

DELAVAN

**Oil Burner Nozzles
and Accessories**
for residential applications



**TO PROVIDE HIGH-TEC COMBUSTION
THAT IS ENVIRONMENTALLY FRIENDLY**

DELAVAN PRECISION OIL BURNER NOZZLES



Delavan has specialized in the development and production of components for highly specialized industries for over 50 years. The Bamberg, South Carolina, plant produces a wide range of oil burner nozzles for domestic and industrial applications as well as accessories for the heating business in general.



Delavan's inspectors have the latest test instruments such as this video projection microscope, here being used to inspect the orifice dimension on the face of the nozzle.



Delavan 100% tests its nozzles for flow rate and spray angle using test oil, maintained to nominal fuel oil properties. Each is rotated to check symmetry and spray quality, and to look for any voids, streaks, or pulsations in the spray pattern.



Delavan inspectors audit nozzle components numerous times during production prior to assembling and testing. These checks are done to ensure the highest quality product is delivered.

Delavan has been designing and manufacturing nozzles for oil heating industry for over 60 years. Quality assurance was important to us way back then and still is today. Since those early days, Delavan has grown and expanded into other product lines as well, such as gas turbine engine nozzles and accessories; nozzles, pumps and accessories for agricultural and industrial spraying.

Delavan is unique in the oil heating industry because we have developed training materials and programs to educate the oil heating service technician. Our nozzles are the most widely distributed in the U.S. and Canada and are also exported to many other countries. Delavan is the leader in designing and manufacturing nozzles for special industrial combustion applications. We specialize

in assisting original equipment manufacturers in designing and specifying the best nozzles to fit their applications.

Whether you are an engineer designing original oil burner equipment or a service technician performing annual service, remember Delavan for assured quality and call on our knowledge and experience whenever you have a combination nozzle application problem.

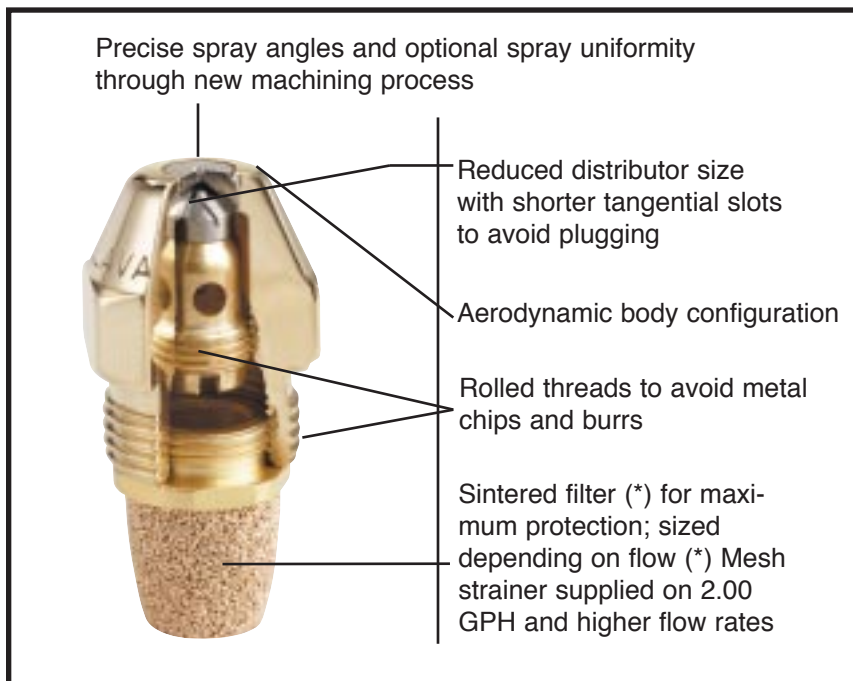
DELAVAN 

Fuel Metering Products Operation
P.O. Box 969 • Bamberg • South Carolina 29003
www.delavaninc.com

DELAVAN PRECISION OIL BURNER NOZZLES

Why is Delavan so different?

→ UNIQUE INSIDE ANTI PLUG CONSTRUCTION



100% Tested

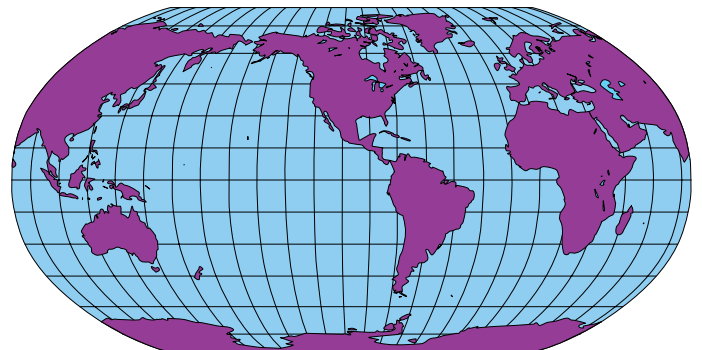
Every nozzle tested. Then we go one step further and clean the test oil from the nozzle to avoid plugging.

MEET THE CHALLENGE

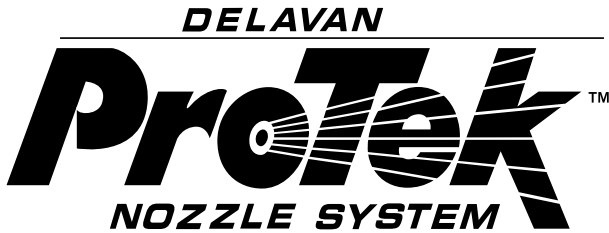
- World leader in spray technology
- ISO 9001 Certified
- State of the art manufacturing equipment
- High technology research, design and quality assurance methods

THE WORLD DIMENSION

- Two manufacturing facilities with R and D in the USA.
- Manufacturing and marketing facility in the UK.
- Marketing and technical services in Belgium.
- Intercontinental distribution network



DELAVAN PRECISION OIL BURNER NOZZLES



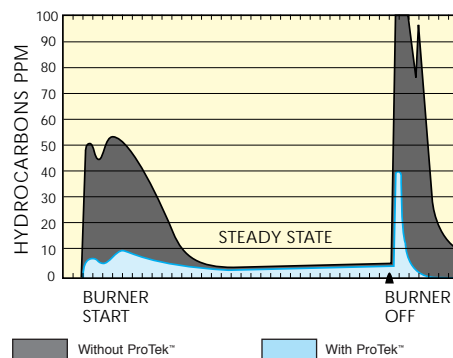
**SMART VALVE
DESIGN REDUCES
COMBUSTION
POLLUTION FOR
CLEANER HEATING**



The all-new Delavan ProTek™ Nozzle System provides the first step into the future of Clean Air Technology™. This unique, patented System from Delavan provides significant reductions in combustion pollutants for cleaner air. The ProTek Nozzle System includes a factory-installed, one-piece Valve Component which reduces smoke and oil smell in the off cycle by preventing oil after-drip from the nozzle. Also, the reduction of smoke (carbon and soot) helps maintain burner set up efficiency longer and extend the time period between appliance clean ups.

Installation is fast and easy; there's no need to increase pump supply pressure at installation because there's no pressure drop. Plus, ProTek Nozzle Systems maintain the same flow pattern and flow rating characteristics of comparably rated Delavan nozzles.

The dramatic benefits of the ProTek Nozzle System are available in either a factory-installed, complete system or as the ProTek Valve Component sold separately to replace the standard filter on a Delavan nozzle.



Hydrocarbon emissions are greatly reduced when the Delavan ProTek™ Nozzle System is used. Hydrocarbons are typically elevated at start-up and shut-down of the nozzle firing, as both of these graphs show. When the ProTek Nozzle System is installed, the dramatic benefits are seen in these charts which show comparative results with and without the ProTek™ valve. Results will vary by application.

TEK TALK

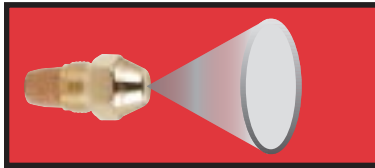
The Delavan ProTek™ Nozzle System has been thoroughly tested. In the tests, approximately seven years of "on/off" cycle operation simulation in the laboratory with no failures. A total of 107,000 cycles were recorded. After the first 11,350 cycles, the cut-on pressures shifted upward an average of 3.0 PSI. The cut off pressure shifted up an average of 7.75 PSI. After this initial seating process, there was very little change of either "on" or "off" pressures. Very little change in nozzle flow was noted after 107,000 cycles, either. Additional testing has included pressure tests up to 500 PSI (34,5 BAR), as well as combustion tests and tests with various fuels such as kerosene, #2, and heavier oils. Detailed test results are available from Delavan Technical Services.

Operating Pressures

Valve Part #	Minimum Operating Pressures		
	Supply Pump PSI (BAR)	Valve Open PSI (BAR)	Valve Close PSI (BAR)
60030-1	135.0 (9,3)	125.0 (8,6)	65.0 (4,5)
60030-2	100.0 (7,0)	60.0 (4,1)	45.0 (3,1)

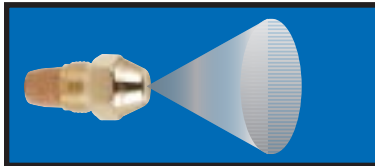
DELAVAN PRECISION OIL BURNER NOZZLES

A VARIETY OF NOZZLES THAT SUITS EVERY APPLICATION



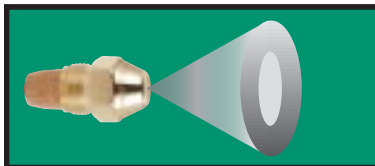
A
Red Vial

HOLLOW-CONE Type A-nozzles are mainly used on burners with a hollow cone air pattern and for through puts up to 2.00 GPH. The droplet distribution is concentrated on the outside of the cone and results in good ignition and low-noise combustion.



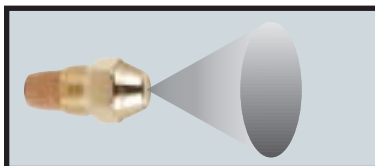
B
Blue Vial

SOLID-CONE Type B-nozzles produce a spray that distributes droplets fairly uniformly throughout the complete pattern. The spray pattern becomes progressively more hollow at higher flow rates, particularly above 8.00 GPH. Provides smooth ignition and efficient combustion, particularly in larger burners.



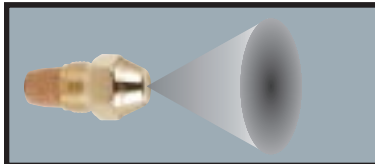
W
Green Vial

Type W "ALL PURPOSE" -nozzles are neither truly hollow nor solid. These nozzles frequently can be used in place of either solid or hollow cone nozzles between 0.40 and 8.00 GPH, regardless of the burner's air pattern. The lower flow rates tend to be more solid.



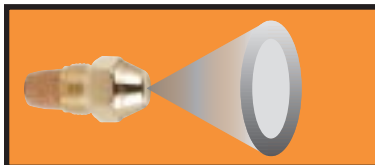
AR-D
Light Grey Vial

Type AR-D Nozzles are of a "solid cone" type similar to Type B but with a slightly lower concentration of the droplets in the center of the cone. They are high performance in burners of low up to medium capacity (up to flows of 2.00 GPH).



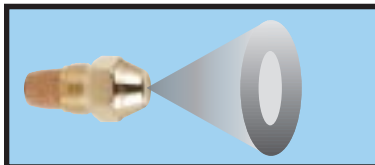
R-D
Dark Grey Vial

Type R-D Nozzles have a high concentration of droplets in the center of the spray cone. They are particularly recommended for burners with a highly concentrated solid air pattern. The average droplet size is slightly coarser than on the Standard Solid Cone Type B.



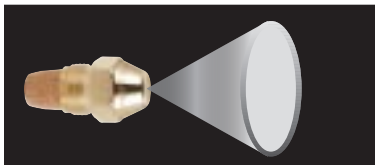
MH
Orange Vial

Type .579 MH Mobile Home Nozzles are low-capacity nozzles designed for mobile home use. This design will minimize the usual plugging problems associated with low flow rates.



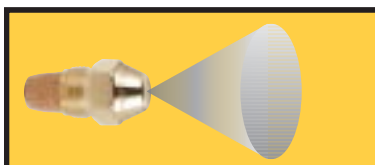
SS
Powder Blue Vial

Semi-Solid nozzle (.50-2.00) 60°, 70° and 80° spray angles; interchanges with other SS nozzles.



