CO-Too Carbonated

Dealing with Multiple Carbonation Levels on Your Draught System

Neil Witte

Craft Quality Solutions

CICERONE® CERTIFICATION PROGRAM

BA BREWERS ASSOCIATION®

CO-Too Carbonated

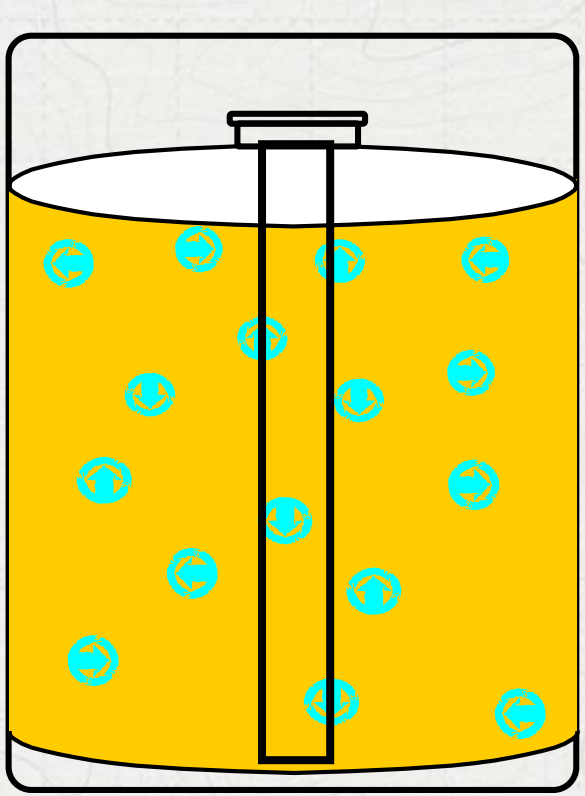
The Standard System

Dispense Gas Goals

1. Keep the beer properly carbonated
2. Push the beer from the keg to the faucet

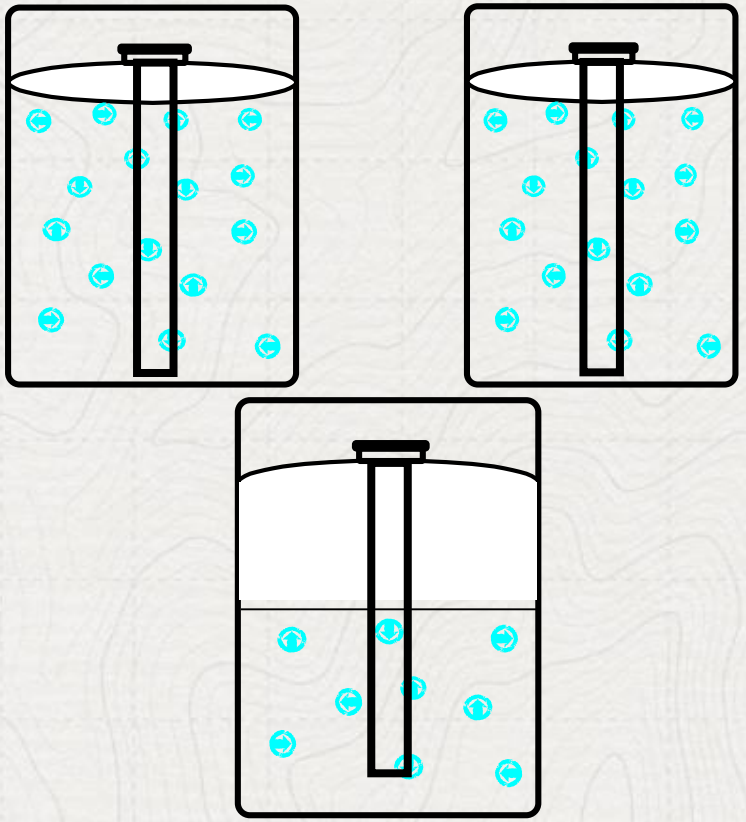
CO2 – Measuring Carbonation

CO2 is measured in Volumes per volume (v/v)



2.5 v/v

=



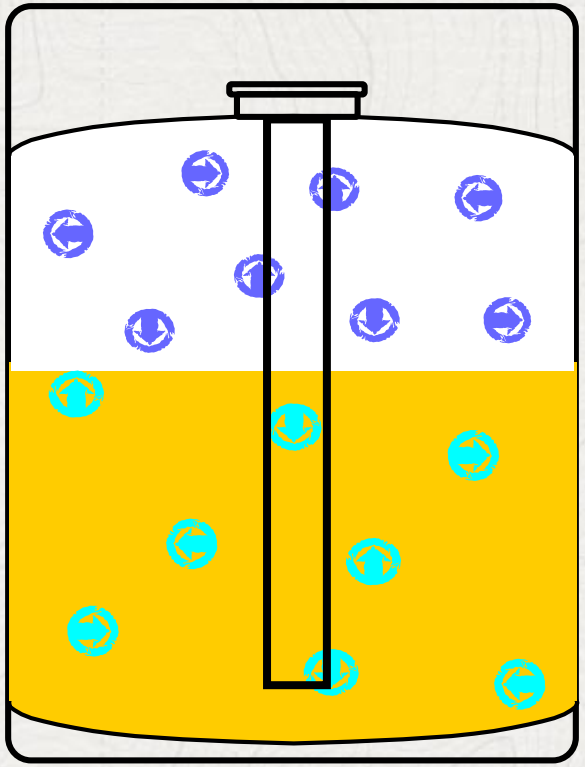
2.5 v/v

CO_2 – Maintaining Carbonation

A balanced keg will maintain the same carbonation throughout the life of the keg.

