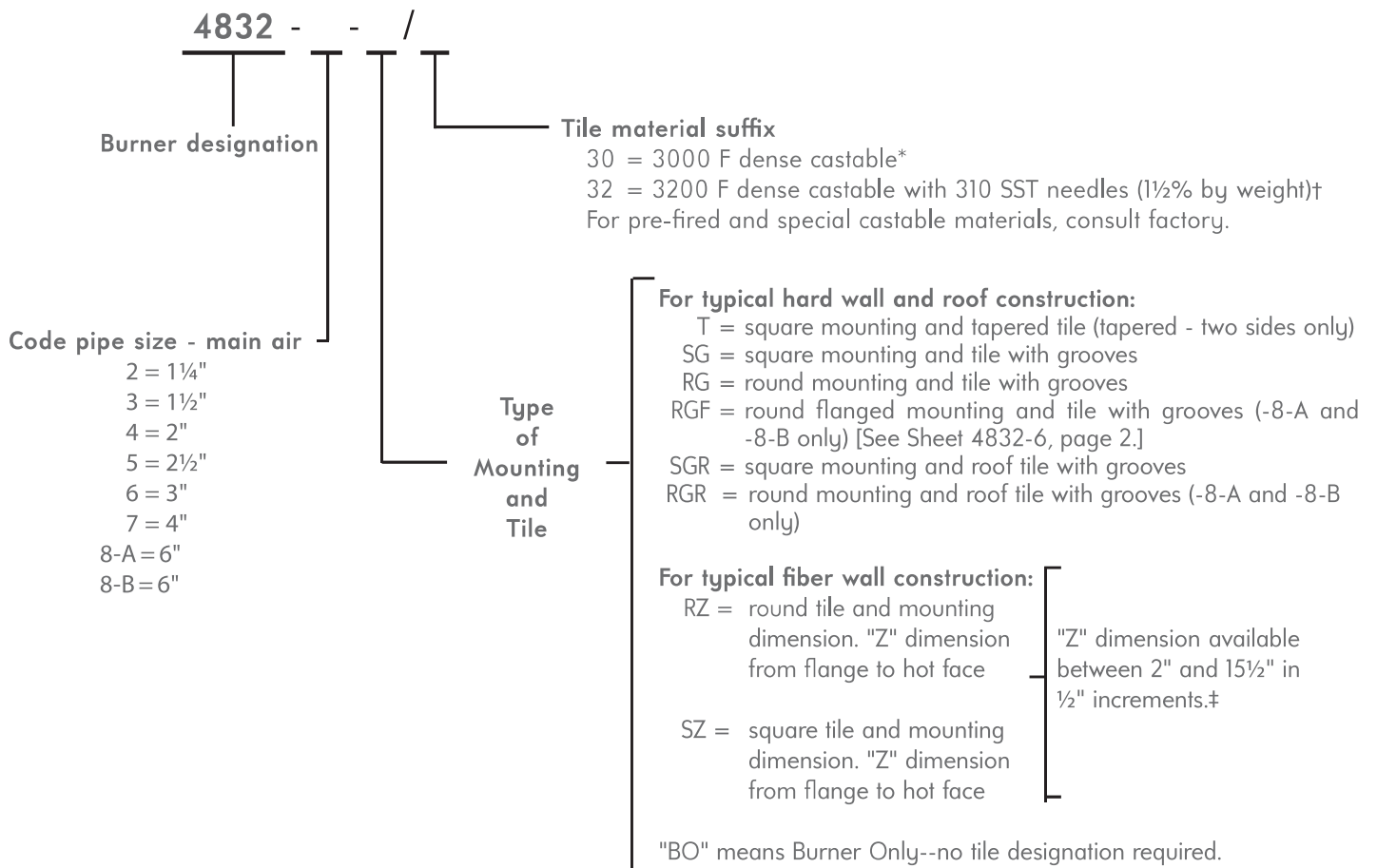


North American Low NO_x Standard Flat Flame™ Gas Burners - Ordering Procedure

Product code prefixes will no longer be used to identify tile and mounting assemblies. Tile and mounting assemblies will be identified by part number only. See Sheet 4832-5. "Z" dimension on Z-type tiles is now specified in the configuration.