A
Black Vial

Del-O-Flo™ nozzles are low-capacity nozzles designed to minimize the plugging problems associated with very low flow rates. The special interior design of the Del-O-Flo™ flushes contaminants through, limiting build-up. These nozzles will satisfactorily interchange with other hollow and solid cone nozzles. The Del-O-Flo™ is available in 0.40 GPH up to 0.85 GPH.



B
Yellow Vial

DELAVAN PRECISION OIL BURNER NOZZLES

Oil Burner Nozzles For Residential Applications AVAILABLE NOZZLE SIZES

Types A and B						
GPH	30°	45°	60°	70°	80°	90°
.40	Red	Green				
.50	Yellow	Green				
.55	Yellow	Green				
.60	Yellow	Green				
.65	Yellow	Green				
.70	Yellow	Green				
.75	Yellow	Green				
.80	Yellow	Green				
.85	Yellow	Green				
.90	Yellow	Green				
1.00	Yellow	Green				
1.10	Yellow	Green				
1.20	Yellow	Green				
1.25	Yellow	Green				
1.35	Yellow	Green				
1.50	Yellow	Green				
1.65	Yellow	Green				
1.75	Yellow	Green				
2.00	Yellow	Green				
2.25	Yellow	Green				
2.50	Yellow	Green				
2.75	Yellow	Green				
3.00	Yellow	Green				
3.25	Yellow	Green				
3.50	Yellow	Green				
4.00	Yellow	Green				
4.50	Yellow	Green				
5.00	Yellow	Green				
5.50	Yellow	Green				
6.00	Yellow	Green				
6.50	Yellow	Green				
7.00	Yellow	Green				
7.50	Yellow	Green				
8.00	Yellow	Green				
8.50	Yellow	Green				
9.00	Yellow	Green	Green	Green	Green	Green
10.00	Yellow	Green	Green	Green	Green	Green
11.00	Yellow	Green	Green	Green	Green	Green
12.00	Yellow	Green	Green	Green	Green	Green
13.00	Yellow	Green	Green	Green	Green	Green
14.00	Yellow	Green	Green	Green	Green	Green
15.00	Yellow	Green	Green	Green	Green	Green
16.00	Red	Green	Green	Green	Green	Green
17.00	Red	Green	Green	Green	Green	Green
18.00	Red	Green	Green	Green	Green	Green
19.00	Red	Green	Green	Green	Green	Green
20.00	Red	Green	Green	Green	Green	Green
22.00	Red	Yellow	Yellow	Yellow	Yellow	Yellow
24.00	Red	Yellow	Yellow	Yellow	Yellow	Yellow
26.00	Red	Yellow	Yellow	Yellow	Yellow	Yellow
28.00	Red	Yellow	Yellow	Yellow	Yellow	Yellow
30.00	Red	Yellow	Yellow	Yellow	Yellow	Yellow
32.00	Red	Yellow	Yellow	Yellow	Yellow	Yellow
35.00	Red	Yellow	Yellow	Yellow	Yellow	Yellow
40.00	Red	Yellow	Yellow	Yellow	Yellow	Yellow
45.00	Red	Yellow	Yellow	Yellow	Yellow	Yellow
50.00	Red	Yellow	Yellow	Yellow	Yellow	Yellow

Type W						
GPH	30°	45°	60°	70°	80°	90°
.40	Red	Green				
.50	Yellow	Green				
.55	Yellow	Green				
.60	Yellow	Green				
.65	Yellow	Green				
.70	Yellow	Green				
.75	Yellow	Green				
.80	Yellow	Green				
.85	Yellow	Green				
.90	Yellow	Green				
1.00	Yellow	Green				
1.10	Yellow	Green				
1.20	Yellow	Green				
1.25	Yellow	Green				
1.35	Yellow	Green				
1.50	Yellow	Green				
1.65	Yellow	Green				
1.75	Yellow	Green				
2.00	Yellow	Green				
2.50	Yellow	Green				
2.75	Yellow	Green				
3.00	Yellow	Green				
3.25	Yellow	Green				
3.50	Yellow	Green				
4.00	Yellow	Green				
4.50	Yellow	Green				
5.00	Yellow	Green				
5.50	Yellow	Green				
6.00	Yellow	Green				
6.50	Yellow	Green				
7.00	Yellow	Green				
7.50	Yellow	Green				
8.00	Yellow	Green				

Del-O-Flo Type A and B					
GPH	45°	60°	70°	80°	90°
.40	Green				Red
.50	Green				
.55	Green				
.60	Green				
.65	Green				
.75	Green				
.80	Green				
.85	Green				

Type SS					
GPH	45°	60°	70°	80°	90°
.50	Red	Green			Red
.60	Red	Green			Red
.65	Red	Green			Red
.75	Red	Green			Red
.85	Red	Green			Red
1.00	Red	Green			Red
1.10	Red	Green			Red
1.20	Red	Green			Red
1.25	Red	Green			Red
1.35	Red	Green			Red
1.50	Red	Green			Red
1.65	Red	Green			Red
1.75	Red	Green			Red
1.75	Red	Green			Red
2.00	Red	Green			Red

.579 MH Mobile Home Nozzle	
	Normally Stocked
Green	Limited Inventory
Yellow	Special Order
Red	Not Available

Types AR-D and RD					
GPH	45°	60°	70°	80°	90°
.50	Red				Red
.60	Red				Red
.65	Red				Red
.75	Red				Red
.85	Red				Red
1.00	Red				Red
1.10	Red				Red
1.20	Red				Red
1.25	Red				Red
1.35	Red				Red
1.50	Red				Red
1.65	Red				Red
1.75	Red				Red
1.75	Red				Red
2.00	Red				Red

DELAVAN PRECISION OIL BURNER NOZZLES

NOZZLE INTERCHANGE

Replacing a nozzle of one make with another sometimes presents problems. This is partly due to unique design differences among the various makes, plus the fact that the nozzle manufacturers use different methods for evaluating spray angles, patterns and spray quality.

In many cases, nozzles with similar patterns and spray angles are directly interchangeable. However, there are other cases where nozzles that would seem to be equivalent really are not. When this happens it is best to ask the burner manufacturer for a recommendation. Otherwise, it is a matter of trial and error: (1) Trying nozzles with slightly higher or lower flow rates, (2) wider or narrower angles and (3) more solid or more hollow patterns, to see which one performs best.

Nozzle Interchange Chart	
Spray Angles 30° through 90°	
HAGO/SID HARVEY	DELAVAN
H	A
SS (up to 2.0)	SS
SS (over 2.0)	A or W
ES/P	B*
B	B*
MONARCH	DELAVAN
NS/PL	A
R/AR (up to 2.0)	R-D/AR-D
R/AR (over 2.0)	A/A or W
PLP	B*
DANFOSS	DELAVAN
AS	W or B
AH	A

*The original B Nozzle

WARNING: Improper modification to combustion units may create a fire hazard resulting in possible injury. Contact the original equipment manufacturer before modifying the combustion unit.

P.O. Box 969 • Bamberg, SC 29003
www.delavaninc.com

1-800-982-6943

NOZZLE RATINGS AND TESTING

Every nozzle is spray tested for flow rate, spray angle and spray quality. Our nozzles are flow rated at 100 psi. Test conditions include: fuel gravity within a total spread of 1-1/2° API . . . viscosity within ± .04 centistoke (.03 SSU) . . . pressure at 100 psi . . . fuel temperature at 80°F, ± 2°F . . . an air-conditioned test area maintained at a temperature spread of 4°F or less . . . and regularly calibrated pressure gauges and flow meters.

BURNER/NOZZLE SELECTION

Proper nozzle selection is a subject of great importance because the performance of the nozzle is so directly related to the overall performance of the burner. The wrong choice of flow rate, spray angle or spray pattern for a given burner air pattern can result in improper firing.

To match a nozzle to a burner takes field-service experience, or trial-and-error, or a good foundation of understanding angles, rates and patterns. Refer to Delavan's service technicians guide #884, "A Total Look at Oil Burner Nozzles" for more technical information on nozzle selection and understanding angle, rates and patterns. Also refer to the Burner Manufacturers' Recommendations Chart below.

Manufacturer	Model	Delavan Nozzle	
Aero Burner	F-AFC	80° W, A or B	
	HF-US	80° W, A or B	
	HF-AFC	80° W, A or B	
	SV-SSV	70° or 80° B	
R.W. Beckett	AF/FG (F)	60°, 70° or 80° A or B (100-150 PSI)	
	AF/AFG (M)	60° or 70° A or B (100-150 PSI)	
	AFII (FB)	45°, 60° or 70° A, W or B (140-200 PSI)	
	AF II (HLX)	45°, 60° or 70° A, W or B (140-200 PSI)	
The Carlin Co.	99 FRD (Std.)	.50-.75 GPH	60°A
		.85-3.00 GPH	45°A, 60°A or B
	100 CRD (Std.)	.50-.75 GPH	60°A
		.85-2.25 GPH	45°A, 60°A or B
		.75-1.10 GPH	60°
	Elite EZ-1	.50-1.00 GPH	70°A
.50-.85 GPH		60° SS	
1.00-1.65 GPH		60° or 70°	
Elite (EZ-2,3)	All Flow Rates 60° A, B or SS		
Riello Burners	Mectron 3M 5M	60° W, B, or Del-O-Flo A (Up to to .85 GPH)	
	F3, F.5	.40-1.25 GPH	60° or 80° W or A
	F10	1.25-2.50 GPH	60° or W or B
	F15, F20	2.00-5.00 GPH	45° or 60° W or B
	R35.3, R35.5	.50-1.25 GPH	60° or 80° W or B
	Press Series	2.00-12.00 GPH	60° or 45° B or W
Intertherm	MAC 1265	P/N 6601-181 or .55 GPH 90° W or .579 MH	
	MSH 066	.50-.80°A	
	MSH 086	.65 - 80° A	
Wayne Home Equipment	P100	.50-1.00 GPH	60°, 70°, 80° A or B
	EHASR	.75-3.00 GPH	80°, 70°, 60° **
	MSR	.75-2.75 GPH	80°, 70°, 60° **
	HS	.50-2.50 GPH	80°, 70°, 60° **
	HS	.50-3.00 GPH	80°, 70°, 60° B
	EG-1	.50-3.00 GPH	80°, 70°, 60° **
		**Under 1.00 GPH use A; above 1.00 use B.	
Weil-Mclain	QB180 (150 PSI)	.55-1.80 GPH	45°, 60°, 70°, 80° A or B
	QB300 (140 PSI)	1.75-3.00 GPH	45°, 60°, 70°, 80° B

*Effective November 1999. Subject to updating by burner manufacturers. For models not listed contact burner manufacturer. Always follow the appliance manufacturer's instructions for the correct nozzle specification.

WARNING: Improper modification to combustion units may create a fire hazard resulting in possible injury. Contact the original equipment manufacturer before modifying the combustion unit.

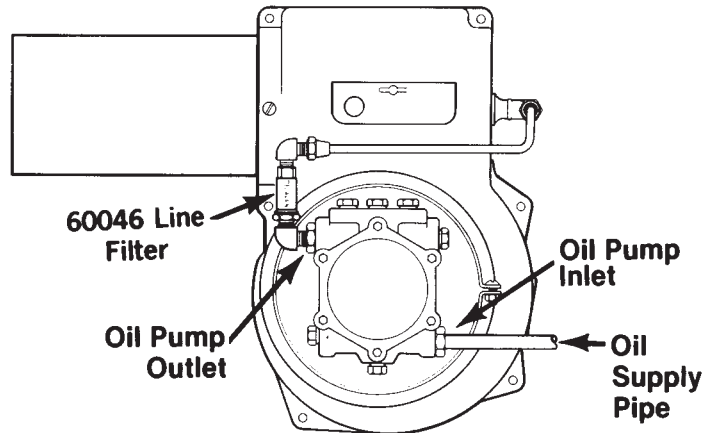
NOTE: Information on this chart is to be used as a general guide only.

DELAVAN PRECISION OIL BURNER NOZZLES



LINE FILTER

Use Delavan's line filter for extra filtration in burner applications of 2.00 GPH or less. These offer four times the filtering area of a standard nozzle strainer and twice the protection. A plugged line filter can cause a pressure drop. Check the pressure on the outlet side of the filter while the unit is flowing to see that it is the same as the pump pressure. If less, replace filter.



