



bcMeter

Quick Reference

Practical tips for getting the best measurements — bcmeter.org

Pro Tips

- **Extend measurement duration:** Lower the airflow (e.g. 50 ml/min) so the filter loads slower. Then increase denoise filtering and use longer resampling intervals to compensate for the reduced signal. At very low flow rates, set sample frequency to 30 minutes or longer, or use resampling 6-12x or more afterwards.
- **High BC environment (>2000 ng/m³):** Reduce airflow to 50 ml/min to prevent rapid filter saturation. Enable Auto Airflow Control (AFC) with a longer target filter lifetime (e.g. 30+ days).
- **Low BC / clean air (<500 ng/m³):** Increase airflow to 300-400 ml/min for better signal-to-noise ratio. Use longer sample times (300-600s) and stronger denoise filtering.
- **Signal is inherently noisy:** This is normal for optical absorption. The rolling average is closer to the real value. Apply median or EMA smoothing in the plot controls.
- **First data takes 25-30 minutes:** Warmup (default 10 min) + 3 sample intervals (at 300s each) before the first data point appears.
- **Power supply is the #1 cause of instability:** Use a 5V / 2.5A adapter with a short cable (<40 cm). Long or thin cables cause voltage drops that crash the pump.

Airflow Settings by Environment

Environment	BC Range	Airflow	Sample Time	Notes
High pollution	>2000 ng/m ³	50 ml/min	300s+	Use AFC, high denoise
Urban / typical	500-2000 ng/m ³	100-250 ml/min	300s	Default settings work well
Rural / clean air	<500 ng/m ³	300-400 ml/min	300-600s	Maximize signal
Long-term unattended	Variable	AFC on	300s+	Enable autostart + email alerts

Filter Handling

- **Marked side UP** — always! Wrong orientation = ~30% measurement error.
- **Never bend or fold** the filter. Creases damage the surface.
- **Check air inlet for filter residue** before inserting a new filter.
- **Calibrate after every filter change** — required for accurate filter status.

Filter Loading Status

Status	Loading	Action
Green	0-30%	Optimal — no action needed
Orange	30-70%	Compensation active, prepare replacement
Red	70-85%	Replace soon (email alert every 12h)
Dark	85%+	Replace immediately

Blue Status LED

Pattern	Meaning
Steady dim blue	Device has not fully or correctly started, or has been shut down.
Slow pulse	Idle / ready; pump off.
Fast pulse	Measurement session is running.

BC Smoothing Filters

Filter	Best for	Behavior
Median3	General use (default)	3-point median, good balance of smoothing and responsiveness
EMA	Ambient monitoring	Exponential moving average, smoother but slower response
Kalman	Variable conditions	Adaptive, tracks signal dynamics automatically

Troubleshooting

Problem	Likely Cause & Fix
Negative BC values	Temperature or lighting changes. Move away from direct sunlight and radiators.
Device keeps restarting	Power supply issue. Use short cable (<40 cm), 5V/2.5A adapter.
WiFi drops / unstable	Voltage instability or weak signal. Hotspot self-recovers in 2-3 min.
No data on graph	Sample interval too long. With 300s sample time, first data ~15-20 min.
Pump noise when stopped	Motor controller latch. Reboot or start/stop a session.
Pump stall / no airflow	Auto-recovery active (up to 4 attempts). Check tubing and filter.
ADC saturated (>3.8V)	Filter missing or LED over-driven. Check filter; auto-recovery active.
ADC signal too low	Filter heavily loaded. Compensation active; prepare replacement.

Auto-Recovery Features

- **LED saturation:** Auto-lowers LED duty. Notified via email.
- **Pump stall:** Auto-boosts airflow, up to 4 attempts. Notified via email.
- **Power loss:** Resumes measurement automatically after reboot.
- **Auto Airflow Control (AFC):** Adjusts flow based on measured BC to hit target filter lifetime.

Connectivity

- **Hotspot:** IP 192.168.18.8, password: bcMeterbcMeter
- **mDNS:** Access via <http://bcmeter-XXXX.local> (last 4 hex of MAC address)
- **Boot time:** ~2 minutes until WiFi is available
- **macOS:** Check 'Other Networks' if hotspot doesn't appear immediately