4832 (Complete Burners only)

(Use 4832D for 13" deep tiles.)



<i>Examples:</i>	4832-4-SG/30	2" Burner complete with 3000°F, 13½" square grooved 9" deep tile and square, cast flangeless mounting.	
	4832D-5-RG/32	2½" Burner complete with 3200°F, 13¾" diameter round, grooved 13" deep tile and round, cast flangeless mounting.	
	4832-3-BO	1½" Burner only.	
	4832-6-SZ/30	3" Burner complete with 3000°F, 9" deep square tile and flanged fabricated mounting. Must specify "Z" dimension as part of configuration.	
	4832D-4-RZ/32	2" Burner complete with 3200°F, 13" deep round tile and flanged fabricated mounting. Must specify "Z" dimension as part of configuration.	
Formerly 4836	}	4832-7-SGR/32	4" Burner complete with 3200°F, 24" square grooved 9" deep tile and square, cast flangeless mounting and four hanger rod assemblies for roof mounting.
		4832-8-A/SGR/32	6" Burner complete with 3200°F, 20" square grooved 9" deep tile and square, cast flangeless mounting, and four hanger rod assemblies for roof mounting.
		4832D-8-B/RGR/32	6" Burner complete with 3200°F, 21" diameter round grooved 13" deep tile and round cast flangeless mounting, and four hanger rod assemblies for roof mounting.

* Not available in 4832 roof-mounted burners--must specify 3200°F material.

† 4832 roof tiles and tiles rated for 3200°F service temperature are supplied with this construction.

‡ For "Z" ≤ 9, a 9" deep tile is supplied. For "Z" > 9, a 13" deep tile is supplied. The tile may therefore extend back beyond the mounting flange. See page 2 of the 4832 Dimensions Sheet to calculate the flange to main air connection distance once a "Z" dimension is chosen.

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

fna.sales@fivesgroup.com

T +1 800 626 3477 - F +1 216 373 4237

Fives North American Combustion, Inc.
4455 East 71st Street - Cleveland, OH 44105 - USA
www.fivesgroup.com



fives
Industry can do it

Low NOx Flat Flame™ Burner Tiles

Sheet 4832-4

All tiles are grooved except for tapered and fiber wall tiles.

4832 (Wall)

Burner size/shape	3000°F castable		3200°F castable	
	9" deep	13" deep	9" deep	13" deep
4832-2, -3, -4				
Standard tile				
Round	4-8678-1	4-8678-7	4-8678-3	4-8678-9
Square	4-8686-1	4-8686-7	4-8686-3	4-8686-9
Square tapered	4-8688-1	4-8688-7	4-8688-3	4-8688-9
Fiber wall tile				
Round with liner	4-6982-1	4-6982-7	4-6982-3	4-6982-9
Square with liner	4-7401-1	4-7401-7	4-7401-3	4-7401-9
4832-5, -6, -7				
Standard tile				
Round	4-8678-2	4-8678-8	4-8678-4	4-8678-10
Square	4-8686-2	4-8686-8	4-8686-4	4-8686-10
Square tapered	4-8688-2	4-8688-8	4-8688-4	4-8688-10
Fiber wall tile*				
Round with liner	4-6982-2	4-6982-8	4-6982-4	4-6982-10
Square with liner	4-7401-2	4-7401-8	4-7401-4	4-7401-10

* suitable for wall installation only

4832 (Roof) - for use in fiber and hard refractory roofs

Burner size/shape	3200°F castable	
	9" deep	13" deep
4832-2, -3, -4		
Square tile	OB4-0402-5	OB4-0402-7
4832-5, -6, -7		
Square tile	OB4-0402-6	OB4-0402-8
4832-8-A, -8-B		
Square tile	OC4-0975-1	OC4-0975-2
Round tile	OC4-2512-1	OC4-2512-2

NOTE:

Consult Fives North American Combustion, Inc. for delivery of 13" deep tiles--tooling not yet available for all configurations.

