

S SPECTRONIK

MINIATURE GAS PRESSURE REGULATOR

MGPR

USER GUIDE



SAFETY, HANDLING & SUPPORT

WARNING: *Failure to follow these safety instructions could result in gas leakage, injuries, damage to the Miniature Gas Pressure Regulator (MGPR) or other property. Read all the safety information below before using MGPR.*

Handling Handle MGPR with care. MGPR is not designed for extreme conditions, rough handling, vibration, shock or drop. Keep MGPR away from heat, flame, strong sunlight, water, dust, soil or mud. Do not use a damaged MGPR.

Repairing Do not troubleshoot, disassemble or tamper with MGPR. Do not attempt to repair or replace any component by yourself.

Hydrogen Follow all local rules and regulations for safe handling, storage and usage of Hydrogen gas. Do not smoke when operating MGPR. It is recommended to operate in a well-ventilated environment.

Pressure Never operate beyond MGPR's rated inlet pressure of 350bar.

Connectors and ports Never force a connector into a port or apply excessive pressure. If the connector and port do not join with reasonable ease, they probably do not match. Check for obstructions and ensure that the connector matches the correct port.

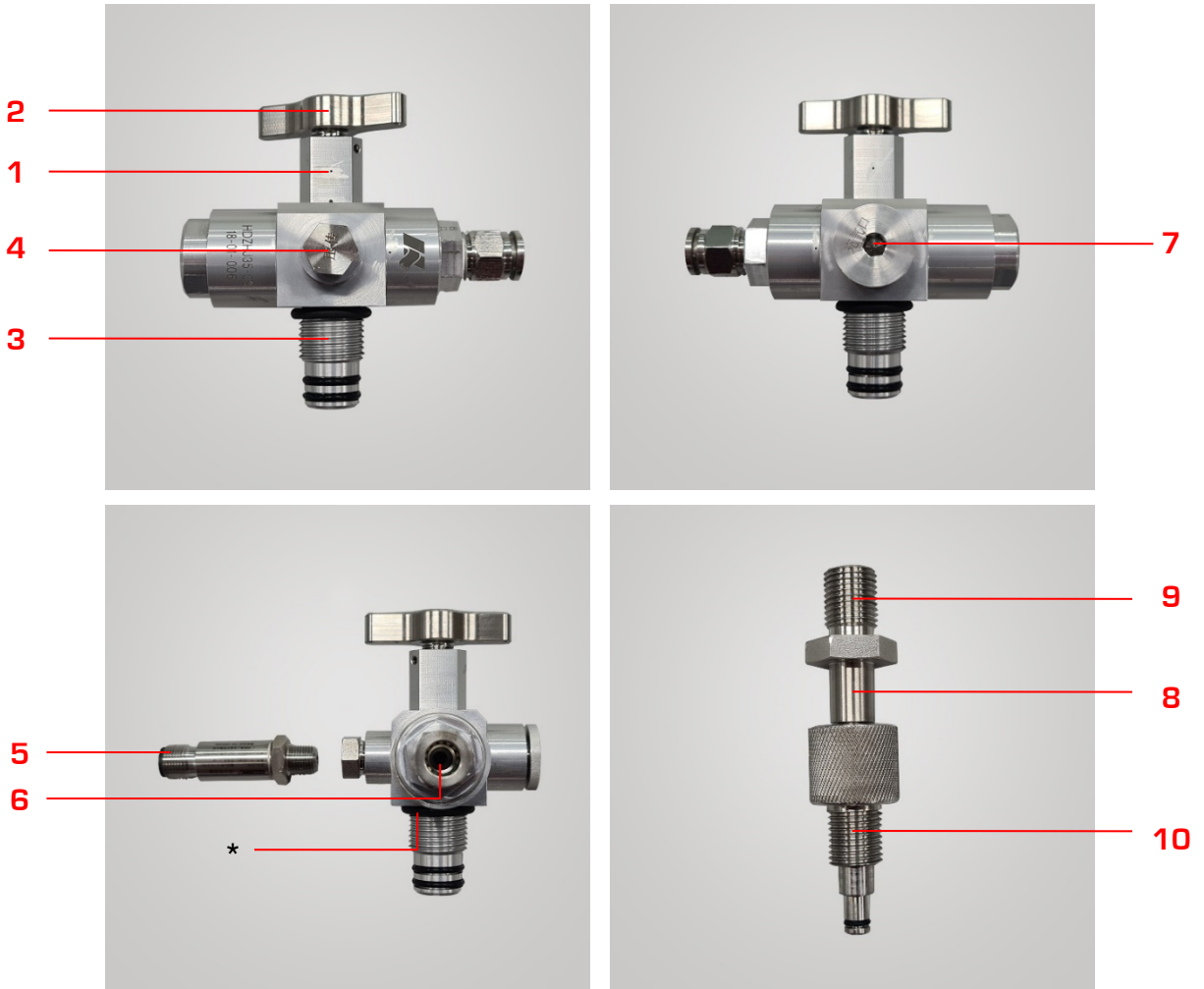
High-consequence activities MGPR is a customized system with pending safety tests and certifications. It is not intended for use where the failure of the system could lead to death, personal injury or severe environmental damage.

