

ALTERNATIVE STROMVERSORGUNG

Brennstoffzellen

ElectraGen ME

Brennstoffzellen versorgen Ihre Systeme mit sicherem Strom als Ergänzung oder Ersatz bestehender Stromerzeuger. Die Versorgung der Brennstoffzellen erfolgt bei unseren Anlagen über einen eingebauten Reformer, welcher aus dem Energieträger Wasser-Methanol den Wasserstoff in der Anlage direkt erzeugt.

TECHNISCHE BESCHREIBUNG



Introduction

ElectraGen™ ME is a backup power fuel cell system available in 2.5 kW and 5 kW configurations. The system includes an integrated fuel reformer that converts liquid methanol-water into hydrogen gas to power the fuel cell system. The integrated 225 liter (59 gallon) fuel tank allows for the following run times:

24 Vdc System		
Run Time	Load (amps)	Load (kW)
140 hours	40 amps	1 kW
100 hours	80 amps	2 kW
70 hours	120 amps	3 kW
50 hours	160 amps	4 kW
40 hours	200 amps	5 kW

48 Vdc System		
Run Time	Load (amps)	Load (kW)
140 hours	20 amps	1 kW
100 hours	40 amps	2 kW
70 hours	60 amps	3 kW
50 hours	80 amps	4 kW
40 hours	100 amps	5 kW

Applications

ElectraGen™ ME was developed for telecom backup power applications that require run times of days instead of hours between refueling. Current solutions such as batteries and compressed hydrogen-fueled fuel cell systems are only practical for a limited number of hours.

ElectraGen™ ME eliminates the need for stored hydrogen. The system generates its own hydrogen on demand through its fuel reformer technology. ElectraGen™ ME operates on HydroPlus liquid fuel (methanol-water), which has five times more energy for the same volume than compressed hydrogen (200 bars) while occupying a significantly smaller footprint.

ElectraGen™ ME is designed for backup power applications:

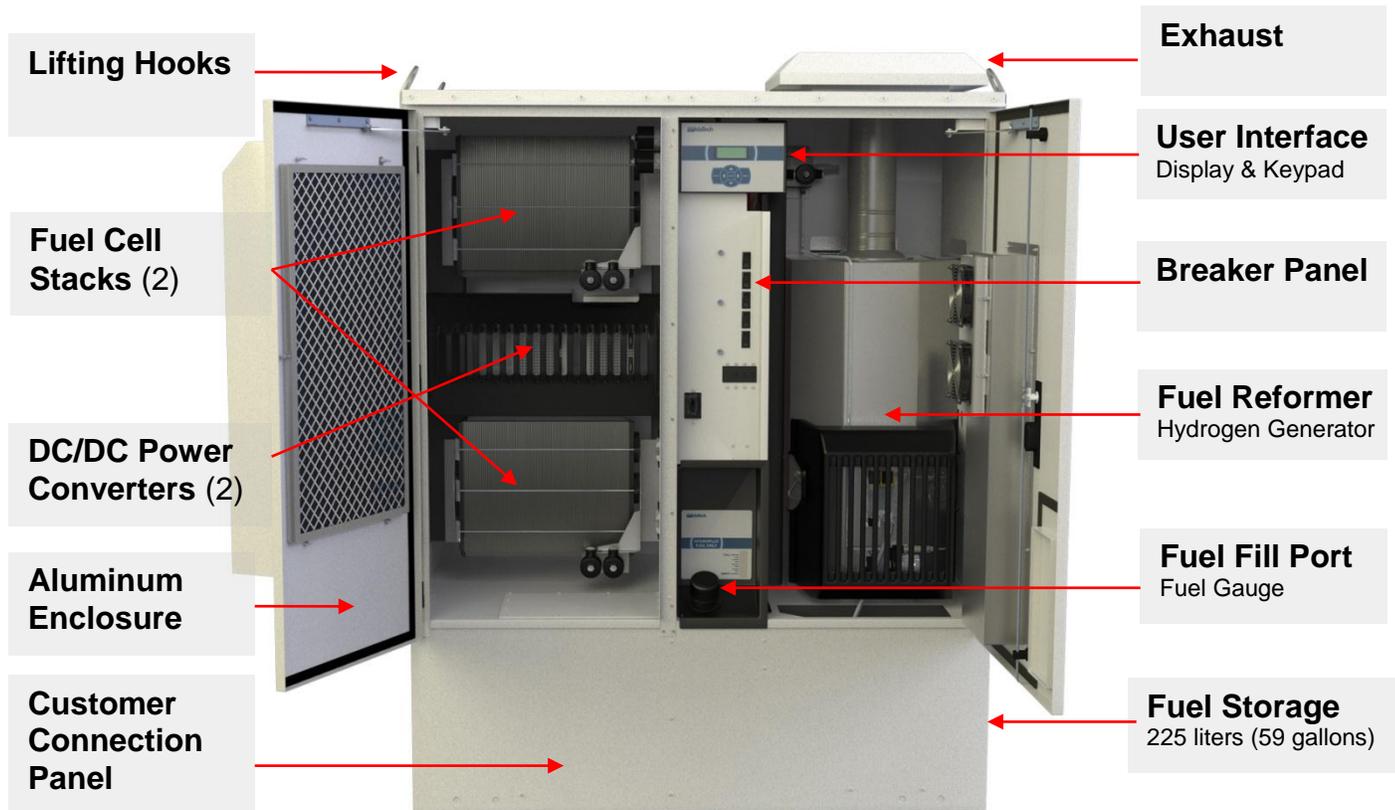
- Wireless Base Stations
- Secure Communication Networks (TETRA)
- Wireline Remote Terminals
- Broadband
- Telecom Rooftop Applications