- 1/8" NPT inlet and outlet threads

Easy installation (see drawing)

NOTE: Replace the line filter during the annual service check for an economical way to maintain clear lines.



SINTERED FILTERS & STRAINERS

Nozzles up to 2.00 GPH have as standard a sintered filter. From 2.25 up to 15.00, monel filters are provided. Nozzles with through-put of 16.00 GPH and higher have no filter attached.

Type	Part #	Media/Mesh size
Sintered Filter	45560-4	25 Micron
Sintered Filter	45560-1	40 Micron
Mesh Strainer	46046-1	74 micron/200M
Mesh Strainer	46046-2	125 Micron/120M

It is recommended to use sintered filters on nozzles with low throughput.



NOZZLE ADAPTERS

All nozzle adapters are made of brass, with precision machined mating surfaces for proper sealing.

IMPORTANT specify 1/8" or 1/4" pipe thread size

All nozzle adapters 9/16-24 UNEF internal thread

	Thd Size	Part Number
Long (Female)	1/8"	28738-1
	1/4"	28738-3
Standard (Female)	1/8"	28737-1
	1/4"	28737-3
Male	3/8"	28741-1

DELAVAN PRECISION OIL BURNER NOZZLES



DISPLAY STORAGE RACKS

An attractive black plastic display and storage rack is available and will hold up 120 nozzles (12 vials in 10 slots). It is inexpensive, lightweight and easy to mount on the wall. Holes are drilled in the rack for easy mounting. This rack is packaged two to a carton; order in multiples of two.

Also available is a metal nozzle rack that will hold more than 500 nozzles. It can be mounted flush or at an angle on a wall. Mounting brackets are furnished.

Part number #47749 #32779



NOZZLE CHANGER: TWO IN ONE

Delavan's versatile nozzle changer passes through the small openings of the flame retention-disc. Just snap off outer socket and use the inner socket alone to remove the nozzle.

For wider openings, snap on outer socket and use like a standard nozzle changer. The nozzle changer fits the hex of the adapter (3/4"), and the nozzle hex (9/16").

Part number: #34478



TELESCOPING MIRRORS

Three types of flame inspection mirrors are available... the round (3-3/4" dia.), the rectangular (1-15/16x3-3/4") or mini (1-1/8x3"). They are furnished with handles, which telescope down to fit into a service technician's kit. A cloth bag is provided to protect the mirror finish.

Mirror Parts:

#12269 Rectangular Mirror Head Assembly
 #12672 Round Mirror Head Assembly
 #33174 Mini Mirror Head Assembly
 #13148 Swivel Bracket Assembly

Complete Mirror Assemblies:

#33175 Mini Mirror w/handle
 #12640 Round mirror w/handle
 #12275 Rectangular mirror w/handle



ADAPTRAP

A nozzle adapter designed to reduce the volume of oil in the adapter and minimize oil after drip. Specify 1/8" or 1/4" NPT pipe thread size and length.

Available in brass only.

	Part Number	
Thd Size	1 5/8" Length	1 3/8" Length
1/8"	37231-3	37231-1
1/4"	37231-4	37231-2

DELAVAN PRECISION OIL BURNER NOZZLES

SERVICE TECHNICIANS KIT

This kit is designed to hold 41 nozzles and is constructed of heavy-gauge steel with carrying handle, snap latch and removable steel tray. It is also designed to hold the following accessories:

- #32781-4 1/4" test gauge (0 to 300 psi)
- #29168 Plastic containers for filters and strainers
- #34478 Nozzle changer
- # 2838 Female coupling (1/4" FPTx1/4" flare)
- # 2839 Half union (1/8"x1/4" flare) #26846-3 Kit with tray only
- # 2840 Half union (1/4"x1/4" flare) #2624 Kit with accessories
- # 2843 Tubing section and flare nuts

PRESSURE & VACUUM GAUGES

Accessories available include pressure and vacuum gauges, nozzle boxes, a display and storage rack and telescoping mirrors.

#32781-4 -- 1/4" Pressure Gauge

#32781-2 -- 1/4" NPT Vacuum Gauge

NOZZLE BOXES

Delavan nozzle boxes handle all brands of nozzle vials. Our 110-nozzle and 55-nozzle boxes are made up of heavy-gauge steel with rugged hinges and snap-latch construction... finished in baked-on jet black enamel.

#26846-4 -- 110 Nozzle Box -- (5" x 3 5/8" x 11 15/16")

#26846-5 -- 55 Nozzle Box --
(5" x 1 3/4" x 11 15/16")

*Visit our website at
www.delavaninc.com
for more details about
our products and
services.*

DELAVAN PRECISION OIL BURNER NOZZLES

Type WDA & WDB

Pressure Atomizing Nozzles for humidifying

Spray Characteristics

- Finely atomized cone spray pattern for humidifying
- WDA has a hollow cone pattern
- WDB has a solid cone pattern
- Available spray angles - 30 , 45 , 60 , 70 , 80 and 90

Ordering Instructions

WHEN ORDERING TYPE WDA & WDB NOZZLES, be sure to specify the following :

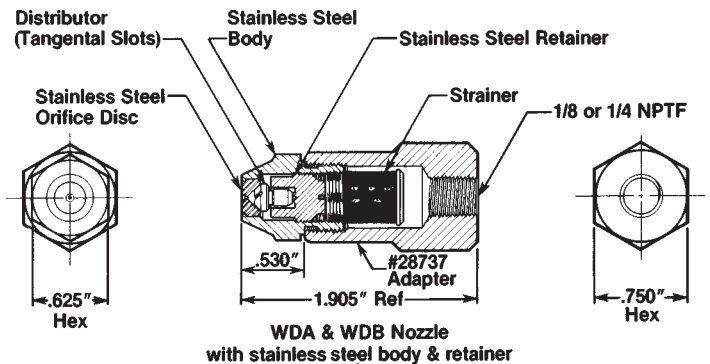
- 1) Nozzle number per capacity chart
 - 2) Spray angle
 - 3) Material (brass with stainless steel metering parts will be furnished if material is not specified).
- Order adapters separately, see selection chart.

Materials

Nozzle bodies are available in brass or stainless steel with a stainless steel orifice disc. Distributors are stainless steel and retainers are available in brass or stainless steel. Strainers are furnished up through WDA/WDB15 (15.0 GPH @ 125 PSIG) with each nozzle.

Adapter Selection Chart

Pipe Size	Adapter P/N		Length	
	Brass	S.S.	Adapter only	Adapter plus nozzle
1/8 NPTF	28737-1	28737-2	1.375"	1.905"
1/4 NPTF	28737-3	28737-4	1.375"	1.905"
3/8 NPTM	28741-1	—	1.375"	1.905"



WDA-WDB CAPACITY CHART

NOZZLE NO. = CAPACITY AT 125 PSIG

NOZZLE NUMBER			App. Orif. Dia.	CAPACITY — GPH AT PSIG PRESSURE — based on water							
WDA	WDB	No.		30 PSIG	40 PSIG	75 PSIG	100 PSIG	125 PSIG	150 PSIG	300 PSIG	500 PSIG
WDA	WDB	*.50	.0083	—	—	.39	.45	.50	.55	.77	1.0
WDA	WDB	*.75	.0092	—	—	.58	.67	.75	.82	1.16	1.5
WDA	WDB	1.0	.011	—	—	.77	.89	1.00	1.10	1.55	2.0
WDA	WDB	1.5	.013	—	—	1.16	1.34	1.50	1.65	2.32	3.0
WDA	WDB	2.0	.015	—	—	1.55	1.79	2.00	2.20	3.10	4.0
WDA	WDB	2.5	.016	—	—	1.93	2.24	2.50	2.74	3.88	5.0
WDA	WDB	3.0	.018	—	—	2.32	2.68	3.00	3.30	4.65	6.0
WDA	WDB	4.0	.025	—	2.2	3.1	3.6	4.0	4.4	6.2	8.0
WDA	WDB	5.0	.025	—	2.8	3.9	4.5	5.0	5.5	7.7	10.0
WDA	WDB	6.0	.029	—	3.6	4.7	5.4	6.0	6.6	9.3	12.0
WDA	WDB	8.0	.032	—	4.5	6.2	7.2	8.0	8.9	12.4	16.0
WDA	WDB	10.0	.035	4.8	5.6	7.7	8.9	10.0	11.0	15.5	20.0
WDA	WDB	12.0	.040	5.8	6.8	9.3	10.7	12.0	13.2	18.6	24.0
WDA	WDB	14.0	.040	6.8	7.9	10.8	12.5	14.0	15.3	21.7	28.0
WDA	WDB	16.0	.046	7.8	9.0	12.4	14.3	16.0	17.5	24.8	32.0
WDA	WDB	18.0	.052	8.8	10.1	13.9	16.1	18.0	19.7	27.9	36.0
WDA	WDB	20.0	.055	9.8	11.3	15.5	17.9	20.0	21.9	31.0	40.0
WDA	WDB	24.0	.060	12.3	13.5	18.6	21.5	24.0	26.3	37.2	48.0
WDA	WDB	30.0	.067	14.6	16.9	23.2	26.8	30.0	32.9	46.5	60.0
WDA	WDB	35.0	.070	17.2	19.8	27.2	31.4	35.0	38.4	54.3	70.0

*NOT AVAILABLE IN 30"

WDA-WDB Nozzles above 16.0 GPH are furnished without strainers.

Max. Design Pressure: 500 psig

DELAVAN PRECISION OIL BURNER NOZZLES

DELAVAN TECHNICAL AIDS

For greater detail on nozzle selection and other technical subjects consult specific publications such as:

"Keep The Flame Burning" -- A video series (1/2" VHS) for service technicians. It is an overview of fuel oil heating, presented from the standpoint of nozzle needs. It points out and reminds the service technician of the various elements in a heating system that affect nozzle performance.

"A Total Look At Oil Burner Nozzles" -- A guide towards understanding how a nozzle works and what affects nozzle performance. Included are examples of proper nozzle selection, nozzle care and service tips plus a general trouble shooting guide and answers to some commonly asked questions by service technicians.

"How to Select the Right Nozzle" -- A four-page reprinted article which explains how to match a spray pattern to an air pattern for quiet, efficient performance.

"Combustion of Fuel Oil" -- A four-page reprinted article which explains what is meant by CO₂, excess air and zero smoke in simple scientific terms.

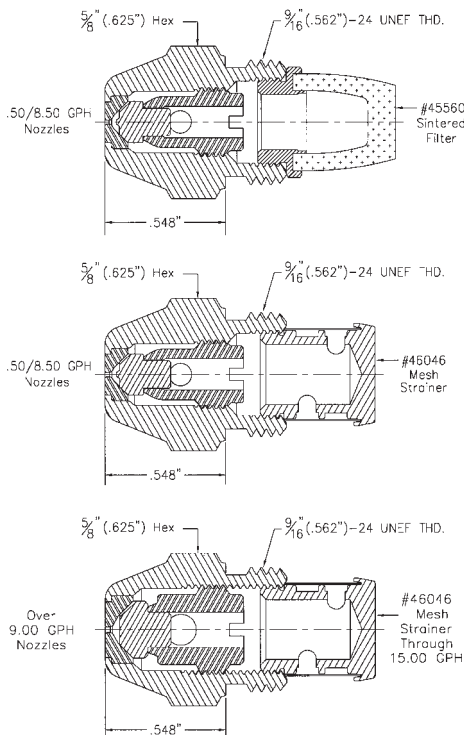
"Oil Burner Nozzle Interchange Card" -- A wallet-size plastic card that will quickly tell you which Delavan nozzle will interchange with which competitive nozzles.

Video tapes are also available. For more details contact:

Delavan Fuel Metering Products Operation
P.O. Box 969 • Bamberg • South Carolina 29003



Nozzle Dimensions



Ordering Instructions

WHEN ORDERING OIL BURNER NOZZLES, be sure to specify the following:

- (1) Quantity
- (2) Capacity rating in gallons per hour (gph)
- (3) Spray angle
- (4) Spray pattern or type:
Hollow cone--Type A, Del-O-Flo Type A
Solid cone--Type B, Del-O-Flo Type B, Type W
- (5) Filter or strainer--See selection chart on page 8 for sintered filters and mesh strainers furnished with each nozzle. Optional mesh sizes may be substituted when ordering nozzles. Order by part number and description.

