

PEM-HG Operating Manual

Installation, operation, alarms and filter service for the PEM-HG laboratory hydrogen generator.

READ BEFORE FIRST USE

- Never add lye or any electrolyte — no KOH, no NaOH — to the water tank.
- Use deionised water only: below 0.5 $\mu\text{S}/\text{cm}$, equivalently above 2 $\text{M}\Omega\cdot\text{cm}$.
- Change the water and clean the tank every month (30 days).
- Hydrogen is flammable. Vent the outlet to the consuming instrument only, and check every fitting after service.

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1 · How the generator works

PEM-HG produces hydrogen by electrolysing pure water across a proton-exchange membrane. Water is drawn from the tank into the cell; under DC power the cell splits it, oxygen is vented and hydrogen leaves the cathode side at the pressure set on the front

panel. Purity reaches 99.9995% after the three-stage drying train. Nothing is stored under pressure beyond the small volume held in the filters, so the instrument makes gas only as the consumer draws it.

The gas path runs: water tank → PEM cell → water trap → silica gel filter → 5 Å molecular sieve → H₂ outlet. A solenoid drain returns trapped liquid, and the tank level is sensed at three points (low, medium, full) to drive the water-level LEDs and the tank alarms.

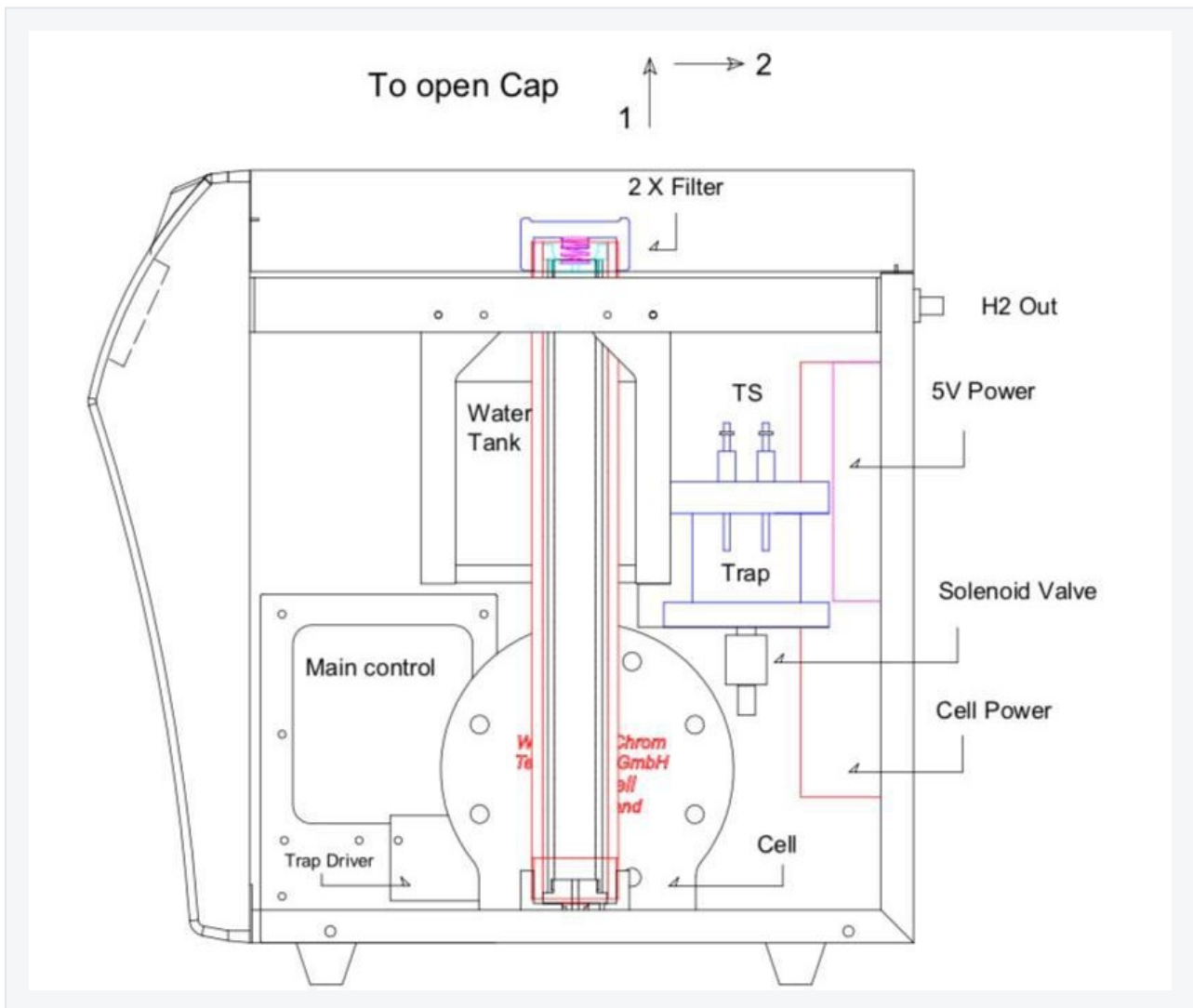


FIG. 1 - INTERNAL ARRANGEMENT, SIDE SECTION

2 · Water quality

Water quality decides both hydrogen purity and cell life. Use distilled or deionised water of at most 0.5 $\mu\text{S}/\text{cm}$ (at least 2 $\text{M}\Omega\cdot\text{cm}$). Water quality is shown as **WQ** on line 1 of the LCD in set mode; if it drifts, replace the tank contents before continuing. Adding any alkali to raise conductivity destroys the membrane and voids the warranty.

Empty, rinse and refill the tank every 30 days even if the level has not fallen — standing water picks up conductivity and biological growth.

3 · Installation and connections

ITEM	REQUIREMENT
Mains supply	220 V AC, 50 Hz
Power and protection	150 W · 5 A glass fuse in the AC inlet jacket
Rear panel	AC inlet jacket with fuse and power key, cooling fan, H ₂ outlet, water drain, RS-232
Siting	Level bench, fan and rear panel clear, drain accessible