With few moving parts and no degradation during standby periods, fuel cell technology provides an attractive solution compared to existing backup power systems. ElectraGen™ ME is designed for high reliability, long autonomy and minimal maintenance.

System Description

ElectraGen™ ME consists of several modules enclosed in an outdoor cabinet:

Fuel Cell	Fuel cell stacks (two 2.5 kW fuel cell stacks)
Fuel Reformer	Fuel Reformer modules that convert methanol-water into high purity hydrogen gas.
Electronic Control	System control board, user interface display, and DC/DC power converters.
Customer Connection Panel	DC power connections, system breakers, dry contacts, and Ethernet SNMP connector. Bottom and left side access.
Fuel Storage	225 liter (59 gallon) fuel tank and fuel delivery system (pump, fuel level monitoring).



How it works

The system continuously senses the direct current (DC) bus voltage and seamlessly takes over critical loads if the DC bus falls below a customer determined set point. Additionally, the system can be commanded to start locally, through the user interface, or remotely via an SNMP start command or through the remote start input switch via the site controller. Further, the system can be setup to run scheduled self-tests at customer defined intervals.

The system is fueled by hydrogen which is delivered to the PEM fuel cell stacks by the reformer module. The reformer module is fueled by a mix of methanol and de-ionized water called HydroPlus. The liquid HydroPlus fuel is first heated to the vapor point. After converting from liquid to gas, the fuel is steam-reformed in the presence of a catalyst into a reformat. The reformat consists of hydrogen, carbon dioxide and trace amounts of other compounds. The reformat then enters the hydrogen purification module, where it is separated into purified hydrogen and waste gases. The purified hydrogen is delivered to the fuel cell module and the waste gas is sent to the burner.

Electricity is generated by the chemical reaction between hydrogen produced by the reformer module and oxygen from the air in the fuel cell stack. The DC energy is passed to a DC/DC converter which converts the unregulated DC electricity from the fuel cell stack into high quality regulated DC electricity to serve the required loads.

Liquid Fuel

The ElectraGen™ ME system is designed to operate on HydroPlus (methanol-water). Methanol is an ideal source of hydrogen for fuel cells. As a fuel, methanol (CH₃OH) offers significant advantages over other hydrocarbons such as natural gas, propane and gasoline. Among these are its freeze tolerance, biodegradability, consistent high quality, and lower reforming temperature. Widely distributed, cost-competitive, and already found in a range of products such as windshield washer fluid and household solvents, methanol is a reliable fuel with a bright future.

As one of the world's most widely distributed chemical feedstocks, methanol is a consistently high quality fuel that meets strict industry specifications. Compared to competing fuels it has a very low sulfur content (a maximum of 0.5 ppm) which simplifies the reforming process. It reduces the capital, operating and maintenance costs of the fuel cell system and greatly reduces the risk of fuel cell damage.