WHEN ORDERING ACCESSORIES, be sure to specify part number and brief description.

Delavan Fuel Metering Products Operation
P.O. Box 969 • Bamberg • South Carolina 29003

Refer to each product section for specific instructions on information to include when ordering. Contact your Delavan representative or the factory for the current price list and for any assistance in finding the right nozzle for your application.

DELAVAN OIL BURNER NOZZLES FOR INDUSTRIAL APPLICATIONS

FOR INDUSTRIAL AND SPECIAL COMBUSTION APPLICATIONS

Delavan, as a world leader in nozzle technology, offers a unique variety of products to meet the requirements of domestic and industrial combustion.



VARIFLO - RETURN FLOW NOZZLES

Pressure atomizing nozzles for good atomization over a wide flow range.

- Permits variable burner outputs based on by-pass pressure
- Wider spray angles at lower flow rates
- Less subject to clogging



SNA-SIPHON TYPE AIR ATOMIZING NOZZLES

for extremely fine spray particle size at low air pressures

- Permits good combustion with medium and heavy oils
- Produces a solid cone spray with extremely fine particle size at low air pressures
- Clog free operation of low volume due to large inside passages and orifice



AIRO - AIR ATOMIZING NOZZLES

For good atomization of both light and heavy oils at higher flow rates.

Covers a wide range of throughputs from 10.00 GPH (32 kg./h up to 200.00 GPH (720 kg./h)



SWIRL AIR - AIR ATOMIZING NOZZLES

For maximum use of input hydraulic and pneumatic energy to atomize fuels at low pressures.

Delavan's two-fluid Swirl-Air nozzle is designed to make maximum use of input hydraulic and pneumatic energy to atomize fuels at low pressures. In combustion applications it can produce fine atomization at flow rates up to 300 gph.

VARIFLO™ Pressure Atomizing Nozzles for good atomizing over a wide flow range



SPRAY CHARACTERISTICS

- Good atomization over a wider flow range.
- Wider spray angles at lower flow rates.
- Less subject to clogging.
- Less buildup of carbon and gum residue

HOW IT WORKS

The Delavan Variflo nozzle is a pressure atomizing nozzle which provides discharge rate variations without changing nozzles. This is accomplished by the bypass principle.

With constant inlet supply pressure and the bypass (return line) closed, the nozzle operates as a simplex atomizing nozzle. For a reduced discharge flow the bypass line is opened and part of the fuel is allowed to return to the tank. The advantage is reduced flow without deterioration of the spray quality.

The maximum to minimum discharge flow rate at constant supply pressure is referred to as the “turndown ratio”. The standard catalog nozzles have turndown ratios of approximately 5 to 1.

The key advantage of the Variflo over a simplex nozzle (like Delavan’s oil burner nozzles) is flexibility; larger turndown ratios with better atomization. With the Variflo nozzle, using a constant supply pressure, the discharge flow rate varies approximately as the square of the bypass pressure. This means that at minimum flows the atomization pressure is reduced approximately 34 percent. With the simplex nozzle the discharge flow rate varies as the square root of the supply pressure. This means that to obtain one-half of the design flow rate the supply pressure must be reduced by 1/4 of the original pressure. This pressure is too low for good atomization.

INSTALLATION

The Delavan Variflo nozzle may be:

1. Operated at a fixed discharge rate. The rates may be set by a valve to any flow rate in the nozzle’s range.

2. Adapted for 2-stage firing. This is helpful when a low-fire start is required.
3. Operated with complete modulation over the designed flow range (with proper equipment).

The fuel supply system for the Variflo nozzle is the same inlet pump and pressure control system as for a simplex nozzle. The only difference is that pump capacity must be at least 50 percent over the rated (maximum) flow rate of the nozzle.

For a **FIXED FIRING RATE**, with manual adjustment when required, hook up as shown in figure 1. Use a relief valve for the bypass system control.

For **2-STAGE FIRING**, the hookup is the same except a solenoid valve is added. (See inset, figure 1.) The bypass control valve in this hookup should be set for minimum flow with the solenoid normally open for low fire. High fire is obtained by closing the solenoid. The solenoid may be actuated by a timer or temperature or pressure sensing element.

For **COMPLETE MODULATION**, hook up as shown in figure 1 except use a modulating valve by temperature or pressure, through the proper modulating motor, linked to the combustion air supply.

Remove pressure gauges from the system after making adjustments. The pressure gauge provides an air cushion in the system which causes after-squirt and drooling.

Return the bypass line to the supply tank as shown in figure 1. The Variflo nozzle can, under some conditions, draw air into the bypass line through the discharge orifice even during operation. If the air were piped to the suction side of the pump, the pump could become air locked with a resulting pressure loss. Another advantage to returning the line to the tank is extended nozzle life because the nozzle will run cooler.

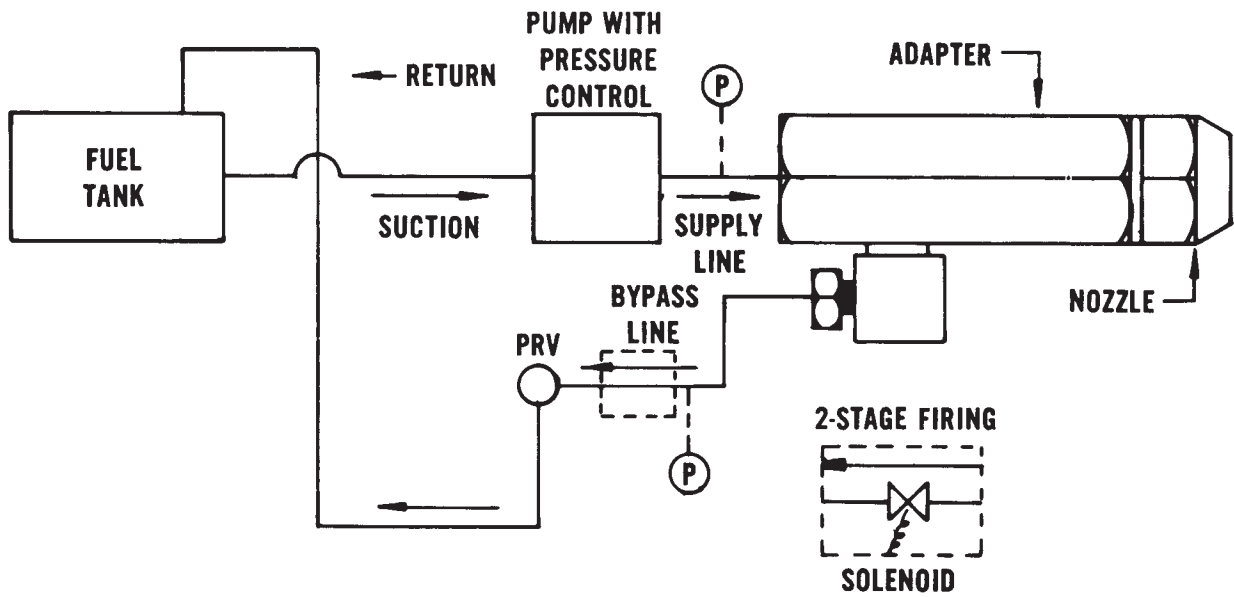
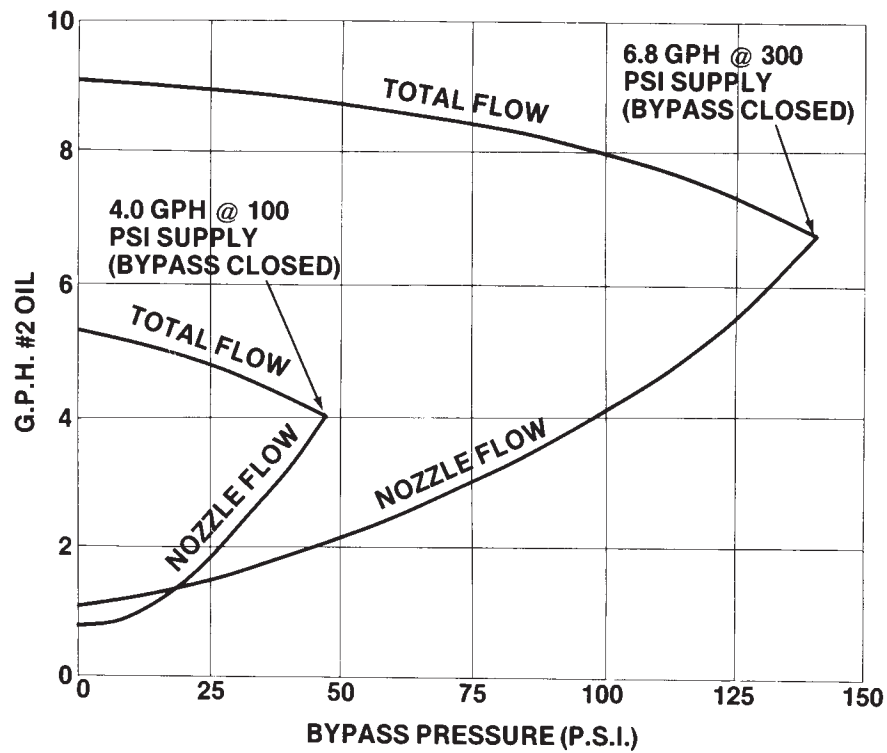
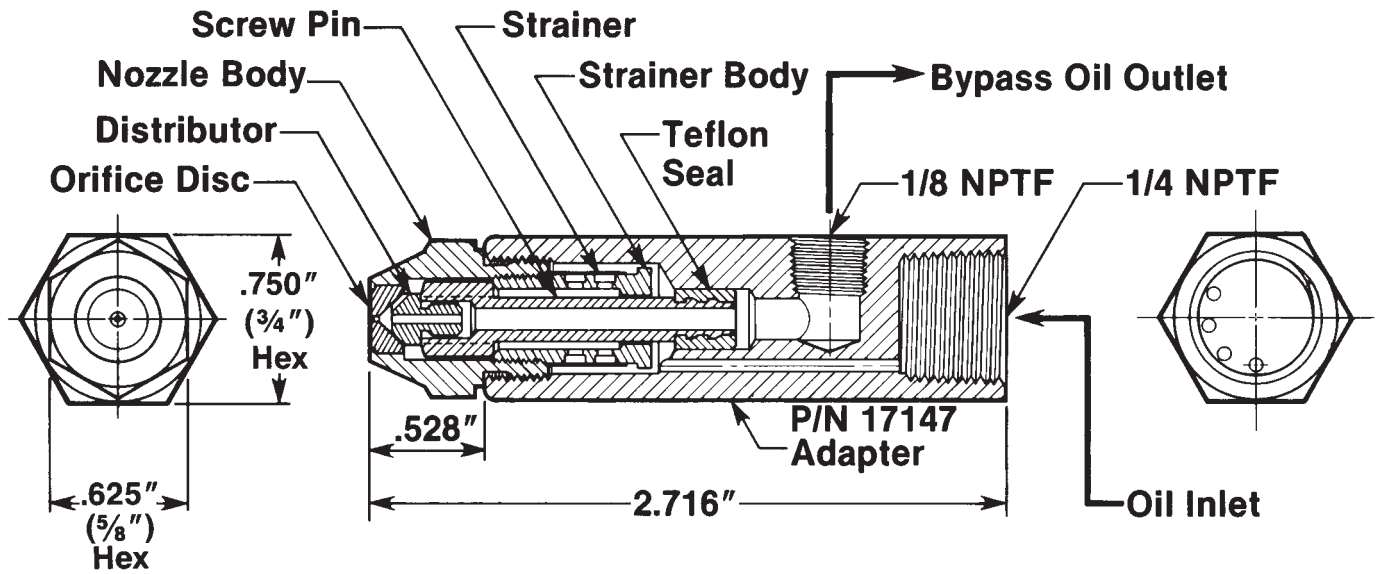


FIGURE 1. INSTALLATION SCHEMATIC



TYPICAL CURVE @ 100 & 300 PSI SUPPLY
(5 to 1 turn down — 5/8" hex size)



Variflo Nozzle Assembly P/N 33769

- (see chart for dash no. corresponding to flow & spray angle desired)
VARIFLO NOZZLE CAPACITY CHART

