

POC Settings Need to be Equivalent Or Comparable to LPM

A Pharmaceutical company would not be allowed to label one of their manufactured drugs in a way that obscures the medical dosage per pill.

Currently POC manufacturers are purposefully obscuring the dosage of oxygen provided per setting on the portable oxygen concentrators they manufacture.

Making POC settings equivalent or comparable to LPM is vital in knowing which POC will fill a prescription! The first step to do that is simple. Use the following formula to find the pulse sizes for 1 Liter of gaseous Oxygen.

I : E Ratio of 1:3 = Inhale for 1 second : exhale for 2 seconds. 1,000ml = 1 LPM

$$1 \text{ Liter of O}_2 \div 3^* = 333 \text{ mL of O}_2 \div 20 \text{ RR}^{**} = 16.65 \text{ ml pulse dose of O}_2 \text{ at 20 RR}^{**}$$

* 3 = the total of an I:E Ratio of 1:2

** Respiratory Rate or Breaths per minute

Below is a chart showing pulse sizes that may be compared to pulse size charts provided by POC manufacturers.

1:2 RR 333		ml ÷ BPM = Pulse size for 99% Pure Oxygen						
BPM	1	LPM Pulse Settings						7
		2	3	4	5	6	8	
10	33.3	66.6	99.9	133.2	166.5	199.8	233.1	
15	22.2	44.4	66.6	88.8	111.0	88.8	155.4	
20	16.7	33.3	50.0	66.6	83.3	99.9	116.6	
25	13.3	26.6	40.0	53.3	66.6	79.9	93.2	
30	11.1	22.2	33.3	44.4	55.5	66.6	44.4	
35	9.5	19.0	28.5	38.1	47.6	57.1	66.6	
40	8.3	16.7	25.0	33.3	41.6	50.0	58.3	

To mathematically convert a POC setting to equivalent or comparable LPM setting

$$\text{Pulse setting size} \div \text{LPM pulse size} \times \text{POC Equalizer} = \text{Equivalent LPM}$$

For a 6 pulse setting size @ 20 RR is 10.5ml, Pure Oxygen pulse size @ 20 RR is 16.7

$$10.5 \div 16.7 = 63\% \times 1 = .63 \text{ LPM is equivalent or comparable to 1 LPM}$$

Pulse size is important when converting POC settings but so are the inspiratory trigger sensitivity and the psi pressure at the POCs outlet. The better POCs I have tested using a treadmill have an inspiratory trigger sensitivity of <0.12 and between a 20 to 28 psi pressure at the outlet.

A treadmill test will be needed to adjust for differing trigger sensitivities and psi at the outlet

A prescription is needed to get a Portable Oxygen Concentrator.

Prescriptions use Liter Per Minute to specify the amount of oxygen needed!

!!! NOT SETTINGS !!!

02 LPM Pulse Settings

Pulse size for Rhythm P2 - E7

On settings 1-4 the Rhythm-P2-E7 is 64% the size of pure oxygen.

On settings 5, 6 & 7 the Rhythm is 60% the size of pure 0₂

The pulses are slightly smaller than pulses on the Inogen.

Pulse size for Inogen Rove 6

Find LPM equivalent a POC setting by using a treadmill

I warm up on the treadmill using 99+% pure O₂. I then pick the setting on the POC I want to test and start walking and keep adjusting the speed of the treadmill until my SpO₂ stays at 88% to 89% and continue walking for six minutes with my blood oxygen holding at 88% to 89%. I Write the speed down for that setting and move on to the next setting. I run the same test on one of my Portable Liquid Oxygen units to have treadmill speeds for 99+% pure oxygen to find the speed for that LPM.

