

[Product Instructions Ver. 0]

For applied research engineers studying atomization

Matrix variation of droplet size and flow rate of atomization

MICROFOG UNIT [MATRIX MF58MT]

Patents pending in Japan and overseas



Nozzle Network Co., Ltd.
(JAPAN)

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MICROFOG UNIT [MATRIX MF58MT]

This nozzle was mainly developed for engineers researching the applications of atomization. For example, it is extremely useful if various atomization conditions are required in research for new products or technologies, because just one of these nozzles makes it possible to combine a wide range of different average diameters of the particles and flow rates of atomization. (Patents pending in Japan and overseas)

Caution: The contents of these instructions are written for the case when the spray liquid is water.

Depending on the viscosity, some viscous liquids can also be sprayed, but the atomization performance will be different to that for water.

1. Features

❖ Just one unit allows matrix-type selection of Particle diameter × Flow rate of atomization × Spray distance

A wide range of average diameters of the particles, flow rates of atomization and spray distances can be selected in a matrix by varying the air pressure, the liquid pressure and the type of component set. (Refer to the characteristics data on pages 6 to 9 for the atomization performance.)

Range of average diameter of the particles selection: 1.64 - 59.77 µm Range of flow rate of atomization selection: 0.21 - 19.8 ml/min

❖ An air atomization system using a new atomization principle (Patents pending in Japan and overseas)

This is an innovative principle in which the liquid and gas are made to cross paths for efficient collisions to reduce particle size.

❖ Compact and lightweight

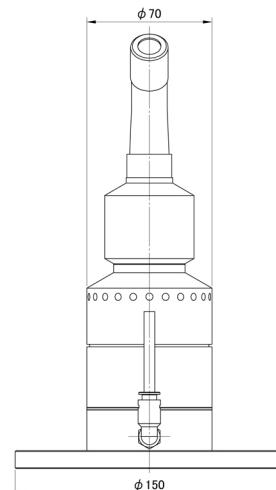
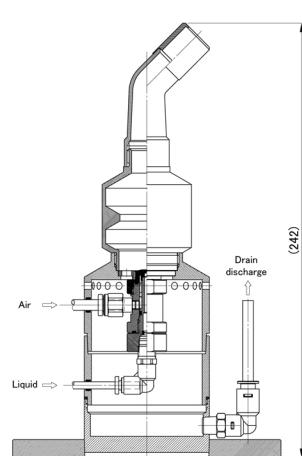
Weight: 500 grams Material: All plastic (PPS / PTFE / POM)
(Please consult us if you would like to specify the material.)

2. Product photograph showing scope of supply and profile drawings

(Detailed product drawings are included on page 10.)



This component (the installation base) c:



Please consult us if you require a full set of items such as a compressor, water pump and control devices.

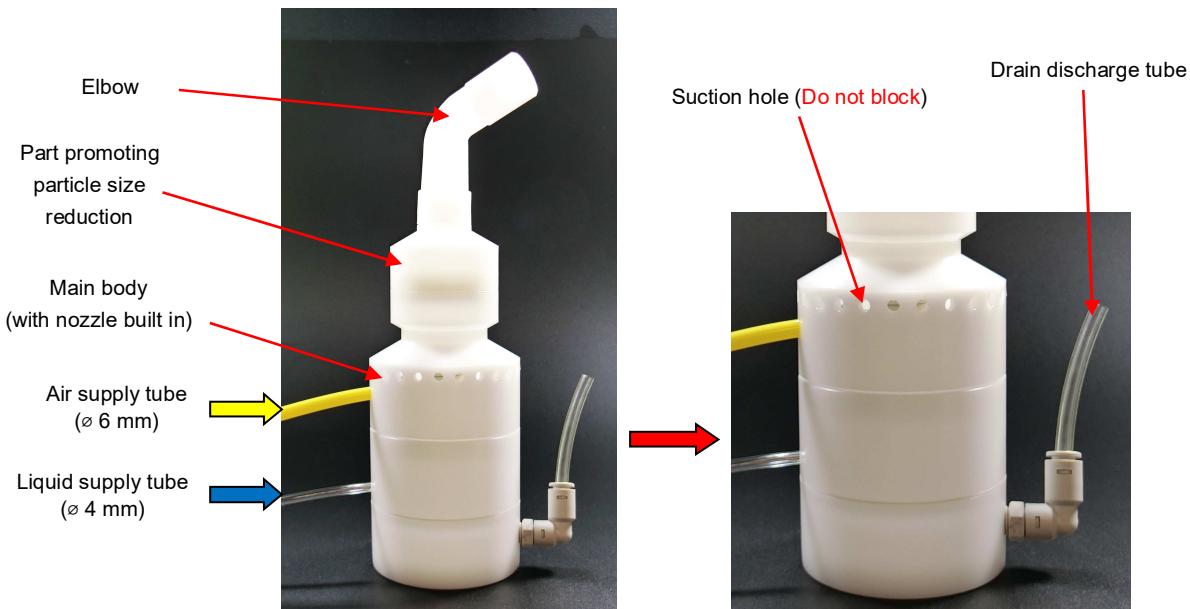
3. Main atomization specifications

To use this product, please refer to the table below and prepare a compressor and a pump. Please refer to the characteristics data on pages 6 to 9 for the details of the atomization performance.

