

Hydrogen Mass/Volume Lookup Table

This table has been included to assist those wishing to convert common tank sizes and pressures of hydrogen to mass. Similarly, it can also be used to identify potential storage solutions if the required mass of hydrogen has been identified previously. The numbers in the table should be used as an approximation only.

Unlike ideal gases, it is not accurate to assume a linear relationship between mass and pressure for a given volume of hydrogen; if you double the pressure of hydrogen within a storage vessel, you don't necessarily double the mass of hydrogen stored.

There are many ways to attempt to model the change in mass of hydrogen for variations in temperature, pressure, and volume. To the right is an example incorporating a Redlich-Kwong derivation of the real gas law. This is believed to be the closest representation of the behaviour of pressurised hydrogen.

This table assumes a steady state temperature of 15°C (or 288°K), a critical temperature of -240°C (33°K) and critical pressure of 1298000Pa (12.98 bar). If the tank is at a different temperature, this can have a significant effect on the mass of hydrogen stored.

Assumptions

Mass in kg
 288 Deg K Steady State Temp
 1298000Pa Critical Pressure
 33.2 Deg K Critical Temp
 8.314472 Real Gas Const

Tank Vol (Std Litres)	Pressure (bar)			
	15	200	350	700
100	0.1	1.5	2.3	3.5
200	0.3	2.9	4.5	7.1
300	0.4	4.4	6.8	10.6
400	0.5	5.9	9.1	14.1
500	0.6	7.3	11.4	17.6
600	0.8	8.8	13.6	21.2
700	0.9	10.3	15.9	24.7
800	1.0	11.7	18.2	28.2
900	1.1	13.2	20.5	31.7
1000	1.3	14.6	22.7	35.3
2000	2.5	29.3	45.5	70.5
3000	3.8	43.9	68.2	105.9
4000	5.1	58.6	90.9	141.1
5000	6.3	73.2	113.7	176.4
6000	7.6	87.9	136.4	211.6
7000	8.9	102.5	159.2	246.9
8000	10.1	117.1	181.9	282.2
9000	11.4	131.8	204.6	317.4
10000	12.7	146.4	227.4	352.7
11000	13.9	161.1	250.1	388.0
12000	15.2	175.7	272.8	423.2
13000	16.4	190.4	295.6	458.5
14000	17.7	205.0	318.3	493.8
15000	19.0	219.6	341.0	529.1
16000	20.2	234.3	363.8	564.3
17000	21.5	248.9	386.5	599.6
18000	22.8	263.6	409.2	634.9
19000	24.0	278.2	432.0	670.1
20000	25.3	292.9	454.7	705.4