Disclaimer Every effort has been made to ensure that the information in this manual is accurate. This manual serves to adequately recommend safe operating procedures but shall not be treated as comprehensive. Do not use MGPR in any other way than the one recommended in this manual. Spectronik reserves the right to change system specifications, appearance or discontinue the product at any time.

Warranty Spectronik warrants the included hardware product and accessories against defects in materials and workmanship for 1 year after delivery. Spectronik does not warrant against normal wear and tear, nor damage caused by accident or abuse.

To obtain service, contact support@spectronik.com

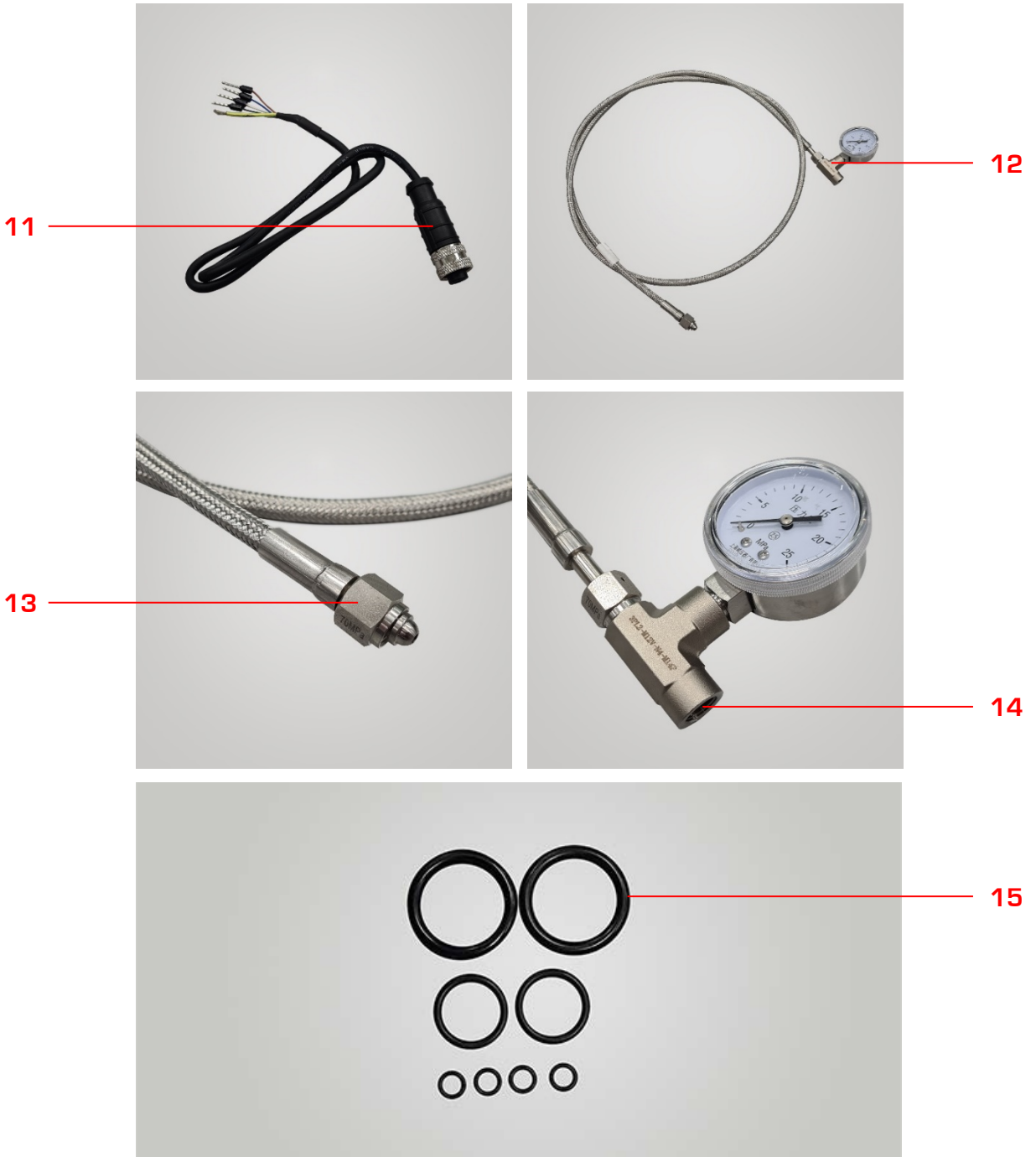
1 OVERVIEW



ITEM DESCRIPTION

1	MGPR	6	Gas outlet port NPT ¼ to PU 8mm
2	On/Off manual valve	7	Refueling port with cap M12 x 1.25
3	Carbon fiber cylinder plug M18 x 1.5	8	Refueling adapter
4	Gas pressure transducer socket	9	Refueling hose mating plug M12 x 1.25
5	Gas pressure transducer NPT 1/8 (to MGPR) M12 x 1 (to receptacle)	10	Refueling port mating plug M12 x 1.25

* ID17 CS3 EPDM O-ring may or may not be required depending on user's gas cylinder thread. Included as spare part in the shipment.



ITEM DESCRIPTION			
11	Gas pressure transducer receptacle M12 x 1	14	Threaded socket to Hydrogen source NPT 1/4
12	Stainless steel refueling hose	15	Spare O-rings
13	Refueling hose mating socket to (9) M12 x 1.25		

2 SPECIFICATIONS

MGPR	
Gas media	Hydrogen
Rated inlet pressure	350bar
Min inlet pressure	10bar
Gas outlet pressure (@ rated flow)	0.45-0.75bar (factory set during order)
