AUTOMATIC ELECTROLYSIS PRESSURE REGULATOR

INSTALLATION & CONFIGURATION MANUAL

Rev. A, 6/2025

SAFETY WARNING

This equipment and software must be operated and maintained only by trained and qualified people familiar with safe laboratory techniques. All users should have adequate training and knowledge of the hazards associated with the use of hazardous chemicals, pressurized gases and all applicable laboratory techniques before operation of this equipment.

⚠ ***Install an excess flow valve appropriate to your laboratory's standard safety practice on the pilot gas supply line before connecting to unit.*** The AEPR requires a connection to a high-pressure gas source to operate; this source represents a HAZARD to the operator and laboratory personnel.

⚠ ***High pressure tubing MUST be rated for pressures greater than 4000 kPa (580 psi).*** Failure to use properly rated lines can lead to line rupture and the release of all contained fluids.

⚠ ***DO NOT block the vent port of the instrument.*** The safety of the instrument depends on the ability of the instrument to exhaust reaction product gases. A blocked vent port can lead to Hydrogen gas leakage and result in product failure.

⚠ ***DO NOT loosen or adjust any tubing lines while the system is pressurized.*** During normal operation, the AEPR contains pressurized flammable-gas reaction products. Do not adjust the plumbing of the AEPR while in operation.

⚠ ***Fittings and surfaces may become HOT.*** During normal operation of the AEPR, reaction product lines may become HOT to the touch, observe caution when manipulating the AEPR during or after operation of an electrolysis cell. There are no heat sources internal to the AEPR.

⚠ on the top of the instrument: Indicates the high-pressure fittings on the top of the unit; these connections MUST NOT be adjusted or loosened while the device is pressurized.

⚠ on the front of the instrument, near the VENT port: Indicates that the VENT port must not be blocked during operation.

Important - Notes on Operation of the AEPR Unit

- Fully depressurize unit before attempting to adjust or loosen any lines.
- Do not exceed fluid temperature of 90 °C when using the AEPR unit.
- Unit can contain up to 25 standard liters of potentially flammable gas which may be released if used improperly.
- To avoid introducing safety hazards, never install non-standard parts in the equipment, or make any unauthorized modification. To maintain safety, return the equipment to Scribner for service and repair.
- The AC Supply cordset for powering the AEPR is a double insulation cordset. Use only this cordset, or another approved cordset with the AEPR. Do not construct a power cord for use with the AEPR.
- Please review the Installation and Start-up portions of this manual prior to calling for support. Users of AEPRMon software can receive technical assistance through your Authorized Distributor.

This device is manufactured by:
Scribner
1930 N. Poplar Street, Suite 23
Southern Pines, North Carolina, USA 28387
Telephone: +1-910-695-8884
Email: info@scribner.com

Introduction

This document describes installation, set-up and operation of Scribner's Automatic Electrolysis Pressure Regulator. The Automatic Electrolysis Pressure Regulator (AEPR) unit is designed to provide automatic differential pressure control up to 3000 kPag (435 PSIG) PEM electrolysis.

The AEPR unit allows the user of a Scribner 600, 620, or 670 Electrolyzer Test System or third party electrolyzer test system to control and measure electrolyzer cell back pressure from AEPRMon software and maintain the specified pressure for one side of the cell. The AEPR unit also provides gas/liquid separation with automatic drain for smooth handling of two-phase flow.

Features

- Automatically control back pressure from 0 - 3000 kPag (0 - 435 PSIG)
- Setpoint accuracy rating ±1.5% F.S.
- Stainless steel pressure regulators, condensate collection tanks, tubing and fittings
- Auto-draining
- Precision pressure monitoring
- Operation with humidified gas with dew point up to 90 °C, gas flow rate validated up to 5 SLPM, and liquid drain rate up to 50 mL/min
- Accurate and flexible pressure control through AEPRMon software

Requirements

- Power: 100-240 V, 50-60 Hz, 0.5 A
    - Fuse type is: 1 Amp 5x20mm Slow Blow (Bussmann GMC; Littelfuse 239 or similar)
- Pilot gas: N_2, 3100 - 3800 kPag (450 – 550 PSIG), consumption up to 55scc/Bar
- Purge gas: N_2, 345 - 485 kPag (50 - 70 PSIG)
- Tubing: ¼" Swagelok® stainless steel tubing connections
- Facility vent
- Computer system requirements
    - Microsoft windows 10 or later
    - 2 GHz or faster processor with 2 or more cores
    - Minimum 8 GB RAM
    - 256 GB or larger storage device
    - 1600 x 900, recommended 1920 x 1080 or larger display
    - 1 available USB port

Specifications

Back Pressure

Range	0-3000 kPag (0-435 PSIG)
Setpoint Accuracy	±1.5% F.S.
Readback accuracy	±1.5% F.S.
Gas Flow Rate	Validated up to 5 SLPM
Liquid Drain	Automatic
Inlet Gas Dew Point	Up to 90 °C
Fluid Temp	Up to 90 °C
Pilot Gas Supply	Clean N_2, 3100-3800 kPag (450-550 PSIG), consumption up to 55 scc/Bar
Condensate collection tank:	All stainless steel, Auto-draining; ~ 0.6 L