Two main factors control this:

1. Pressure
2. Temperature



2.5 v/v
11.3 psi @ 38F

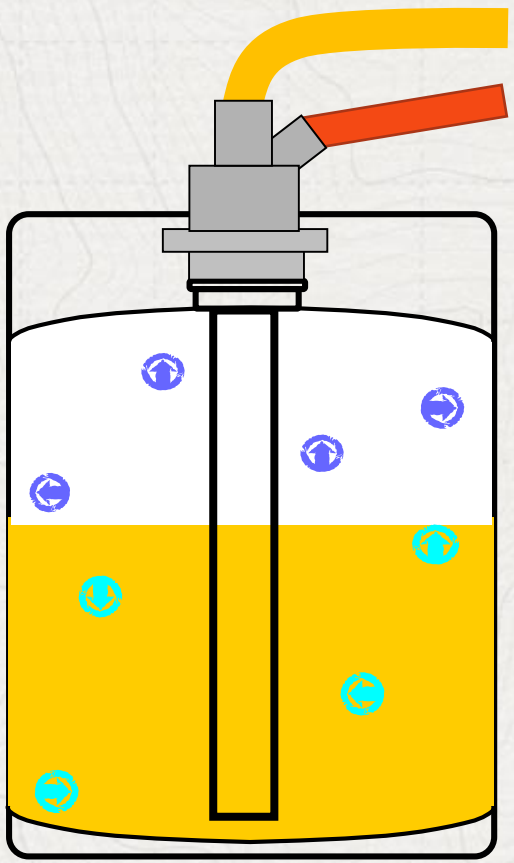
Pressure/Temperature Relationship

Temp (F)	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
33	5.0	6.0	6.9	7.9	8.8	9.8	10.7	11.7	12.6	13.6
34	5.2	6.2	7.2	8.1	9.1	10.1	11.1	12.0	13.0	14.0
35	5.6	6.6	7.6	8.6	9.7	10.7	11.7	12.7	13.7	14.8
36	6.1	7.1	8.2	9.2	10.2	11.3	12.3	13.4	14.4	15.5
37	6.6	7.6	8.7	9.8	10.8	11.9	12.9	14.0	15.1	16.1
38	7.0	8.1	9.2	10.3	11.3	12.4	13.5	14.5	15.6	16.7
39	7.6	8.7	9.8	10.8	11.9	13.0	14.1	15.2	16.3	17.4
40	8.0	9.1	10.2	11.3	12.4	13.5	14.6	15.7	16.8	17.9
41	8.3	9.4	10.6	11.7	12.8	13.9	15.1	16.2	17.3	18.4
42	8.8	9.9	11.0	12.2	13.3	14.4	15.6	16.7	17.8	19.0

Assumes sea-level altitude. Add 1psi for every 2,000ft above sea-level.

