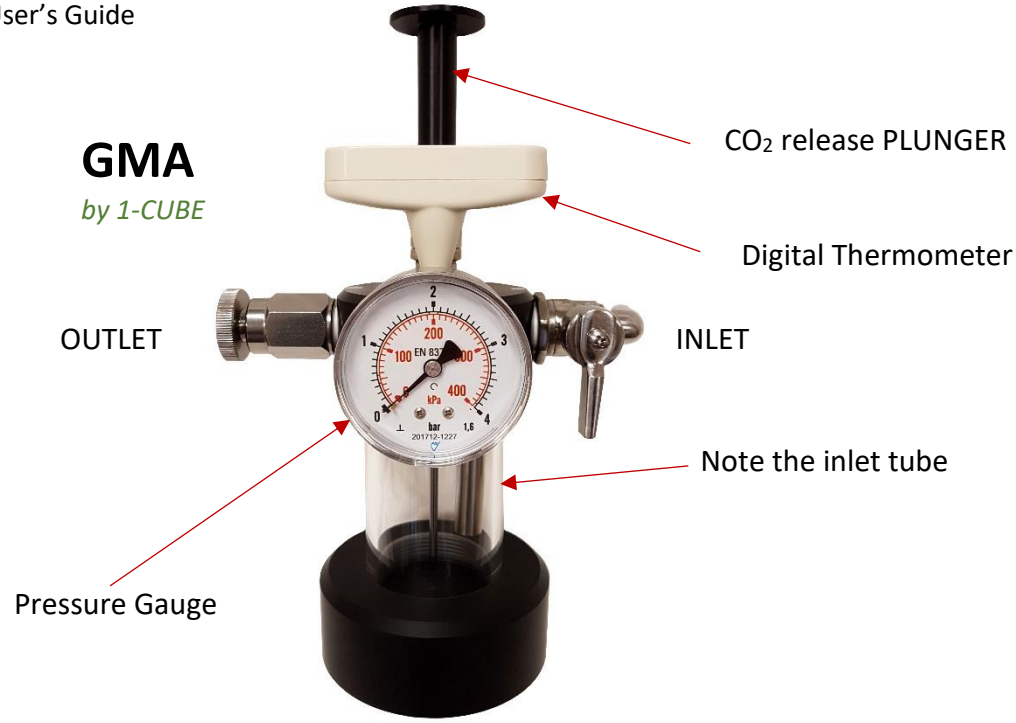
Quick Guide for using a 1-CUBE ***GMA Dissolved CO_2 Carbonation Analyser*** *for Beer and Cider*

Also read the User's Guide



To start measuring the dissolved CO_2 in a sample, **first take a sample from a tank** as follows:

It will help if you watch this YouTube video: https://www.youtube.com/watch?v=z_M7LpkEv1Q

1) Direct the outlet hose to a suitable drain or waste beer collection container
2) **To clean any debris** from inside the tank outlet valve, **open the tank sampling valve**. Allow beer to flow out to waste for a short time. **Close the tank sampling valve**.
3) **Connect the inlet hose** to the tank sampling valve. If necessary, secure with a clip or cable tie to achieve a gas tight seal. Remember to allow for the pressure in the tank, it will be applied to the hose.
4) **Fully Open the tank sampling valve** and **Fully Open** the **GMA inlet valve**
5) **Gently Open** the **GMA outlet valve** until beer starts to flow. **Adjust the outlet valve** until a slow and steady flow is achieved to flush through and fill the chamber with new beer. Normally allow the beer to flow for at least 30 seconds, and until the beer flows clear in the chamber.
6) Fully **Close the GMA outlet valve**. Then **Fully close the inlet valve.**

You now have your sample for analysis with the instrument, but the beer in the chamber is under pressure, notice the gauge. This excess pressure must be released, otherwise our equilibrium pressure reading will be wrong.

7) **Open the outlet valve for a short time** (about 1 sec.) **Close the valve**. Excess gas will have released. The pressure should now be about zero or just above.
8) **Rotate and unlock the black plunger** on top of the GMA, so that the plunger can move up & down. Notice the position of the white dot and the locked position.
9) **Fully lift the plunger and push down hard, repeat for THREE full strokes** in quick succession. (Only three times. No more and no less!). NOTE: On each stroke you will see gas being released from solution inside the chamber.
10) After the third down stroke rotate and **lock the plunger**
11) In theory partial pressure equilibrium has been reached. Notice how the pressure in the chamber has increased. This is because dissolved gas has come out of solution.
12) Switch on the digital thermometer and **read the temperature**.
13) **Read the pressure in kPa**
14) To calculate the dissolve CO_2 content, **line up the pressure and temperature** on the rotary nomogram on the base of the instrument. **Read off the CO_2 content in g/l**

    NOTE: 1 g/l = 0.506 %vol. 1%vol = 1.976 g/l.

To measure another tank, re-connect the GMA and repeat the steps above. The new beer sample will push out the previous beer.

Continued…please read on, cleaning is important!

Finally REMEMBER TO CLEAN the GMA after each session.

1) **Connect the inlet hose to a clean cold water supply** (Max. pressure for GMA: 4 bar g).
2) **Flush through by opening both inlet and outlet valves**, with water flowing to drain until the chamber is clean. **REMEMBER to** unlock and **pump the gas release plunger several times** to avoid the piston becoming stuck with dry beer. Relock the plunger.
   If the plunger does become stuck, unscrew it and soak it in warm water until it frees.

3) **Disconnect the water supply**, with the valves still open. Lift the inlet hose and lay the instrument on its side so the **water drains out via the outlet valve**. Finally, turn the instrument upside-down to drain the last few drops.
4) Close the valve gently and store the unit upright until it is next required.

Normally cold water is sufficient for cleaning. In severe cases, the GMA can be opened for cleaning. Unscrew the chamber from the head block and clean the inside. Check that the o-ring is in the groove before reassembling the parts.

Max. Temperature: 25°C. Max. Pressure for GMA: 4 bar g. (notice the gauge limit!)

Do not clean nomogram with solvent or chemical products! Use only a clean wet cloth.

GMA construction materials: Chamber: PMMA, Body: PVC, Pump: Nickel-plated Brass and stainless steel, Valves: Stainless steel, Hoses: Silicone rubber, O-rings: NBR

Application Information

Just as with other more expensive instruments in the market, the dissolved CO_2 result is a calculated value based on the measured pressure and temperature values. The calculation formula describes detailed observations and measurements of a physical behaviour. It was first defined in 1803 by Dr William Henry, as 'Henry's Law of Partial Pressures'. The mathematics are very complex. Over the years numerous learned people have developed and improved various different formulae. Nevertheless, none can give us an absolute and 100% true value. Variations between different instruments and different 'measuring' methods are normal and must be expected.

For best results, a good understanding of the physical behaviour and a consistent operating procedure are essential. With this, reliable temperature and pressure measurements should be achievable. Attention should be given to achieving both temperature stability and true partial pressure equilibrium, which is not as quick or easy as one might think. For example, the temperature of the equipment, the operating environment or the operator's hands will adversely affect the beer temperature and thereby the pressure. They both influence the gas solubility. Ideally and before testing starts, the instrument should be at exactly the same temperature as the beer. Even the shortest exposure of the beer to air will reduce the dissolved CO_2 content, this is especially significant when testing kegs. The smallest of opening in pipes and seals will allow CO_2 gas out and O_2 & N_2 in, even though a beer leak might not be seen.

We hope you enjoy making great beer, helped a little by your new 1-CUBE instrument.

There is more equipment for brewers on our website http://www.1-cube.com