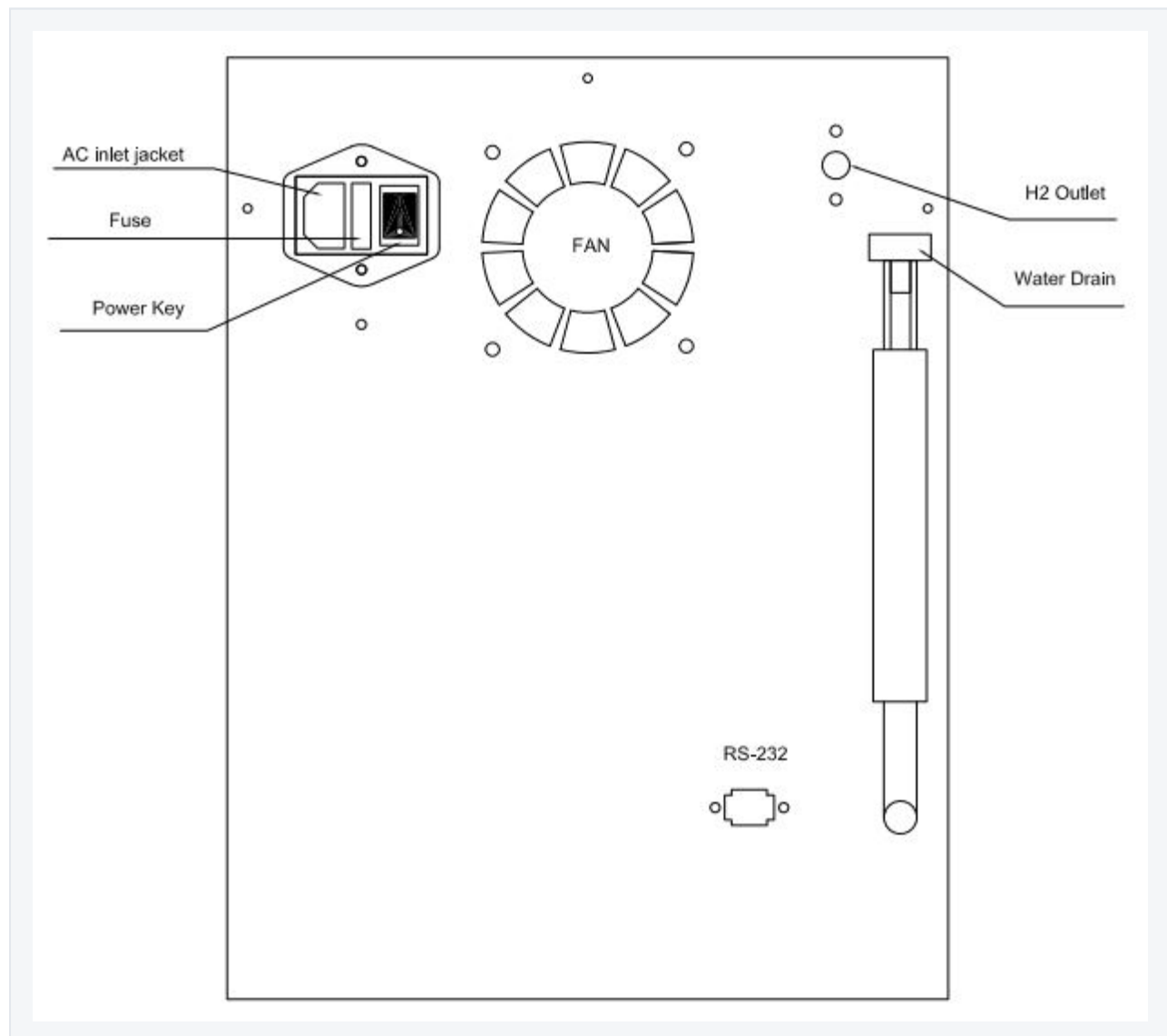


FIG. 2 – REAR PANEL AND CONNECTIONS

4 · Front panel, keypad and LCD

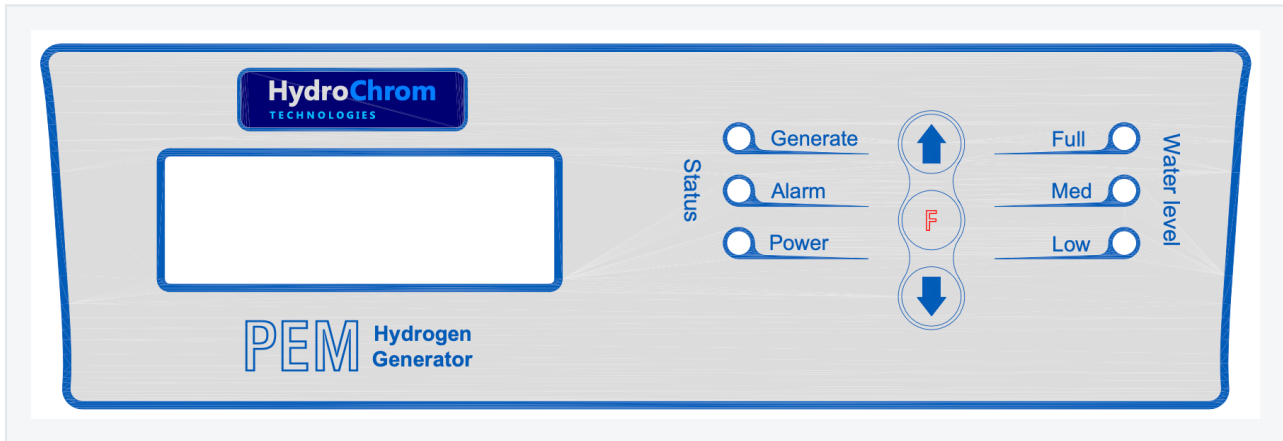


FIG. 3 – FRONT PANEL LAYOUT

4.1 Keys

- ▲ — increase the set value.
- ▼ — decrease the set value.
- F — function key; toggles between the pressure set point and the overflow set point.

4.2 LCD in normal mode

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Line 1 HydroChrom Technologies
Line 2 H2 generation flow (ml/min)
Line 3 H2 output pressure (PSI)
Line 4 Instrument status and alarm message
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4.3 LCD in set mode

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Line 1 OH = operating hours (h:min) · WQ = water quality
Line 2 H2 overflow set point (ml/min)
Line 3 H2 output pressure set point (PSI)
Line 4 TH = total H2 generated (M = m³ · L = litre · C = cc)
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4.4 Status LEDs

- **Power** — instrument power is on.
- **Generate** — hydrogen is being generated; the brightness of the LED tracks the generation rate.
- **Alarm** — blinking indicates an alarm: the buzzer sounds every 10 seconds and the message appears on LCD line 4.

4.5 Water-level LEDs

- **Full** — the tank is full. If it blinks the tank is overfilled: drain it until the blinking and the alarm stop.
- **Med** — the level is medium and good.
- **Low** — the level is low; add distilled water. If it blinks the tank is empty, generation stops and the alarm appears on the LCD.

5 · Alarms and troubleshooting

Every alarm blinks the Alarm LED, sounds the buzzer every 10 seconds and writes a message to LCD line 4.

MESSAGE	CAUSE	EFFECT	REMEDY
Water empty error	The water tank is empty	Generation stops	Fill the tank with distilled water
Water over error	The water tank is over full	Generation stops	Empty the tank until the alarm disappears
Pressure over error	H ₂ pressure above 90 PSI	Generation stops	Switch the instrument off and call the service department
H ₂ leak error	Consumption above the rated flow for more than 12 minutes	Generation continues	Follow the leak procedure below

5.1 Leak procedure

1. Switch the instrument off and disconnect the outlet pipe.
2. Fit a blank nut to the outlet, switch the instrument on and wait 15 minutes.
3. If no leak error returns, the leak is outside the generator: check the consuming instrument and all pipe connections.
4. If the leak alarm persists, check the filter caps — a cap may be loose.
5. If the caps are tight and there is no leak at the cap, contact the maintenance department.