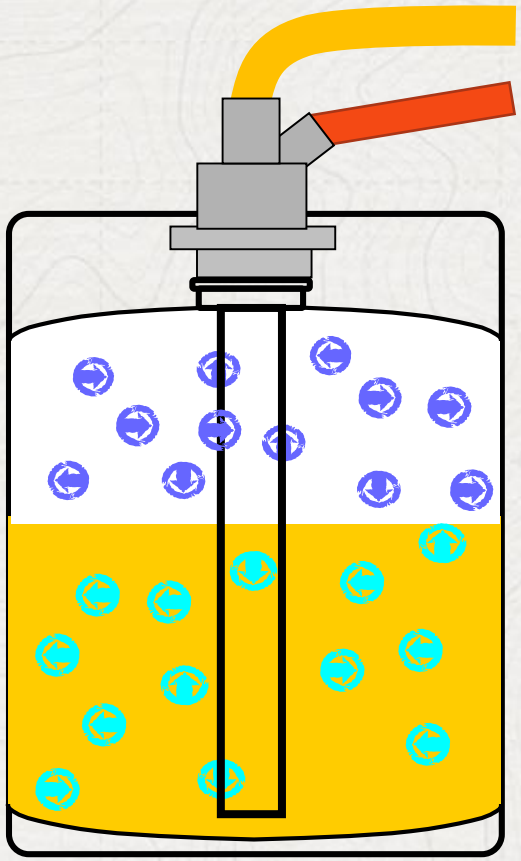
Balancing Carbonation

9 psi = 2.3 v/v



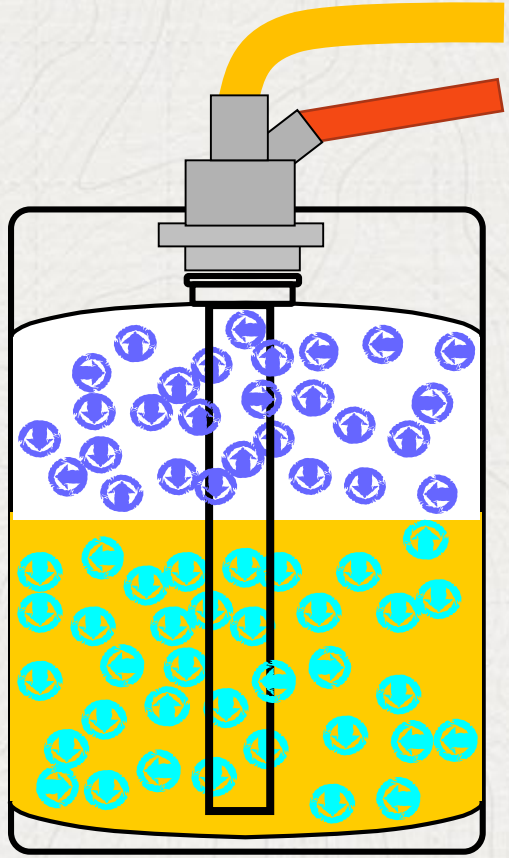
38F

11 psi = 2.5 v/v



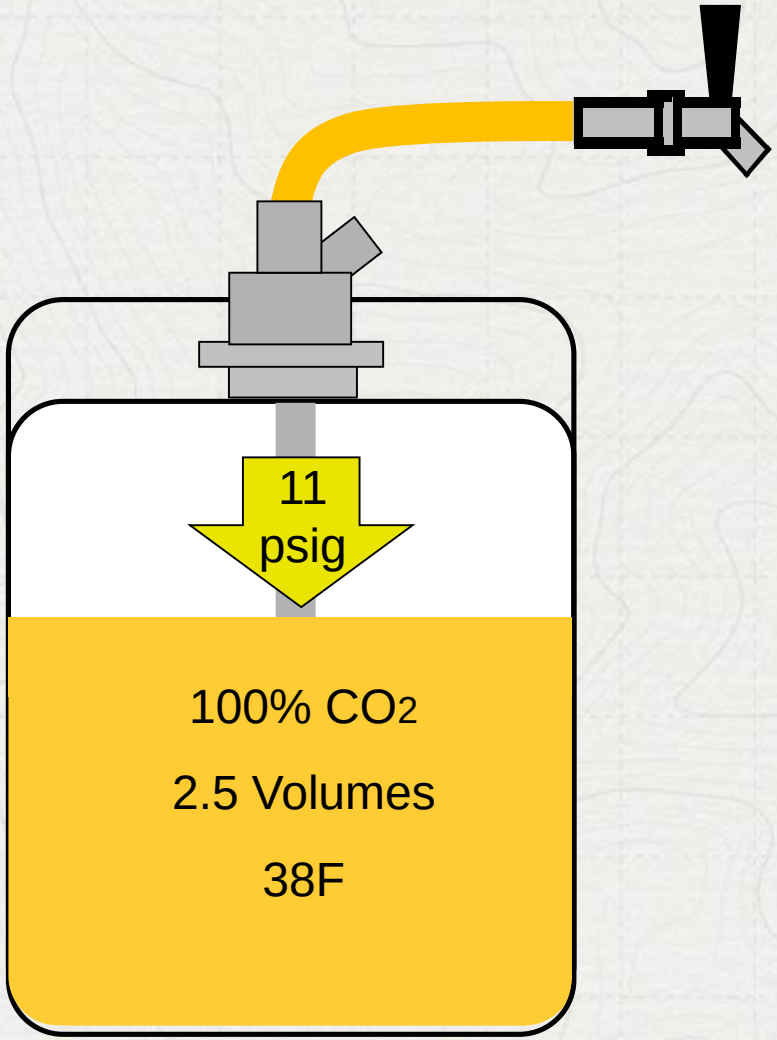
38F

13 psi = 2.65 v/v



38F

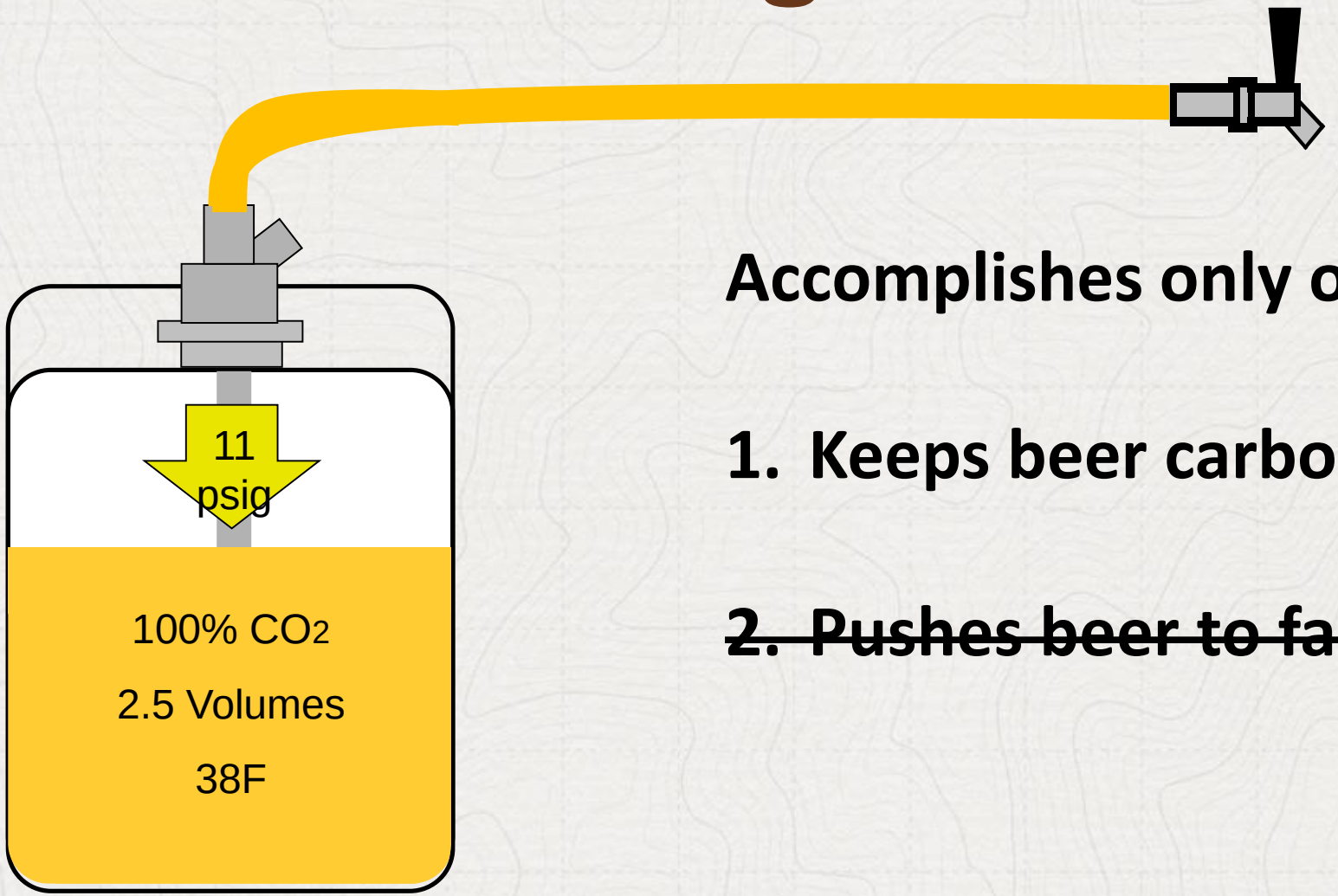
Short Draw



Accomplishes both goals:

