



OPERATION MANUAL

FOR SHC-1000 MODEL

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Dear Clients: Please read carefully the Operation Manual prior to operation. Juveniles and those who do not understand the requirements of the manual cannot operate the generators.

Operation Manual for SHC Series Hydrogen Generators

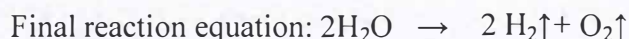
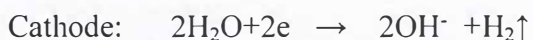
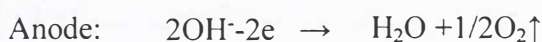
1. General description

The data and operating requirements stipulated in this Operation Manual are applicable to all the SHC series hydrogen generators.

SHC series hydrogen generator is to electrolysis KOH liquid to produce hydrogen. There are many intelligent control equipments inside of equipment, easy and safety. Could meet requirement of many kinds of gas chromatograph and other instrument at home and abroad.

2. Operational principles and technological process

2.1 The operational principle of this instrument is traditional electrolyzing lye. The conducting medium in the cell is water solution of KOH. The membrane between the two electrode chambers is for the navigation electrolysis equipment. After electrifying direct current, the electrochemical reaction of water molecule occurs. It produces oxygen on the anode, and hydrogen on the cathode. The reaction equation is as follows:



The pressure control, protective pressure, flow display and flow tracking are all automatic control. The hydrogen output is self-regulation according to the using hydrogen flow under stable pressure. (in the range of output flow)

2.2 Technological Process

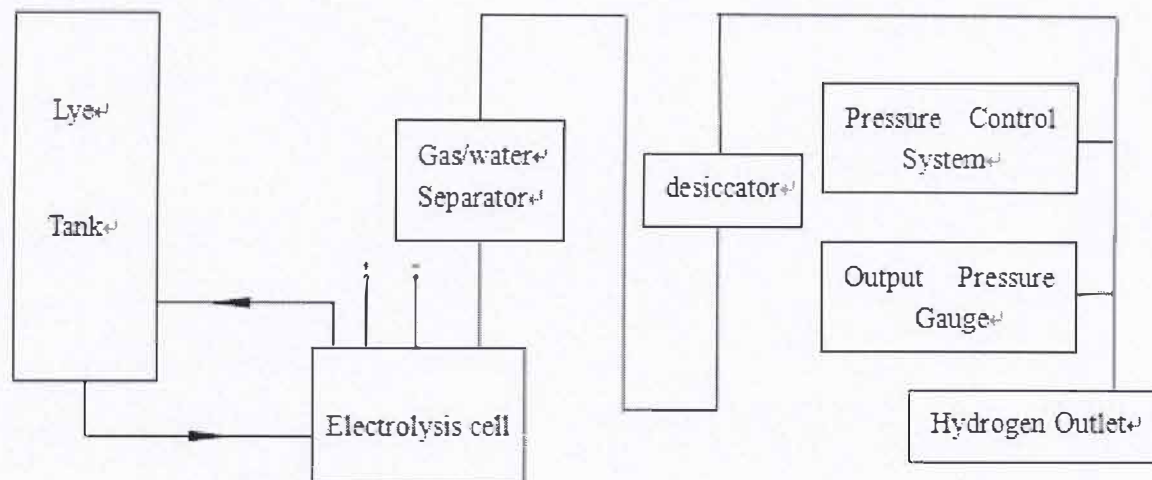


Fig. 1 Technological Process Schematic Diagram

3. Technical parameters

Type	SHC-1000
Output Volume (ml/min)	0~1020
Output Pressure (MPa)	0.4
Hydrogen Purity (%)	>99.999
Overpressure Protective Value (MPa)	0.45
Power (V)	110±15% 50~60Hz
Input Power (W)	<500
Dimension (mm)	610×365×355
Weight (kg)	<30

4. Acceptance Check

4.1 Unpacking for the acceptance check

Open the carton, check equipment is in good condition, the attached accessories and technical documents should be checked according to the packing list. otherwise claims should be filed against carriers and supplier in accordance with the actual conditions .