Specification item	Variable range
Air pressure	0 - 0.6 MPa
Water pressure	0.001 - 0.5 MPa
Air volume	0 - 5.78 NL/min
Flow rate of atomization	0.21 - 19.8 ml/min
Average diameter of the particles (SMD)	1.64 - 59.77 μm
Spray distance (or spray height)	100 – 1,200 mm

4. Atomization operation

(1) Names of each part



(2) Atomization operation procedure

- 1) Connect the compressed air to the air supply tube (with the valve closed).
- 2) Connect the liquid pump to the liquid supply tube (with the valve closed).
- 3) Open the valve for the air.
- 4) Open the valve for the liquid. (The atomization will begin.)
- 5) Set the air pressure and liquid pressure to the predetermined atomization conditions.
Please refer to the characteristics data on pages 6 to 9 for the details of the atomization performance.

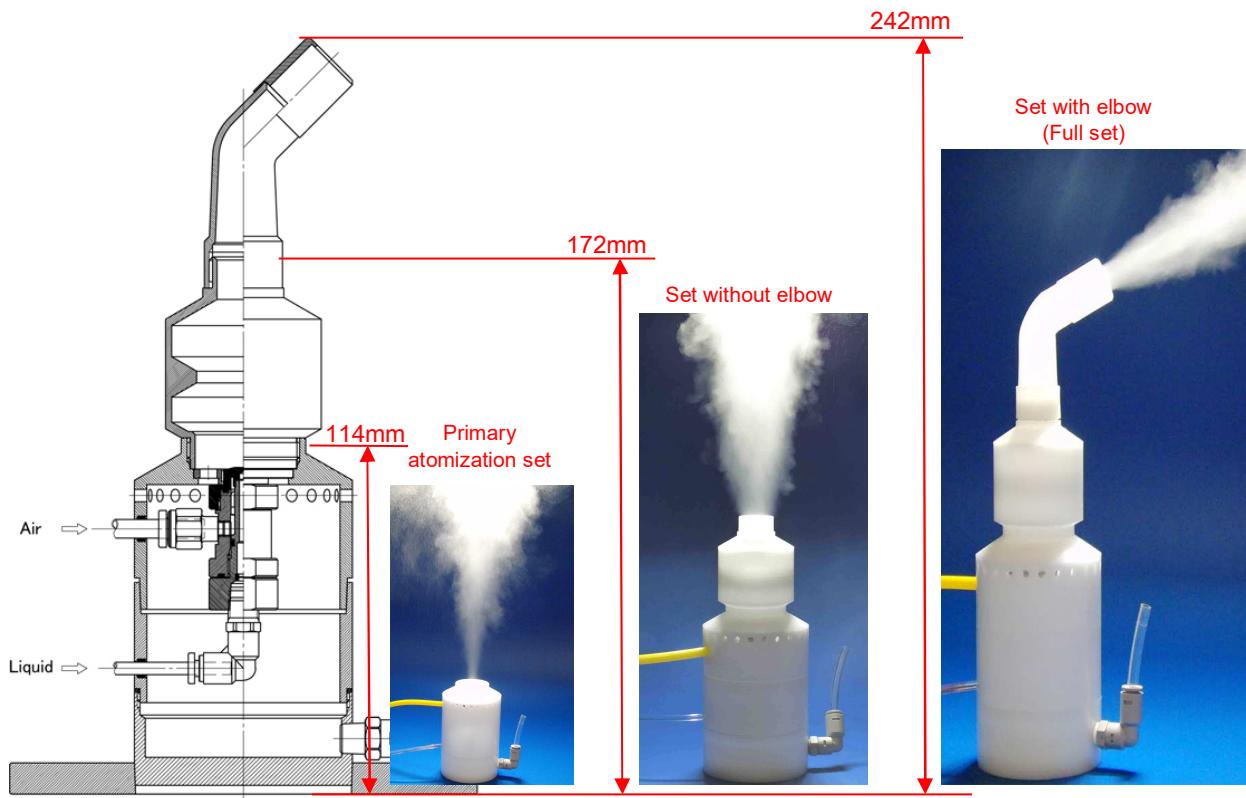
(3) Atomization stopping operation (to prevent danger)

The method for stopping the atomization is to **first close the valve for the liquid** and then close the valve for the air.
If this procedure is not followed, then **the liquid may spout out dangerously in a needle-like shape**. After stopping the atomization, blow air into the liquid supply port to discharge any liquid remaining inside the nozzle.

