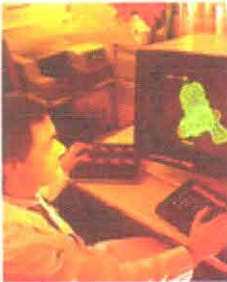


Atomizing Nozzles

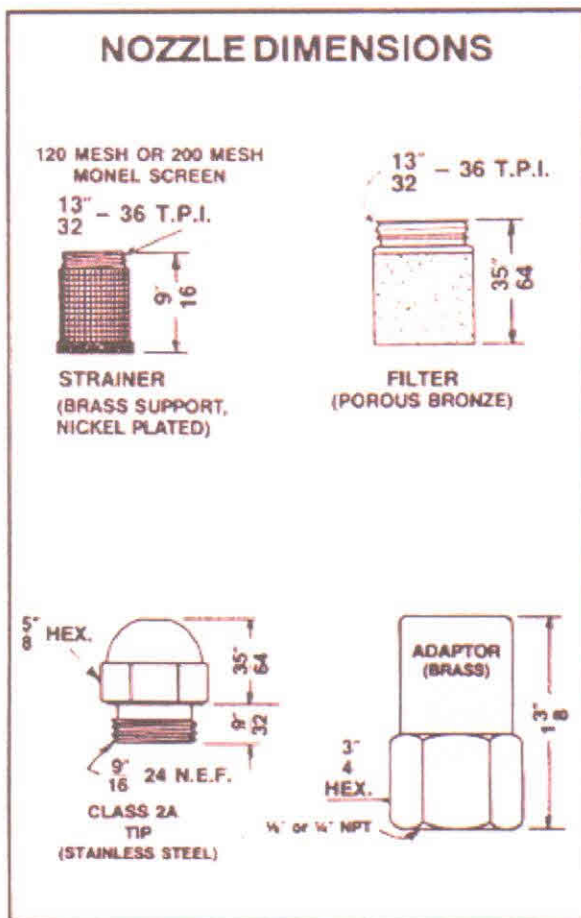


Technical Data



I. Concept

The MTD-92 nozzle was developed by MONARCH specifically to meet the needs of the European market. Indeed, in a number of countries, new laws have been issued to protect the air and the environment, thus forcing the manufacturers to develop better performing but less and less polluting burners. It has been widely recognized that the nozzle is a crucial element to achieve this, as it controls the atomization and oil flow rate which are essential factors for a clean and efficient combustion.



Atomizing Nozzles



The dimensions and characteristics of the threaded parts of nozzles have been fixed by CEN standard regulations; the new MTD-92 MONARCH nozzle conforms to those regulations and related tolerances.

The tolerances for the dimensions above hold for all nozzles up to and including 3.50 USGPH. They can be slightly different for higher capacities.

The body and swirl disc are made of a high chrome grade stainless steel (416 SS), specially selected for its high heat resistance.

The locknut is nickel plated to avoid all risk of even a partial obstruction by metal particles.

The nozzle body and orifice are made of a one piece construction. Although expensive, this procedure guarantees against possible leakage or heat expansion related problems.



II. Operating

85% of MONARCH staff are involved in the overall production process. 33% of those employed in the production are fully qualified nozzle testers. This commitment is an eloquent and exemplary demonstration of MONARCH's concern for manufacturing perfection and highest possible quality; it has been individual testing of each nozzle that has built our Company's reputation.

Each MTD-92 is individually spray tested by MONARCH for spray angle, quality and balance. All tests are made at 10 bar pressure.

The nominal flow stamped on the nozzle is rated at 100 PSI = 6.895 bar. Flow tolerances have been reduced in conformity with the European norms CEN. The MTD-

Atomizing Nozzles



92 nozzles have a nominal flow tolerance of $\pm 4\%$ for all flows up to, and including 3.50 USGPH. Tolerances can differ slightly for higher capacities.

III Technology

MONARCH has installed new test rigs equipped with digital flow measuring devices, to insure the utmost precision in the work of our experts monitoring the individual production of MTD-92 nozzles.

New digital control machines have been developed for manufacturing MTD-92 nozzles. This new generation of CNC automatic machines provides our customers with a necessary guarantee of a perfect uniformity of each part we make. It is a means of controlling the strict accuracy of the flow and spray angles, as well as homogeneity and consistency of spray patterns. In addition to the modern equipment, the micro-finish and monitoring procedures, applied by MONARCH exclusively, assure consistent production.