4.2 Operation for the acceptance check

4.2.1 Make Lye Liquid

Mix 1000ml distilled water with 640 grams KOH, put all in a clean Beaker or bottle (anti-corrosion, polythene bottle is enough). Stir the liquid to make KOH fully melt. The KOH should be analysis purity, and purity is 85%. When the lye liquid cooled, put it into the tank.

4.2.2 Open the cover of Lye tank, pull out the nut. (Nut is used in case of lye leaking during transport). Nut should be taken away when instrument is used. Please keep the nut well for further use when transport again.

4.2.3 Put cooling lye into the tank, and then add distilled water. Water level should be in the range of up&bottom water level.

Notice: Please don't let lye liquid onto the skin and other products !

4.3 Starting Equipment (Don't link with Gas Chromatograph)

Connect power supply (should have ground connection wire). After connecting the power cord, turn on the switch of power supply on the front pane, will immediately start working, H₂ output flow reaches to 300ml/mi. When the nut for hydrogen outlet of the generator is sealed securely, output pressure will rise, and when the pressure reaches 0.4MPa, the number indicating output flow rate will show falling to zero. This indicates the generator is in normal operation. After the acceptance check is completed, the generator can be operated in accordance to the Operational Manual.

4.4 Equipment Installation

Take off sealing nut of H₂ output port at rear of the equipment. (Please keep it well for checking instrument in future). Connect H₂ output port and hydrogen-applied equipment with copper pipe in fitting bag, don't screw the nut too tightly. Turn on the switch of power supply, equipment starts to produce gas, after several minutes, screw the nut tightly, at this time,

equipment is in normal working condition.

5. Operational Requirements

5.1 Requirements for operational environments and conditions of the generators :

5.1.1 The hydrogen generators are forbidden to be operated in a sealed room.

5.1.2 The generators should be put horizontally near hydrogen-applied instruments

5.1.3 Temperature : 0℃–45℃

Humidity : <85%

5.1.4 Nut on the lye tank is to prevent lye liquid spreading out when delivery. Customer should not put on again when normal use. Otherwise, oxygen could not be vented out. Should keep the nut well in order to future use.

5.2 Requirement for Lye Liquid

5.2.1 Electrolysis liquid is made according to 4.2.1--4.2.3.

5.2.2 Electrolysis liquid purity controlling

After working for a while, electrolysis liquid will be less, when the liquid nearly reaches to bottom of water level, customers should add distilled water in time, which should guarantee water level is in the range of up&bottom level.

5.2.3 Electrolysis liquid replacement time and method

Electrolysis liquid should be replaced every three months. When replacing, first, open the outlet in back of instrument to discharge electrolysis liquid. Clean the system 2--3 times with distilled water according to electrolysis cell and tank pollution conditions. Electrolysis liquid is made according to 4.2.1--4.2.3

Drain pipe is at the back panel of instrument. It could be taken down or put into freely.

Hole on cover of lye tank is oxygen outlet. Don't clog it. Don't replace cover of water tank at will!

Notice: Please don't let lye liquid onto the skin and other products !

5.3 Handing of accumulated liquid in the gas/water separator (Operate when equipment stops working, pressure released to zero)

5.3.1 Gas/Water separator is to control H₂ purity and avoid lye liquid returning. It is a empty pipe. Most water will be cooled into liquid. Low boiling point hydrogen will go into desiccant with

less water.

When hydrogen goes into desiccant, after absorbing by silica gel, hydrogen purity could reach above 99.999%, which could meet gas chromatograph requirement.

5.3.2 Observation Method of Accumulated Liquid: Often observe the level of accumulated liquid through window of lateral panel.

5.3.3 Drain Accumulated Liquid

At the bottom of the gas/water separator, once there is much liquid, should stop the equipment, release pressure to zero. Insert the absorbing flexible tube into the gas-liquid separator, and then absorb accumulated liquid with rubber pipette bulb.