(4) Method for setting the atomization conditions

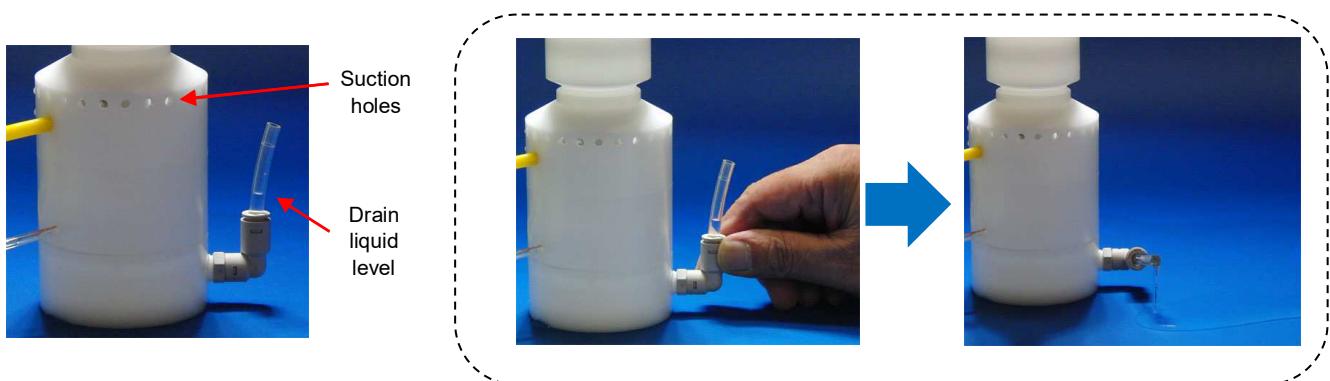
From the set with elbow (full set) shown below, select the component set that matches the atomization conditions that you wish to use and then set the air pressure and liquid pressure to perform the predetermined atomization.

- Please refer to the characteristics data on pages 6 to 9 for the atomization performance of each set.
- Please refer to the drawings at the end of this document for the components of each set.



(5) Drain discharge inside the main body

In the case of the "primary atomization set," all of the liquid supplied to the nozzle part attached inside the main body is sprayed into the atmosphere, so no drain is generated. In the case of the "set with elbow" or "set without elbow," some of the total amount of liquid supplied from the pump becomes a fine mist and the rest accumulates inside the part promoting particle size reduction. If the volume of liquid that has accumulated becomes so large that it blocks the air holes, then **there will be insufficient suction of air so the spray velocity will fall and the flow rate of atomization will decrease dramatically**. Please refer to the photographs below and use a "drain discharge tube" with appropriate timing.



(6) Regarding clogging

Be careful of clogging inside the nozzle component mixing the air and the liquid.

Avoid the use of corrosive liquids and liquids that form solids if dried.

Minimum passage dimensions for air: Rectangular section 0.3 mm x 0.14 mm

Minimum passage dimensions for liquid: Round hole ø 0.15 (with filter 200 mesh)

* We can restore the nozzle for a fee if for some reason clogging has meant that normal atomization is no longer possible.

(7) Precautions for safe use

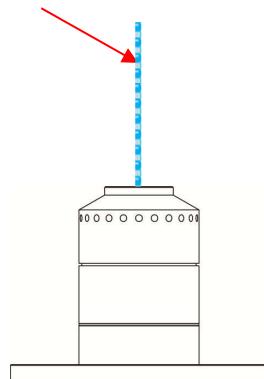
 When spraying without the elbow attached, mistaken operation **may result in the liquid spraying out vigorously in a needle shape and there is a risk of injury**. Please be particularly careful about the following items.

 Operation procedure

[1] When starting the atomization, open the valve for the air before opening the valve for the liquid.

[2] When stopping the atomization, close the valve for the liquid before closing the valve for the air.

DANGER: Straight spray (Keep your face away from the spray)



5. Product guarantee and disclaimer

- (1) If any problem occurs on the product delivered that is the responsibility of Nozzle Network Co., Ltd., including any defects on the components or normal atomization not being possible, then we will either perform repairs or replace the components free of charge.
- (2) This guarantee does not cover the cases when the normal atomization is not possible due to wear of the parts, corrosion or clogging.
- (3) This guarantee does not cover any accident that may result due to the atomization from this product.

6. Cautions

- (1) Sterilization treatment has not been performed on this product.
- (2) The specifications of this product may be changed without notice.

MATRIX MF58MT Atomization Conditions Chart

Please search for the atomization conditions you require on the abbreviated table below and then use the characteristics data for "with elbow," "without elbow" and "primary atomization" on pages 6 to 8 for the details of the atomization conditions.