User Controls and Connections

Front	Drain rate control knob
Top	Serial interface, event port, and E-stop button
Rear	AC power in and power switch

Physical and Environment

Operating Temperature	5 - 35 °C
Power Source:	100-120 VAC, 50/60 Hz, 0.5 A minimum 220-240 VAC, 50/60 Hz, 0.25 A minimum
Replacement Battery Type	Automation Direct Part Number: D0-MC-BAT
Size (excluding tubing connections)	33 cm x 33 cm x 64 cm (13 in. x 13 in. x 25 in.)
Weight (estimated)	17 kg (38 lb.)
Altitude	Up to 2,000 m
Relative Humidity	Below 80%
Pollution Degree	2 – Equipment is intended for environments with no conductive pollution (expect for occasional condensation)

Event Port Electrical Specifications

Inputs 1-3	
Voltage Range	12-24V Nominal; 36V Absolute maximum
ON voltage level	> 9.0 Vac / Vdc
OFF voltage level	< 2.0 Vac / Vdc
Input impedance	3kOhm @ 24 Vac / Vdc
Alarm Output	
Absolute maximum voltage	12-24V Nominal; 36V Absolute maximum
Absolute maximum allowable current	0.5A
ALARM ON sink current	0.25A
ALARM OFF leakage current	10µA

Water Fill Procedure

1. Remove any fittings or caps connected to the “INLET FROM CELL” and “VENT” ports.
2. Through any convenient means (pump, siphon, funnel, etc.) fill the unit with 300ml of DI water through the “INLET FROM CELL” port.

Installation

1. Follow the “Water Fill Procedure” above to fill the unit to the typical water level before the first use.
2. Position the AEPR unit such that the gas inlets are below the outlet of the electrolyzer cell. The AEPR unit is designed to function as a floor-standing device when used with an electrolyzer cell at typical bench or table-top level.
    - Ensure the emergency stop button is easily accessible when positioning unit.
3. Remove the black rubber caps that cover the remaining ports.
4. Connect a line from the outlet of the electrolyzer cell (the side to be pressurized) to the port labeled “INLET FROM CELL” on the top of the unit - Figure 1.
5. Connect a purge supply line to the port labeled “PURGE(N_2) SUPPLY” on the top of the AEPR unit - Figure 1.
    - Purge gas pressure must be 345 - 485 kPag (50 - 70 PSIG).
6. Connect a high-pressure pilot gas line to the port labeled “HIGH-PRESSURE PILOT SUPPLY” on the top of the AEPR unit - Figure 1.
    - High pressure pilot gas pressure must be 3100 - 3800 kPag (450 - 550 PSIG).
    - Ensure an excess flow valve appropriate to your laboratory’s standard safety practice has been installed on the pilot gas supply line before connecting to unit.
7. Connect a high-pressure line from the port labeled “PURGE OUTLET” to the inlet of the electrolyzer cell (the side to be pressurized) or tee into the port labeled “INLET FROM CELL” if cell inlet is unavailable.
8. Connect AEPR exhaust line from the port labeled “VENT” on the front of the unit - Figure 2.
    - Route the line to safely vent the exhaust gas via the facility vent system (e.g., forced air fume hood).
    - DO NOT block the VENT port of the AEPR.
    - NOTE: the exhaust is potentially flammable!
9. Drain port for the collection tank is labeled “TANK DRAIN”.
    - Condensate collection tank is auto-draining.
    - Connect drain tube to the drain fitting and route the drain tubing to a suitable location, such as fume hood or floor drain.
10. Connect the provided serial cable to the connector labeled “COMM” on the top of the AEPR unit and connect the other end to the host computer.
11. Connect any external inputs to the port labeled “EVENT” following the pin assignment shown in Table 2 in the EVENT connector section below.
    - The 3 input wire pairs detect a closed circuit to trigger the alarm.
    - The output wire pair is a normally open circuit that is closed in the case of an alarm condition.
12. Attach power cable and turn on power located on the back of the AEPR.
13. Always check for gas leaks using a combustible gas detector and liquid leak detector such as Snoop®.
14. Set the “Drain Rate Control” knob to 1 & ½ turns from fully closed.

Figure 1. Top of the Auto Electrolysis Pressure Regulator Unit.

Figure 2. Front of the Auto Electrolysis Pressure Regulator Unit.