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

fna.sales@fivesgroup.com

T +1 800 626 3477 - F +1 216 373 4237

Fives North American Combustion, Inc.
4455 East 71st Street - Cleveland, OH 44105 - USA
www.fivesgroup.com



North American Low NOx Flat Flame™ Burners Tile and Mounting Assemblies

Sheet 4832-5

All tiles have externally grooved sides except the tapered and fiber wall versions.

4832 (Wall)

Burner size/shape	3000 F castable		3200 F castable	
	9" deep	13" deep	9" deep	13" deep
4832-2, -3, -4				
Standard tile				
Round	4-28571-1	4-28571-7	4-28571-3	4-28571-9
Square	4-28570-1	4-28570-7	4-28570-3	4-28570-9
Square tapered	4-28569-1	4-28569-7	4-28569-3	4-28569-9
Fiber wall tile	See page 2		See page 2	
4832-5, -6, -7				
Standard tile				
Round	4-28571-2	4-28571-8	4-28571-4	4-28571-10
Square	4-28570-2	4-28570-8	4-28570-4	4-28570-10
Square tapered	4-28569-2	4-28569-8	4-28569-4	4-28569-10
Fiber wall tile♦	See page 2		See page 2	
4832-8-A, -8 -B				
Round, flanged*			4-28629-1	4-28625-2

* See Sheet 4832-6, page 2

♦ Suitable for wall installation only

4832 (Roof) - for use in fiber and hard refractory roofs

Burner size/shape	3200°F castable	
	9" deep	13" deep
4832-2, -3, -4 (Square tile)	4-28626-1	4-28626-3
4832-5, -6, -7 (Square tile)	4-28626-2	4-28626-4
4832-8-A, -8-B (Square tile)	4-28627-1	4-28627-2
(Round tile)	4-28628-1	4-28628-2

NOTE:

Consult Fives North American Combustion, Inc. for delivery of 13" deep tiles--tooling not yet available for all configurations.

**FIBER WALL TILE and MOUNTING ASSEMBLY
(Round)**

Figure 1

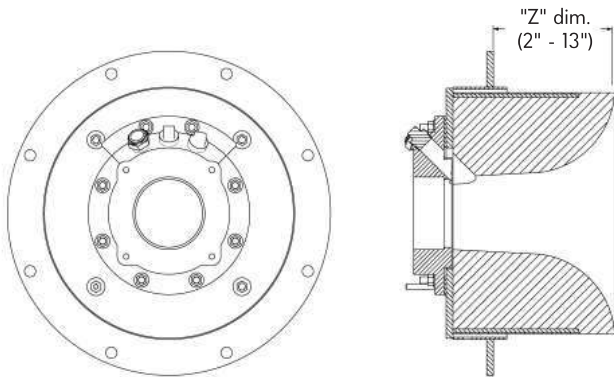
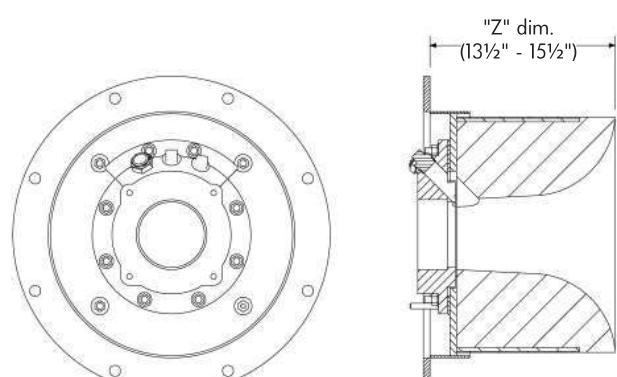


Figure 2



Burner Size	9" Deep (Fig. 1) Z = 2" to 9"	13" Deep (Fig. 1) Z = 9½" to 13"	13" Deep (Fig. 2) Z = 13½" to 15½"
4832-2, -3, -4	4-28572-1/X.X/T	-	-
4832D-2, -3, -4	-	4-28572-2/X.X/T	4-28572-3/X.X/T
4832-5, -6, -7	4-28572-4/X.X/T	-	-
4832D-5, -6, -7	-	4-28572-5/X.X/T	4-28572-6/X.X/T