1. **Keeps beer carbonated**
2. **Pushes beer to faucet**

Long Draw

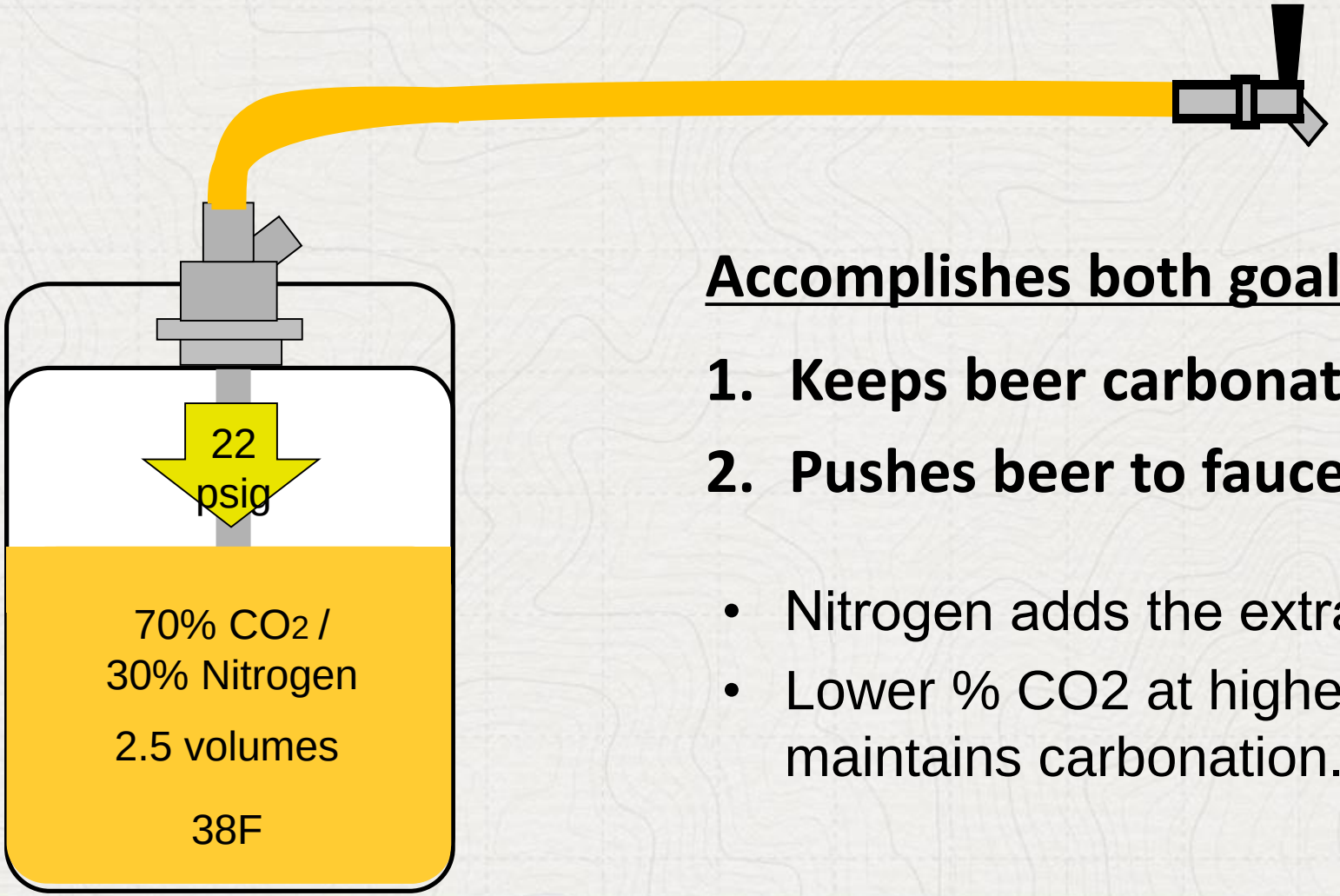


Accomplishes only one goal:

1. **Keeps beer carbonated**

2. ~~**Pushes beer to faucet**~~

Long Draw with Blended Gas



Accomplishes both goals:

1. **Keeps beer carbonated**
2. **Pushes beer to faucet**

- Nitrogen adds the extra “push”.
- Lower % CO2 at higher pressure maintains carbonation.

psi/Volumes Relationship at 38F

60% CO_2

PSI	Volumes
39	3.12
38	3.06
37	3.00
36	2.95
35	2.89
34	2.83
33	2.77
32	2.71
31	2.66
30	2.60
29	2.54
28	2.48
27	2.42
26	2.36
25	2.31
24	2.25
23	2.19
22	2.13

70% CO_2

PSI	Volumes
32	3.17
31	3.10
30	3.03
29	2.96
28	2.89
27	2.83
26	2.76
25	2.69
24	2.62
23	2.56
22	2.49
21	2.42
20	2.35
19	2.28
18	2.22
17	2.15

100% CO_2

PSI	Volumes
18	3.17
17	3.07
16	2.97
15	2.88
14	2.78
13	2.68
12	2.59
11	2.49
10	2.39
9	2.30
8	2.20
7	2.10

Achieving Flow

Balancing two key elements:

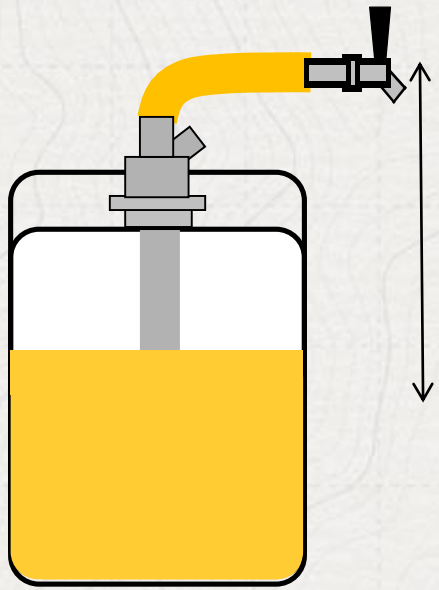
1. Applied Pressure (psi)
2. System Resistance (lbs.)
   - Gravity
   - Tubing, parts

When **System Resistance** = **Applied Pressure** on the keg,

Flow rate will equal 1 gallon/minute

Resistance to Flow

Gravity



1 ft. = .5 lb. resistance

Measurement is from middle of the keg.

Tubing

Type	Size	Restriction
Vinyl	3/16” ID	3.00 lbs/ft
Vinyl	1/4” ID	0.85 lbs/ft
Vinyl	5/16” ID	0.40 lbs/ft
Vinyl	3/8” ID	0.20 lbs/ft
Vinyl	1/2” ID	0.025 lbs/ft
Barrier	1/4” ID	0.30 lbs/ft
Barrier	5/16” ID	0.10 lbs/ft
Barrier	3/8” ID	0.06 lbs/ft
Stainless	1/4” OD	1.20 lbs/ft
Stainless	5/16” OD	0.30 lbs/ft
Stainless	3/8” OD	0.12 lbs/ft

The Standard System

- Single temperature
- Single gas/gas blend
- Single pressure
- Set restriction

The result: Ideal for only one level of CO_2

Pouring a High-Carbonated Beer

Pressure Adjustment

PSI Adjustment Requirements

Dedicated Regulators

PSI Adjustment Requirements

CO_2 content knowledge

- Difficult for retailers
  - No definitive list
- General guidelines
  - Craft – ~2.5 vol
  - Domestic – ~2.7 vol
  - Imported Specialty/Wild - ~2.8+

