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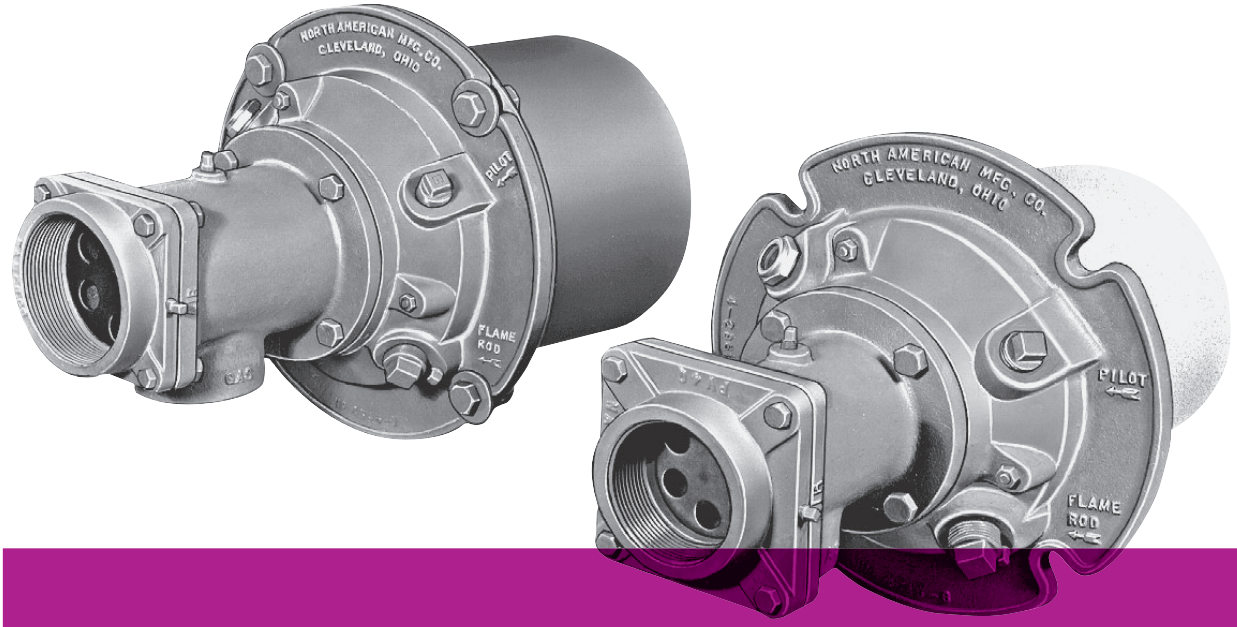
PROCESS TECHNOLOGIES

ENERGY | COMBUSITION

North American 4545 Flame-Jet™
Gas Burners Low NOx



Sealed-in Nozzle-Mix Burners for :

- Controlled furnace atmosphere
- Reliable operation
- Excellent heat penetration

Product Overview | Flame-Jet™

4545 Flame-Jet Burners are nozzle mixing, sealed-in gas burners of large capacity for use on installations ranging from low temperature air heaters and ovens to high temperature forging furnaces. They produce a penetrating jet of hot gases with high forward velocity. Flame-Jet burners operate dependably at air/gas ratios (listed in Table 2) ranging from excess air to excess fuel (with sufficient air for near-complete combustion in the furnace, supplied adjacent to the burners).

Design Features. The burners are made of relatively few, large parts that minimize maintenance problems. The internal flow passages are designed to give quiet operation. Air flows from a central orifice that is surrounded by an annular gas orifice. The result is a single jet flame of high forward velocity, causing heat to penetrate deeply into the furnace.

Because Flame-Jet burners are nozzle-mix, there is no possibility of flashback. The burner turndown is high, provided the control system is good enough to maintain correct air/gas ratio at very low firing rates.

Flame-Jet burners are suitable where control of furnace atmosphere is important and air infiltration is not desirable. The burners are tightly sealed, with threaded connections for the observation port, pilot, and flame rod adapter; the cast iron mounting plate is large enough to make a tight seal with the furnace wall; and the burner can be operated rich, lean, or on correct air/gas ratio, even against some backpressure in the combustion chamber.

A complete burner includes mounting plate, tile, and observation port, but does not include pilot tip or flame rod adapter which are optional extras. If no pilot or flame monitoring device is ordered with the burner, the openings for these devices are plugged and should be kept closed when not used.

