Horizon Educational

Cienytec
CIENCIA Y TECNICA
Tecnologías para Educación

CATALOG

STEAM

THROUGH THE MEDIUM OF **RENEWABLE ENERGY**

CURRICULUM
ONLINE

COMPATIBLE
WITH:

NGSS
ENERGY LITERACY FRAMEWORK
COMMON CORE

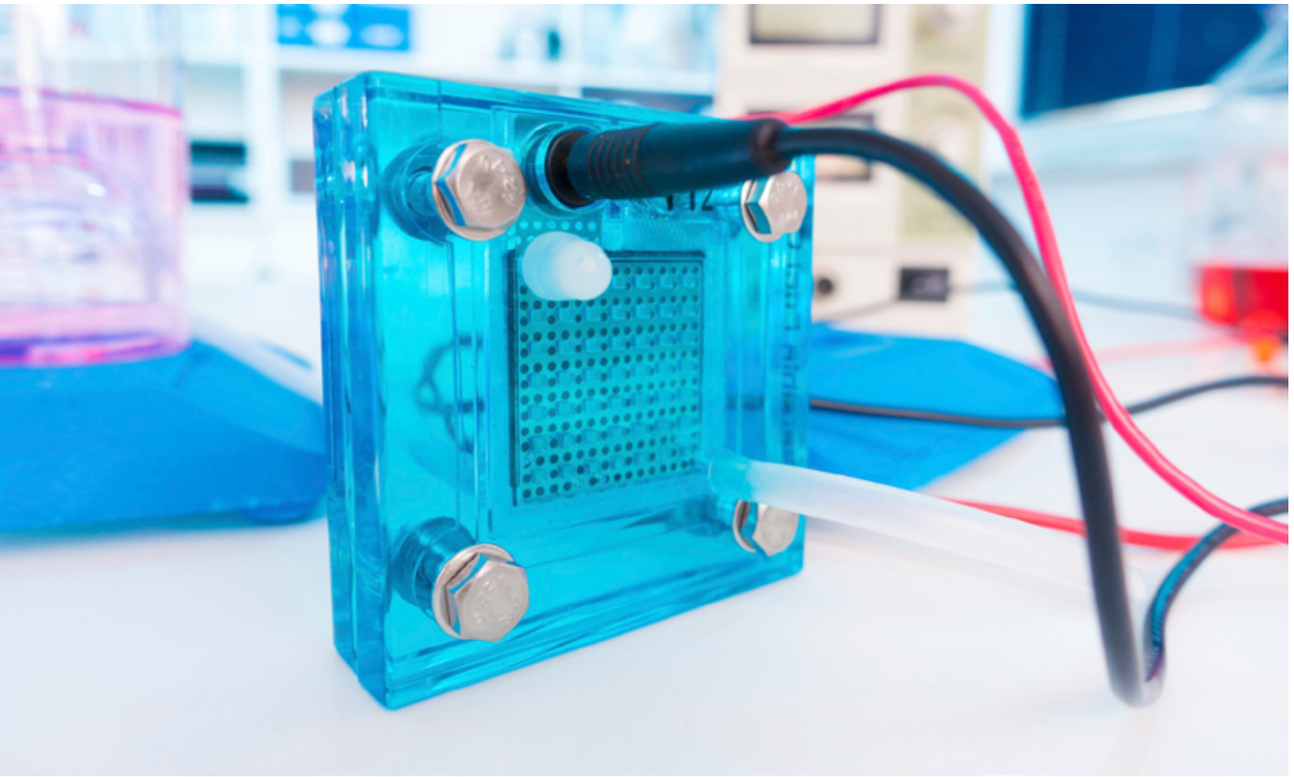
Cienytec
CIENCIA Y TECNICA
Tecnologías para Educación

WHAT **WE DO**

We design, produce, and distribute STEM education kits and teaching materials to over 150 countries, enabling students from the ages of 6-26 to develop renewable energy technology skills through hands-on learning.

Our classroom equipment include hydrogen fuel cell model cars, wind/hydrogen conversion kits, solar energy demonstration kits, and even complete full-cell stacks. These are used by teachers around the world to help students understand the key scientific processes behind the renewable energy technology of the future.