DUTY LIMIT

For continuous consumption, draw no more than 70% of the model's maximum capacity — 175 ml/min on HG-250, 350 ml/min on HG-500, 700 ml/min on HG-1000.

6 · Filters

Three filters sit at the outlet of the electrolysis cell.

1. **Water trap** — automatically removes bulk water from the produced hydrogen.
2. **Silica gel filter**, blue — absorbs residual water vapour and turns pink at 60% saturation. Regenerate in an oven at 120 °C for 60–120 minutes.
3. **Molecular sieve, 5 Å**, dark yellow — shows no colour change when saturated. Change or regenerate it every month; regenerate in an oven at 300 °C for 120–240 minutes.

6.1 Change or regeneration sequence

1. Turn the instrument off.
2. Reduce the H₂ pressure to zero.
3. Open the filter cap — both side caps, Fig. 4 step 1.
4. Take the inner filter out with pliers (step 2).
5. Open the inner filter cap and either change the content or empty it into a clean glass vessel and regenerate it in the oven (step 3).
6. Reassemble the filter and return the instrument to service.

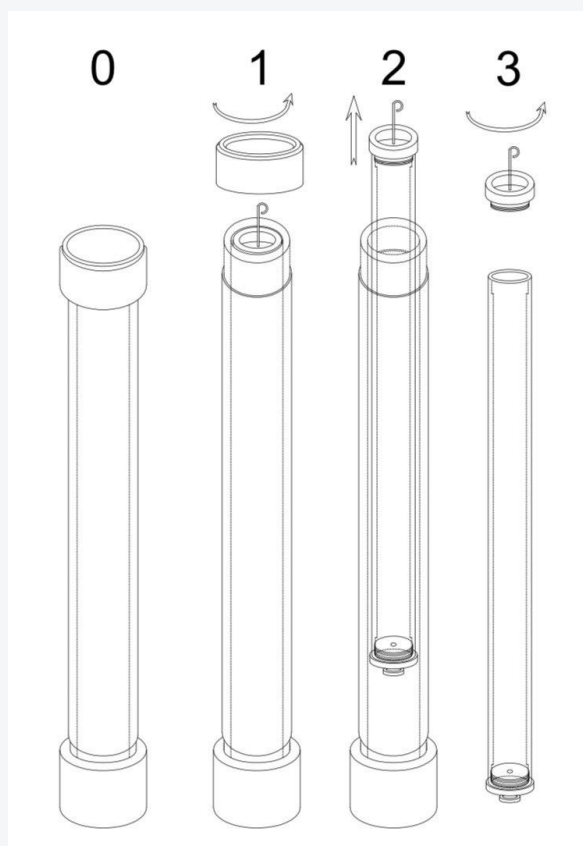


FIG. 4 – FILTER SERVICE SEQUENCE, STEPS 0–3

7 · Optional H₂ overflow control

The overflow option adds an event output driven by the SET flow value. When the real flow exceeds the set flow for more than 60 seconds — a broken column in the GC oven, or any other leak in the hydrogen stream — the system recognises an overflow, stops generating hydrogen and activates a three-port valve that purges the oven or chamber with a neutral gas such as nitrogen. The overflow error is written to LCD line 4 and the buzzer sounds.

Set the overflow value with the **F** key and the arrow keys, a little above the normal working flow of the consuming instrument, so that normal operation does not trip the purge.

8 · Maintenance schedule

INTERVAL	TASK
Daily	Check the water-level LEDs and the silica gel colour
As indicated	Regenerate the silica gel once it has turned pink
Monthly (30 days)	Change the water, clean the tank, change or regenerate the molecular sieve
After any service	Tighten the filter caps and run 15 minutes to confirm no leak error

9 · Warranty conditions

Warranty service is not free of charge where:

- the generator is not operated according to this operating manual;
- parts are disassembled by the user;
- the rated generation capacity is exceeded, or water of insufficient quality is used.

10 · Specifications

SPECIFICATION	HG - 250	HG - 500	HG - 1000
Maximum H ₂ generation	250 ml/min	500 ml/min	1000 ml/min
Continuous duty (70%)	175 ml/min	350 ml/min	700 ml/min
H ₂ purity	up to 99.9995%		
Over-pressure cut-out	90 PSI		
Feed water	Deionised, < 0.5 µS/cm (> 2 MΩ·cm), no electrolyte		
Mains supply	220 V AC, 50 Hz · 150 W · 5 A glass fuse (as supplied for HG-250)		
Interface	4-line LCD, 3-key panel, status and water-level LEDs, RS-232		

SERVICE & SUPPORT

info@hydrochromtech.com · hydrochromtech.com