Burner Operation. Flame-Jet burners, whether operating on natural or coke gas, require very little gas pressure at the burner, although higher gas pressures are an advantage for air/gas ratio control. The minimum required supply pressure for the gas is determined primarily by the pressure drop through the gas piping and accessories.

Flame-Jet burners may be lighted in hot or cold furnaces, at rich or lean air/gas ratios, by a North American 4011-12 Pilot Set.

Flame Supervision. The stability of Flame-Jet burners permits any size to be operated with an interrupted pilot, which is strongly recommended. Either a flame rod or an ultraviolet detector can be used with -6 through -8-B sizes to monitor main flame when using an interrupted pilot. Use a UV detector with the 4545-9. Do not use a flame rod. A pilot flame just large enough to satisfy a flame rod will not light the -9 flame. When using flame supervision devices, 6 osi minimum pilot air pressure and low fire lighting are recommended. Ultraviolet detecting devices can be used with air/gas ratios within the range shown in Table 2.

Ground Rods. The main flame is not normally grounded, and thus requires ground rods to complete a circuit through a flame rod. Ground rods are not required with ultraviolet flame detectors. When using a flame rod, one ground rod is required with a 4545-6 or -7 Burner, and four rods with a -8-A or -8-B. The appropriate ground rods (7½" long) are furnished at no extra cost when ordered with a burner.

Burner tiles are a dense castable that is good for 3200°F in the tile or about 2800°F furnace temperature. When the burner is shut off, continue air flow to protect the nozzle from furnace radiation. The cast tile has an expanded metal liner with welded mounting hooks. This unit is bolted to the heavy duty mounting plate. Bonding cement seals the joint. The uniform thickness of the cylindrical burner tiles greatly reduces the likelihood of thermal cracking.

Jacketed Tiles. 4545 Burners are available with metal support jackets around the tile for applications where the tile is not supported by furnace refractory.

Jackets are available in three different metals and have maximum temperature rating for each. 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. Continuous annealing furnaces 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
4545- -LC	carbon steel	700°F	700°F
4545- -L4	304 stainless	1600°F	1500°F
4545- -L9	309 stainless	1900°F	1800°F

Table 1. Combustion air capacities, scfh (for Btu/h HVV, multiply by 100)

Burner designation	air pressure drop across the burner in osi						
	0.1	1	5	6	8	12	16
4545-6	1 180	3 710	8 300	9 100	10 500	12 800	14 800
4545-7	2 070	6 540	14 600	16 000	18 500	22 700	26 200
4545-8-A	3 350	10 600	23 700	26 000	30 000	36 700	42 400
4545-8-B	5 360	17 000	37 900	41 600	48 000	58 800	68 000
4545-9	9 840	31 100	69 600	76 200	88 000	108 000	124 000

Table 2. Flame characteristics with natural gas

Burner Size	Stability Limits			
	Air at burner, osi	excess air, %	excess fuel, %	flame length, feet
-6	1 16	160 120	75 73	2.5 3.0
-7	1 16	480 330	100 85	3.0 4.0
-8-A	1 16	270 200	100 100	4.0 6.0
-8-B	1 16	300 200	100 100	4.5 6.0
-9	1 16	1500 1300	100 100	7.0 9.0

To order, specify: 4545-(code)-(A or B if applicable) (modifiers: LC, L4 or L9) burner complete