Our products come with lesson plans, quizzes, and instructional videos – allowing teachers to make learning fun, innovative, and meaningful.

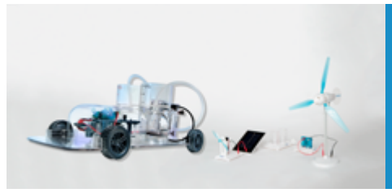


"THERE IS A LONG WAY TO GO FROM IMPROVING A RC CAR TO IMPROVING THE WORLD, BUT THIS ACTIVITY CAN BECOME THE CRUCIAL FIRST STEP ON THE JOURNEY TOWARDS FORMING A BETTER, SUSTAINABLE FUTURE."

We're here to educate a future workforce capable of tackling the world's biggest challenges. Our products teach students in over 150 countries about all aspects of renewable energy technologies. Through using our STEM kits and engineering equipment, students from Singapore to South Carolina have gained practical experience in a variety of future energy technologies – from solar energy, wind energy, and thermal power – to super capacitors, hydrogen fuel cells, electrolyzers, and bio-energy.

H2 GRAND PRIX SERIES

EDUCATIONAL PROGRAMS



STEM KITS

TECHNICAL EDUCATION

FUEL CELL STACKS

CURRICULUM
EASY TO DOWNLOAD

HORIZON ENERGY CURRICULUM

The lab equipment is just the beginning. We've built the Horizon Energy Curriculum to provide teachers with multiple resources for engaging their students.

The free online quality content consists of an extensive e-book, readymade STEM lesson plans, quizzes, scaffolding material, videos and collaborative forums. The content is developed together with clean energy experts from industry and specialized science educators. The structure is aligned with the Next Generation Science Standards (NGSS), Common Core and Energy Literacy Principles.

PROFESSIONAL
TRAINING

Supporting teachers is the number one priority of Horizon Educational. Our online training content includes tutorials covering how Horizon science kits work and best practices for how to use them in the classroom.

EASY TO DOWNLOAD

www.horizoneducational.com

WHAT IS INCLUDED

	Fuel Cell Car Science Kit	Solar Hydrogen Education Kit	Wind Energy Education Kit	Vertical Axis Wind Turbine	Salt Water Fuel Cell Science Kit	Super Capacitor Science Kit	Thermal Power Science Kit	Wind to Hydrogen Education Kit	Ethanol Fuel Cell Science Kit	Electric Mobility Experiment Set	Renewable Energy Education Set	Horizon Energy Box
TECHNOLOGY												
Ethanol Fuel Cells									✓			✓
Hydrogen Fuel Cells	✓	✓						✓		✓	✓	✓
Salt Water Batteries					✓					✓		✓
Solar Panels	✓	✓								✓	✓	✓
Supercapacitors						✓				✓		✓
Thermoelectrics							✓					✓
Wind Turbines			✓	✓				✓			✓	✓
MATERIALS PROVIDED												
Hands-on Lab Activities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Teacher's Guides	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PBL Units										✓	✓	✓
E-Book	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Teacher Forum	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