With its low energy chemical bonds, methanol can be reformed into hydrogen at relatively low temperatures while other hydrocarbon fuels require reformation at much higher temperatures. Methanol's lower reforming temperature ensures faster startup, improved system efficiencies, lower fuel processor capital costs, and a longer fuel processor life.

Methanol offers other important advantages:

- Found in many consumer products
- Environmentally friendly - biodegrades rapidly in air, soil and water
- Liquid at atmospheric conditions
- Made from renewable and non-renewable resources
- Cost competitive

The ElectraGen™ ME includes an integrated 225 liter (59 gallon) fuel tank for extended run times (i.e. approximately 2 to 6 days depending on the load). The fuel port is accessed behind a locked door and includes an easy to read fuel gauge. An external fuel tank connection kit is available from IdaTech for sites that require very long run times.

Product Specifications – ElectraGen™ ME

Power Rating:	2.5 kW or 5 kW
Nominal Voltage:	24 Vdc or 48 Vdc
Voltage Adjustable:	23 to 28 Vdc, 46 to 57 Vdc
Size (WxDxH):	1.3 x 1.1 x 1.77 meters (52 x 45 x 69.5 inches)
Footprint (WxD):	1.3 x 0.9 meters (52 x 34 inches)
Product Weight:	295 kg (650 lbs) excluding fuel
Fuel Weight:	193 kg (425 lbs)
Fuel Tank Size:	225 Liters (59 gallons)
Fuel Specification:	HydroPlus: Methanol - DI Water (62%/38% by weight)
Fuel Consumption:	1.1 liters of HydroPlus per kWh
Fuel Gauge:	Local and remote fuel level monitoring
Enclosure Material:	Aluminum
Sound Level:	< 70 dBA
Temperature Range:	-5° to +46°C (+23° to +115°F) Standard -40° to +46°C (-40° to +115°F) Cold Weather
Relative Humidity:	5-95% non-condensing
Communications:	SNMPv2c and optional wireless remote monitoring
Alarms:	Dry Contacts
Parallel Operation:	Up to 3 ElectraGen™ ME systems can be operated in parallel for up to 15 kW of power output
Startup Time:	System provides seamless response to grid loss with DC bus battery.
Standby Power (DC):	Approximately 275 watts in standby
Certifications:	CE and FC-1 (ANSI/CSA)

ElectraGen™ ME Startup

The ElectraGen™ ME system is designed to detect power outages by monitoring for a voltage sag on the DC power bus. When a power outage is detected, the system prepares itself for a run cycle but does not start until the battery voltage falls below the start threshold. (Most power outages are short in duration and are most efficiently covered by a local battery bank. In this way, unnecessary fuel consumption and run cycles are avoided). A start cycle commences with power transitioning from the batteries to the system. Once online, the system will ramp up/down following the load. Excess power capacity will be used to charge the batteries as the output voltage setting and battery state of charge allows.

Alarms

Digital outputs (dry contacts) are configurable as Normally Open (NO) or Normally Closed (NC).

Relay	Description
1	System Status (standby or online)
2	System Fault
3	Stack Fault
4	Fuel Low
5	Fuel Empty
6	Air Filter Replacement Warning
7	Start Command (input signal)

Product Design

The 5kW ElectraGen™ ME system is designed with two independent 2.5kW fuel cell stacks and DC/DC converters. For sites with loads less than 2.5kW, the system provides redundant operation. In addition, the fuel cell stacks alternate usage, resulting in the doubling of the product's lifetime operating hours. The 2.5kW ElectraGen™ ME system is field upgradeable to 5kW, allowing customers to expand their backup power capacity as the site loads increase.

Maintenance

ElectraGen™ ME is designed for minimal maintenance. Only one annual visit by a technician is required to clean or replace two easily accessible air filters. The system is designed with an air filter warning which is activated under two conditions, (1) 500 operating hours or (2) fuel cell stack over-temperature (indicates dirty filter).

Test & Qualification

The ElectraGen™ ME system is CE and ANSI/CSA FC-1 certified. IdaTech is one of the few ISO 9001:2008 certified fuel cell companies and complies with all certification requirements to ensure consistent and repeatable performance. Factory testing includes Six Sigma error elimination methods and rigorous testing at the component and system levels.