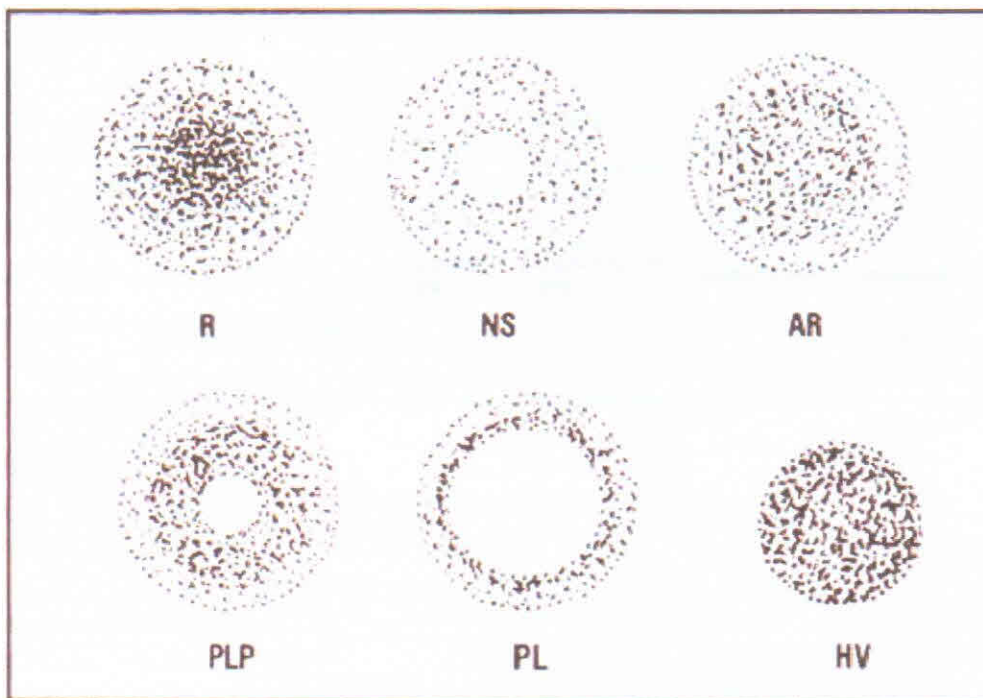
MONARCH has recently developed a Computer Laser System to monitor quality and homogeneity of spray patterns and angles. This laser controlled measuring device is computer-guided to provide high precision monitoring of nozzle tests. When tested, the nozzle is analyzed by the Laser System; the results are simultaneously computer-processed and compared with Master Reference Nozzles. This method enables MONARCH to assure uniformity and consistency of nozzle production as compared to the reference samples.

Atomizing Nozzles



ATTENTION: Considering the high precision level, demonstrated by flow tolerances, and the extremely high precaution measures in manufacturing, we strongly advise you not to disassemble the MTD-92 nozzle; the original precision will not be recovered. The problem posed is that of a maximum filtration guarantee. This is why MONARCH has chosen to use porous bronze filters with a straining capacity of 40 to 60 microns or 200 mesh (approx. 70 microns) strainers, for capacities up to and including 1.00 USGPH.

Spray Patterns



All MONARCH nozzles are stamped with the following characteristics, subject to modification on adoption of CEN standards:

- the flow (in USGPH at 100 PSI = 6.895 bar)
- manufacturing code
- spray angle;
- letters to identify the series of spray patterns;
- the, MONARCH trade mark.



MONARCH nozzles are individually tested at different production stages to assure exact conformity with master nozzles in each series.

The spray patterns (i.e. hollow cone or solid cone) described below refer to tests



Atomizing Nozzles

carried out with a 60° nozzle at a 75 mm distance from the orifice. Nozzles with spray angles of 60° or less, and with low flows in particular, the empty section of a hollow cone becomes smaller. The difference between a hollow cone and solid cone nearly disappears at this point.

Solid Cone "R" Series: .40 to 3.50 USGPH

This is the series supplied regularly unless specified otherwise. It is a good nozzle suitable for most burners. Atomization of the oil is not as fine as with the "NS" series.

Hollow Cone "NS" Series: .50 to 2.00 USGPH

This Series works best on many burners due to its exceptionally fine atomization. It produces a quiet, stable flame and is widely used on 80 and 90 flame retention burners.

Special Solid Cone "AR" Series: .50 to 3.50 USGPH

This series has become widely used due to its success in obtaining quiet combustion in flame retention head burners. Traditionally, a "cure-all" replacement nozzle, it now is increasingly specified on original equipment.

Semi-Solid Cone "PLP" Series: 2.25 to 100.00 USGPH

The standard nozzle for larger capacities. Fine atomization and "solid" spray pattern up to approximately 3.50 USGPH, gradually becoming more "hollow" in the larger sizes.