CONCEPTS COVERED

	Fuel Cell Car Science Kit	Solar Hydrogen Education Kit	Wind Energy Education Kit	Vertical Axis Wind Turbine	Salt Water Fuel Cell Science Kit	Super Capacitor Science Kit	Thermal Power Science Kit	Wind to Hydrogen Education Kit	Ethanol Fuel Cell Science Kit	Electric Mobility Experiment Set	Renewable Energy Education Set	Horizon Energy Box
CHEMISTRY CONCEPTS												
Biofuels									✓			✓
Electrochemistry					✓					✓		✓
Electrolysis	✓	✓						✓		✓	✓	✓
Energy	✓	✓			✓			✓	✓	✓	✓	✓
Ethanol Reactions									✓			✓
Hydrogen Generation	✓	✓			✓			✓		✓	✓	✓
Organic Chemistry									✓			✓
pH									✓			✓
Reaction Rates	✓	✓			✓			✓	✓	✓	✓	✓
Reaction Yield		✓			✓						✓	✓
Reactions	✓				✓			✓	✓	✓	✓	✓
Redox Reactions	✓									✓	✓	✓
Semiconductors		✓									✓	✓
Solution Concentrations					✓					✓		✓
Stoichiometry		✓							✓		✓	✓
PHYSICS CONCEPTS												
Angular velocity			✓	✓				✓			✓	✓
Capacitors						✓				✓		✓
Classical Mechanics	✓		✓	✓				✓		✓	✓	✓
Current/Voltage						✓	✓			✓		✓
Efficiency	✓		✓	✓				✓			✓	✓
Electric Charge						✓				✓		✓
Electric Circuits		✓				✓				✓	✓	✓
Energy	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓
Generators						✓				✓		✓
Heat							✓					✓
Light		✓										✓
Ohm's Law	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓
Parallel Circuits		✓								✓	✓	✓
Power (Electric)	✓	✓	✓	✓		✓		✓		✓	✓	✓
Rotational Mechanics			✓	✓				✓			✓	✓
Series Circuits		✓								✓	✓	✓
Thermal Energy							✓					✓
EARTH SCIENCE CONCEPTS												
Climate Change										✓	✓	✓
Renewable Energy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Human Impacts										✓	✓	✓

WHAT IS INCLUDED IN THE HORIZON ENERGY CURRICULUM?

H2GP Series

Cienytec
CIENCIA Y TECNICA
Tecnologías para Educación

UNIQUE EDUCATIONAL PROGRAMS

THE TIME FOR HYDROGEN EDUCATION IS NOW!

HORIZON HYDROGEN GRAND PRIX SERIES
H2GP Series

The H2GP Series challenges students to design, develop and race hydrogen-powered cars. This enables students from all over the world to learn about the fun and exciting world of renewable energy.

STEAM

STEAM Education
Students gain vital skills in critical thinking and teamwork which employers greatly value.

TOMORROW'S STEAM EXPERTS RACE WITH US TODAY

HORIZON HYDROGEN GRAND PRIX PRO

The H2GP PRO program provides high school students with a comprehensive understanding of the engineering principles behind the future renewable energy society. Students work in teams to design, engineer and build their own fuel cell-powered RC car and compete in a 4-hour race.

HORIZON HYDROGEN GRAND PRIX SPRINT
H2GP SPRINT

The H2GP SPRINT program challenges secondary school students aged 10-13 to take their renewable energy and engineering skills to the next level.

NEW

HORIZON HYDROGEN GRAND PRIX EXPLORER H2GP XPR

The H2GP XPR program introduces elementary students to the basic science and engineering principles behind sustainable and renewable energy. This program allows students to design & build their very own fuel cell-powered vehicles using sustainable materials.

H2 GRAND PRIX PRO
(H2GP PRO)

STEAM EDUCATION
H2 GRAND PRIX PRO

Cienytec
CIENCIA Y TECNICA
Tecnologías para Educación

EDUCATIONAL PROGRAM
FOR HIGH SCHOOL STUDENTS

Horizon Educational calls Earth's young engineers to design and race HYDROGEN-POWERED RC cars.

H2 Grand Prix PRO is the only program in the world that gives students a real-life fuel cell. With a dedicated curriculum

H2GP PRO empowers students to be the problem solvers of tomorrow, connect with Earth's automotive industry and gear it up with renewable energy technology. Each year we impact over 5000 students.

Students must apply a wide range of foundational knowledge acquired in the first part of the program throughout the competition.

Their task is to design, engineer and build their own fuel cell powered RC car and test it during a final endurancerace.

From the earliest conceptual stages to maintaining repairing their car during the race, students are in control of every step of the process, enabling a truly immersive experience that captures the rigor and excitement of real- world science and engineering endeavors.

1:10 MODEL CAR

PRO PROGRAM

1 PROBLEM DEFINITION

Education in the field of environment and climate change, renewable energy, and alternative fuels, especially fuel cells.

2 DESIGN OWN SOLUTION

Design, manufacture and assembly of a car, using a 3D printer, CNC lathe, laser cutting, vacuum forming and Autodesk software.