Dash No.	Spray Angle	Bypass Closed Calibrated Nozzle Flow-GPH	100 PSI Supply		300 PSI Supply
			Bypass Open		Bypass Closed
			Total Flow -GPH (Ref.)	Nozzle Flow -GPH (Ref.)	Nozzle Flow -GPH (Ref.)
- 1 - 2	45° 60°	.75	1.02	.20	1.27
- 3 - 4	45° 60°	1.00	1.30	.22	1.60
- 5 - 6 - 7	45° 60° 80°	1.50	1.90	.30	2.30
- 8 - 9 -10	45° 60° 80°	2.00	2.60	.38	3.30
-11 -12 -13	45° 60° 80°	2.50	3.40	.49	4.00
-14 -15 -16 -17	30° 45° 60° 80°	3.00	4.00	.57	5.00
-18 -19 -20 -21	30° 45° 60° 80°	3.50	4.60	.67	6.00
-22 -23 -24 -25	30° 45° 60° 80°	4.00	5.20	.78	6.80
-26 -27 -28 -29	30° 45° 60° 80°	4.50	6.00	.85	7.50
-30 -31 -32 -33	30° 45° 60° 80°	5.00	6.6	.97	8.60
-34 -35 -36 -37	30° 45° 60° 80°	5.50	7.40	1.02	9.10
-38 -39 -40 -41	30° 45° 60° 80°	6.00	8.00	1.17	9.90

Dash No.	Spray Angle	Bypass Closed Calibrated Nozzle Flow-GPH	100 PSI Supply		300 PSI Supply
			Bypass Open		Bypass Closed
			Total Flow -GPH (Ref.)	Nozzle Flow -GPH (Ref.)	Nozzle Flow -GPH (Ref.)
-42 -43 -44 -45	30° 45° 60° 80°	6.50	8.50	1.25	10.75
-46 -47 -48 -49	30° 45° 60° 80°	7.00	8.90	1.35	11.80
-50 -51 -52 -53	30° 45° 60° 80°	7.50	9.90	1.41	12.50
-54 -55 -56 -57	30° 45° 60° 80°	8.00	10.60	1.56	13.5
-58 -59 -60 -61	30° 45° 60° 80°	9.00	11.50	1.72	15.00
-62 -63 -64 -65	30° 45° 60° 80°	9.50	12.80	1.78	15.90
-66 -67 -68 -69	30° 45° 60° 80°	10.00	13.40	1.92	16.70
-70 -71 -72 -73	30° 45° 60° 80°	12.00	15.90	2.26	20.80
-74 -75 -76 -77	30° 45° 60° 80°	14.00	19.00	2.75	23.50
-78 -79 -80	45° 60° 80°	16.00	21.00	3.10	27.00
-81 -82 -83	45° 60° 80°	18.00	24.00	3.40	31.20
-84 -85 -86	45° 60° 80°	20.00	26.50	3.70	33.80
-87 -88 -89	45° 60° 80°	22.00	28.70	4.10	36.80
-90 -91 -92	45° 60° 80°	24.00	31.50	4.65	41.00
-93 -94 -95	60° 80° 90°	28.00	36.00	5.22	48.50
-96 -97 -98	60° 80° 90°	30.00	38.50	5.80	51.50
-99 -100 -101	60° 80° 90°	35.00	46.40	6.70	59.60
-102 -103	60° 80°	40.00	50.00	10.70	68.00
-104 -105	60° 80°	45.00	58.00	9.70	75.50
-106 -107	60° 80°	50.00	62.00	13.90	84.50

NOTE: 30° & 90° nozzles listed above available on special order only.

Other flow rates and spray angles available on special order.

Nozzles are calibrated for flow and spray angle at 100 PSI on #2 oil. Spray angles at 300 PSI will be somewhat narrower than spray angle at 100 PSI. As bypass is opened, spray angle will increase (up to 15° wider) both at 100 PSI and 300 PSI supply.

ORDERING INSTRUCTIONS

WHEN ORDERING VARIFLO NOZZLES, be sure to include both part number and description. Specify P/N 33769 – (see nozzle capacity chart for dash number corresponding to flow and spray angle desired). Order adapter separately (specify P/N 17147).

SIPHON TYPE SNA™ Air Atomizing Nozzles

for extremely fine spray
particle size at low air pressures



SPRAY CHARACTERISTICS

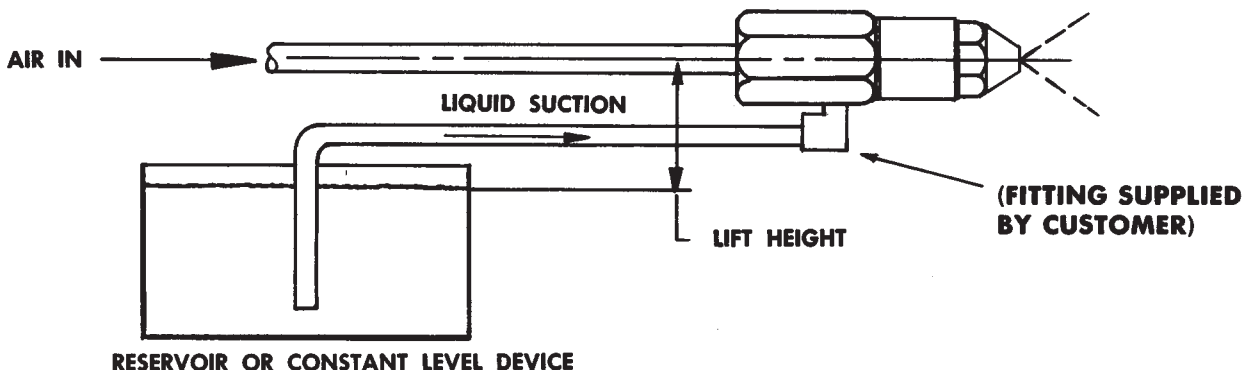
- Produces a solid cone spray pattern with extremely fine particle size at low air pressures and low CFM.
- Flow rates, spray angles and droplet sizes can be modified, with limitations, by variations in air, lift, etc.
- Clog free operation of low volume due to relatively large passages.

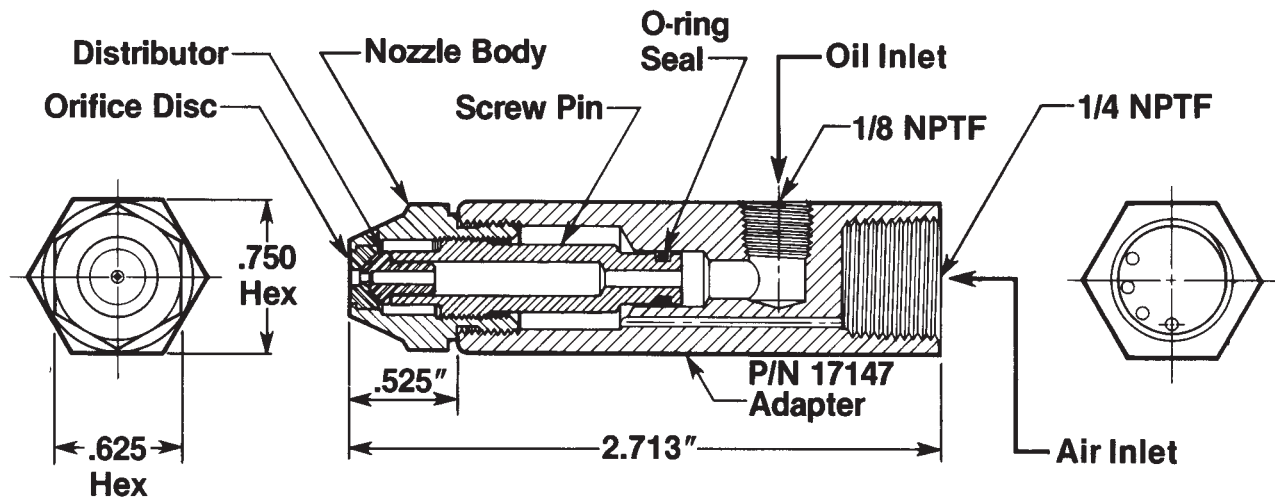
INSTALLATION

The air compressor should be capable of providing at least 10% more air than the specified values. All fuel and air line connections must be tight. Any leaks, especially in the fuel line, will have an adverse effect on the lift characteristics.

The nozzle will flow in either a horizontal or vertical position. The lift distance for a vertical mounted nozzle is measured from the liquid level to the end (face) of the nozzle. The lift distance for the horizontal mounting is shown in the installation drawing.

If the combustion application does not permit the use of a constant level device, excellent spray characteristics can be obtained using a fuel metering pump and an air compressor. It is also possible to operate the nozzle in a closed pressurized system utilizing air pressure for both lifting and atomizing the fuel.





Siphon Type SNA Nozzle P/N 30609

Siphon Nozzle Capacity Chart

Part Number	Nozzle No.	3 PSIG Air		4 PSIG Air		5 PSIG Air		Lift Height (Inches)
		Fuel (GPH)	Air (CFM)	Fuel (GPH)	Air (CFM)	Fuel (GPH)	Air (CFM)	
30609-2	SNA .20	.19	.36	.23	.45	.25	.49	1
		.16	.36	.20	.45	.22	.49	4
		.14	.36	.17	.45	.20	.49	7
30609-3	SNA .30	.29	.41	.33	.49	.36	.55	1
		.26	.41	.30	.49	.33	.55	4
		.23	.41	.27	.49	.30	.55	7
30609-4	SNA .40	.38	.45	.44	.54	.49	.61	1
		.34	.45	.40	.54	.45	.61	4
		.30	.45	.36	.54	.41	.61	7
30609-5	SNA .50	.48	.50	.54	.59	.58	.65	1
		.43	.50	.50	.59	.53	.65	4
		.38	.50	.46	.59	.48	.65	7
30609-7	SNA .65	.63	.59	.72	.67	.78	.76	1
		.57	.59	.65	.67	.72	.76	4
		.51	.59	.58	.67	.66	.76	7
30609-8	SNA .75	.75	.63	.83	.74	.93	.87	1
		.65	.63	.75	.74	.84	.87	4
		.59	.63	.67	.74	.75	.87	7
30609-9	SNA .85	.84	.71	.93	.80	1.04	.93	1
		.75	.71	.85	.80	.95	.93	4
		.66	.71	.77	.80	.86	.93	7
30609-11	SNA 1.00	.96	.73	1.10	.91	1.15	1.02	1
		.84	.73	1.00	.91	1.06	1.02	4
		.72	.73	.90	.91	.97	1.02	7

ORDERING INSTRUCTIONS

WHEN ORDERING SIPHON TYPE SNA NOZZLES, be sure to include both part number and description. Specify P/N 30609 – (see nozzle capacity chart for dash number corresponding to flow and spray angle desired). Order adapter separately (specify P/N 17147).

AIRO™ Air Atomizing Nozzles

for good atomization of both
light and heavy fuels at higher flow rates



The industrial Airo Nozzle is an air atomizing nozzle designed to handle #2, #4, and preheated #5 and #6 fuels. Air is supplied at relatively low pressure to provide the energy for atomization. Air atomizing nozzles provide good atomization of fuels too viscous for pressure atomizing nozzles. They can also provide finer breakup if sufficient air is available.

The Airo Nozzle is of the internal mixing type. That means that the air and fuel are piped separately to the nozzle and are mixed just before they enter the atomizing slots. The air under pressure is mixed thoroughly with the fuel in the swirl chamber so that a uniform emulsion is discharged through the orifice. The resultant spray is well atomized in a solid cone pattern.

The cost of equipment with air atomizing nozzles is higher than for equivalent pressure atomizing nozzles because of the addition of the compressor. The power requirement is also higher because of the extra power required to compress air. These disadvantages are offset, however, by the advantages in handling of heavy fuels.

APPLICATIONS

- The Airo Nozzle may be used as a fixed discharge nozzle. (Fuel metering is discussed in a following heading.)
- This nozzle may be arranged for two-stage firing if desired.
- This type of nozzle may be arranged for complete modulating over the desired flow range.
- The Airo Nozzle will handle light fuels at any flow rate from 2 GPH and up. The proper nozzle must be selected for each range.
- The Industrial Airo Nozzle will handle #5 oil or #6 oil preheated to approximately 100 SSU. Above 20 GPH, higher viscosities may be handled if sufficient air is available.