With elbow, without elbow

(Pa:Air pressure , Pw:Water pressure)

Average diameter of the particles SMD	Flow rate of atomization Qf (ml/min)			
	0.1~0.5	0.5~1.0	1.0~1.5	1.5~
1~5µm	With elbow Pa=0.4~0.5MPa Pw=0.02~0.03MPa	With elbow Pa=0.1MPa Pw=0.003~0.05MPa	With elbow Pa=0.1~0.5MPa Pw=0.02~0.15MPa	With elbow Pa=0.3~0.4MPa Pw=0.05~0.2MPa
5~10µm	With elbow Pa=0.02~0.03MPa Pw=0.003~0.07MPa	With elbow Pa=0.03~0.1MPa Pw=0.003~0.1MPa	With elbow Pa=0.1~0.4MPa Pw=0.1~0.3MPa	Without elbow Pa=0.3MPa Pw=0.03~0.05MPa
10~30µm	With elbow Pa=0 Pw=0.07MPa	With elbow Pa=0.05~0.08MPa Pw=0.15~0.3MPa	Without elbow Pa=0.03MPa Pw=0.03MPa	Without elbow Pa=0.05~0.3MPa Pw=0.2MPa
30µm~	With elbow Pa=0 Pw=0.1MPa		With elbow Pa=0 Pw=0.2MPa	Without elbow Pa=0.1MPa Pw=0.2MPa

Primary atomization

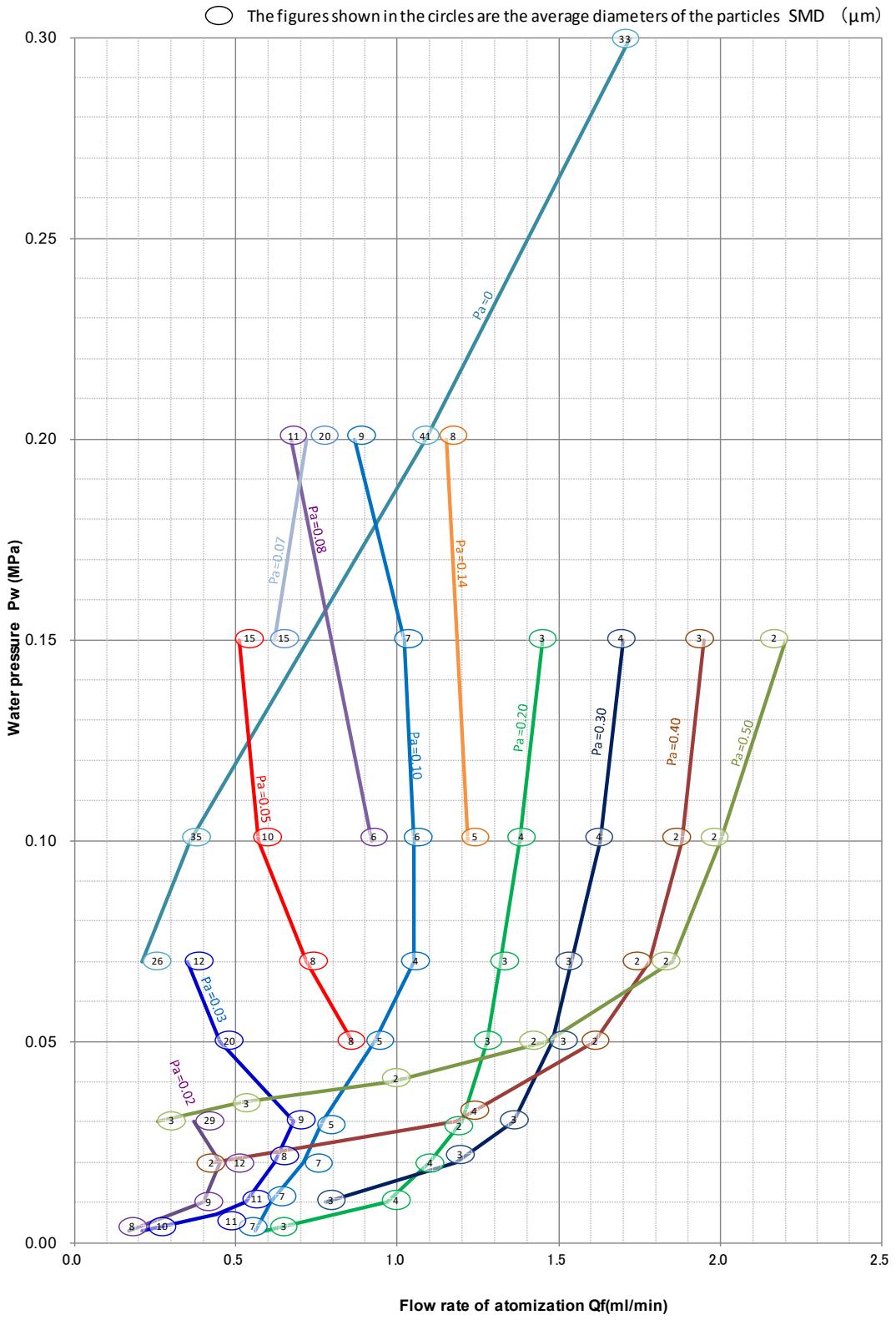
Average diameter of the particles SMD	Flow rate of atomization Qw (ml/min)			
	0.1~0.5	0.5~1.0	1.0~1.5	1.5~
1~5µm			Pa=0.6MPa Pw=0.05MPa	Pa=0.6MPa Pw=0.06~0.1MPa
5~10µm			Pa=0.5MPa Pw=0.03MPa	Pa=0.2~0.6MPa Pw=0.003~0.15MPa
10~30µm				Pa=0.1~0.6MPa Pw=0.003~0.2MPa

