MH-20 Metal Hydride Canisters
Operating Instructions

Read all instructions prior to product use and keep this manual for future reference. Further copies can be obtained from Horizon Fuel Cell Technologies or by emailing support@horizonfuelcell.com

Please refer to the Horizon website for latest information www.horizonfuelcell.com

TECHNICAL SPECIFICATIONS:

- Storable H2 volume: 20 SL
- Storable H2 weight: 1.8g
- Mass of metal hydride: 0.13kg
- Dimensions: 25.4 mm x 105 mm
- Weight: 165g
- Cylinder type: Aluminum Alloy
- Valve type: Brass screw-on valve
- Pressure at 20°C: 8 Bar

Metal Hydride composition (ReNi5)
- Rhenium: 33.7% Wt
- Nickel: 65.6% Wt
- Manganese: 0.18% Wt
- Aluminum: 0.30% Wt

Specifications and descriptions in this document were in effect at the time of publication. Horizon Fuel Cell Technologies reserves the right to change specifications, product appearance or to discontinue products at any time.

1. PRODUCT DESCRIPTION:

Metal hydride hydrogen storage canisters developed and manufactured by Horizon Fuel Cell Technologies are designed with an aluminum alloy materials enclosure and a ReNi5 alloy for hydrogen absorption. After activation (see instructions for activation process below), the ReNi5 alloy is capable of absorbing hydrogen, expanding and releasing heat until saturation. The internal pressure of the canister remains at 8 Bar at ambient temperatures of 20°C - 25°C and the weight is 1.8gram higher. Once the canister valve is opened and pressure is reduced, hydrogen will be continuously released from the alloy which will absorb heat. If the heat absorption rate decreases, so will the hydrogen release rate. The canister enclosure materials are made of an aluminum alloy which has excellent heat conductivity properties that can facilitate heat conduction of the alloy during gas absorption and release processes. Gas absorption efficiency of the alloy can be significantly impacted by oxidation due to humidity, therefore dry hydrogen gas with a purity of no less than 99.99% is required for use.

2. SAFETY INSTRUCTIONS:

The canister must be put horizontally when it is activated and charged otherwise the canister can be ruptured. Canisters filled with hydrogen shall be kept away from fire, and temperatures above 40°C while activating, filling, storage and using. The maximum outlet pressure of the regulator should not exceed 40 Bar. When using a cylinder to refill or activate the canister, the inlet pressure from the compressed cylinder should be at least 1.5 times that of the outlet pressure.
WARNING: Fire Hazard!

Contains flammable gas under pressure

Do not tamper with device. Read and understand Operation instructions. WARNING: This is not toy – keep away from children.

IMPORTANT SAFETY WARNING AND INSTRUCTIONS TO REDUCE RISK OF INJURY

Before using the appliance, be sure everyone using reads and understands all safety instructions and other information contained in this Operation Instructions.

Save these instructions and review frequently.

! CAUTION: When using the appliance, basic safety precautions should always be followed to reduce risk of fire, electric shock or personal injury.

READ ALL INSTRUCTIONS

PROVIDE ADEQUATE VENTILATION and refrain from placing items on or around the appliance during operation. Refrain from placing the appliance in enclosures or causing the appliance to not vent freely.

NO NOT use an attachment not recommended, as it may result in a risk of electric shock or fire.

DO NOT disassemble or tamper with appliance.

THIS APPLIANCE is not tested for use with medical devices.

WARNING: Under no circumstance is the canister to be disassembled. Exposure to air will render the hydride material useless and require replacement. Materials within the hydride are potentially dangerous.

WARNING

The canister must be put horizontally when it is activated and charged otherwise the canister can be ruptured.
3. ACTIVATING YOUR MH-20 METAL HYDRIDE CANISTER:

What Horizon provides:
- A MH-20 metal hydride canister
- A Horizon-designed adaptor that connects the SWAGELOK connector to the MH-20

What you need:
- A compressed hydrogen cylinder with pressure of 150 to 200 Bar
- A H2 regulator that can handle an input pressure of at least 200 Bar and output pressures that can be adjusted from 10 Bar to 40 Bar. This regulator should include 2 meter gauges that can display input pressure and output pressure
- Male & Female SWAGELOK 1/8” quick connectors type QC4-B-200 or QC4-D-200, or other compatible types recommended by SWAGELOK
- A 40 Bar resistant hose assembly connecting the output of the regulator to the SWAGELOK quick connector
- A water basin that is big enough to hold the canister underwater
- Two adjustable wrenches.

Step 1:
Fill the water basin with cold water.

Step 2:
Separate the Swagelok quick connector system into male and female parts.

Insert the fine point of the special Horizon-designed adaptor into the male part of the SWAGELOK QC4-B-200 or QC4-D-200. Once the adaptor component is positioned inside the SWAGELOK unit, use the wrench to tightly fasten the SWAGELOK nut onto the adaptor. This will create a permanent connection between the adaptor and the male part of the SWAGELOK unit. Once the nut is fastened, do not attempt to disassemble it.

Reassemble the female and male parts of the SWAGELOK unit, and connect it to your regulator’s hose. Make sure this hose is resistant to 40 Bar of pressure.
**Step 3:**
*If your regulator is already connected to your pressurized hydrogen cylinder, go to step 7.*
Make sure the hydrogen pressure cylinder valve is tightly closed.
To connect your regulator / hose assembly to the pressurized hydrogen cylinder, use the adjustable wrench to tighten the regulator inlet connector nut onto the compressed cylinder in a counter clockwise direction.