SPRAY CHARACTERISTICS

- Uniform solid cone-spray angle varies with air pressure and flow. A separate metering device, such as an orifice, metering pump or valve is required.
- Large flow passages greatly reduce clogging.
- With the internal mixing type of nozzle, the spray angle changes with the fuel-air ratio (pounds of fuel per pound of atomizing air). The spray angle is wider at high fuel-air ratios. For example if the spray angle is 75° at a fuel-air ratio of 30 to 1, it may be reduced to 60° at a fuel-air ratio of 10 to 1.
- Higher air pressures produce narrower spray angles.
- Droplet size is smaller at higher air pressures and narrower spray angles.
- Constant spray angles may be obtained by modulating air pressure with the fluid flow.

ADAPTERS

Adapters are optional and, if required, must be ordered separately. Adapters come with seals installed.

Hex Size	Part Number	Material
7/8	23034-1	Brass
	23034-2	Stainless steel
1 1/4	30678-1	Mild steel
	30678-2	Stainless steel
	30678-3	Inconel

INSTALLATION:

FUEL METERING

- A fixed firing rate may be obtained by supplying fuel by a pressure pump through a fixed metering orifice to the nozzle.
- Two stage operation may be obtained by the use of two metering orifices in the fuel line, one of them in series with a solenoid valve. This solenoid valve will be actuated by pressure or temperature.
- A positive fuel metering pump of the piston type is satisfactory for single stage operation.
- Modulating metering may be obtained by the use of a fuel pump in combination with a modulating valve.
- Metering *cannot* be done with this type of nozzle by balancing fuel pressure against air pressure.

METHODS OF METERING FUEL

- Metering pump.
- Constant pressure pump and metering orifice in the line.
- Constant pressure pump and motorized modulating valve actuated by steam pressure, water or process temperature.

AIR COMPRESSOR

- May be rotary type for pressures up to 25 PSI or as rated by manufacturer.
- May be piston type for higher pressure.
- May have built in pressure relief valve.
- Must have enough capacity for the nozzle requirement.

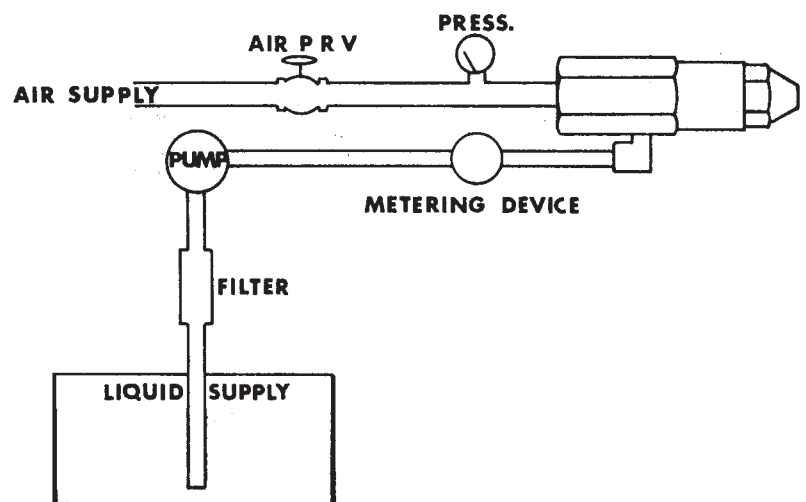
SPECIAL CONDITIONS:

It may be necessary when burning residual fuels to provide some means for heating the nozzle and fuel line before starting. It may also be advantageous to provide air purge of the fuel line to the nozzle on shut-down.

It is *always* advisable to make certain that air flow through the nozzle is established *before* fuel is supplied. This will prevent backing up of fuel into the air line and equipment. It will also insure good atomization at the start.

SERVICE:

- Since the fuel and air passages in this type of nozzle are quite large, clogging is not a serious problem. It is recommended, however, that both the air and the fuel be filtered to remove lint and large particles of foreign matter. Clogging of air passages or fuel passages will result in off-center fires.
- Damage to the orifice may result in a streaky fire, an off-center fire, or drooling.



CONSTRUCTION & MATERIALS:

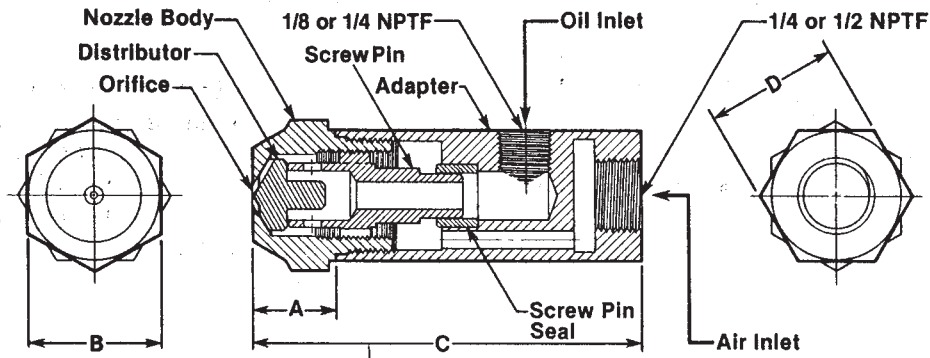
The Airo nozzle is made up of three basic parts, available in the following materials:

- **NOZZLE BODY** – Brass or stainless steel.
Thread sizes: 3/4"-20 UNEF on #30615 and 1-1/8"-18 UNEF on #30616.
- **DISTRIBUTOR** – Brass, stainless steel, or tungsten carbide (requires special body with replaceable tungsten carbide orifice disc, integral with body.)
- **SCREW PIN** – Brass or stainless steel.

NOTE: Contact factory for other material requirements.

DIMENSIONS AND WEIGHTS FOR AIRO NOZZLES

Nozzle Type	Material	Dimensions (Inches)				Inlet Sizes		Weight (Ounces)
		A	B	C	D	Air	Liquid	
30615 with 23034-1 Adapter	Brass	.625	.875 Hex	3.125	.875 Hex	1/4 NPT	1/8 NPT	7
30615 with 23034-2 Adapter	Stainless Steel	.625	.875 Hex	3.125	.875 Hex	1/4 NPT	1/8 NPT	8
30616 with 30678 Adapter	Stainless Steel	.800	1.25 Hex	3.620	1.25 Hex	1/2 NPT	1/4 NPT	9



Airo Nozzle Assembly
P/N 30615 (.875" Hex) & P/N 30616 (1.250" Hex)

1 1/4 " AIRO NOZZLE CAPACITIES

Part Number	Customer or Old Catalog PN	Flow Rate (GPH)	Body Material	Screw Pin Type and Material	Air Press (PSI)	Air Flow @ Max Disch (PPH)	Spray Angle (°)
30616-1	9078-60	60	SS	SS	30.0	14.5-16.0	70°
30616-4	9078-70	70	SS	SS	30.0	16.0-17.5	70°
30616-5	12581-70	70	SS	Thd'd, SS	30.0	16.0-17.5	70°
30616-8	9078-80	80	SS	SS	30.0	17.0-18.5	70°
30616-9	12581-80	80	SS	Thd'd, SS	30.0	17.0-18.5	70°
30616-11	15293-80	80	HSS	HSS	30.0	17.0-18.5	70°
30616-12	27932	80	SS	SS	30.0	20.0-22.0	75-85°
30616-14	9078-100	100	SS	SS	30.0	21.0-22.5	70°
30616-15	12581-100	100	SS	Thd'd, SS	30.0	21.0-22.5	70°
30616-17	15293-100	100	HSS	HSS	30.0	21.0-22.5	70°
30616-19	17022	100	Incon	Incon	30.0	21.0-22.5	70°
30616-20	9078-120	120	SS	SS	30.0	23.5-25.0	70°
30616-21	12581-120	120	SS	Thd'd, SS	30.0	23.5-25.0	70°
30616-24	9078-130	130	SS	SS	30.0	25.0-26.5	70°
30616-25	12581-130	130	SS	Thd'd, SS	30.0	25.0-26.5	70°
30616-27	15293-150	130	HSS	HSS	35.0	25.0-26.5	70°
30616-29	9078-150	150	SS	SS	30.0	26.0-27.5	70°
30616-30	12581-150	150	SS	Thd'd, SS	30.0	26.0-27.5	70°
30616-32	15293-150	150	HSS	HSS	30.0	23.0-24.5	70°
30616-33	19279	150	Incon	Thd'd, Incon	30.0	26.0-27.5	70°
30616-34	19810	150	Incon	Incon	30.0	26.0-27.5	70°
30616-35	9078-200	150	SS	SS	20.0	25.0-26.5	70°
30616-36	12581-200	150	SS	Thd'd, SS	20.0	25.0-26.5	70°
30616-39	14788	150	SS	SS	25.0	23.0-25.0	65°

Abbreviations: HSS—Hardened Stainless Steel Thd'd—Threaded BR—Brass Incon—Inconel
SS—Stainless Steel