**FIBER WALL TILE and MOUNTING ASSEMBLY
(Square)**

Figure 1

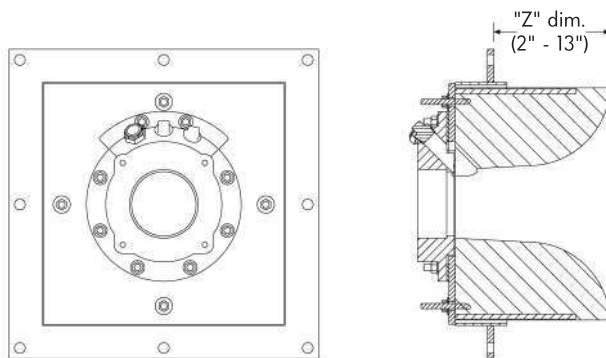
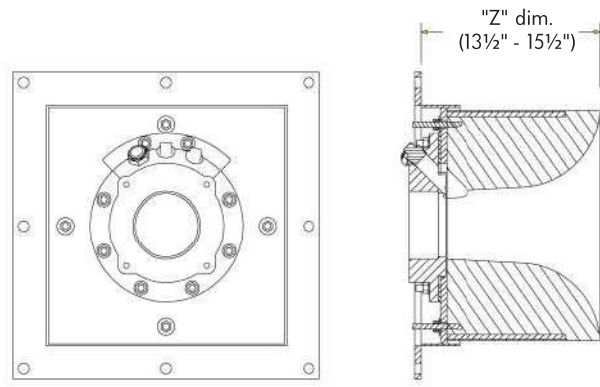


Figure 2



Burner Size	9" Deep (Fig. 1) Z = 2" to 9"	13" Deep (Fig. 1) Z = 9½" to 13"	13" Deep (Fig. 2) Z = 13½" to 15½"
4832-2, -3, -4	4-28573-1/X.X/T	-	-
4832D-2, -3, -4	-	4-28573-2/X.X/T	4-28573-3/X.X/T
4832-5, -6, -7	4-28573-4/X.X/T	-	-
4832D-5, -6, -7	-	4-28573-5/X.X/T	4-28573-6/X.X/T

NOTE: Tile and mounting assembly part numbers have been revised to include the required "Z" dimension and tile material. When selecting tile and mounting assembly, include the "X.X" suffix to represent the required "Z" dimension in 0.5" increments, 2.0" min to 15.5" max, and the "T" suffix to represent the tile material (30 for 3000°F and 32 for 3200°F).

CONTACT

fna.sales@fivesgroup.com
T +1 800 626 3477 - F +1 216 373 4237

Fives North American Combustion, Inc.
4455 East 71st Street - Cleveland, OH 44105 - USA
www.fivesgroup.com