Max outlet pressure (@ zero flow)	Gas outlet pressure + 0.3bar
Rated flow rate	40 SLPM
Operating temperature	[-20,85]°C
Operating lifetime	10,000 cycles
Outer body material	Al 2A14-T6
Core internal material	SS 316/ H62/ TC4
Core sealing material	PTFE
Sealing gasket material	NBR
Dimension	75 x 85 x 58 mm
Weight	270g
Connection to gas cylinder	M18 x 1.5
Connection to pressure sensor	NPT 1/8
Connection to refueling hose	M12 x 1.25
Gas outlet connector	NPT 1/4 to PU 8mm

3 OPERATING PROCEDURES

3.1 SETTING UP MGPR

1. Visually check MGPR for obvious cracks or other physical damage. **Warning:** never use a faulty regulator.
2. Ensure that *On/Off manual valve (2)* is in the Off state (fully clockwise). Do not over-tighten.
3. Ensure that *gas pressure transducer (5)* is securely connected. If you do not wish to use the gas pressure transducer, then ensure that the gas pressure transducer socket is sealed with the plug provided.
4. Block the *gas outlet port (6)* either with the blocker provided or gas tubing and valve.
5. Connect MGPR to the carbon fiber cylinder by manually turning the threaded *carbon fiber cylinder plug (3)* into its corresponding female socket at the cylinder neck. There is no need to apply excessive force at the end of the turns. The carbon fiber cylinder is now ready for gas filling. **Note:** an ID17 CS3 EPDM O-ring (provided) may or may not be needed depending on your carbon fiber cylinder thread design.

3.2 FILLING THE CARBON FIBER CYLINDER

1. Prepare the necessary adapter to link the *threaded socket to Hydrogen source (14)*. This adapter is not provided due to the different connector standards of Hydrogen source cylinders worldwide.