3 SOLUTION TESTING

Testing of own solution in comparison with other students from the region and from the world.

www.h2grandprix.com

info@cienytec.com

H2 GRAND PRIX SPRINT
(H2GP SPRINT)

STEAM EDUCATION H2 GRAND PRIX SPRINT

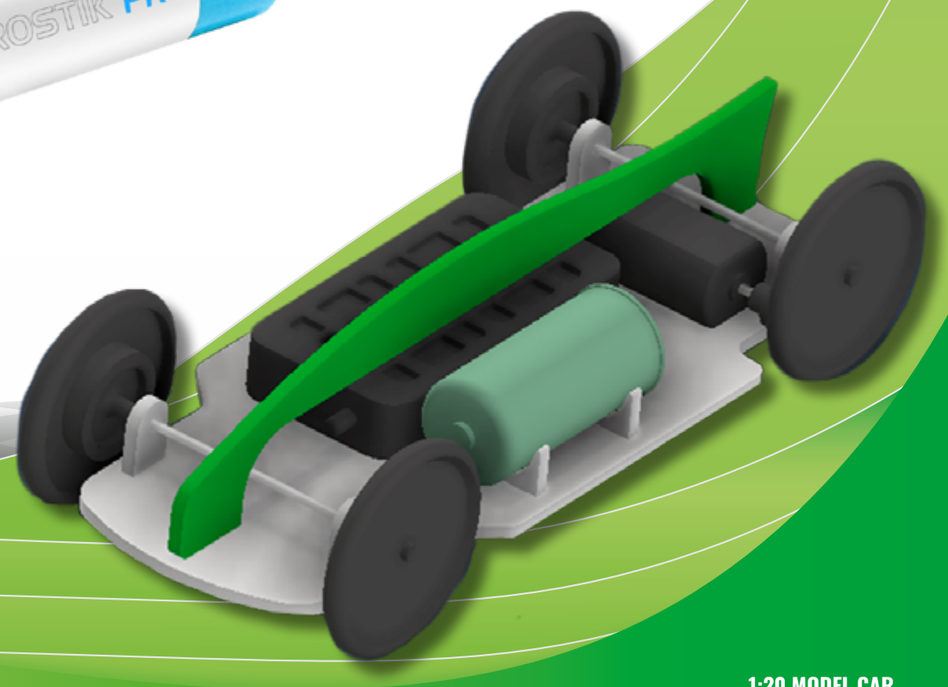
Cienytec CIENCIA Y TECNICA
Tecnologías para Educación

EDUCATIONAL PROGRAM
FOR SECONDARY SCHOOL STUDENTS

H2 Grand Prix SPRINT challenges secondary school students aged 10-13 to take their renewable energy and engineering skills to the next level.

H2GP SPRINT provides students with a comprehensive understanding of renewable energy concepts through hands-on learning. A dedicated curriculum builds confidence and knowledge while practical engineering sessions guide students in constructing their very own 1:20 scale hydrogen-powered car.

Designing, engineering and racing individual hydrogen-powered cars enables students to learn about more advanced hydrogen fuel cell technology, together with applied physics and movement, 3D design, weight distribution, and gear-to-weight ratio.



1:20 MODEL CAR

SPRINT PROGRAM

1 LEARN

Perform a series of hands-on experiments to learn about more advanced concepts of renewable energy.

2 CREATE

Design, manufacture and assemble an individual 1:20 scale hydrogen-powered car. Use a variety of design and manufacturing tools – such as 3D design software, 3D printers or Laser Cutters – to continually improve and optimize car design and performance.