Hollow Cone "PL" Series: 2.25 to 50.00 USGPH

This series represents an extension of the "NS" type spray pattern for larger capacity sizes. Spray is not as finely atomized as the "PLP" series, but produces the best results in equipment specifying hollow cone nozzles.

Narrow Spray Angle "HV" Series: 1.65 to 60.00 USGPH

Used mostly for Semi-Industrial or Scotch Marine applications where narrow spray angle and high spray velocity is essential, and some combustion noise is not objectionable.


Heavy Oil Nozzle Series: 1.25 to 100.00 USGPH

Designed for use on 70 SSU (approx. 13 centistokes) viscosity oil at operating pressures ranging from 200-450 PSIG (13.8 to 31 bar). Write for special data sheet.

Spray Angles & Capacities

Atomizing Nozzles



	30	45	60	70	80	90
	Nozzle Series					
R SOLID	.50 to 1.50	.40 to 3.50	.40 to 3.50	.50 to 3.50	.50 to 3.50	.50 to 3.50
NS HOLLOW	.50 to 1.50	.50 to 2.00	.50 to 2.00	.50 to 2.00	.50 to 2.00	.50 to 2.00
AR SPECIAL SOLID	-	.60 to 3.50	.60 to 3.50	.60 to 3.50	.60 to 3.50	.65 to 3.50
PLP SEMI HOLLOW	-	2.25 to 9.50	2.25 to 30.00	2.25 to 60.00	2.25 to 100.00	2.25 to 50.00
PL HOLLOW	-	2.25 to 9.50	2.25 to 30.00	2.25 to 50.00	2.25 to 50.00	2.25 to 9.50
HV SCOTCH MARINE	1.65 to 24.00	10.50 to 60.00				

POROUS BRONZE FILTERS

MONARCH developed the first porous metal Oil Burner Nozzle Filter to provide highly efficient filtration with a one piece construction. These Filters (40 to 60 microns) are supplied as standard up through 1.00 USGPH on all series, unless Mesh Strainers (200 mesh/approx. 70 microns) are requested.

MESH STRAINERS

1.10 USGPH to 10.50 USGPH nozzles are fitted with 120 mesh (approx. 120 microns) Monel screen strainers. Mesh strainers may be used with higher GPH nozzles, up to a maximum of 30.00 USGPH, if ordered separately.

Atomizing Nozzles



CAPACITY SIZES

Nozzles are available in sizes from .40 to 100.00 USGPH, at 100 PSI (6.895 bar) for No. 2 fuel oil. Field tests may vary from the nominal rating due to oil viscosity (the higher the viscosity, the greater the nozzle flow and vice versa). When using No. 2 fuel oil within normal operating temperature range, the flow changes approximately 1% for each SSU change in viscosity.

OPERATING PRESSURES AND VISCOSITIES

MONARCH nozzles are tested at nominal pressures of 7 to 10 bar, with test oil, similar to No. 2 fuel oil, 34 to 36 SSU viscosity at 100 F, gravity 32 to 38 A.P.I. at 60° F and test temperatures 75° to 80° F (3.36 to 3.44 mm²/s at 20C, and a density of 0.840). The recommended operating pressures for nozzles used with domestic fuel oil and kerosene are from 7 to 25 bar. (Please consult us for higher pressures). For higher viscosity fluids, possible operating pressures range from 10 to 14 bar. However, this will result in a considerable reduction of spray angles, unless specially designed nozzles are used (see HO nozzles).

The "HO" nozzle is to be used on higher viscosity oils at elevated operating pressures. The nozzle nominal flow rate is 100 PSIG (6.895 bar) for No. 2 fuel oil and are available in capacities sizes from 1.00 to 100.00 USGPH.

HO-200 PSI (14 bar)

When regular light oil nozzles are used on more viscous oil, their sprays tend to "flutter", and produce a narrower spray angle with streaks in the spray. Accordingly, the standard "HO" nozzles are specially tested for spray quality and rated for spray angle at a pressure of 200 PSIG (14 bar) on 70 SSU (13 Centistoke) operating viscosity oil. This special testing assures that the nozzles will perform properly under heavy oil operating conditions. The spray angle stamped on the nozzles is the nominal spray angle at 200 PSIG operating pressure. HO - 30 PSI (30 bar) For high pressure operation, HO nozzles which are tested for spray angle and spray quality at 430 PSIG (30 bar) on 70 SSU operating viscosity oil, are also available. The additional testing is necessary to ensure that no streaks, voids or flutter appear in the spray at these pressures. The spray angle stamped on the nozzle is the nominal Spray Angle at 430 PSIG operating pressure. Note: the nominal flow rates stamped on the nozzles are based on 100 PSIG using U.S. No.2 fuel oil, subject to a flow tolerance of plus or minus 5%. Flow rates shown at 300 PSIG on 70 SSU operating viscosity oil are from actual tests. Flow rates at higher and lower pressures are predicted from the 300 PSIG data. Actual flow rates may vary, depending on exact operating conditions. Nozzles for operation at 200 PSIG are available in 45°, 60° and 80° spray angles in sizes of 2.25 USGPH up to, and including 45.00 USGPH, sizes of 50.00 USGPH nozzles, and up, are available only in 60° and 80° spray angles. Nozzles for