Examples: 4545-9 burner complete
4545-8-BL4 burner complete with 304 SST jacket

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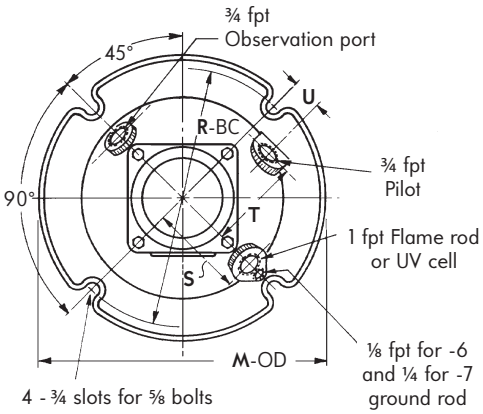
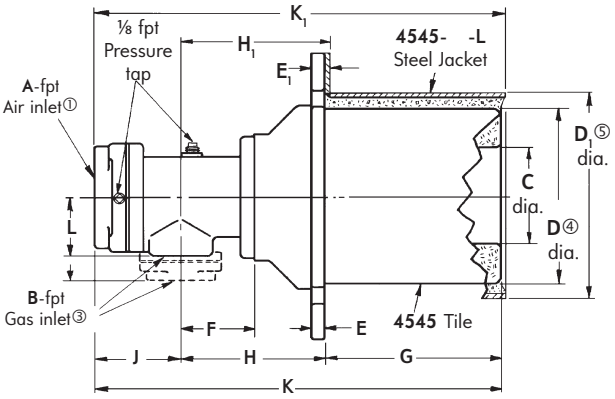
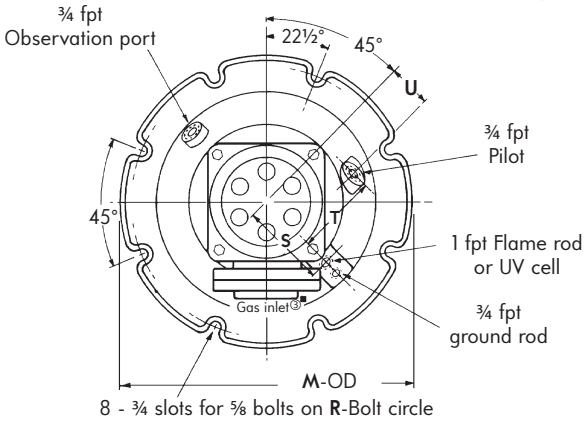
North American Flame Jet™
4545 Gas Burners

DIMENSIONS
inches

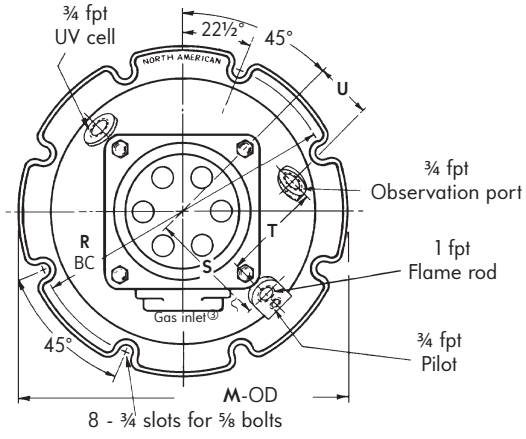


Burner Mounting 4545-6 & -7





Burner Mounting 4545-8-A & -8-B



Burner Mounting 4545-9

See page 2 for dimensions chart

Burner designation	dimensions in inches and degrees																wt. lb	recomended pilot size
	A	B	C	D④	E	F	G	H	J	K	L	M	R	S	T	U		
4545-6	3	2	5	9	5/8	3 11/16	9	7 1/8	4 3/8	20 1/2	3	13 1/2	12	4 1/4	4 5/16	1 1/4	82	
4545-7	4	2 1/2	6 1/8	10	5/8	3 13/16	9	7 7/16	4 7/16	20 7/8	3 7/8	14 1/2	13	4 13/16	4 5/8	1 9/16	100	4021-12
4545-8-A	6	3	10 3/16	15 1/4	5/8	4 15/16	12	8 7/16	6 1/4	26 11/16	6 3/4②	20 1/4	18 3/4	6	5 7/16	3	235	4021-11
4545-8-B	6	3	10 3/16	15 1/4	5/8	4 15/16	12	8 7/16	6 1/4	26 11/16	6 3/4②	20 1/4	18 3/4	6	5 7/16	3	235	
4545-9	8①	4	12 3/4	18	5/8	6 3/8	13	14 1/4	9 5/16	36 9/16	8 1/16②	23	21 1/2	8 1/4	6 7/8	4	405	

Burner designation	dimensions in inches				wt, lb
	$D_1$④	E_1	H_1	K_1	
4545-6-L	10	3/4	7 1/4	20 5/8	100
4545-7-L	11	3/4	7 9/16	21	135
4545-8-AL	16 1/4	3/4	8 9/16	26 13/16	280
4545-8-BL	16 1/4	3/4	8 9/16	26 13/16	280
4545-9-L	19	3/4	14 3/8	36 1/16	475

Notes:
4545 and 4545- -L Burners are identical except for dimensions noted in table at left.

4545-6 through -8 require ground rods when rod-type flame detectors are used. When required, add "with ground rod" to burner description. Price is unchanged.

Pilot and UV locations are not interchangeable.

①Flanged connection--a standard Fives North American square threaded flange is used for sizes -6, -7, -8 main air connections, but SW style inlet may be specified with no change in price. An SW inlet (suitable for slip-on or welded connection) is standard for -9 burner.

②Indicates Flanged Model.

③Gas inlet may be mounted in 90° intervals.