3 RACE

Put these renewable skills to the test against racers from your own school and around the world.

www.h2grandprix.com

info@cienytec.com

H2 GRAND PRIX EXPLORER
(H2GP XPR)

STEAM EDUCATION
H2 GRAND PRIX XPR

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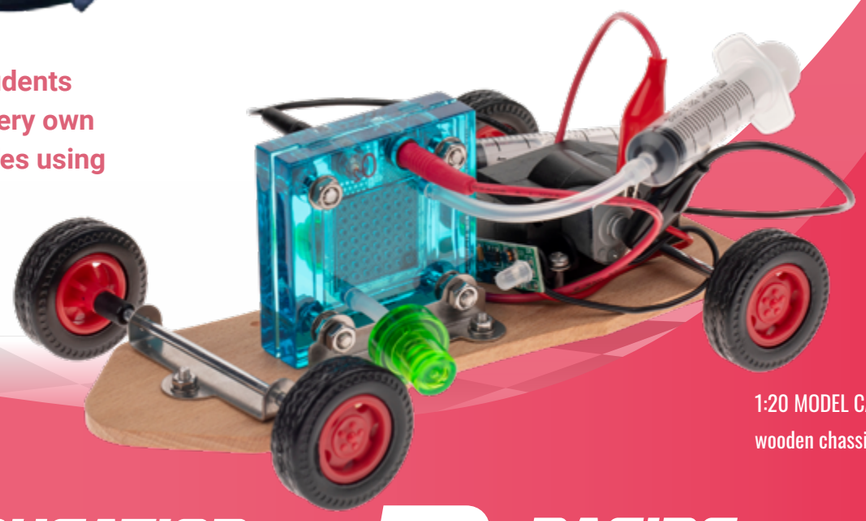
EDUCATIONAL PROGRAM
FOR ELEMENTARY SCHOOL STUDENTS

The H2GP XPR program introduces elementary students to the basic science and engineering principles behind sustainable and renewable energy.

Horizon Educational has developed special STEAM-based equipment that introduces elementary and middle school students to basic science and engineering principles, while providing them with awareness of sustainability and renewable energy.

Our kit includes instructions and all necessary parts to assemble a functioning hydrogen-powered car. Once your students familiarize themselves with the technology, encourage them to build their own car from scratch and then use the Fuel Cell and motor to power it. Let them become engineers and designers of their own unique vehicle!

This program allows students to design & build their very own fuel cell-powered vehicles using sustainable materials.



1:20 MODEL CAR
wooden chassis

XPR PROGRAM

1 EQUIPMENT

H2GP EXPLORER allows students to design & build their own fuel cell-powered vehicles using recycled materials.

2 EDUCATION

Through its broad and developed curriculum, the H2GP XPR will easily fit in science, math and art classes.

3 RACING

Students are tasked with assembling and designing a car powered exclusively by hydrogen.

www.h2grandprix.com

info@cienytec.com

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STEAM EDUCATION
H2 GRAND PRIX XPR

PRODUCT CODE:
RESK-02C-1
Classroom Set available

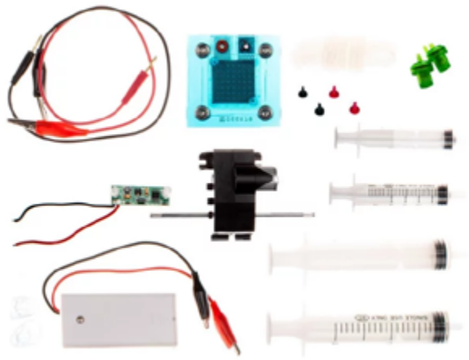
DIY CHASSIS KIT

1 Wooden chassis
6 Small nuts
4 Wheels
2 Big nut
4 Short screws
1 Front wheel supporter
2 Front wheel bumping post
2 Long screws
1 Axle
1 Fuel Cell holder
7 Flat metal washer
2 Rubber washer
1 metal profiled washer

PRODUCT CODE:
RESK-02B-1
Classroom Set available

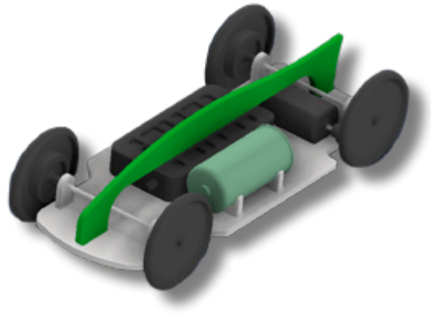
DIY FUEL CELL SCIENCE KIT

1 Set of red and black pins
1 Motor (required input 0.6V)
1 Transaxle
2 Pressure relief valve
2 Plastic clamps
1 Bag to protect fuel cells
1 Reversible fuel cell
1 Set of silicone tubing
2 Syringes (5ml)
2 Syringes (20ml)
1 LED diode
1 Set of aligator wire



STEAM EDUCATION
H2 GRAND PRIX SPRINT

For actual information contact our sales team:
h2gp@horizoneducational.com



STEAM EDUCATION
H2 GRAND PRIX PRO

PRODUCT CODE:
H2GP-S1

H2GP PRO STARTER Competition Set - year 1

Get everything you need to start your H2GP PRO experience at one click!