Atomizing Nozzles



operation at 430 PSIG are available in 45°, 60° and 80° in sizes 1.00 USGPH up to and including 45.00 USGPH. Sizes of 50.00 USGPH and up are available only in 80°. Strainers are not included with nozzles but 120 mesh Monel Strainers may be ordered separately. Strainers are specifically not recommended for use on sizes over 50.00 USGPH, as restriction may occur.

Nozzle Capacities

U.S. Gallons per Hour No. 2 Fuel Oil

RATED PGH @ 100 PSI	OPERATING PRESSURE: POUNDS PER SQUARE INCH					
	75	100	125	150	175	200
.40	-	.40	.45	.49	.53	.56
.50	-	.50	.56	.61	.66	.71
.60	-	.60	.67	.74	.79	.85
.65	-	.65	.73	.80	.86	.92
.75	-	.75	.84	.92	.99	1.06
.85	-	.85	.95	1.04	1.13	1.20
1.00	.87	1.00	1.12	1.23	1.32	1.41
1.10	.95	1.10	1.23	1.34	1.45	1.55
1.20	1.04	1.20	1.34	1.47	1.59	1.70
1.25	1.07	1.25	1.39	1.53	1.65	1.77
1.35	1.17	1.35	1.51	1.65	1.79	1.91
1.50	1.30	1.50	1.68	1.84	1.98	2.12
1.65	1.43	1.65	1.84	2.02	2.18	2.34
1.75	1.51	1.75	1.96	2.14	2.32	2.48
2.00	1.73	2.00	2.24	2.45	2.65	2.83
2.25	1.95	2.25	2.52	2.74	2.98	3.18
2.50	2.16	2.50	2.80	3.06	3.30	3.54
3.00	2.59	3.00	3.35	3.68	3.97	4.25
3.50	3.03	3.50	3.91	4.29	4.63	4.95
4.00	3.46	4.00	4.47	4.90	5.30	5.66
4.50	3.90	4.50	5.04	5.51	5.95	6.36
5.00	4.33	5.00	5.59	6.13	6.61	7.07
5.50	4.76	5.50	6.15	6.74	7.27	7.78
6.00	5.19	6.00	6.71	7.33	7.94	8.48
6.50	5.63	6.50	7.26	7.96	8.60	9.20
7.00	6.05	7.00	7.82	8.58	9.25	9.90
7.50	6.49	7.50	8.38	9.19	9.91	10.60
8.00	6.93	8.00	8.94	9.80	10.58	11.31
8.50	7.36	8.50	9.50	10.45	11.27	12.08

Atomizing Nozzles



9.00	7.79	9.00	10.06	11.02	11.91	12.73
9.50	8.22	9.50	10.60	11.70	12.60	13.50
10.50	9.10	10.50	11.70	12.90	13.90	14.90
12.00	10.40	12.00	13.40	14.70	15.90	17.00
13.50	11.65	13.50	15.07	16.53	17.90	19.17
15.50	13.37	15.50	17.33	18.95	20.56	21.89
17.50	15.10	17.50	19.60	21.40	23.20	24.80
19.50	16.90	19.50	21.80	23.90	25.80	27.60
21.50	18.60	21.50	24.00	26.40	28.40	30.40
24.00	20.80	24.00	26.80	29.40	31.80	34.00
28.00	24.20	28.00	31.30	34.30	37.00	39.60
30.00	26.00	30.00	33.60	36.80	39.70	42.50
35.00	30.30	35.00	39.10	42.90	46.30	49.50
40.00	34.60	40.00	44.70	49.00	53.00	56.50
45.00	39.00	45.00	50.40	55.20	59.50	63.70
50.00	43.30	50.00	55.90	61.30	66.10	70.70
55.00	47.60	55.00	61.50	67.40	72.70	77.70
60.00	52.00	60.00	67.00	73.50	79.40	84.00
70.00	60.60	70.00	78.20	85.70	92.50	99.00
80.00	69.20	80.00	89.40	98.00	106.00	113.50
90.00	77.90	90.00	100.90	110.50	119.20	127.50
100.00	86.50	100.00	111.90	122.50	132.30	141.40