④Opening in furnace shell should be about ½" larger than dimension D to allow for fillets and draft on mounting plate.

⑤Opening in oven shell should be about ¼" larger than dimension D.

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Flame-Jet Gas Burners - Flame Characteristics

TABLE 1. Capacities, Stability Limits, Flame Lengths.

Burner size	Air Pressure, osi	Air Capacity, cfh	Stability limits without pilot		Flame Lengths with natural gas, correct ratio, open cold furnace
			Excess Air (Lean Limit)	Excess Fuel (Rich Limit)	
4545-6	1	3,710	160%	75%	2.5′
	4	7,400	130%	78%	3.0′
	8	10,500	125%	82%	3.0′
	16	14,800	120%	73%	3.0′
4545-7	1	6,550	480%	100%	3.0′
	4	13,100	420%	100%	4.0′
	8	18,500	400%	100%	4.0′
	16	26,200	330%	85%	4.0′
4545-8-A	1	10,600	270%	100%	4.0′
	4	21,200	250%	100%	4.5′
	8	30,000	200%	100%	6.0′
	16	42,400	200%	100%	6.0′
4545-8-B	1	17,000	300%	100%	4.5′
	4	34,000	370%	100%	5.5′
	8	48,000	330%	100%	6.0′
	16	68,000	200%	100%	6.0′
4545-9	1	31,100	1500%	100%	7.0′
	4	62,000	1500%	100%	7.0′
	8	88,000	1400%	100%	8.0′
	16	124,000	1300%	100%	9.0′

Note: Burner stability is influenced by the location of the combustion air inlet elbow. Maintain a minimum of four pipe diameters between air inlet flange and nearest elbow.

TABLE 2. Flame Lengths at Various Ratios.

Burner size	Air Pressure, osi	230% Excess Air	Correct Ratio	100% Excess Fuel
4545-8-A	1	1.0′	4.0′	6.0′
	4	1.0′	4.5′	9.0′
	8	1.5′	6.0′	10.0′
	16	1.5′	6.0′	10.0′

FLAME SAFEGUARD INFORMATION. See Sheet 8832-1

4545D MODELS. See Sheet 4545-2 for information on 4545D Burners (30% greater capacity).

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4545-—-D Burners (1.3 capacity) — Specifications

30% more than standard capacity is available with 4545-7-D through -9-D Burners by installing a special main air orifice plate. Flames are stable over the entire operating range, with satisfactory signals for flame safety devices. Burner dimensions are shown on Dimensions 4545. Orifice plates are located between the body and air flange on 4545-7-D through -8-BD and between the body and mounting on the 4545-9-D.

CAUTION: Air and gas pipe sizes may be undersized for these increased firing rates, so pressure drops should be checked carefully.
SUGGESTION: Avoid difficulty by adding the oversized air flanges listed below.

Burner designation	Air pressure	Air capacity	Excess air without pilot	Flame length[a] (natural gas)	"J"[b] dimension
4545-7-D	1 osi	8,525 cfh	490%	3.0 ft	8 3/16"
	4	17,050	450	4.0	
	8	24,100	450	5.0	
	16	34,100	450	5.0	
4545-8-AD	1	13,800	1900	4.0	c
	4	27,600	2400	5.0	
	8	39,000	730	5.5	
	16	55,200	180	6.0	
4545-8-BD	1	22,100	730	5.0	10 9/16"
	4	44,200	300	6.0	
	8	62,500	300	8.0	
	16	88,400	250	8.0	
4545-9-D‡	1	40,250	500	—	11 5/8"
	4	80,500	—	—	
	8	114,000	800	—	
	16	161,000	200	—	

‡ 4545-9-D only: Gas pressure at burner must be 80% of air pressure. Bleeders cannot be used.

PARTS All parts except orifice plate and oversize air flange (if specified) are the same as for standard 4545 Burners. Oversize flanges are specified as 4545-—DOF.

Part name	4545-7-D	4545-8-AD	4545-8-BD	4545-9-D
Orifice plate	4-5881-1	4-5882-1	4-5883-1	4-5880-1
Oversize air flange (OF) (one pipe size larger than standard)	8765-8×7-D	c	OB4-1033-1[d]	OB4-1034-1[d]

[a] With correct air/gas ratio, open cold furnace.
[b] See Dimensions 4545.
[c] An oversize flange is not required for 4545-8-AD.
[d] SW Slip-on or Weld type.

ORDER MUST SPECIFY:
1 - Complete burner designation.
2 - Standard or oversize air flange (select one).
3 - Ground rod(s), if required (see Bulletin 4545).