MATRIX MF58MT "Set with elbow" characteristics data – Spray liquid: Purified water



- This data is the standard data. The performance values may differ slightly to the values on actual products.
- Droplets may attach to the nozzle on the end of the elbow when some atomization conditions are used, but this does not affect the flow rate of atomization or the average diameter of the particles.

Pressure – Flow rate of atomization characteristics graph



Air pressure Pa (MPa)	Water pressure Pw (MPa)	Air volume Qa (Nl/min)	Water supplied by pump Qw (ml/min)	Flow rate of atomization Qf (ml/min)	Air to water ratio Qa/Qf	Spray distance (mm)	Average diameter of the particles SMD (μm)
0.00	0.070	0.00	12.90	0.21	0	100	25.67
0.00	0.100	0.00	16.00	0.36	0	200	34.54
0.00	0.200	0.00	22.10	1.09	0	200	40.78
0.00	0.300	0.00	26.90	1.72	0	300	33.48
0.00	0.400	0.00	31.10	2.02	0	300	33.00
0.02	0.003	0.59	3.00	0.17	3470.6	100	7.61
0.02	0.010	0.59	5.20	0.40	1475.0	200	8.53
0.02	0.020	0.60	7.30	0.45	1333.3	200	12.11
0.02	0.030	0.62	8.50	0.37	1675.7	300	29.08
0.03	0.003	0.74	2.90	0.21	3523.8	200	10.13
0.03	0.007	0.74	4.30	0.44	1681.8	200	7.60
0.03	0.010	0.74	5.50	0.53	1396.2	300	10.65
0.03	0.020	0.75	7.00	0.62	1209.7	300	8.43
0.03	0.030	0.76	8.80	0.68	1117.6	300	9.33
0.03	0.050	0.76	11.30	0.45	1688.9	400	19.66
0.03	0.070	0.76	13.20	0.35	2171.4	300	12.31
0.05	0.050	0.98	11.20	0.86	1139.5	400	7.90
0.05	0.070	0.97	12.80	0.72	1347.2	500	7.77
0.05	0.100	0.97	16.70	0.57	1701.8	300	9.69
0.05	0.150	0.97	19.40	0.51	1902.0	300	18.61
0.07	0.150	1.18	19.20	0.62	1903.2	300	14.95
0.07	0.200	1.18	22.50	0.72	1638.9	300	19.61
0.08	0.100	1.28	16.40	0.92	1391.3	500	6.10
0.08	0.200	1.29	22.00	0.67	1925.4	500	11.25
0.08	0.300	1.29	27.50	0.90	1433.3	500	25.80
0.08	0.400	1.29	31.50	1.80	716.7	600	59.77
0.08	0.500	1.29	35.30	2.90	444.8	700	50.52
0.10	0.003	1.46	3.10	0.56	2607.1	300	7.11
0.10	0.010	1.45	4.50	0.61	2377.0	400	7.05
0.10	0.020	1.45	7.10	0.71	2042.3	500	6.79
0.10	0.030	1.45	8.20	0.77	1883.1	500	5.29
0.10	0.050	1.45	10.80	0.93	1559.1	500	4.84
0.10	0.070	1.47	13.30	1.05	1400.0	600	4.07
0.10	0.100	1.47	15.90	1.05	1400.0	600	5.76
0.10	0.150	1.47	19.70	1.02	1441.2	300	7.12
0.10	0.200	1.48	22.40	0.87	1701.1	400	8.81
0.14	0.100	1.82	15.30	1.22	1491.8	700	5.35
0.14	0.200	1.82	22.30	1.15	1582.6	700	7.60
0.20	0.003	2.38	2.10	0.59	4033.9	400	3.33
0.20	0.010	2.38	3.90	0.97	2453.6	600	4.07
0.20	0.020	2.37	6.40	1.10	2154.5	600	4.07
0.20	0.030	2.38	7.00	1.20	1983.3	600	3.56
0.20	0.050	2.38	10.40	1.28	1859.4	600	3.27
0.20	0.070	2.37	12.50	1.32	1795.5	700	3.27
0.20	0.100	2.37	14.30	1.38	1717.4	700	4.07
0.20	0.150	2.37	18.90	1.45	1634.5	700	3.19
0.30	0.010	3.23	2.00	0.78	4141.0	500	3.44
0.30	0.020	3.22	4.00	1.18	2728.8	600	2.76
0.30	0.030	3.22	5.30	1.36	2367.6	600	2.78
0.30	0.050	3.22	7.50	1.48	2175.7	700	3.02
0.30	0.070	3.22	10.50	1.54	2090.9	700	3.29
0.30	0.100	3.22	13.50	1.63	1975.5	700	3.53
0.30	0.150	3.22	17.60	1.70	1894.1	700	3.52
0.40	0.020	4.04	1.80	0.43	9395.3	600	2.35
0.40	0.030	4.05	3.20	1.18	3432.2	600	2.10
0.40	0.050	4.02	6.30	1.61	2496.9	700	2.09
0.40	0.070	4.02	8.70	1.78	2258.4	700	2.10
0.40	0.100	4.04	12.00	1.88	2148.9	700	2.09
0.40	0.150	4.03	16.10	1.95	2066.7	700	2.78
0.50	0.030	4.90	1.00	0.26	18846.2	500	3.15
0.50	0.035	4.88	-	0.52	9384.6	500	2.81
0.50	0.040	4.88	2.20	0.98	4979.6	500	2.10
0.50	0.050	4.88	4.10	1.46	3342.5	600	2.02
0.50	0.070	4.88	7.20	1.85	2637.8	700	1.64
0.50	0.100	4.88	10.70	2.00	2440.0	700	1.79
0.50	0.150	4.88	15.00	2.20	2218.2	800	2.09