![Image of a hydrogen cylinder with a regulator being attached](image)

**Step 4:**
Make sure the regulator inlet valve is closed. To close the regulator’s valve, turn the regulator’s adjusting knob in the counter clockwise direction.

![Image of closing the regulator valve](image)

**Step 5:**
Slowly open the compressed cylinder valve to observe the reading in the high pressure gauge. This will indicate the internal pressure of the compressed cylinder, which should not be more than 200 Bar. If above 200 Bar, please close the cylinder valve and stop the procedure.
Step 6:
Inspect the connections for leaks by applying some soap water on all connections. If you notice bubbles appearing please close the cylinder valve, stop the procedure and contact your professional suppliers for technical support.

Step 7:
Remove the protective cap from the MH-20 canister,

Step 8:
Screw (clockwise) the MH-20 canister onto the SWAGELOK / Horizon adaptor assembly.
Step 9:
Place the MH-20 canister connected to the SWAGELOK / hose assembly horizontally into the water basin.

Step 10:
Turn the regulator adjustment knob slowly in the clockwise direction until the low pressure gauge indicates a reading of no more than 0.5 Bar. Look at the canister and connections in the water to ensure no bubbles are appearing under water. If you see bubbles close the cylinder valve, stop this procedure, and go back to step 1. If problems persist, please contact your professional suppliers for technical support.

Step 11:
Slightly unscrew the MH-20 canister from its connector to release the excess air located within the attachment/hose assembly. Then tighten the canister onto the connector again, repeat steps 9 and 10, then go straight to step 12.

Step 12:
Turn the regulator adjustment knob to open the regulator valve slowly until the outlet low pressure gauge meter indicates a reading of 30 Bar. Now wait 80 minutes. Please ensure no bubbles appear in the water basin. If so, immediately close the cylinder valve, stop this procedure, and go back to step 1.

Step 13:
After 60-80 minutes, close the pressure regulator valve by turning the regulator adjustment knob counter-clockwise until it is loose. The reading of the low pressure gauge should remain at 30 Bar.

Step 14:
Use a wrench to slowly release (clockwise) the nut connecting the hose assembly with the regulator’s low pressure outlet until you hear the gas leak from the connections, and while the reading of the outlet low pressure gauge decreases to 10 Bar. Then firmly tighten the nut back again (counter clockwise).
Step 15: Perform steps 12 to 14 in a series of four times.

Step 16: Close the pressure cylinder valve. Remove the canister and all connections from the water basin. Unscrew the canister from the SWAGELOK connector assembly.

**Note:** The inactive alloy materials are in the form of small granules, which can be heard if the canister is shaken. After activation of the canister, this alloy material turns to a powder substance which can't be heard by shaking the canister. If you can still hear these granules inside the canister, you must repeat the process.

4. REFILLING AN ACTIVATED MH-20 METAL HYDRIDE CANISTER

Step 1: If your canister is not activated go to steps 1-16 of “activating your MH-20 Metal Hydride Canister”. If your MH-20 canister is activated but empty of hydrogen, please complete to steps 1-11 of “Activating your MH-20 Metal Hydride Canister, and then proceed to the next steps.

Step 2: After completing steps 1-11, turn the regulator knob slowly until the outlet low pressure gauge indicates the reading 30 Bar. Wait for 30 minutes. Please ensure no bubbles are released inside the water basin during this process. If you see bubbles, close the pressure cylinder valve, stop the process and contact technical support.

Step 3: After 30 minutes, unscrew the regulator knob (counter clockwise) until you feel it loosens. The low pressure gauge reading should remain at 30 Bar.

Step 4: Use a wrench to slowly unscrew (clockwise) the nut connecting the hose assembly with the regulator’s low pressure outlet until the gas leaks from the connections, and while the reading of the outlet low pressure gauge decreases to 10 Bar. Then retighten the nut again (counter clockwise).

Step 5: Close the compressed cylinder valve. Remove the canister and all connections from the water basin. Unscrew the canister from the SWAGELOK connector assembly.
5. LIMITED WARRANTY

The limited warranties provided by Horizon Fuel Cell Technologies Pte. Ltd. apply only to Horizon-branded products (“Horizon Products”).

The warranties set forth in this Standard do not apply to:

- Any third party products or services included with or used with the Horizon products.
- Damage that results from accident, abuse, misuse, neglect or any use of the Horizon Products other than for its intended use.
- Damage that results from any unauthorized attempts to open, maintain, repair or modify the Horizon Products.
- Damage that results from the Horizon Products being subjected to abnormal physical, thermal or electrical stress, including power fluctuations or other hazards.

Warranty Remedies and Procedures

As Customer’s sole and exclusive remedy and Horizon’s entire liability under this warranty, Horizon will, at its option, repair the Horizon Product or replace it with a comparable Horizon Product. Replacement Horizon Products and parts used to repair the Horizon Products may be new, refurbished or reconditioned. Repaired or replaced Horizon Products are warranted for the unexpired portion of the original warranty period or 90 days from the date of shipment whichever longer. All Horizon Products and parts that are replaced become the property of Horizon.

Customer must contact Horizon Technical Support within the warranty period and furnish a dated proof of original purchase prior to the return of any Horizon Product for warranty service. To obtain contact information, refer to Horizon website at www.horizonfuelcell.com.