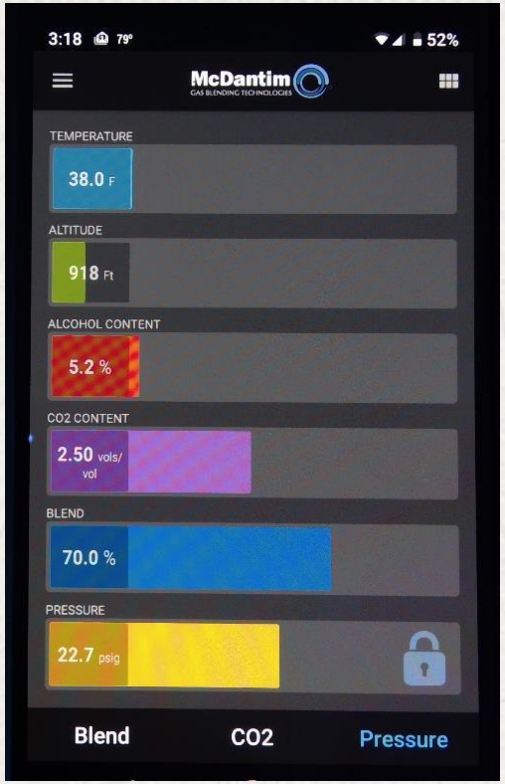
PSI Adjustment

If you know the CO_2 content:

1. Look up ideal pressure
2. Keep within 5psi of restriction on system
   - Minimizes flow rate change

Temp (F)	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
33	5.0	6.0	6.9	7.9	8.8	9.8	10.7	11.7	12.6	13.6
34	5.2	6.2	7.2	8.1	9.1	10.1	11.1	12.0	13.0	14.0
35	5.6	6.6	7.6	8.6	9.7	10.7	11.7	12.7	13.7	14.8
36	6.1	7.1	8.2	9.2	10.2	11.3	12.3	13.4	14.4	15.5
37	6.6	7.6	8.7	9.8	10.8	11.9	12.9	14.0	15.1	16.1
38	7.0	8.1	9.2	10.3	11.3	12.4	13.5	14.5	15.6	16.7
39	7.6	8.7	9.8	10.8	11.9	13.0	14.1	15.2	16.3	17.4
40	8.0	9.1	10.2	11.3	12.4	13.5	14.6	15.7	16.8	17.9
41	8.3	9.4	10.6	11.7	12.8	13.9	15.1	16.2	17.3	18.4
42	8.8	9.9	11.0	12.2	13.3	14.4	15.6	16.7	17.8	19.0

Draught Beer Quality Manual Chart – 100% CO_2



McDantim EasyBlend App

PSI Adjustment – Short/ 100% CO_2 System

If you don't know the CO_2 content:

Flashlight test

1. Set regulator low - ~5psi
2. Tap fresh keg – make sure keg is at temp
3. Pour a small amount of beer
4. Look for bubbles in the line coming out of the coupler
5. If bubbles are present – raise pressure by 1 or 2 psi
6. Repeat steps 3-5 until beer no bubbles are present and beer pours clear

** Keep within 5 psi of restriction on system*

PSI Adjustment – Long/ Blended Gas System

		psi at 60% CO_2				psi at 65% CO_2				psi at 70% CO_2	
		2.5 v/v	2.7 v/v			2.5 v/v	2.7 v/v			2.5 v/v	2.7 v/v
temp	40	27-33		temp	40	24-30	27-33	temp	40	21-26	24-29
°F	38	25-31	29-35	°F	38	22-28	26-31	°F	38	20-25	23-28
	37	25-30	28-34		37	22-27	25-30		37	19-24	22-27
	35	23-28	26-32		35	20-25	23-28		35	18-22	20-25

		psi at 75% CO_2				psi at 80% CO_2				psi at 85% CO_2	
		2.5 v/v	2.7 v/v			2.5 v/v	2.7 v/v			2.5 v/v	2.7 v/v
temp	40	19-24	22-25	temp	40	17-21	19-24	temp	40	15-19	17-22
°F	38	17-22	20-25	°F	38	15-20	18-22	°F	38	14-18	16-20
	37	17-21	20-24		37	15-19	17-21		37	13-17	16-19
	35	16-20	18-22		35	14-18	16-20		35	12-16	14-18

*Add 1 psi for every 2,000 feet of elevation to account for differences in atmospheric pressure.

PSI Adjustment – Long/ Blended Gas System

		psi at 70% CO_2	
		2.5 v/v	2.7 v/v
temp °F	40	21-26	24-29
	38	20-25	23-28
	37	19-24	22-27
	35	18-22	20-25