5.4 Requirements for replacing desiccant

5.4.1 The desiccant (discolored silica gel) will lose effectiveness after water uptake to saturation, and should thus be replaced on time . When the height of discolored silica gel is over half of that of the view port, it must be replaced ! Or the water content in hydrogen will be more than the standard, influencing the purity of generated hydrogen .

5.4.2 Before desiccant is replaced, a generator must be shut down and the pressure must be released prior to unscrewing and opening top cap of the purifier(turn counterclockwise for opening it). The top cap should be put there unpolluted, and the seal ring in the cap should not be discarded. The spring fixed in the top cap shall not be removed, nor polluted.

5.4.3 Unscrew the top cap of the desiccant cartridge, and pour out the desiccants. Wash the cartridge with distilled water and dry the cartridge (by blowing or airing). Refill the new or regenerated desiccant into the cartridge, and screw the top cap and put the cartridge into its original place.

You should pay attention to the following two points during the procedures: a. The protruded head at the bottom of the internal cartridge should be seated in the cavity of the outer cartridge base! b. The O-rings in the protruded head at the bottom of the internal cartridge should not be lost ! If damaged, it should be replaced with the new one from the attached accessories. The purpose of attention to the two points is to guarantee that the hydrogen can go through the desiccator according to the required drying route , so as to guarantee purity of the hydrogen .

5.4.4 Finally, securely screw and seal the cover of the desiccator.

5.4.5 The silica gel should be baked under the temperature between 120 and 140 °C until its color changes into blue completely. The above-mentioned desiccant should be packed for future use when it is dried and its temperature decreases to below 50° C

5.4.6 After replacing new desiccant, when turn on the equipment for using, should vent gas without using for several minutes. When air in the desiccant pipes empty, hydrogen purity reaches standard, customer could only use hydrogen.

5.5 Pressure and Output Flow Requirement

5.5.1 This equipment utmost output pressure is 0.4MP, maximum output flow should less than 1020ml/min, pressure and flow should not exceed requirement.

5.5.2 This equipment should not be used under normal pressure! As long as turn on the equipment, pressure should be more than 0.1MPa.

5.6 When operating instrument, please notice outflow is accord with that of Gas Chromatography. If exceed, turn off instrument and check leakage.

5.7 Users are forbidden to disassemble electrolysis cell.

5.8 **Equipment Delivery Requirement:** when delivery, should empty lye liquid in the tank.

6. Troubleshooting

Breakdown	Causes	Guide for maintenance
1.When the power switch is turned on , the generator will not be in operation.	1. The power plug is in poor connection. 2. Blown fuse. 3. Power switch is damaged.	1.Recheck the plug and make it in good connection. 2.Take out and replace the damaged safety wire in the fuse. The replaced safety wire must be up to the type of the original safety wire . Do not change type of safety wire at will. 3.Repair or make replacement.
2. When the electrolysis indicator light is on with the maximum output generated , the pressure does not rise.	1. Leak in the pipe system. of hydrogen. 2. Over output flow 3. Hydrogen produced too little	1.Use leak-hunting liquid to check sealing of all nuts, screw securely the fittings at the leaks. 2 Lower using output flow 3 Replace electrolysis lye liquid or electrolysis cell. Forbidden to

		disassemble !
3.Instrument stops electrolyzing	<p>1. Overpressure. Pressure gauge indicates above 0.45Mpa.</p> <p>2. Accumulated liquid in gas-liquid separator is excessive, floater reaches to upper limit of accumulated liquid.</p>	<p>1. Replace flow controller.</p> <p>2. Discharge accumulated liquid.</p>

7. After-sales Service

The warranty period of the generators is one year, and the maintenance will be lifelong . Maintenance and replacement of parts within the warranty period will be done free of charge, and beyond the warranty period, they will be done with only cost of the raw materials charged .

If the following occurs , the maintenance will not be done free of charge :

- a. users do not operate the generators according to the operational manual ;**
- b. users disassemble parts by themselves , which are forbidden by the manufacturer to be disassembled .**