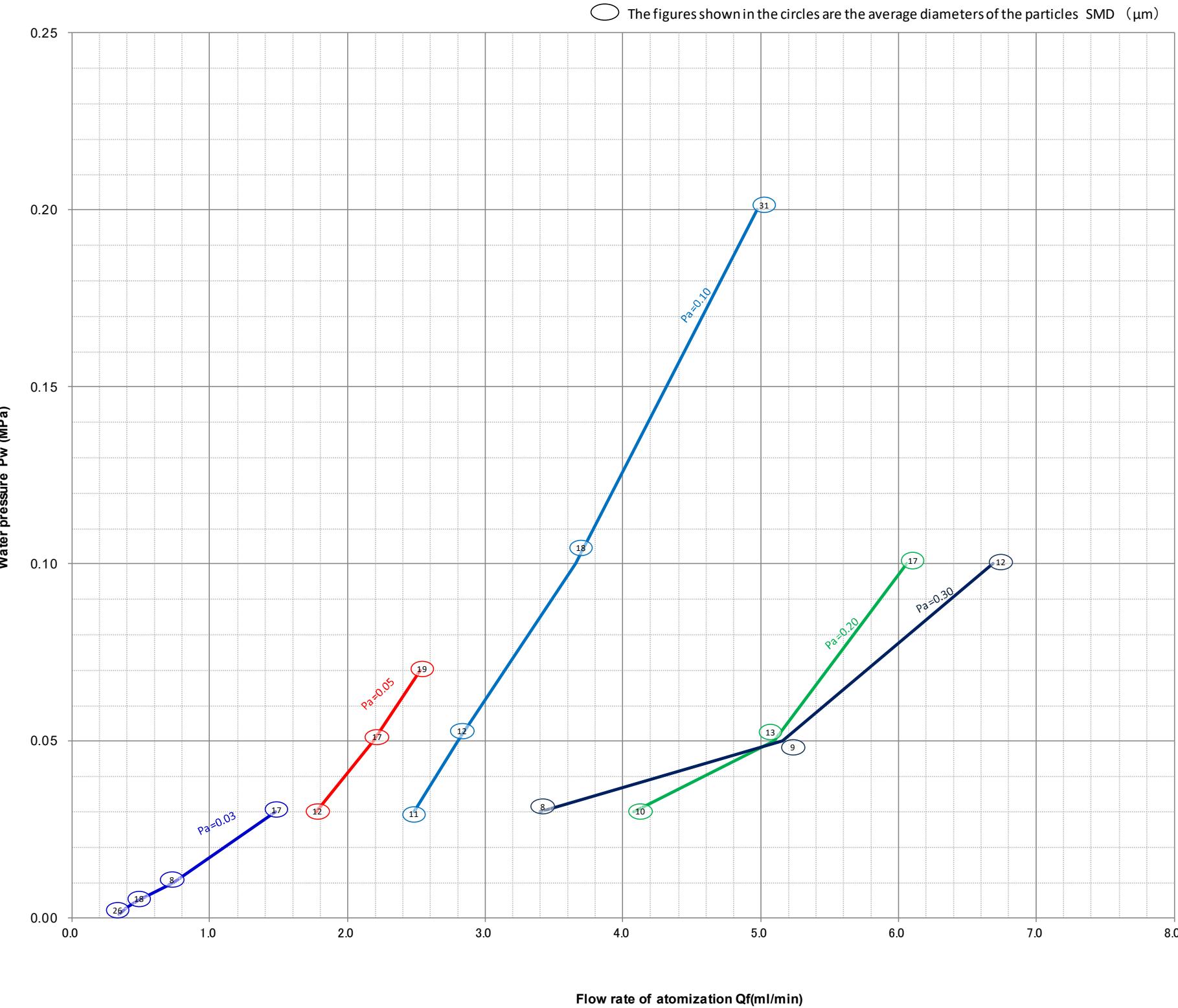
MATRIX MF58MT “Set without elbow” characteristics data – Spray liquid: Purified water