Warning: the pressure gauge provided has a maximum pressure of 25MPa. It is assumed that the Hydrogen source will be standard industrial steel cylinder with pressure of less than 20MPa and that filling the carbon fiber cylinder will be by means of pressure cascade. If you are connecting directly to a gas booster pump or higher source pressures, change the pressure gauge or bypass it completely. **At any time, do not operate higher than 35MPa.**

2. Connect the *refueling hose mating socket (13)* to the *refueling hose mating plug (9)*.
3. Open the refueling cap. Keep it in a safe place, do not lose it. Connect *refueling port mating plug (10)* into the *refueling port (7)* of MGPR. Do not use excessive force at the end of the turns.
4. Turn on your Hydrogen source.
5. Slowly turn On the On/Off manual valve by turning it anti-clockwise. Hissing sound can be heard as gas rushes in from the source into the carbon fiber cylinder. Continue turning the valve anti-clockwise until it is fully opened (i.e. cannot be turned anymore). Do not use excessive force at the end of the turns.
6. The gas will now fill into the carbon fiber cylinder until it reaches equilibrium with the source.
7. If you are using a gas booster pump, it can now be turned on.
8. At the end of the filling process, turn off your Hydrogen source. Close the On/Off manual valve by turning it fully clockwise. **Caution:** at this point, there is still high pressure gas remaining in the refueling hose. Remove your blocker at gas outlet port to release the remaining gas through the MGPR low pressure gas outlet port.
9. Once all the gas is released, fully remove refueling port mating plug from the refueling port and put back the refueling cap.
10. The carbon fiber cylinder is now ready for usage.

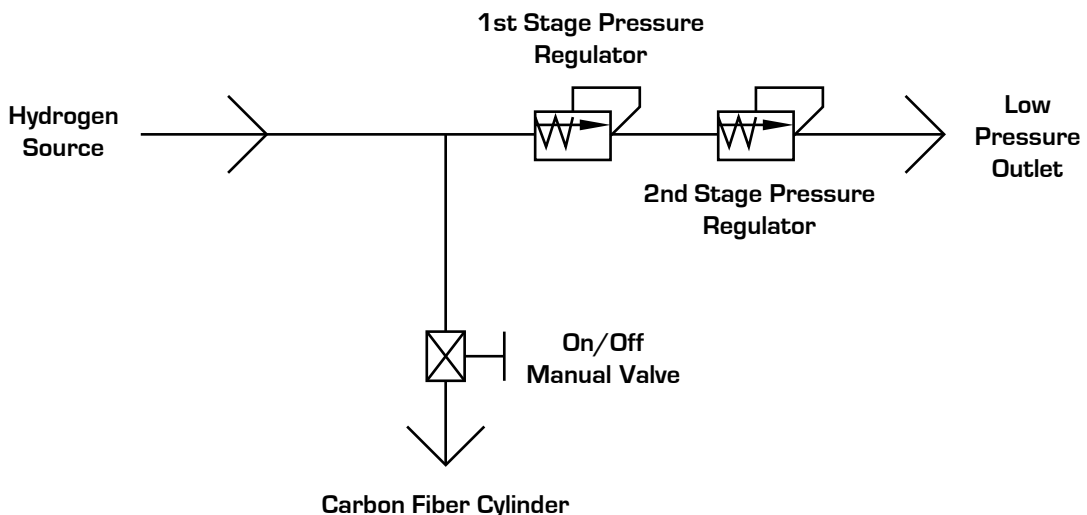
3.3 USING THE FILLED CARBON FIBER CYLINDER

1. Remove the blocker at gas outlet port that was in place during gas filling process.
2. Connect the gas outlet port to your desired application, e.g. to the inlet of the supply valve of a fuel cell system.
3. Open the On/Off manual valve by turning it anti-clockwise slowly until the end. Gas from inside the carbon fiber cylinder will now flow out through the gas outlet port.
4. To turn off the gas at the end of usage, shut off the On/Off manual valve by turning it clockwise.

3.4 USING THE MGPR WITHOUT CARBON FIBER CYLINDER

The MGPR can be used as a lab bench-top equipment without being connected to a carbon fiber cylinder.