Communication

The ElectraGen™ ME is designed with multiple communication capabilities:

LOCAL COMMUNICATION

The local user interface includes a bright LCD display and easy to use keypad to access the following information:

- Operational status
- Voltage output
- Amperage output
- Power output
- Warnings
- Faults
- Fuel level
- Total number of times the system has operated
- Total amount of time the system has operated
- Total amount of net power output in kilowatt-hours
- Number of hours remaining until filter cleaning is suggested
- Fault Acknowledgement; returns system to standby
- Command the system to start and produce power
- Command the system to stop
- Run a system self-test and diagnostic routine to determine if an issue exists
- Reset the filter maintenance timer
- Reset the parameters to the default settings loaded during manufacturing

REMOTE COMMUNICATION

- **Direct Connection:** Dry contact alarms
- **Direct Connection:** SNMP v2c (direct Ethernet connection at site)
- **Wireless:** GPRS modem to access SNMP data
- **Wireless:** SMS modem – sends SMS text message when dry contact alarm is activated
- **PC Software:** SNMP Viewer available from IdaTech allows customers to view SNMP data locally or remotely
- **Reports:** IdaTech offers monthly reports that summarize fleet status on the network. Report includes run hours (monthly and total), cycles (monthly and total), kW-hours (monthly and total), and status of each system.

Product Options

Part Number	Description
ElectraGen™ ME Systems (-5C to 46C)	
0015110	ElectraGen™ 2.5ME 48V
0015112	ElectraGen™ 5ME 48V
0015113	ElectraGen™ 5ME 24V
ElectraGen™ ME Systems (-40C to 46C)	
0015132	ElectraGen™ 5ME 48V (cold)
0015133	ElectraGen™ 5ME 24V (cold)
Annual Maintenance Kits	
0015134	Annual Maintenance Kit: ElectraGen™ H2-I
0016584	Annual Maintenance Kit: ElectraGen™ ME
Options	
0016271	Communication: GPRS Modem Kit
0016272	Communication: SMS Modem Kit
0016273	Communication: GPRS & SMS Modem Kit
0016270	Communication: Battery Backup, Modems
0016274	Communication: Multiple Ethernet Ports
0012256	Communication: Data Fee (1 MB/month)
0017026	Communication: SNMP Viewer with VPN setup
0016593	Battery Current Sensor

Modularity & Redundancy

The ElectraGen™ ME is designed with 2.5 kW fuel cell modules. Each module includes a specific 2.5 kW PEM fuel cell stack with balance of plant, a DC converter with control and its thermal management. Each 2.5 kW module can operate independently and in redundancy from each other. One enclosure can use 2 modules to form a compact 5 kW system. It is possible to have up to 3 x 5 kW systems connected together to provide up to 15 kW.

Clean Technology Solution for Mobile Networks

Low emissions, high efficiency, and quiet operation are a few of the “green” characteristics of the ElectraGen™ ME fuel cell system. Mobile network operators are increasingly implementing clean technology solutions to lower their environmental impact, improve network reliability, and reduce operating expenses.

Telecom Backup Power Technology Comparison

Fuel Cell Systems vs. Diesel Generator

Exhaust Emissions ^{1,2}	ElectraGen ME System	Diesel Generator
Nitrogen Oxides (NOx)	0.007 g/kWh	7.5 g/kWh
Carbon Monoxide (CO)	0.17 g/kWh	8.0 g/kWh
Particulate Matter	0 g/kWh	0.8 g/kWh
Carbon Dioxide (CO2)	783 g/kWh	1,500 g/kWh

Note 1: ElectraGen™ ME System emissions data from IdaTech
Note 2: Diesel generator emissions data from EPA standards for 2007 and newer generators, *EPA Standards of Performance for Stationary Compression Ignition Internal Combustion Engines; Final Rule July 11, 2006*

Conclusion

Backup power fuel cell systems are clean technology solutions that lower operating costs, improve network reliability, and benefit the environment. For more information, visit www.idatech.com.

Specifications, descriptions and images contained in this document were in effect at the time of publication. IdaTech, LLC reserves the right to change specifications without notice and without incurring obligation.

ALTERNATIVE STROMVERSORGUNG

Damit Energie entsteht

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