

10 Hydraulic Calculations

Reproduced verbatim from Section 10 of the DIOM, with the AP12 pump specification from Section 4.5. The AP12 (240V 60Hz) is the US pump.

Section 10 — verbatim

Automist is a pre-engineered system as per NFPA 3.3.13.7. All components connected to the water supply are designed to be installed according to pretested limitations. It has a maximum total pipe length of 60 m (196.85 ft). All fire tests were performed with the worst-case scenario; 60m total pipe lengths with an inner diameter of 8 mm (5/16”).

Pipe Flow/Friction Factor Calculations I: (U.S. units)

1. Calculation of Head Loss, h_L , and Frictional Pressure Drop, ΔP_f , for given flow rate, Q, pipe diam., D, pipe length, L, pipe roughness, ϵ , and fluid properties, ρ & μ .

Determine Friction Factor, f, assuming completely turbulent flow

$f = [1.14 + 2 \log_{10}(D/\epsilon)]^{-2}$

Pipe Diameter, D_{in} = 0.315 in, Pipe ID = 8 mm	Pipe Diameter, D = 0.0263 ft
Pipe Roughness, ϵ = 0.00015 ft, Commercial Steel	Friction Factor, f = 0.03159
Pipe Length, L = 98.43 ft, Max Length = 30 m	Cross-Sect. Area, A = 0.0005 ft ²
Pipe Flow Rate, Q = 0.006 cfs, Max Flow rate = 9.4 l/min	Ave. Velocity, V = 10.2 ft/sec
Fluid Density, ρ = 1.94 slugs/ft ³ , Water	Reynolds number, Re = 25,595
Fluid Viscosity, μ = 0.00002034 lb-sec/ft ² , 70 F (room temperature)	

2. Check on whether the given flow is “completely turbulent flow”.

(Calculate f with the transition region equation and see if differs from the one calculated above.)

$f = \{-2 \cdot \log_{10} [((\epsilon/D)/3.7) + (2.51/(Re \cdot (f^{1/2})))]\}^{-2}$

Transition Region Friction Factor, f:	f = 0.0348
Repeat calc of f using the new value of f:	f = 0.0347
Repeat again if necessary:	f = 0.0347

3. Calculate h_L and ΔP_f , using the final value for f calculated in step 2:

$h_L = f(L/D)(V^2/2g)$ and $\Delta P_f = \rho g h_L$

Frictional Head Loss, h_L	211.40 ft
Frictional Pressure Drop, ΔP_f	13193 psf
Frictional Pressure Drop, ΔP_f	91.62 psi or 6.32 bar

Pump inputs — AP12

Section 4.5, verbatim.

AP12 240V 60Hz

Below is the specification for an AP12 Automist pump utilising an incoming electrical supply of 240V 60Hz

Weight	23 kg
Size	250 mm (9.84 inch) (height) x 300 mm (11.81 inch) (depth) x 400 mm (15.74 inch) (width)
Output Pressure	76 – 100 bar (1102 – 1450 Psi)
Flow rate	9 litres per minute (2.37 Gallons) per minute
Inlet Pressure (Dynamic)	1 – 3 bar (14.5 – 43.51 Psi)
Rated Motor Speed	3400 rpm
Input Voltage Pump	240V AC/60Hz
Input Current Pump Max	11.4 amp
Input Power Pump Max	2.4 KW
Input Voltage Solenoid	24 VDC
Type of Solenoid	Normally closed (NC)
Temperature & Humidity	Indoor, dry

Source: Automist AP09 & AP12 Design, Installation, Operation and Maintenance (DIOM) Manual, version 2.0, 4th August 2025 — Section 10 (p. 62–63) and Section 4.5 (p. 17). Plumis Inc Copyright © 2025. All Rights Reserved.