

## SA-77 Sampler Volume and Air Consumption Calculations

The storage volume for a compressed gas can be calculated using Boyle's Law:

$$p_a V_a = p_c V_c \quad (1)$$

where

$p_a$  = atmospheric pressure (14.7 psi, 101.325 kPa)

$V_a$  = volume of the gas at atmospheric pressure (cubic feet, cubic meter)

$p_c$  = compressed pressure (psi, kPa)

$V_c$  = volume of the gas at compressed pressure (cubic feet, cubic meter)

The amount of free gas at atmospheric pressure in a given volume as a cylinder storage can be calculated by modifying (1) as:

$$V_a = p_c V_c / p_a \quad (2)$$

<b>Static Volume</b>			<b>Consumption per stroke at 15 psig</b>	
Actuator Diameter	Cubic inch to foot conversion		$V_a$	<b>0.0009805 SCF</b>
2.375 inches	0.000579		$P_c$	15 Psi
Actuator Radius			$V_c$	0.0009609
1.1875 inches	Actuator Volume in Cubic Feet		$P_a$	14.7
Actuator Stroke	0.000961		<b>Consumption per stroke at 30 psig</b>	
0.375 inches			$V_a$	<b>0.001961 SCF</b>
Actuator Volume			$P_c$	30 Psi
1.660459 cubic inches			$V_c$	0.0009609
			$P_a$	14.7

### Air Consumption Examples:

5 Strokes per min (one sample every 12 seconds) at 15 psig  
0.004903 SCFM

5 Strokes per min (one sample every 12 seconds) at 30 psig  
0.009805 SCFM

Use of the original Series One Oscillator increases air consumption by 65%  
= 0.016179 SCFM per above example at 30 psi

Use of the low consumption Series Two Oscillator increases air consumption by 10%  
= 0.010786 SCFM per above example at 30 psi