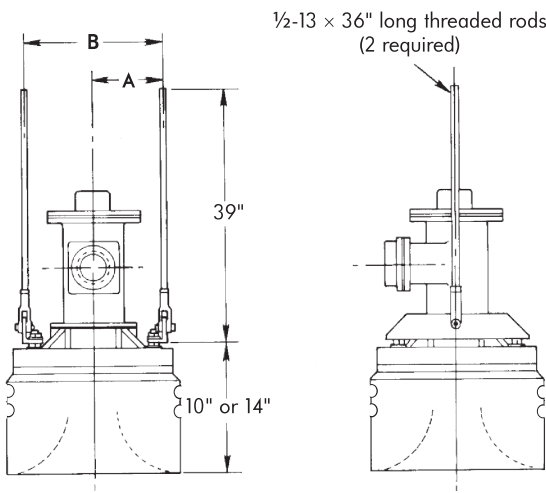


fives
Industry can do it

North American Low NO_x Flat Flame™ Burners Special Mountings

Sheet 4832-6

4832B SUSPENSION ARRANGEMENTS for 4832-2 through -7 and 4832D-2 through -7



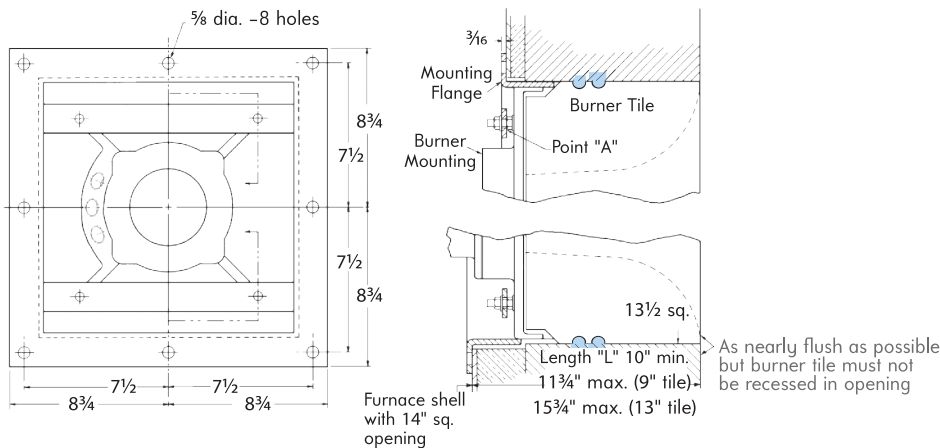
4832B suspension arrangement permits roof mounting of conventional 4832 and 6832 burners with small tiles and flangeless mountings, especially where space limitations do not permit use of large "roof" tiles.

Ordering and Dimensional Information

	Part number*	A	B	Pilot and UV location
4832-2 thru -7 with square tiles with round tiles	4832BS	5½	11	} between brackets
	4832BR	4⅛	9⅞	

* Provides complete set of parts for one burner as shown.

HARD WALL MOUNTING FLANGES for 4832-2 through -7 and 4832D-2 through -7

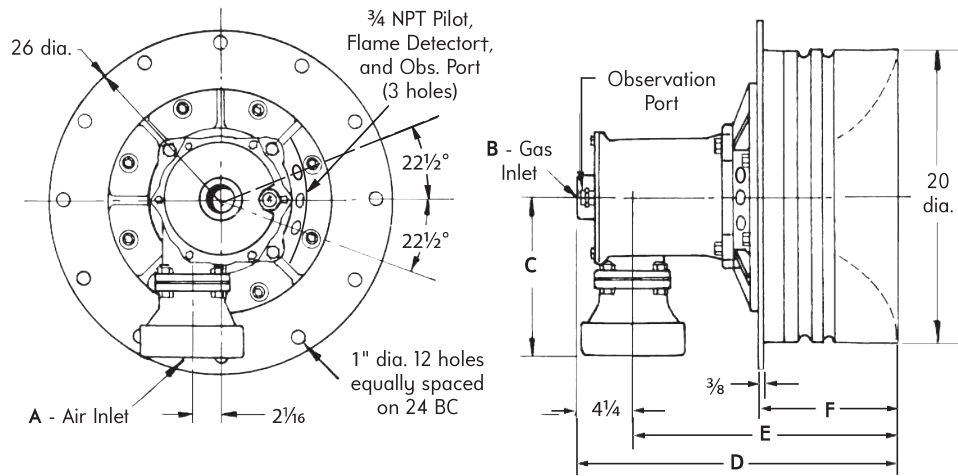


Flange Part No.	9" Tile L	13" Tile L
4-41336-1	10	14
4-41336-2	10½	14½
4-41336-3	11	15
4-41336-4	11½	15½
4-41336-5	10¼	14¼
4-41336-6	10¾	14¾
4-41336-7	11¼	15¼
4-41336-8	11¾	15¾

4832 Wall Mounting Flanges (see part no. in table) allow bolting 4832 and 6832 Burners to steel furnace shells with refractory walls. They do not provide a pressure-tight seal against furnace gas leakage.

Custom-made flanges are assembled to burner mountings by Fives to customer-specified dimension "L" so tile hot face is flush with inside furnace wall. "L" can be increased up to ⅜" in the field by inserting flat washers at point "A" (see above drawing).

