








Quick Guide for using a 1-CUBE GMD Dissolved CO₂ Carbonation Analyser for Beer and Cider

Also read the User's Guide

- Key pads on the instrument panel:

	Press ON to start the electronics		Press OFF to switch off the device
	ENTER symbol. Pressure to start the selected measuring sequence or to enter menu item.		
	Press + to read CO ₂ results 'memory' in g/l. Displays results chronologically (oldest first). Memory capacity is max. 450 readings.		
	BATTERY symbol. 'Charge status' Press to read the battery charge in volts. 8 V = full (after ~8 hours on charge); 6.5 V = 'Recharge' is displayed; 6.2 V or less = 'Low Voltage' is displayed		
	Press - to DELETE Results Memory		CYCLE symbol. Press to move cursor for menu item selection



If the instrument is new or has not been used recently first check the battery charge. Press the ON key pad, hold for a second until the display illuminates. Then Press F1 (BATTERY) to display the voltage (see above). If necessary, recharge the instrument (see Recharging below)

To start measuring the dissolved CO₂ 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=XRqAYRne3HM>

- 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 GMD inlet valve**
- 5) **Gently Open the GMD 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) **After at least 30 seconds. Fully Close the GMD outlet valve**. Then **Fully close the inlet valve**.

You now have your sample for analysis, but it is pressurised. The pressure must be released as follows:

- 7) **Press the ON pad** on the instrument panel, hold for a second until the display illuminates.
- 8) **Press the 'Enter' pad** with CO₂ selected on the menu to start the measuring sequence:
 - i. The GMD continuously measures the pressure inside the chamber. **OPEN the outlet valve slowly** to remove any excess pressure. **Watch the display. Keep the valve open**. When the **display reads 'CLOSE VALVE'** close outlet valve.
 - ii. **Rotate and unlock the black plunger** on top of the GMD, so that the plunger can move up & down. Note the position of the white dot.
 - iii. **Fully lift the plunger and push down hard for THREE full strokes** in quick succession. (Only three times. No more and no less!).
NOTE: On each stroke you will see dissolved gas released inside the chamber.
 - iv. After the third down stroke rotate and **lock the plunger**

- v. **Press 'Enter'** to start the temperature & pressure measuring and calculation sequence, '**measure**' is displayed. Finally, after about 30 secs, first the temperature, then the pressure and then the CO₂ content are displayed. The CO₂ value is stored automatically.

*The units of measure are: **Vol%** = Volume CO₂ at Atm. pressure and 0°C per Volume of beer
g/l = Grams of CO₂ per litre of beer*

- 9) To measure another tank, re-connect the GMD and repeat the steps above. The new beer sample will push out the previous beer.
- 10) At the end, **SWITCH OFF the instrument by pressing OFF.**

Finally REMEMBER TO CLEAN the GMD after each session.

- 1) **Connect the inlet hose to a clean cold water supply** (Max. pressure for GMD: 6 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 warm water (**max. 35°C**) or **dilute** 0.5 to max. 1% acetic or peracetic acid or hydrogen peroxide can be used at ambient temp.

Max. pressure GMD: 6 bar g.

GMD construction materials: PVC-U, PMMA, Stainless Steel, NBR O rings, Silicone rubber hoses

Recharging:

- 1) Unscrew the waterproof metal cap to reveal the socket.
- 2) Carefully connect the special charging plug and gently hand tighten.
- 3) Plug the charger into a mains electrical supply.
- 4) There is no LED indication when charging. To check if everything is ok, press ON to switch on the microcontroller, then F1 to view voltage. You should read about 11.2 V.

Charge time is approx. 8 hours, typically overnight.

- 5) When fully charged Switch off the charger, then unscrew the charging plug.
- 6) Refit the waterproof metal cap.
- 7) Press ON to switch on the microcontroller, then F1 to view voltage. Fully charged battery delivers about 8 V.

To maximise the battery life do not recharge too frequently. The ideal is to only recharge when the battery is empty.

Application Information

Just as with other more expensive instruments in the market, the dissolved CO₂ 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 CO₂ content, this is especially significant when testing kegs. The smallest of opening in pipes and seals will allow CO₂ gas out and O₂ & N₂ 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 websites..*