7/8" Airo Nozzle Capacities

Part Number	Flow Rate (GPH)	Body Material	Screw Pin Material	Air Pressure (PSI)	Air Flow @ max PPH	Spray Angle Degrees
30615-001	10	Brass	Unthreaded Brass	20	4.6 - 4.9	70 - 80
30615-002	10	303 SST	Unthreaded 303 SST	20	4.6 - 4.9	70 - 80
30615-003	10	HT 303 SST	Unthreaded 303	20	4.6 - 4.9	70 - 80
30615-004	10	303 SST	Unthreaded Brass	20	4.6 - 4.9	70 - 80
30615-005	10	303 SST	Threaded Brass	20	4.6 - 4.9	70 - 80
30615-006	10	Brass	Threaded Brass	20	4.6 - 4.9	70 - 80
30615-007	10	303 SST	Threaded 303 SST	20	4.6 - 4.9	70 - 80
30615-009	10	Inconel	Threaded AMS 5665	20	4.6 - 5	60 - 70
30615-010	15	Brass	Unthreaded Brass	20	4.6 - 5	70 - 80
30615-011	15	303 SST	Unthreaded 303 SST	20	4.6 - 5	70 - 80
30615-012	15	HT 303 SST	Unthreaded 303 SST	20	4.6 - 5	70 - 80
30615-013	15	303 SST	Unthreaded Brass	20	4.6 - 5	70 - 80
30615-014	15	303 SST	Threaded Brass	20	4.6 - 5	70 - 80
30615-015	20	Brass	Unthreaded Brass	20	6 - 6.3	70 - 80
30615-016	20	303 SST	Unthreaded 303	20	6 - 6.3	70 - 80
30615-017	20	HT 303 SST	Unthreaded 303 SST	20	6 - 6.3	70 - 80
30615-018	20	303 SST	Unthreaded Brass	20	6 - 6.3	70 - 80
30615-019	20	303 SST	Threaded Brass	20	6 - 6.3	70 - 80
30615-020	20	Brass	Threaded Brass	20	6 - 6.3	70 - 80
30615-021	20	303 SST	Threaded 303 SST	20	6 - 6.3	70 - 80
30615-023	25	Brass	Unthreaded Brass	25	6.1 - 6.4	70 - 80
30615-024	25	303 SST	Unthreaded 303 SST	25	6.1 - 6.4	70 - 80
30615-025	25	HT 303 SST	Unthreaded 303 SST	25	6.1 - 6.4	70 - 80
30615-026	25	303 SST	Unthreaded Brass	25	6.1 - 6.4	70 - 80
30615-027	25	303 SST	Threaded 303 SST	25	6.1 - 6.4	70 - 80
30615-028	30	Brass	Unthreaded Brass	25	6.8 - 7.1	70 - 80
30615-029	30	303 SST	Unthreaded 303	25	6.8 - 7.1	70 - 80
30615-030	30	HT 303 SST	Unthreaded 303 SST	25	6.8 - 7.1	70 - 80
30615-031	30	303 SST	Unthreaded Brass	25	6.8 - 7.1	70 - 80
30615-032	30	303 SST	Threaded Brass	25	6.8 - 7.1	70 - 80
30615-033	30	Brass	Threaded Brass	25	6.8 - 7.1	70 - 80
30615-034	30	303 SST	Threaded 303 SST	25	6.8 - 7.1	70 - 80
30615-036	30	303 SST	Unthreaded Brass	30	9.5 - 10.5	70 - 80
30615-037	30	303 SST	Unthreaded Brass	30	10.2 - 11	70 - 80
30615-038	35	Brass	Unthreaded Brass	25	8 - 8.4	70 - 80
30615-039	35	303 SST	Unthreaded 303	25	8 - 8.4	70 - 80
30615-040	35	HT 303 SST	Unthreaded 303 SST	25	8 - 8.4	70 - 80
30615-041	35	303 SST	Threaded Brass	25	8 - 8.4	70 - 80
30615-042	35	303 SST	Threaded Brass	25	8 - 8.4	70 - 80
30615-043	35	Brass	Unthreaded Brass	30	16 - 18	70 - 80
30615-044	40	Brass	Unthreaded Brass	30	8.5 - 8.9	70 - 80
30615-045	40	303 SST	Unthreaded 303	30	8.5 - 8.9	70 - 80
30615-047	40	Brass	Threaded Brass	30	8.5 - 8.9	70 - 80
30615-048	40	303 SST	Threaded 303 SST	30	8.5 - 8.9	70 - 80
30615-050	40	303 SST	Unthreaded Brass	30	8.5 - 8.9	70 - 80
30615-051	40	303 SST	Threaded Brass	30	8.5 - 8.9	70 - 80
30615-052	40	303 SST	Unthreaded Brass	30	13.5 - 14.5	60 - 70
30615-053	40	Inconel	Threaded AMS 5665	30	8.5 - 9.7	60 - 70
30615-054	40	303 SST	Unthreaded Brass	30	10 - 11	70 - 80
30615-055	50	Brass	Unthreaded Brass	30	9.5 - 10.5	65 - 75
30615-056	50	303 SST	Unthreaded 303	30	9.5 - 10.5	65 - 75
30615-057	50	HT 303 SST	Unthreaded 303 SST	30	9.5 - 10.5	65 - 75
30615-058	50	303 SST	Unthreaded Brass	30	9.5 - 10.5	65 - 75
30615-059	50	303 SST	Threaded Brass	30	9.5 - 10.5	65 - 75
30615-060	50	303 SST	Threaded 303 SST	30	9.5 - 10.5	60 - 70
30615-062	50	303 SST	Unthreaded Brass	30	9.5 - 10.5	70
30615-063	50	Inconel	Unthreaded AMS	30	9.5 - 10.5	60 - 70
30615-064	50	Brass	Unthreaded Brass	30	17 - 18.5	80
30615-069	20	303 SST	Unthreaded 303 SST	20	6 - 6.3	70 - 80
30615-071	25	303 SST	Unthreaded 303	25	6.1 - 6.4	70 - 80
30615-073	30	303 SST	Unthreaded 303 SST	25	6.8 - 7.1	70 - 80
30615-075	35	303 SST	Unthreaded 303 SST	25	8 - 8.4	70 - 80
30615-077	40	303 SST	Unthreaded 303	30	8.5 - 8.9	70 - 80
30615-079	40	316 SST	Threaded 316 SST	30	8.5 - 8.9	70 - 80
30615-081	30	303 SST	Unthreaded Brass	30	10.2 - 11	70 - 80
30615-082	30	303 SST	Threaded 303 SST	30	10.2 - 11	70 - 80
30615-083	10	HT 303 SST	Unthreaded 303 SST	20	4.6 - 4.9	70 - 80
30615-084	30	303 SST	Unthreaded 303 SST	30	10.2 - 11	70 - 80
30615-085	40	303 SST	Unthreaded 303	30	13.5 - 14.5	60 - 70
30615-086	100	Brass	Unthreaded Brass	35	20 - 22	
30615-087	120	Brass	Unthreaded Brass	35	19 - 21	
30615-088	150	Brass	Unthreaded Brass	35	16 - 18	
30615-098	35	303 SST	Unthreaded 303 SST	30	16 - 18	80
30615-099	15	303 SST	Threaded 303 SST	20	4.6 - 5	70 - 80
30615-100	10	Brass	Unthreaded Brass	20	6.6 - 7	70 - 80
30615-101	50	303 SST	Unthreaded 303 SST	30	17 - 18.5	80
30615-102	120	303 SST	Unthreaded 303 SST	35	19 - 21	
30615-103	150	303 SST	Unthreaded 303	35	16 - 18	
30615-104	100	303 SST	Unthreaded 303 SST	35	20 - 22	
30615-105	20	Inconel	Threaded AMS 5665	20	6 - 6.3	70 - 80
30615-106	40	Inconel	Threaded AMS 5665	30	89.7 - 10.8	70 - 80
30615-107	10	303 SST	Unthreaded 303 SST	20	4.6 - 4.9	70 - 80

ORDERING INSTRUCTIONS

WHEN ORDERING AIRO NOZZLES, be sure to include both part number and description. To find part number and dash number, see the nozzle capacity charts. First locate the correct nozzle size and capacity, then select proper body material and screw pin type. NOTE: Please specify distributor material if different than screw pin material.

EXAMPLE: A 1-1/4" 100 GPH stainless steel nozzle with stainless steel, threaded screw pin is PN 30616-15. It will be shipped with a stainless steel distributor.

Order adapter separately. Be sure to specify part number and description.

SWIRL-AIR™ Combustion Air Atomizing Nozzles

for maximum use of input hydraulic and
pneumatic energy to atomize fuels at low pressure



Delavan's two-fluid Swirl-Air is designed to make maximum use of input hydraulic and pneumatic energy to atomize fuels at low pressures. In combustion applications it can produce fine atomization at flow rates up to 300 gph.

Fuel enters the mixing chamber axially coming in contact with tangentially introduced streams of air (or steam). Interaction of the two creates extreme turbulence and mixing. Finally the fuel-air mixture impinges against a circular deflector ring, or pintle plate, before leaving the nozzle as a finely atomized spray.

Design of the pintle plate support eliminates the need for external struts that could interfere with the spray pattern. The progressive application of shear and inertial forces within the nozzle helps to provide high nozzle efficiencies.

SWIRL-AIR ADVANTAGES

Large fuel passages and lack of torturous paths reduce chances for clogging.

Air consumption (SCFM) and power requirements are relatively low, permitting the use of smaller, more economical, air compressors and blowers.

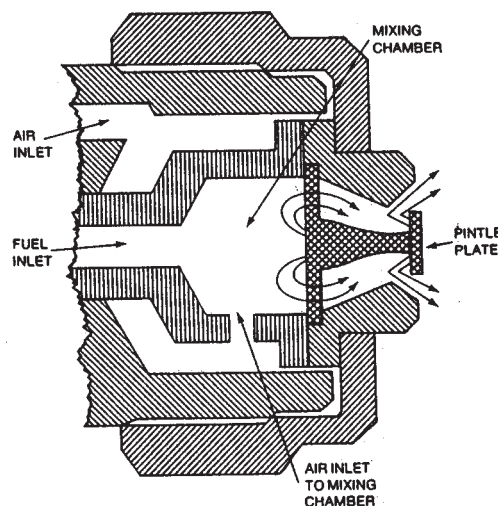
Good atomization ratios.

Nozzle configuration provides vortex mixing of two fluids.

Can handle fuels up to Type C Bunker oil...also combustible waste liquids. (The use of Swirl-Air nozzles in burning Bunker oils often reduces the accumulation of ashes caused by the high concentrations of impurities such as vanadium and sulphur).

Various spray angles and capacities are available through a selection of metering sets and swirl chambers.

No external struts that interfere with the spray.



APPLICATIONS

The list of industrial combustion applications for the Swirl-Air nozzle continues to grow. Here are some of the more common ones:

- As igniter nozzles in both coal-fired and oil-fired electric power stations.
- As main atomizers in large burners, especially where heavier fuels are used. Advantages include one or more of the following: Fewer flue deposits (ashes), lower smoke reading (0 Bacharach not uncommon), higher CO₂ and lower pre-heat temperatures.
- As an incineration atomizer: Products such as waste water, mustard gas, chemical wastes, eggs etc. have been handled successfully.

SPRAY CHARACTERISTICS:

Air, steam, or even a process gas, is introduced tangentially into the nozzle chamber in the low pressure region of the swirling mixture, creating extreme turbulence and primary atomization. As the fuel leaves the orifice, it impinges against the deflector ring which serves a dual purpose: close control of spray angle and breakup of the spray into even finer droplets (secondary atomization). Upon leaving the nozzle, the mixture swirls in a clockwise direction, looking downstream.

The nozzle has demonstrated the capability of achieving mean droplet diameters in the 50 to 100 micron range at modest air pressures and air volumes (SCFM). When using steam instead of air, the steam pressure should be approximately four times greater to achieve the same spray characteristics. Comparable atomization in a hydraulic nozzle would usually require very high fuel pressures. The degree of atomization is also fuel pressures. The degree of atomization is also variable by controlling the ratio of air to fuel flows.

CONSTRUCTION & MATERIALS:

Four-Piece construction (see below): (1) nozzle body (adapter), (2) swirl chamber, (3) metering set (integral nut and pintle) and (4) nozzle cap.

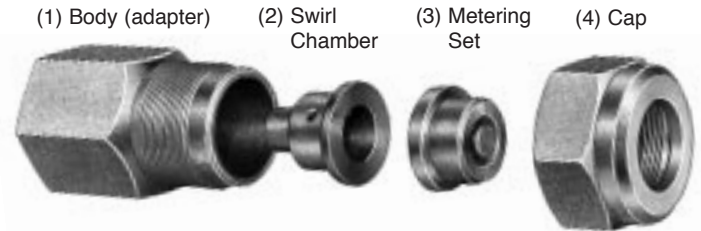
Parallel and concentric bodies (adapters) are available. Both are shown in the dimensional drawings.

Standard nozzle material is mild steel for all four basic parts. Other materials available on special request.

CONSIDERATIONS BEFORE ORDERING:

With the wide variety of combustion applications, there is no way to cover all possibilities in one piece of literature. There are, for example, the problems of nozzle fixtures, the adaptations necessary for existing fireheads, and the needs for special adapters. So if yours is such an application, send us the details and we will give you our recommendation. Use the following list of questions as your guideline:

- (1) What type of fuel? (#2, #4, #6 oil etc.)
- (2) Required flow rate in gallons per hour?
- (3) What atomizing fluid...air, steam or other?
- (4) What atomizing fluid pressure...(psig) is available?
- (5) What atomizing fluid volume (scfm) is available?
- (6) What fuel pressure (psig) is available?
- (7) What is the method of attaching both fuel and atomizing fluid lines to the nozzle? Parallel pipes? Pipe within a pipe? Or Other?
- (8) Fuel pipe size?
- (9) Atomizing fluid pipe size?
- (10) Approximate spray angle required?
- (11) If possible, also furnish prints of existing installation, or a free-hand sketch.



Nozzle Size (GPH)	Nozzle Assy. Number		Component Part Numbers				
	Parallel	Concentric	(1) Body		(2) Swirl Chamber	(3) Metering Set	(4) Cap
			Parallel	Concentric			
50	34429-*	34460-*	34426	34516**	34427#	34431-*	1165-5
60	33240-*	34890-*	33517	33287	33233	33373-*	33516-1
100	33515-*	34892-*	33517	33287	33518	33521-*	33516-1
150	33522-*	34894-*	33517	33287	33523	33526-*	33516-1
200	33527-*	34896-*	33528	33907	33529	33532-*	33516-2
250	33533-*	34898-*	33528	33907	33534	33537-*	33516-2
300	33538-*	34900-*	33528	33907	33539	33542-*	33516-2

* When ordering either a complete nozzle assembly or just a metering set, be sure to specify one of the dash numbers below to designate spray angle.

** Body subassembly 34516 includes swirl chamber for concentric model.

Swirl Chamber 34427 is for parallel model only.

Dash No.	Spray Angle	
	50 GPH Size	All Other Sizes
-1	50°	50°
-2	70°	70°
-3	90°	90°
-4	110°	120°

SWIRL-AIR NOZZLE CAPACITIES

(Based on #2 fuel oil)

The capacities shown in the following charts will (1) serve as a guide to nozzle selection and (2) rate each nozzle according to minimum atomization energy expended per gallon of #2 oil burned. For example, both the 150 gph and 200 gph nozzles are flow rated at 150 gph, but the 200 gph nozzle has a higher air/fuel ratio. The wide turn-down capability of this nozzle also permits each nozzle to be operated at capacities less than shown. However, very low flows would require installation of a fuel metering pre-orifice or valve to prevent oscillation or "chugging" in the fuel line or system. Ideally, a nozzle should be selected for minimum energy used for atomization and for optimum burner performance. For some applications this may require customer testing.