CO-Too Carbonated

Pressure Adjustment

+

Restriction Adjustment

Achieving Flow

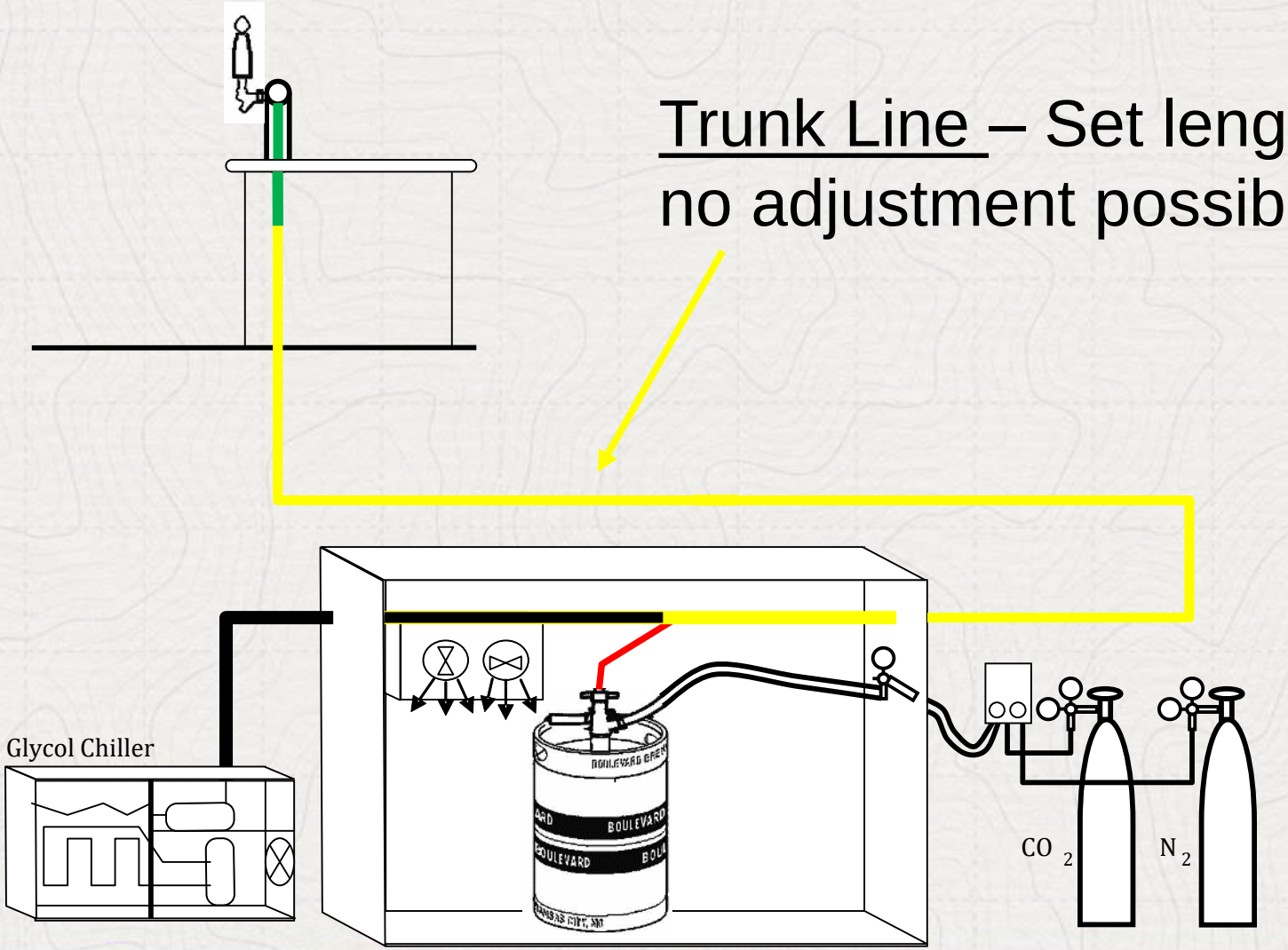
Balancing two key elements:

1. Applied Pressure (psi)
2. System Resistance (lbs.)
   - Gravity
   - Tubing, parts

When **System Resistance** = **Applied Pressure** on the keg,

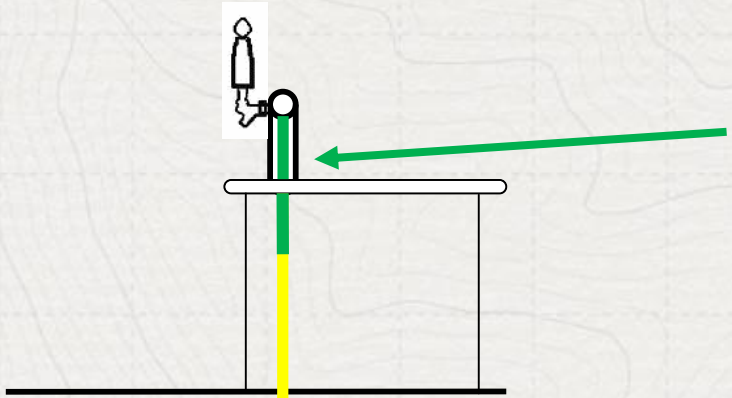
Flow rate will equal 1 gallon/minute

Adding Restriction

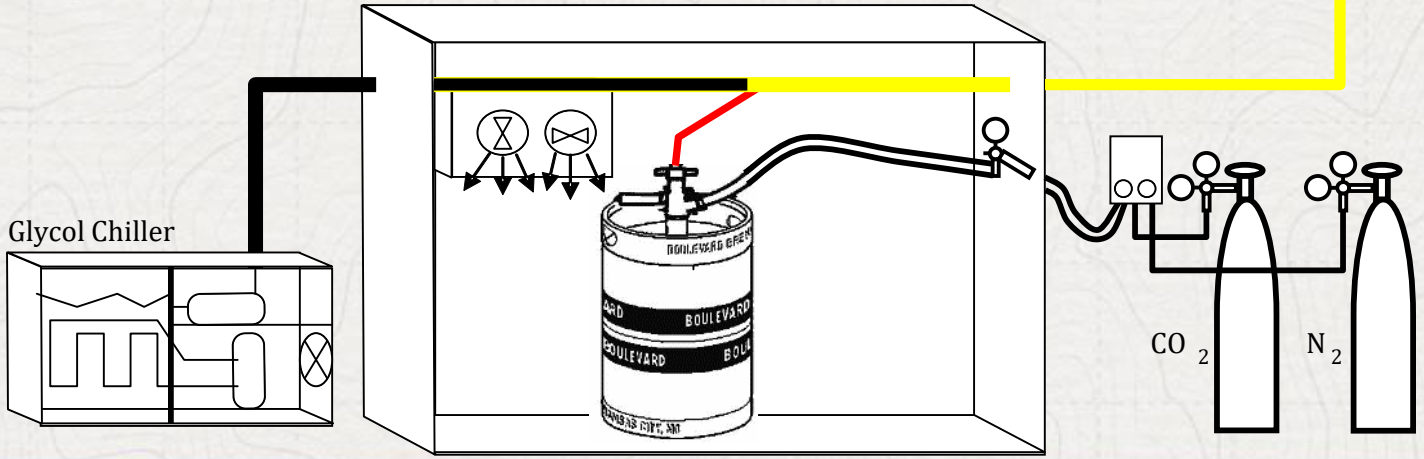


Trunk Line – Set length and diameter, no adjustment possible

Adding Restriction



Choker – Permanent installation, difficult to adjust



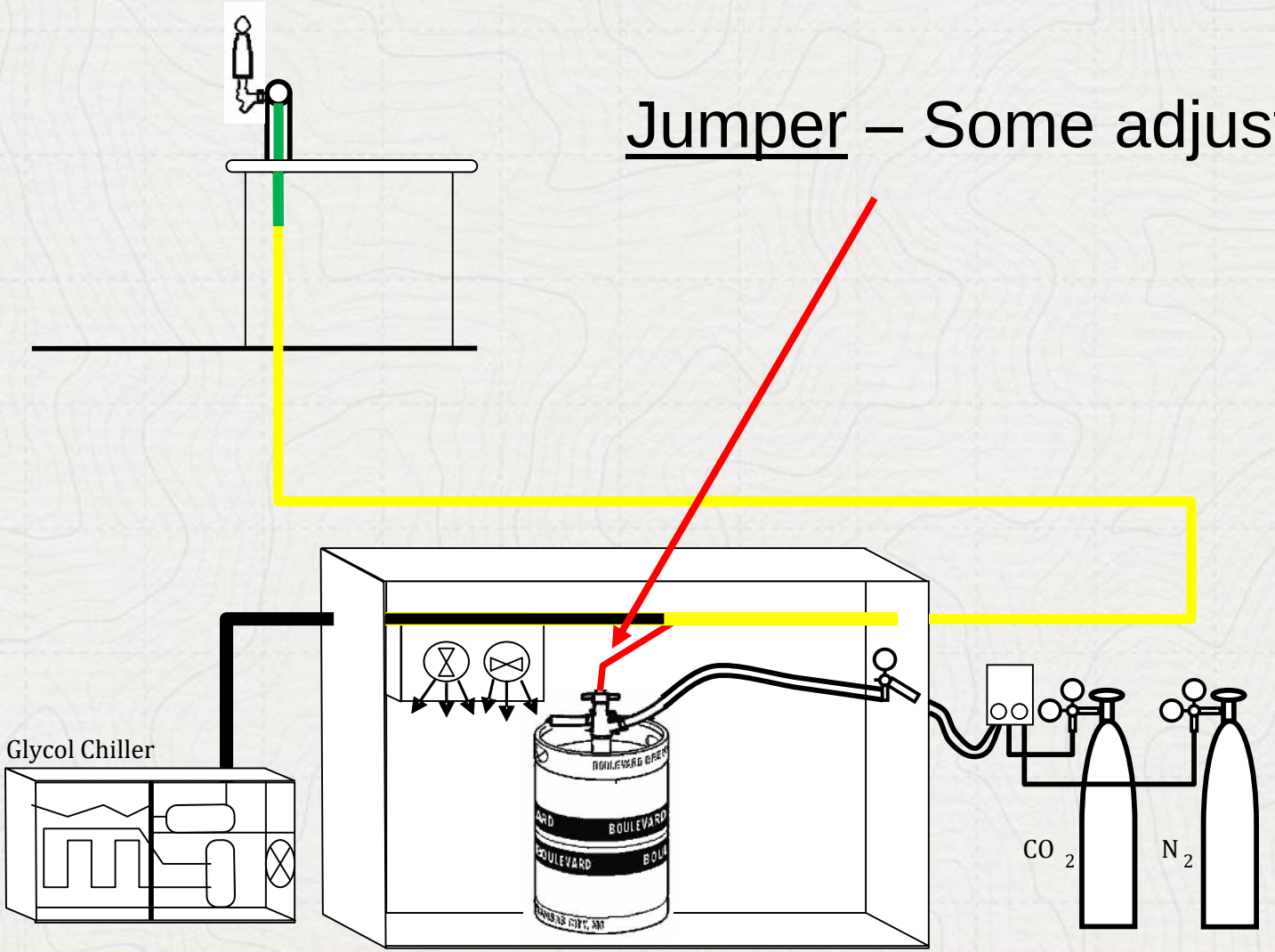
Choker

Stainless Steel

3/16” tubing – vinyl/other

Plastic inserts

Adding Restriction



Adding Restriction

Every pound of restriction equals about 4 oz/min flow rate

Type	Size	Restriction
Vinyl	3/16” ID	3.00 lbs/ft
Vinyl	1/4” ID	0.85 lbs/ft
Vinyl	5/16” ID	0.40 lbs/ft
Vinyl	3/8” ID	0.20 lbs/ft
Vinyl	1/2” ID	0.025 lbs/ft
Barrier	1/4” ID	0.30 lbs/ft
Barrier	5/16” ID	0.10 lbs/ft
Barrier	3/8” ID	0.06 lbs/ft
Stainless	1/4” OD	1.20 lbs/ft
Stainless	5/16” OD	0.30 lbs/ft
Stainless	3/8” OD	0.12 lbs/ft

Tubing Resistance Chart – Draught Beer Quality Manual

*** This solution has limitations with larger serving vessels**

Flow Control Faucets

Maximum flexibility

Flow Control Faucets

- Lever allows for manual control of flow rate
- Bartender training is imperative

Flow Control Faucets

- Tubing restriction should be set at the low end of target range
- Target flow rate may be lower than 1 gal/min
- Very high CO2 volumes may require an extremely slow pour

CO-Too Carbonated

Pressure Adjustment

+

Gas Blend Adjustment

+

Restriction Adjustment

Single Blend

2.2 – 3.2 vol

- 15 psi range

psi	70%
33	3.23
32	3.17
31	3.10
30	3.03
29	2.96
28	2.89
27	2.83
26	2.76
25	2.69
24	2.62
23	2.56
22	2.49
21	2.42
20	2.35
19	2.28
18	2.22

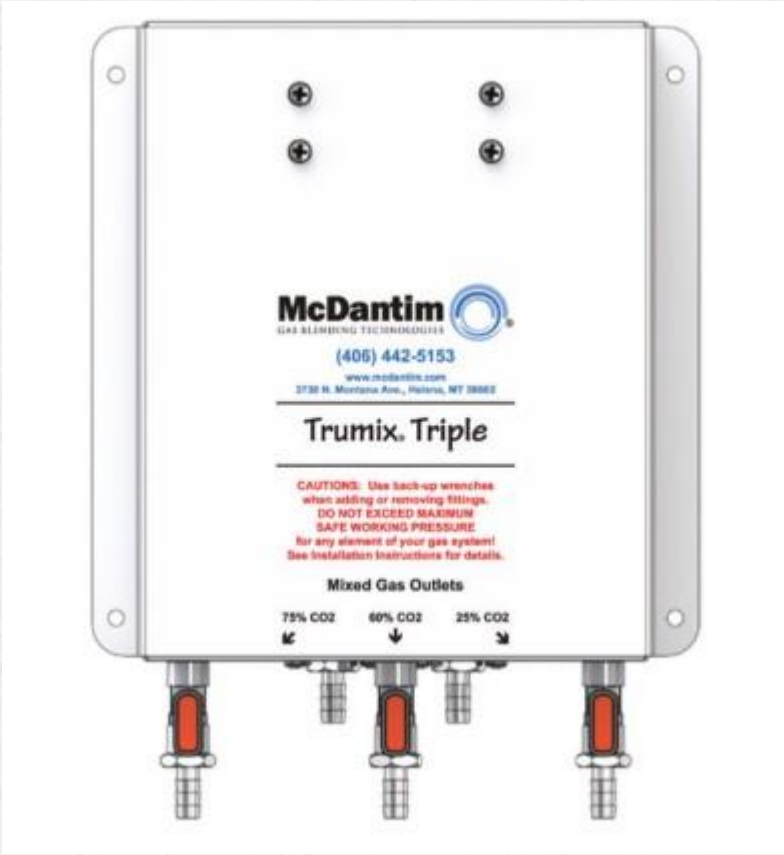
Multiple Blends

2.2 – 3.2 vol

- 8 psi range

psi	60%	70%
32	2.71	3.17
31	2.66	3.10
30	2.60	3.03
29	2.54	2.96
28	2.48	2.89
27	2.42	2.83
26	2.36	2.76
25	2.31	2.69
24	2.25	2.62