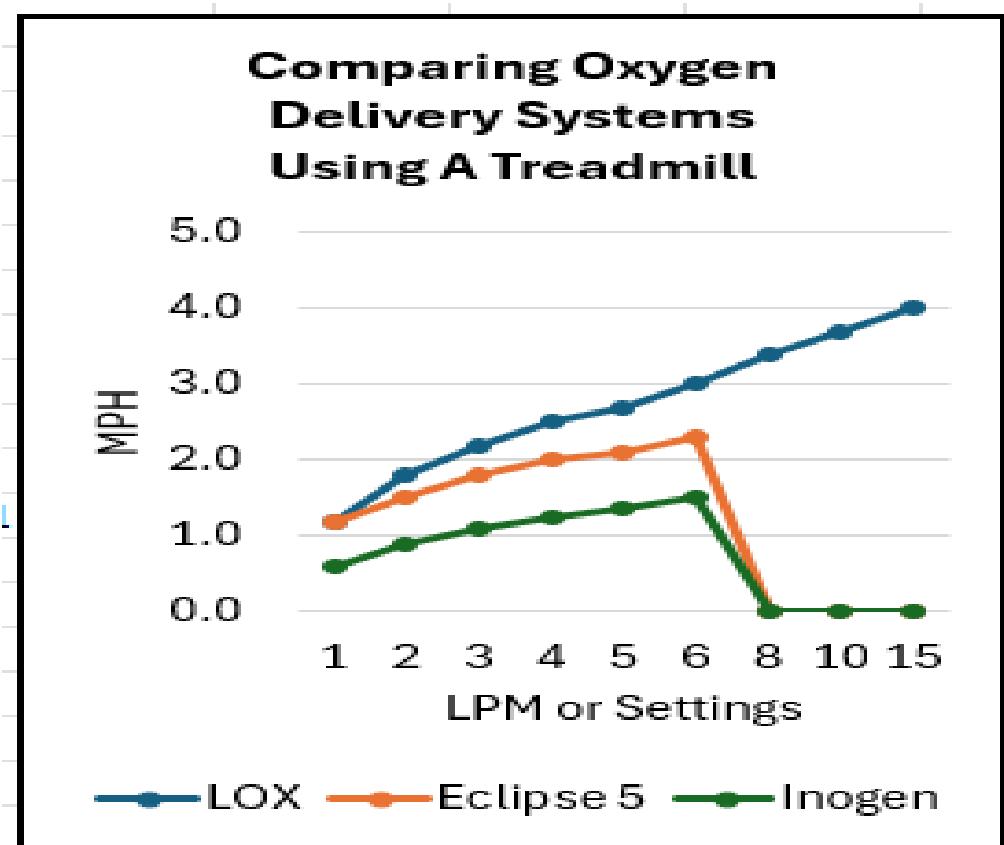
Then I divide the **setting speed** by the **LPM speed** to find the **percent difference between them**. Then the LPM multiplied by that percent to find the actual LPM for that setting.

Setting 1 speed ÷ 1 LPM speed = the percentage difference between them. To get the equivalent or comparable LPM for setting speed 1 multiply 1 LPM by the **percentage difference**.

Setting 1 speed ÷ 1 LPM speed = percent between them X 1 LPM = comparable LPM.

$$.6 \text{ MPH} \div 1.2 \text{ MPH} = .5 = 50\% \times 1 \text{ LPM} = .5 \text{ LPM}$$

The above is the actual numbers for the below testing graph. In this test .5 LPM is equivalent or comparable to the number 1 setting on the older Inogen One G3 I used for testing.



One test will not give accurate results but should be in the ball park. The Eclipse 5 has 9 settings but I only use the first six settings. When active I can out breathe it on a 5 setting and will out breath it on a 6 setting.

There are too many variables to make a POC setting equal to LPM. POC settings should be made equivalent to POC settings so they are comparable.