50 GPH #34429 and #34460

FLOW RATE (GPH)	AIR PRESSURE (PSIG)													
	20		30		40		50		60		70		80	
	Liquid ΔP	Air Flow (SCFM)	Liquid ΔP	Air Flow (SCFM)	Liquid ΔP	Air Flow (SCFM)	Liquid ΔP	Air Flow (SCFM)	Liquid ΔP	Air Flow (SCFM)	Liquid ΔP	Air Flow (SCFM)	Liquid ΔP	Air Flow (SCFM)
5	6	2.2	8	2.8	10	3.5	14	4.2	17	5.2	20	5.7	23	6.2
10	11	2.1	15	2.7	18	3.3	21	4.1	26	4.8	30	5.5	33	6.1
15	16	1.9	22	2.5	25	3.2	30	3.9	34	4.6	38	5.4	43	6.1
20	23	1.8	28	2.3	33	3.0	39	3.8	43	4.5	48	5.1	51	6.0
25	30	1.6	36	2.2	42	2.8	47	3.6	52	4.4	57	5.0	62	5.9
30	38	1.4	44	2.1	50	2.7	56	3.5	62	4.2	67	4.9	72	5.8
40	56	1.3	63	2.0	69	2.6	77	3.4	83	4.1	88	4.8	93	5.7
50	78	1.2	87	1.9	92	2.5	100	3.3	107	4.0	112	4.7	120	5.4

60 GPH #33240 and #34890

30	19	5.7	27	7.8	35	10.5	43	13.0	51	15.5	59	18.5	68	21.0
40	20	4.8	28	6.8	37	9.0	46	11.5	54	14.0	61	17.0	70	19.0
50	21	4.0	30	6.0	39	8.0	48	10.5	56	12.5	65	15.0	73	17.5
60	22	3.5	31	5.3	40	7.1	49	9.4	58	11.5	67	13.5	76	16.0

100 GPH #33515 and #34892

60	20	6.2	27	9.0	35	12.0	42	15.0	49	18.5	57	21.5	64	24.5
70	21	5.7	29	8.1	37	11.0	44	14.0	52	17.0	59	20.5	67	23.0
80	23	5.2	31	7.5	39	10.5	47	13.5	55	16.5	62	19.0	70	22.0
90	25	4.6	33	6.8	41	9.5	49	12.0	57	15.0	64	18.0	72	21.0
100	26	4.2	35	6.2	43	9.0	51	11.5	59	14.5	67	17.0	75	20.0

150 GPH #33522 and #34894

100	21	7.2	28	10.5	34	14.5	41	18.0	47	22.0	53	25.5	59	29.0
110	23	6.6	30	10.0	37	14.0	43	17.5	49	21.5	56	24.5	62	28.5
120	25	6.3	32	9.6	39	13.5	45	17.0	52	20.5	59	24.0	65	28.0
130	26	5.9	34	9.1	41	12.5	48	16.5	55	20.0	61	23.5	67	27.5
140	28	5.4	36	8.6	43	12.0	50	15.5	57	19.5	64	23.0	71	26.5
150	30	5.3	38	8.2	46	11.5	53	15.0	60	18.5	67	22.5	73	26.0

200 GPH #33527 and #34896

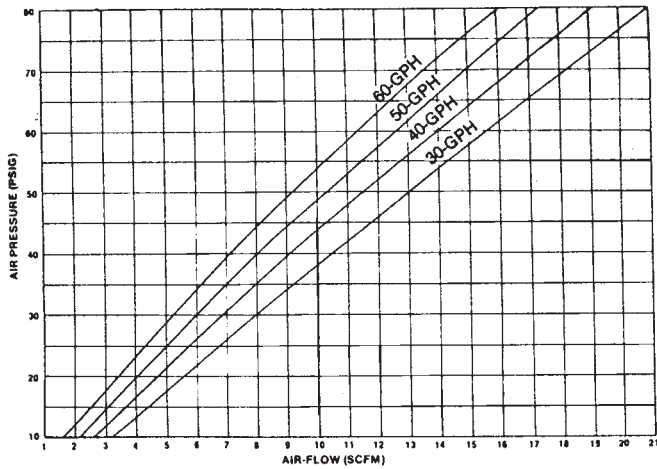
150	23	6.6	31	10.5	38	14.5	46	18.5	53	22.5	60	26.5	66	31.5
160	24	6.4	32	9.9	40	13.5	47	18.0	54	22.0	62	26.0	68	30.5
170	25	6.1	33	9.4	41	13.0	49	17.0	56	21.0	63	25.5	70	29.5
180	26	5.7	35	9.1	42	12.5	50	16.0	58	20.0	65	24.5	72	28.5
190	28	5.5	36	8.6	44	12.0	51	15.5	59	19.5	67	23.5	74	28.0
200	29	5.2	37	8.1	45	11.5	53	15.0	61	19.0	68	23.0	76	27.0

250 GPH #33533 and #34898

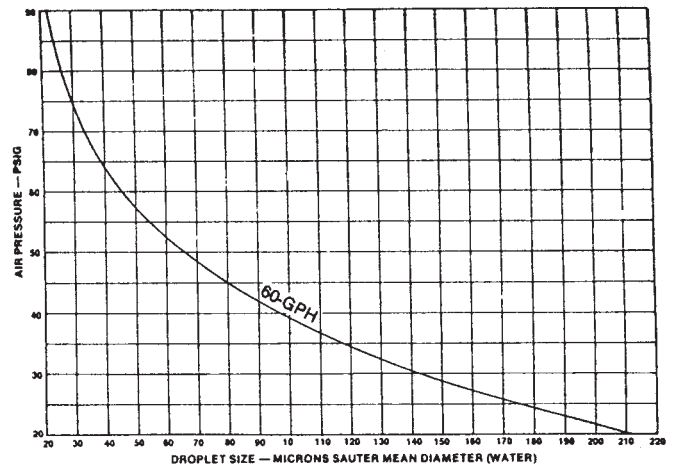
200	24	7.5	32	11.5	38	16.0	46	20.5	52	24.5	59	29.5	65	34.5
210	25	7.2	33	11.0	40	15.5	47	20.0	54	24.0	60	29.0	67	33.5
220	26	6.9	34	10.5	41	15.0	48	19.5	55	23.5	61	28.5	68	33.0
230	27	6.4	35	10.0	42	14.5	49	18.5	56	23.0	63	27.5	70	32.0
240	28	6.2	36	9.8	43	14.0	51	18.0	58	22.5	64	27.0	71	31.5
250	29	5.9	37	9.4	44	13.5	52	17.5	59	22.0	66	26.5	73	31.0

300 GPH #33538 and #34900

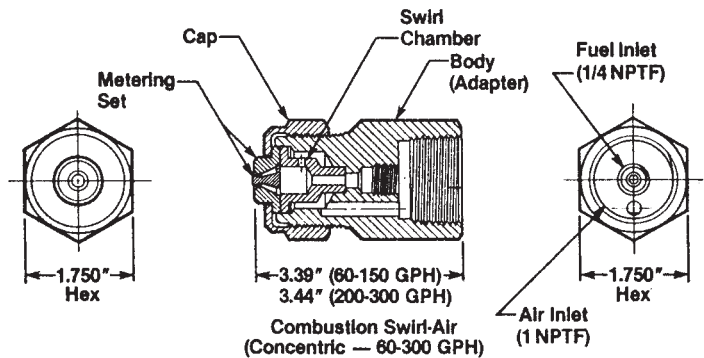
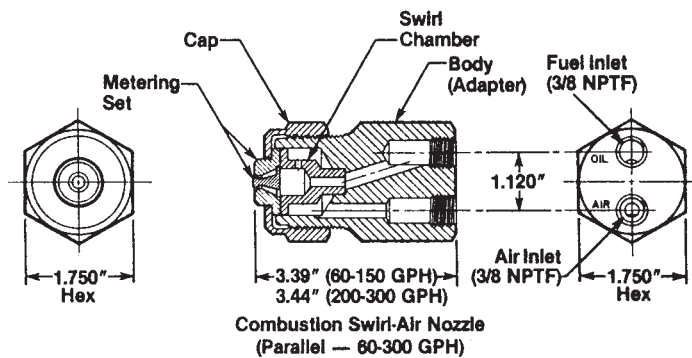
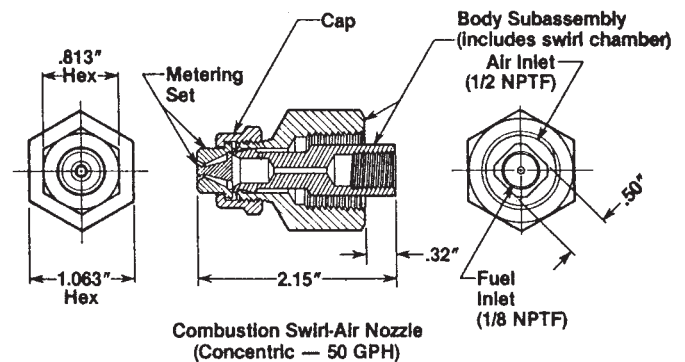
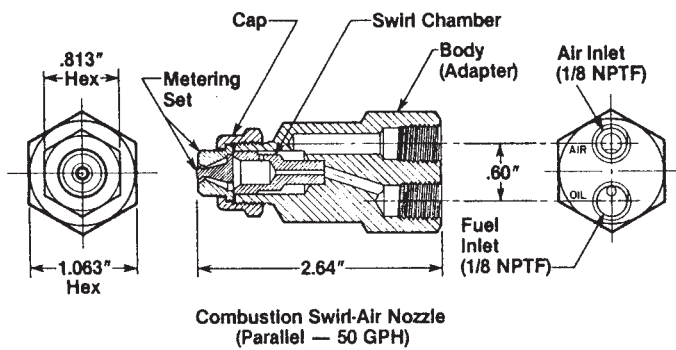
250	23	8.8	31	13.5	38	19.0	45	24.0	52	29.5	58	35.0	64	40.0
260	24	8.6	32	13.0	39	18.5	46	23.5	53	28.5	59	34.0	65	39.5
270	25	8.3	33	13.0	40	18.0	47	23.0	54	28.0	60	33.5	67	39.0
280	26	7.9	34	12.5	41	17.5	48	22.5	55	27.5	62	33.0	68	38.5
290	27	7.5	35	12.0	42	17.0	49	22.0	56	27.0	63	32.5	70	38.0
300	28	7.2	36	11.5	43	16.5	50	21.5	57	26.5	64	32.0	71	37.5



Air Flow vs. Air Pressure (60 GPH Nozzle)



Droplet Size vs. Air Pressure (60 GPH Nozzle)



ORDERING INSTRUCTIONS

Refer to "Considerations Before Ordering" section (page 25) if your specific requirements are not met by the information shown in this catalog.

WHEN ORDERING SWIRL-AIR NOZZLES, be sure to include both part number and description. Specify the complete assembly number, including the dash number

that corresponds to the spray angle you need. To order individual parts, use the part numbers shown, but make sure you add the proper dash number on metering sets to designate spray angle.

EXAMPLE: P/N 33240-3 is a 60 gph 90° parallel inlet nozzle.

ISO 9001 CERTIFIED

DELAVAN PRODUCTS WARRANTY

All products sold by Delavan are warranted only to purchasers from Delavan for resale or for use in purchasers' own business or original equipment manufacture, against defects in workmanship or materials under normal use, maintenance and service (rental use excluded), if notice of said defect is received by Delavan at the factory within 90 days after installation or one year from date of shipment from the factory, whichever first occurs. The sole and exclusive obligation of Delavan under this or any implied warranty shall be to replace or, at its option, to repair, without charge, any product which is determined by Delavan to be defective in workmanship or materials after the product is returned to the Delavan factory, shipping costs prepaid. In no event shall Delavan be liable to any person for indirect or consequential damages or for injury or commercial loss resulting from any use or inability to use any Delavan product. DELAVAN EXPRESSIVELY NEGATES ANY OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR ARISING FROM ANY COURSE OF DEALING OR CUSTOM OR USAGE OR TRADE. No person, including any dealer or representative of Delavan, is authorized to make any representation or warranty on behalf of Delavan in addition to or inconsistent with these provisions. Purchasers to whom these provisions apply agree to hold Delavan harmless from claims by their customers in excess of the obligations of Delavan expressly set forth herein.



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