Multi-Blend Blenders



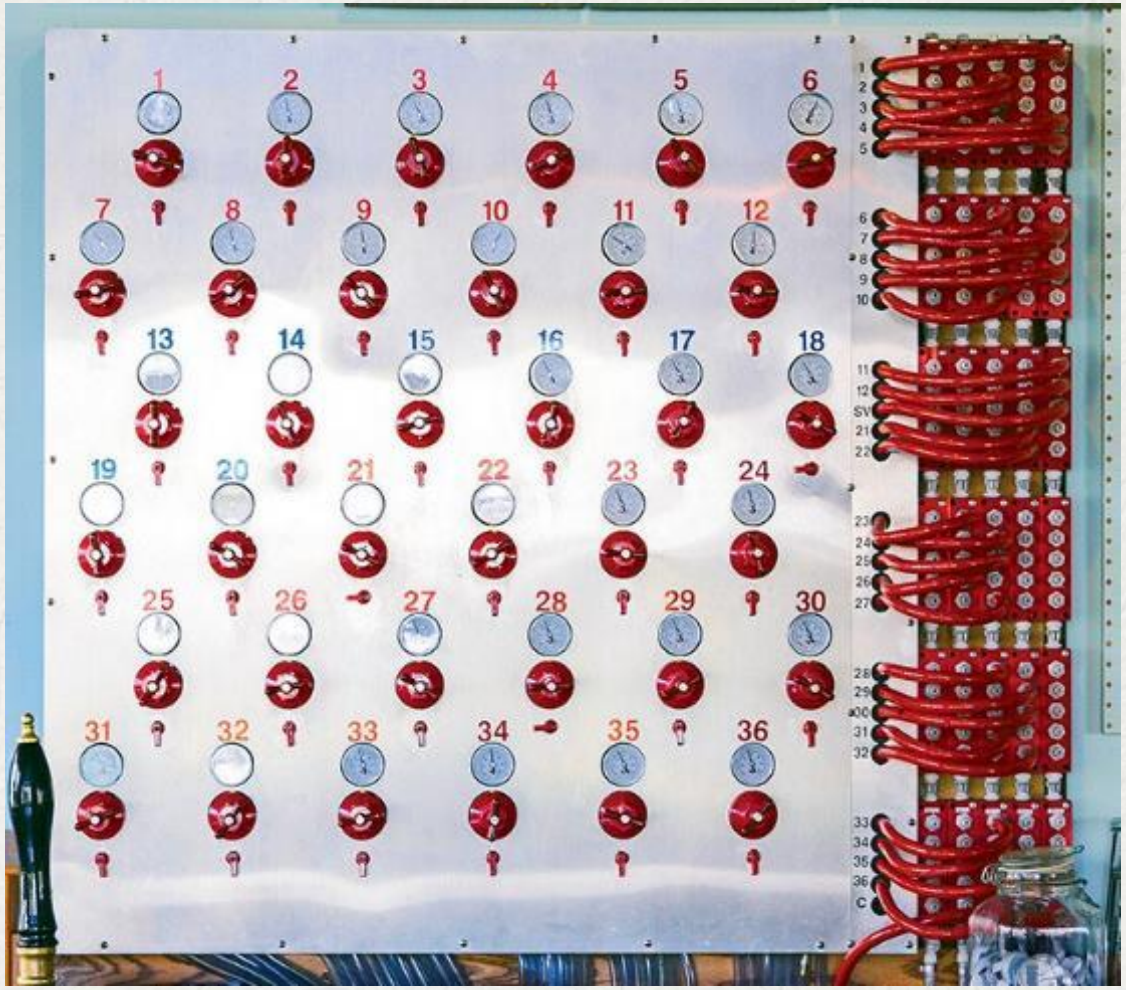
Gas Blend/psi/Volumes

Range

- 2.0 – 4.3 vol
- 11 psi

psi	60%	80%	100%
30	2.60	3.46	4.33
29	2.54	3.39	4.23
28	2.48	3.31	4.14
27	2.42	3.23	4.04
26	2.36	3.15	3.94
25	2.31	3.08	3.84
24	2.25	3.00	3.75
23	2.19	2.92	3.65
22	2.13	2.84	3.55
21	2.07	2.77	3.46
20	2.02	2.69	3.36

Multiple Blends/Temperatures



Multiple Blends/Temperatures

For Beers at

45F

Gas Blend CO_2 %

Beer CO_2 Volumes	100%	80%	60%
1.8	7	12	21
1.9	8	14	23
2	9	15	25
2.1	10	17	27
2.2	12	18	29
2.3	13	20	31
2.4	14	21	33
2.5	15	23	35
2.6	16	24	37
2.7	17	25	39
2.8	19	27	
2.9	20	28	
3	21	30	
3.1	22	31	
3.2	23	33	

For Beers at

50F

Gas Blend CO_2 %

Beer CO_2 Volumes	100%	80%	60%
1.8	9	15	23
1.9	10	16	27
2	11	18	29
2.1	13	20	31
2.2	14	21	33
2.3	15	23	35
2.4	17	25	38
2.5	18	26	
2.6	19	28	
2.7	21	29	
2.8	22	31	
2.9	23	33	
3	25	34	
3.1	26	36	
3.2	27	38	

For Beers at

55F

Gas Blend CO_2 %

Beer CO_2 Volumes	100%	80%	60%
1.8	11	18	28
1.9	13	19	31
2	14	21	33
2.1	15	23	35
2.2	17	25	38
2.3	18	27	
2.4	20	28	
2.5	21	30	
2.6	23	32	
2.7	24	34	
2.8	26	36	
2.9	27	37	
3	28	39	
3.1	30		
3.2	31		

Questions?

Thank You!

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