Inogen Rove 6

Inogen Rove 6 Pulse Volumes per Flow Setting (mL/breath \pm 15% per ISO 80601-2-67)						
BREATHS PER MINUTE	1	2	3	4	5	6
10	21.0	42.0	63.0	84.0	105.0	126.0
15	14.0	28.0	42.0	56.0	70.0	84.0
20	10.5	21.0	31.5	42.0	52.5	63.0
25	8.4	16.8	25.2	33.6	42.0	50.4
30	7.0	14.0	21.0	28.0	35.0	42.0
35	6.0	12.0	18.0	24.0	30.0	36.0
40	5.25	10.5	15.75	21.0	26.25	31.5
TOTAL VOLUME PER MINUTE (ML/MIN)	210	420	630	840	1050	1260

Inspiratory trigger pressure sensitivity	<0.12 cm H ₂ O
Maximum outlet pressure	< 28.9 PSI (199 kPa)

SimplyGo

Breath Rate	Settings										
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Pulse Volumes (mL)											
15	11.5	17.2	24.0	30.0	36.0	42.0	48.0	54.0	60.0	66.0	72.0
20	11.5	17.2	24.0	30.0	36.0	42.0	48.0	53.8	59.5	65.5	71.5
25	11.4	17.1	23.9	29.8	35.6	39.0	42.3	44.0	45.7	51.0	56.2
30	11.4	17.0	22.6	25.8	28.9	30.4	31.8	33.3	34.7	38.8	42.9
35	11.3	14.2	17.1	19.6	22.0	23.3	24.6	25.9	27.1	30.3	33.4
40	10.9	11.9	12.9	14.9	16.8	17.9	19.0	20.0	20.9	23.3	25.7

Inspiratory Trigger Sensitivity	≤ 0.3 cm H ₂ O in Pulse Mode ≤ 0.2 cm H ₂ O in Sleep Mode
Outlet Pressure	6.4 psig maximum (44 kPa)

When I tested the Philips Resironics SimplyGo on a treadmill I was very disappointed!

The pulses on the Resironics SimplyGo are larger than on the Inogen Rove 6 and the Rhythm P2-E7 but when I compare them using a treadmill it shows using 45% of the setting number would be close to the LPM output of the SimplyGo. Only a comparable output of 2.7 LPM on a SimplyGo 6 setting.

I believe the bigger inspiratory trigger and smaller psi on the SimplyGo is the cause a lower LPM output than I was expecting.

Inogen Rove 4

Inogen Rove 4™ Pulse Volumes per Flow Setting (mL/breath +/- 15% per ISO 80601-2-67)				
BREATHS PER MINUTE	1	2	3	4
10	21.0	42.0	63.0	84.0
15	14.0	28.0	42.0	56.0
20	10.5	21.0	31.5	42.0
25	8.4	16.8	25.2	33.6
30	7.0	14.0	21.0	28.0
35	6.0	12.0	18.0	24.0
40	5.25	10.5	15.75	21.0
TOTAL VOLUME PER MINUTE (ml/min)	210	420	630	840

Inspiratory trigger sensitivity	<0.12 cmH2O
Flow control settings	Pulse dose setting 1,2,3,4
Maximum outlet pressure	< 22 PSI 18.7 PSI (129 kPa) ± 10%

Trigger sensitivity good

Psi is okay but lower than Rove 6

Rhythm P2-S4

Settings				
	1	2	3	4
Breath Rate	Pulse Volumes(ml)			
10	21	42	63	84
15	14	28	42	56
20	10.5	21	31.5	42
25	8.4	16.8	25.2	33.6
30	7	14	21	28
35	6	12	18	24
40	5.3	10.5	15.8	21

Inspiratory Trigger Sensitivity	≤0.12 cm H ₂ O
Time Delay from Onset of Inspiration	<10ms
Delivery pressure at the device outlet	16 PSI ± 10%

Slightly low psi and different from the other Rhythm POCs. Horse sense tells me all POCs should have a range for psi, not a steady psi.