Alarms

The AEPR unit is equipped with several alarms for safe operation of the unit. If any alarm is triggered the unit will be set to a safe state. To return the unit to normal operation after an alarm, ensure the issue causing the alarm is resolved by following the appropriate clearing method in Table 1 below:

Table 1

Alarm	Clearing Method
Pressure Deviation Excessive	Ensure no leaks upstream from AEPR. Ensure vent port is not blocked or restricted. Change setpoint to 0.
Tank Overflow	Drain excess water. Blow out tubing, if necessary.
Tank Underflow	Fill water catch tank.
Pressure Change Rate High	Cleared automatically.
High Pressure	Ensure vent port is not blocked or restricted.
I/O Conn 1	Resolve trigger connected to Event port input 1.
I/O Conn 2	Resolve trigger connected to Event port input 2.
I/O Conn 3	Resolve trigger connected to Event port input 3.
ESTOP	Turn E-Stop button to release.

If an alarm continues to recur several times after following the clearing methods described above contact Scribner for further support.

AEPRMon Software & AEPR Controls

Refer to AEPRMon manual on how to use software.

The AEPR is controlled almost exclusively through the software with the only manual control being the emergency stop button located on the top of the unit. The emergency stop button should be pressed in case of an emergency and can be reset by turning the button clockwise 1/8 turn. Note arrows on the button.

EVENT connector

The EVENT connector is connected to the central logic device in the AEPR. These inputs are provided so that the AEPR may receive cues from external laboratory equipment; these cues can be used to move the AEPR through user-defined instrument states. Additionally, the EVENT connector contains one output intended to be attached to external equipment alarm inputs for when the AEPR detects an undesirable condition in the state of the back pressure system.

INPUTS on the EVENT connector are designed to be used with a binary-voltage signal. In each case, the INPUT will interpret a voltage >9V(ac or dc) as being “active”; and voltages <2V(ac or dc) as being “inactive”. Voltages in the range of 2V to 9V are undefined and may cause the AEPR to behave unexpectedly. See an example of an input circuit in Figure 3.

The OUTPUT on the EVENT connector is designed to communicate an ALARM state to external hardware. This signal is designed to be used with a binary-impedance signal. The connector will produce a “low impedance” state when “active”; and a “high impedance” state when inactive. This output will not control current flowing from Output- to Output+; *the voltage present on Output+ must always be higher than the voltage present on Output-.* See an example of an output circuit in Figure 4.

An accessory cable has been provided with the AEPR equipment, but you may construct one by ordering the following parts:

- 1x TE Connectivity Part number: 211768-1
- 1x TE Connectivity Part number: 206070-8
- 8x TE Connectivity Part number: 66400-4
- 22 AWG wire (Suggest Alpha wire 1172C series)

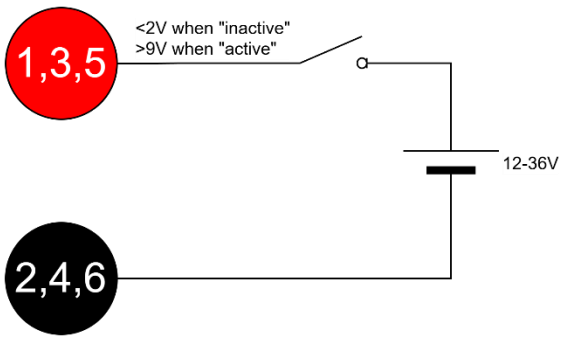


Figure 3 Example of Input circuit

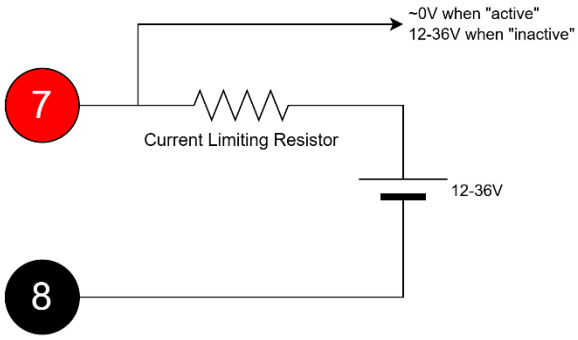
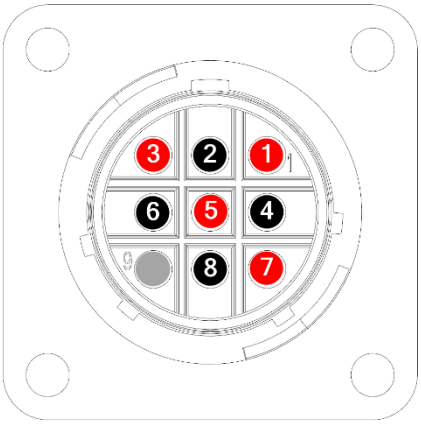


Figure 4 Example of Output circuit

Table 2

	Pin #	Wire color	Signal Description
Input 1	1	Red	Input 1 V+
	2	Black	Input 1 V-
Input 2	3	Red	Input 2 V+
	4	Black	Input 2 V-
Input 3	5	Red	Input 3 V+
	6	Black	Input 3 V-
Output 1	7	Red	Output +
	8	Black	Output -
	9		N/C



Connector Pin Assignment