OPTIONAL ROUND FLANGED MOUNTING for 4832-8-A and -8-B; 4832D-8-A and -8-B
(Formerly 4836-8-A and -8-B)



4832	dimensions in inches								
	A	B	C	D		E		F	
				10 [†]	14 [†]	10 [†]	14 [†]	10 [†]	14 [†]
-8-A, -8-B	6	2	11¼	23	27	18¾	22¾	10¾	14¾

† Detector must be located "downstream" of pilot in regard to main air spin. See Bulletin 4832.

† Tiles available in 10" and 14" depth. "D" designation signifies "Deep" (14") tile.

This round tile (OC4-2512-1, 10" deep, or OC4-2512-2, 14" deep) is normally used for roof applications with flangeless mounting.

Flanged mounting shown accommodates special wall applications requiring capacity of -8-A or -8-B burners.

If mounting (OC4-1143-1) is ordered separately, include mounting adapter (OC4-1140-1) and mounting adapter gasket (OA4-1144-1) for complete mounting assembly.

To order complete burner as shown, specify:

4832-8-A/RGF/32 or
4832-8-B/RGF/32

Also see Ordering Procedure, Sheet 4832-3.

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.

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

fna.sales@fivesgroup.com
T +1 800 626 3477 - F +1 216 373 4237

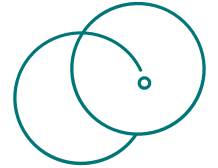
Fives North American Combustion, Inc.
4455 East 71st Street - Cleveland, OH 44105 - USA
www.fivesgroup.com



fives
Industry can do it



fives



PROCESS TECHNOLOGIES

ENERGY | COMBUSTION

Gas Fired North American Flat Flame™ Burners in Cold, Tight Furnaces

Sheet 4833-1

Series 4832/4836 Flat Flame Burners are good performers under excess air conditions for which they were designed thirty-five years ago. Their widespread use attests to that. Now times have changed--since the 1970's, fuel bills are considerably higher and the use of excess air is often restricted. 4832/4836 Burners are not stable in cold, tight furnaces, when operating on stoichiometric ratio, without the aid of constant or intermittent pilot (and that is not our recommendation from the point of view of flame supervision). 4833 (for cold air) and 4828 (for preheated combustion air up to 1000°F) are designed for use in cold, tight furnaces. We will keep 4832/4836 in the line for excess air jobs, since its excess air limits are higher than those for 4833 and 4828.

Burner designation	Air pressure	Natural gas	
		Rich limit	Lean limit
4832-2, -3, -4	16 osi	50-70% Excess <u>Air</u>	—
4832-5	2-16 osit 1 osi	10% Excess Gas 20% Excess <u>Air</u>	500% Excess Air
4832-6	2-16 osit 1 osi	20% Excess <u>Air</u> 70% Excess <u>Air</u>	400% Excess Air
4832-7	all rates	40 to 50% Excess <u>Air</u>	300% Excess Air
St'd 4836-8-A	16 osi	40% Excess <u>Air</u>	—
St'd 4836-8-B	16 osi	40% Excess <u>Air</u>	70% Excess Air at 16 osi to 500% Excess Air at 1 osi
4833-3§	all rates	15% Excess Fuel	80% Excess Air at 16 osi to 250% Excess Air at 0.5 osi
4833-4§	9-1 osi 16-24 osi	15% Excess Fuel 15% Excess Fuel	100% Excess Air 50% Excess Air
4833-5§	30-2 osi	15% Excess Fuel	100% Excess Air at 16-4 osi
4828-5 70°F air	16-0.2 osi	20% Excess Fuel	50% Excess Air†
4828-6§ 70°F air	20-0.5 osi	20% Excess Fuel	50% Excess Air

Air is underlined for emphasis in those cases where the rich limit is on lean side of stoichiometric.

We have built specials of most sizes of 4832's that will run on-ratio in a cold, tight furnace. The -2, -3, and -4 require a radial gas nozzle. The -8-A uses a secondary air connection. The -8-B stays lit but produces a flame that is 5½ ft. long.

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

fna.sales@fivesgroup.com

T +1 800 626 3477 - F +1 216 373 4237

Fives North American Combustion, Inc.
4455 East 71st Street - Cleveland, OH 44105 - USA
www.fivesgroup.com



fives
Industry can do it