Trigger sensitivity is good

Invacare® Platinum® Mobile

4 ft to 25 ft Cannula/Oxygen Tubing Lengths						
	Breaths Per Minute					
	15	20	25	30	35	40
Pulse Setting = P1	14.7	11.0	8.8	7.3	6.3	5.5
Pulse Setting = P2	29.3	22.0	17.6	14.7	12.6	11.0
Pulse Setting = P3	44.0	33.0	26.4	22.0	18.9	16.5
Pulse Setting = P4	58.7	44.0	35.2	29.3	25.1	22.0
Pulse Setting = P5	66.7	50.0	40.0	33.3	28.6	25.0

Conserver Trigger Sensitivity:	$\leq 0.18 \text{ cmH}_2\text{O}$ pressure drop (For all cannula lengths) Factory set—no adjustment, pressure activated
Maximum Outlet	28.5 psig (197 kPa)

On the Invacare® Platinum® Mobile setting 6 dose only increases by 8 ml per pulse, the others increase by about 14 ml per pulse. Even though the psi is good the conserver trigger is slower. I believe the Invacare Platinum would be less efficient than an Inogen but better than SimplyGo. I haven't tested the Invacare Platinum.

DISCOV-R Portable Oxygen Concentrator

	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Setting 6	Setting 7	Setting 8
Breaths Per Minute	Pulse volumes (ml) +/- 15%, per ISO 80601-2-67							
15	16.7	33.3	50.0	66.7	83.3	93.3	103.3	113.3
20	12.5	25.0	37.5	50.0	62.5	70.0	77.5	85.0
25	10.0	20.0	30.0	40.0	50.0	56.0	62.0	68.0
30	8.3	16.7	25.0	33.3	41.7	46.7	51.7	56.7
35	7.1	14.3	21.4	28.6	35.7	40.0	44.3	48.6
40	6.3	12.5	18.8	25.0	31.3	35.0	38.8	42.5
Total Volume Per Minute (ml/min)	250	500	750	1000	1250	1400	1550	1700
Inhalation Trigger Pressure:	<-0.24 cmH ₂ O							
Maximum Outlet Pressure:	21 psig (144.79 kPa)							

Higher inhalation trigger pressure. I believe less efficient.

Low end on the psi.

I believe the larger pulse sizes on this POC will not make up for the higher trigger pressure.

FreeStyle Comfort

Pulse Volume (mL)* Setting					
Breath Rate	1	2	3	4	5
15	14.0	28.0	42.0	56.0	70.0
20	10.5	21.0	31.5	42.0	52.5
25	8.4	16.8	25.2	33.6	42.0
30	7.0	14.0	21.0	28.0	35.0
35	6.0	12.0	18.0	24.0	30.0
40	5.3	10.5	15.8	21.0	26.3

Maximum Outlet Pressure	<30 PSI
Dosing Sensitivity	> -0.5 cm H ₂ O

Much higher inhalation trigger pressure. Am sure it is less efficient.

Oxlife Liberty2

Breaths per Minute	1	2	3	4	5	6	7	8	9	10*
15	8.0	16.0	24.0	32.0	40.0	48.0	56.0	65.0	75.0	80.0
20	8.0	16.0	24.0	32.0	40.0	48.0	56.0	65.0	75.0	80.0
25	6.4	12.8	19.2	25.6	32.0	38.4	44.8	52.0	60.0	64.0
30	5.3	10.7	16.0	21.3	26.7	32.0	37.3	43.3	50.0	53.3
35	4.6	9.1	13.7	18.3	22.9	27.4	32.0	37.1	42.9	45.7
40	4.0	8.0	12.0	16.0	20.0	24.0	28.0	32.5	37.5	40.0

*Pulse Mode setting 10 available with the Liberty2 device.

Breath Sensitivity	The device will deliver a bolus based on a trigger pressure range of -0.08 to -0.35 cmH ₂ O.
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Maximum Outlet Pressure	Maximum outlet pressure is 7.4 psig (51kPa)
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Less sensitivity and lower psi. Less efficient.