For example: 4545-7-DOF burner, with 8765-8×7-D oversize air flange, and ground rod.

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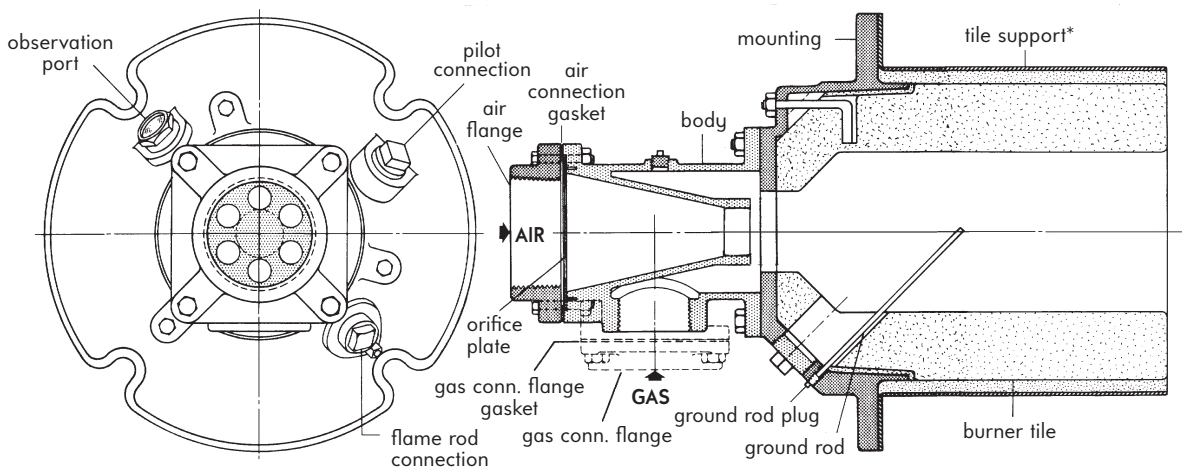

Parts List 4545-3

Part Name	4545-6 4545-6-LC	4545-7 4545-7-LC	4545-8-A 4545-8-ALC	4545-8-B 4545-8-BLC	4545-9 4545-9-LC
Air Connection Gasket	4-2969-1	4-2969-1	4-3031-1	4-3031-1	4-3026-1
Air Flange	4-1695-4	4-1695-5	4-1695-6	4-1695-6	8765-9-FW‡
Body	4-2963-2	4-2977-1	4-3043-1	4-3030-1	4-3024-1
Burner Tile (standard)	4-8362-1	4-8364-1	4-8366-1	4-8366-1	4-8368-1
Burner Tile (2" cast)	4-8361-1	4-8363-1	4-8365-1	4-8365-1	4-8367-1
Gas Connection Flange	–	–	R590-5160	R590-5160	R590-5170
Gas Connection Flange Gasket	–	–	OA3-2302-1F4	OA3-2302-1F4	OA3-2302-2F4
Ground Rod	4-2965-3	4-2965-3	4-2965-3†	4-2965-3†	–
Ground Rod Plug	4-2966-2	4-3006-2	4-3041-2	4-3041-2	–
Mounting	4-2962-1	4-2975-1	4-3029-2	4-3029-2	4-3020-3
Observation Port	8790-0	8790-0	8790-0	8790-0	8790-0
Orifice Plate	4-2968-2	4-2976-1	4-3064-1	4-3032-1	4-3025-1
Tile Support (LC)*	4-3065-1	4-3066-1	4-3042-1	4-3042-1	4-3033-1
Tile Support (L4)*	4-3065-2	4-3066-2	4-3042-2	4-3042-2	4-3033-2
Tile Support (L9)*	4-3065-3	4-3066-3	4-3042-3	4-3042-3	4-3033-3
Replacements - Mounting, Tile, Jacket, Sub-assemblies					
Mounting and Tile	–	4-40282-1	4-30216-1	4-30216-1	4-28668-1
Mounting, Tile & LC Jacket	4-42140-1	4-40282-2	4-30216-2	4-30216-2	4-28668-2
Mounting, Tile & L4 Jacket	4-42140-2	4-40282-3	4-30216-3	4-30216-3	4-28668-3
Mounting, Tile & L9 Jacket	4-42140-3	4-40282-4	4-30216-4	4-30216-4	4-28668-4

* Tile support furnished only with 4545- -L. Specify LC for steel, L4 for 304 SST, or L9 for 309 SST.
† 4 required
‡ SW type flange

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

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.

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