- This data is the standard data. The performance values may differ slightly to the values on actual products.
- Droplets may attach to the nozzle on the end of the elbow when some atomization conditions are used, but this does not affect the flow rate of atomization or the average diameter of the particles.



Air pressure Pa (MPa)	Water pressure Pw (MPa)	Air volume Qa (Nl/min)	Water supplied by pump Qw (ml/min)	Flow rate of atomization Qf (ml/min)	Air to water ratio Qa/Qf	Spray distance (mm)	Average diameter of the particles SMD (μm)
0.03	0.001	0.74	3.00	0.34	2176.5	100	26.05
0.03	0.003	0.74	3.50	0.40	1850.0	100	15.84
0.03	0.005	0.74	4.10	0.48	1541.7	100	18.37
0.03	0.010	0.74	5.90	0.73	1013.7	100	7.55
0.03	0.030	0.74	9.10	1.48	500.0	150	16.79
0.05	0.030	0.96	9.00	1.77	542.4	200	12.38
0.05	0.050	0.97	11.80	2.19	442.9	300	16.56
0.05	0.070	0.97	14.00	2.53	383.4	300	19.20
0.10	0.030	1.45	9.40	2.48	584.7	400	11.38
0.10	0.050	1.45	11.10	2.80	517.9	400	12.31
0.10	0.100	1.45	16.20	3.66	396.2	500	18.34
0.10	0.200	1.47	23.10	4.97	295.8	500	30.78
0.20	0.030	2.39	8.00	4.08	585.8	500	10.12
0.20	0.050	2.39	9.90	5.10	468.6	500	12.91
0.20	0.100	2.39	15.00	6.06	394.4	500	17.30
0.30	0.030	3.20	6.00	3.40	941.2	500	7.69
0.30	0.050	3.20	8.00	5.16	620.2	500	8.86
0.30	0.100	3.21	13.50	6.69	479.8	600	12.31