Eclipse 5

Max Breath Rate

Pulse Dose Setting	Bolus Size (± 15%)	AC Power Supply & Power Cartridge (Battery)		DC Power Supply
		mL	Max Breath Rate	
1.0	16	40	40	
2.0	32	40	40	
3.0	48	40	40	
4.0	64	40	31	
5.0	80	37	25	
6.0	96	31	20	
7	128	23	15	
8	160	18	12	
9	192	15	10	

Note: Bolus volume decreases as breath rate exceeds published range.

Note: The pulse dose setting number (1-9) is not equal to LPM.

Oxygen Concentration	90%+5.5%/-3% @ sea level
Dimensions	19.3 high x 12.3 wide x 7.1 deep (inches), 49.0 height x 31.2 wide x 18.0 deep (CM)
Weight	Eclipse 15 lbs., Battery 3.4 lbs.
Power	AC Power (100-240 VAC, 50-60 Hz); DC Power (12V nominal); Battery (Lithium Ion)
Nominal Battery	1.8 to 5.0 hrs recharge time to achieve 80% capacity (dependent upon the flow)
Recharge Time	
Alarms/Alerts	Loss of power, Low Battery, Low Therapeutic O2 Output, O2 flow outside normal limits. No Inspiration detected in Pulse Dose Mode, Unit Malfunction
O2 Concentration Indicator	Green Light=Normal Yellow=Caution <85%
Outlet Pressure	Nominal: 7.0 psig Maximum: 14.0 psig

specific flows.

Continuous Flow Settings in LPM	Pulse Dose Setting Bolus Size (mL)
0.5	-
1.0	16
1.5	24
2.0	32
2.5	40
3.0	48
-	56
-	64
-	72
-	80
-	88
-	96
-	128
-	160
-	192

Minimum oxygen concentration (82%).

The Eclipse 5 has set pulse sizes and I begin out breathing it by setting 6 when active.

FreeStyle Comfort

O2 Output Setting		Setting 1 - 210 mL/min Setting 2 - 420 mL/min Setting 3 - 630 mL/min Setting 4 - 840 mL/min Setting 5 - 1050 mL/min
Oxygen Concentration*		90% (+5.5% / -3%)
Oxygen Monitor		Yes
Maximum Outlet Pressure		<30 PSI
Dosing Sensitivity		< -0.5 cm H2O

Setting	Pulse Volume (mL)*				
	1	2	3	4	5
15	14	28	42	56	70
20	10.5	21	31.5	42	52.5
25	8.4	16.8	25.2	33.6	42
30	7	14	21	28	35
35	6	12	18	24	30
40	5.3	10.5	15.8	21	26.3

Liquid oxygen is 99+% pure. POCs are not. POCs are similar to the FreeStyle's stated oxygen concentration of 90% (+5.5% / -3%). The lower oxygen concentration would need to be compensated for.

POCs need to have settings that are standard to all POCs and those settings need to be equivalent or comparable to LPM!!!

This Issue should be important to all who support the SOAR Act. How can a person's prescription be matched to a POC now? Test a person on every POC available?

I do believe everyone using a POC for the first time should be given a respiratory therapy session to sure it will meet their needs, teach breathing skills and learn how to use a POC.

Testing a larger group is needed to validate my premise on converting POC settings to equivalent or comparable LPM is valid.

If it is important for Medical professionals to prescribe the proper dosage (LPM) POC settings need to be equivalent or comparable to LPM!

In 2014, eleven years ago I began trying to understand POC settings. I knew it was important to know if a POC could match the LPM on my prescription. It is time for Congress and/or the FDA to force POC manufacturers to use LPM. The manufacturers should not be allowed to continue obscuring the dosage supplied by a POC!!!

OXYGEN IS PRESCRIBED IN LPM, NOT SETTINGS