1. The low regulated output pressure at the gas outlet port is always open. Put a blocker to prevent gas from coming out.
2. The On/Off manual valve serves to open or close the connection between your Hydrogen source which enters the MGPR through the refueling port and the carbon fiber cylinder which is connected at the carbon fiber cylinder plug. If you are not going to use a carbon fiber cylinder, make sure that the On/Off manual valve is turned OFF (fully clockwise). **Caution: unregulated high pressure gas will gush out from the carbon fiber cylinder plug if the On/Off manual valve is not fully turned OFF.**
3. Turn on your Hydrogen gas supply. Hydrogen gas will now flow through the refueling hose and enter the MGPR through the refueling port.
4. Remove the blocker from the gas outlet port. Regulated low pressure Hydrogen gas will now come out from the gas outlet port and can be channeled to your desired application, e.g. to the inlet of the supply valve of a fuel cell system.
5. To turn off the gas at the end of usage, shut off your Hydrogen source directly. **Reminder: the On/Off manual valve on the MGPR is not in use in this configuration and shall be fully OFF (clockwise) at all times.**



REMINDER

- Wear safety goggles and gloves at all times.
- Ensure connections are firm and secure, but do not use excessive force to over-tighten.
- Never operate MGPR at inlet pressure beyond 350bar.
- Carbon fiber cylinder will become warm when filled with Hydrogen gas. Never fill a carbon fiber cylinder too quickly. If you are using a booster pump, it is advisable to pause the filling process every 30-50bar to prevent over temperature.

3.5 STORAGE

When not in use, keep MGPR in its original box and store it in a cool, dry place.

4 GAS PRESSURE TRANSDUCER

4.1 FEATURES AND APPLICATIONS

Stainless steel 316 body

Welded configuration without sealing o-rings

10-90% proportional voltage output

Voltage reversal protection

Hydrogen gas pressure measurement

Hydraulic system pressure measurement

4.2 TECHNICAL SPECIFICATIONS

Pressure range:	0-50 MPaG
Output voltage (I _o):	0.5-4.5VDC
Precision (including non-linearity, hysteresis, repeatability and calibration error, 25°C and V _{cc} 24VDC):	+/- 0.5% F.S.
Long term stability:	+/- 0.25% F.S. per year
Pressure cycling:	>= 5 x 10 ⁶
Operating temperature:	-40 to 120°C
Storage temperature:	-40 to 105°C
Over pressure:	1.5X
Burst pressure:	2X
Response time:	10ms
Supply voltage (V _{cc}):	4.75-5.25VDC
Output load resistance:	>= 10k.ohm
Over voltage:	16VDC
Reverse over voltage:	-16VDC
Insulation resistance:	>= 20M.ohm @ 100VDC
Ingress protection:	IP65
Vibration:	X/Y/Z, 20g, sine 11ms
Shock:	10g, 5-2000Hz

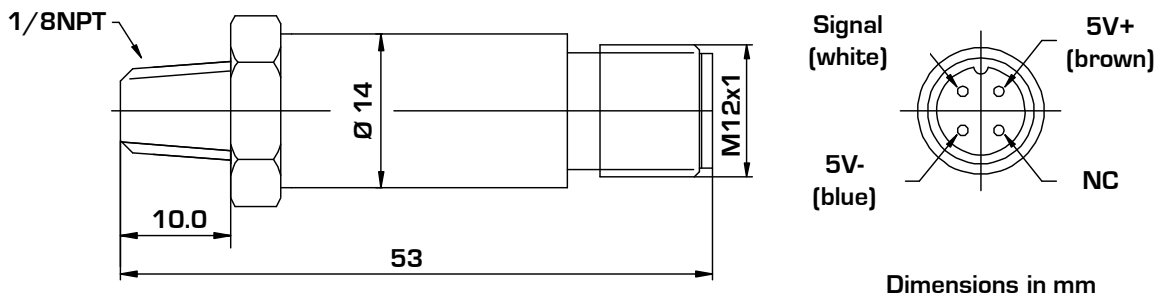
4.3 NOTES

Ensure that all system connections are secure and leak free. Hydrogen leakage may cause fire or explosion in extreme cases.

If the pressure port of the transducer is blocked by a foreign object, do not use a sharp tool to clear the passage. It is recommended to dissolve the foreign object in a solvent instead.

Do not tamper with the device. Contact us for re-calibration purposes.

1. Pin definition



2. Wiring diagram