Pressure – Flow rate of atomization characteristics graph

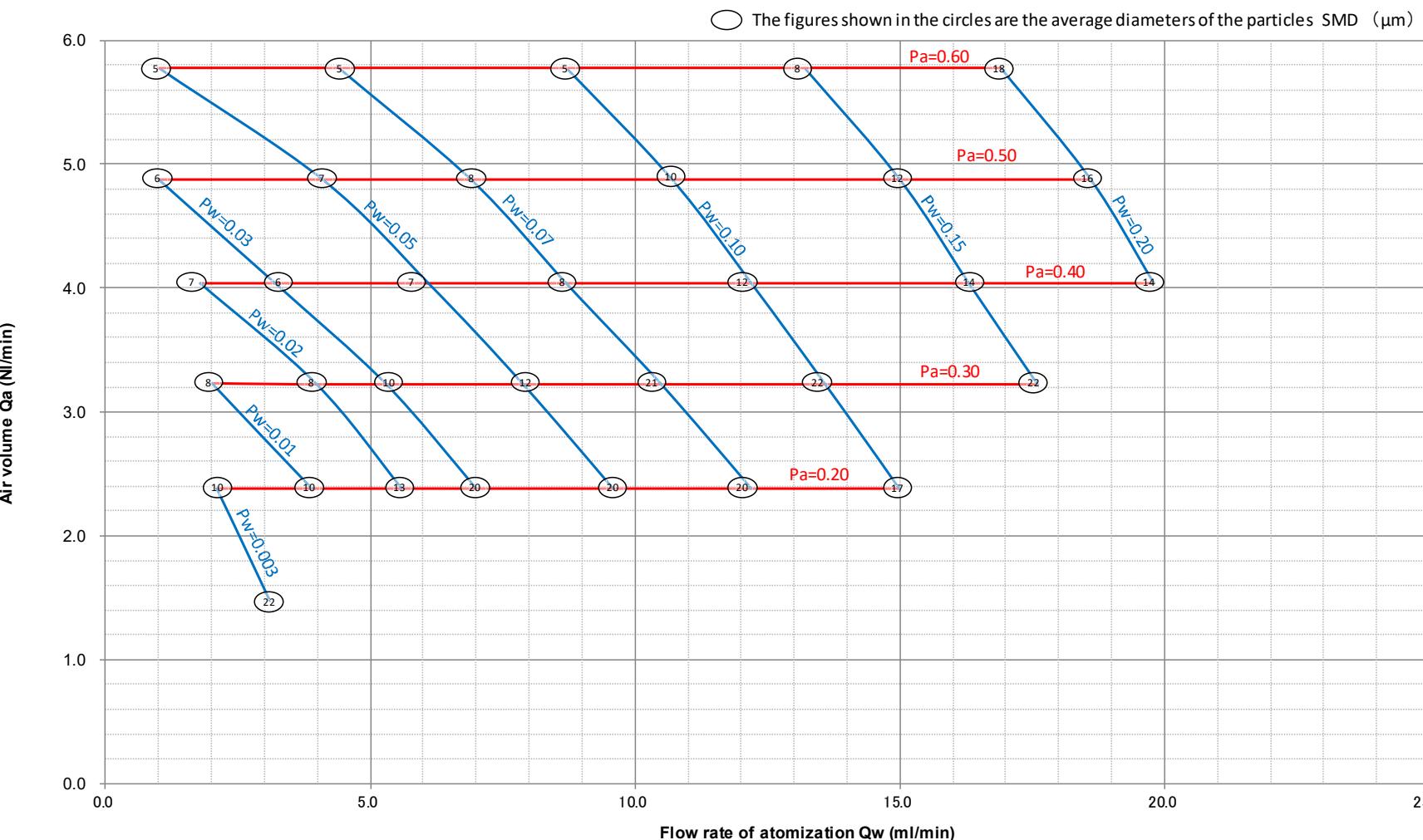


MATRIX MF58MT "Primary atomization set" characteristics data – Spray liquid: Purified water



This data is the standard data. The performance values may differ slightly to the values on actual products.

Pressure – Flow rate of atomization characteristics graph



Air pressure Pa (MPa)	Water pressure Pw (MPa)	Air volume Qa (Nl/min)	Flow rate of atomization (Water supplied by pump) Qw (ml/min)	Air to water ratio Qa/Qw	Spray distance (mm)	Average diameter of the particles SMD (μm)
0.20	0.003	2.38	2.10	1133.3	500	10.39
0.20	0.010	2.38	3.90	610.3	600	10.27
0.20	0.020	2.38	5.60	425.0	700	13.18
0.20	0.030	2.38	7.00	340.0	700	19.60
0.20	0.050	2.38	9.60	247.9	800	20.26
0.20	0.070	2.38	12.20	195.1	800	19.72
0.20	0.100	2.38	15.00	158.7	800	16.85
0.30	0.010	3.23	2.00	1615.0	700	7.89
0.30	0.020	3.22	4.00	805.0	800	8.22
0.30	0.030	3.22	5.30	607.5	800	10.12
0.30	0.050	3.22	7.90	407.6	1000	12.31
0.30	0.070	3.22	10.50	306.7	800	21.13
0.30	0.100	3.22	13.60	236.8	1000	21.71
0.30	0.150	3.22	17.60	183.0	1200	22.36
0.40	0.020	4.04	1.80	2244.4	700	6.60
0.40	0.030	4.04	3.20	1262.5	1000	6.41
0.40	0.050	4.04	6.10	662.3	1000	7.15
0.40	0.070	4.04	8.70	464.4	1000	8.39
0.40	0.100	4.04	12.20	331.1	1200	12.31
0.40	0.150	4.04	16.30	247.9	1200	13.71
0.40	0.200	4.04	19.80	204.0	1200	14.24
0.50	0.030	4.88	1.00	4880.0	600	5.50
0.50	0.050	4.88	4.10	1190.2	1000	6.83
0.50	0.070	4.88	6.90	707.2	1000	8.00
0.50	0.100	4.88	10.70	456.1	1200	10.12
0.50	0.150	4.88	15.00	325.3	1200	12.23
0.50	0.200	4.88	18.60	262.4	1200	15.66
0.60	0.050	5.78	1.00	5780.0	1000	4.83
0.60	0.070	5.78	4.40	1313.6	1200	5.29
0.60	0.100	5.78	8.70	664.4	1200	5.29
0.60	0.150	5.78	13.20	437.9	1200	7.69
0.60	0.200	5.78	16.90	342.0	1200	17.90

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