Easy to assemble 1:10 scale electric off-road vehicle. It is equipped with a powerful RC540 Himoto electric motor ready to reach high speeds (40km/h). The electronic speed control is highly accurate and makes it easy and precise in its movements.

It also includes 6kg waterproof directional servo, 2.4 Ghz radio control and 3-channel receiver, 3 units of 7.2V/3600mAh rechargeable batteries, charger, transparent body, bracket for H-cell, extra four rims and tires.

Height: 112mm, length: 360mm, width: 200mm.

PRODUCT CODE:
H2GP-A2

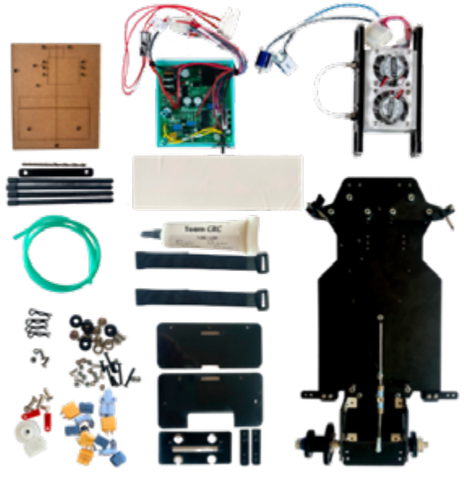
H2GP PRO ADVANCED Competition Set - year 2+

Returning team? Get a new fuel cell and a spare chassis for upcoming season!

The Advanced Package has been developed for teams who want a greater degree of freedom to build winning car. The RC car chassis and components have been selected to meet the quality and performance requirements of our top hydrogen endurance racers!

We also offer a variety of accessories to enhance the performance of your car. You'll find them in the accessories section, as well as standalone Hydrostiks and many more.

This package includes - H2GP PRO Starter Kit, H-CELL 2.0



STEM KITS

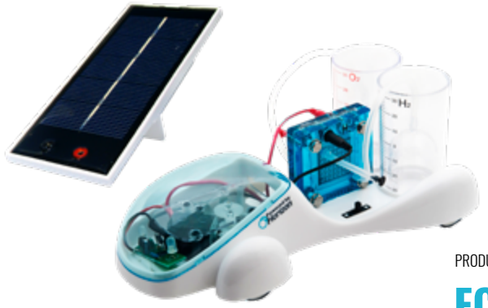
Cienytec CIENCIA Y TECNICA
Tecnologías para Educación

IDEAL FOR:

HS CHEMISTRY	HS PHYSICS
NUMBER OF EXPERIMENTS 3	NUMBER OF EXPERIMENTS 3

STEM KITS

Eploring energy solutions has never been that fun!



PRODUCT CODE:

FCJJ-20
HYDROCAR

- ✓ Full PBL unit on sustainable transportation technologies includes an investigation of the causes of global climate change.
- ✓ Hands-on activities center on designing and building a car that can accelerate quickly and run for a long time.
- ✓ Complete student and teacher materials for up to 10 class periods of activities.

*Dimensions (LxWxH): 43x33.5x23.5cm. Weight (kg/lbs) 2.0514.52

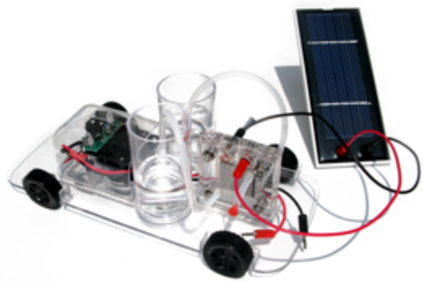
PRODUCT CODE:

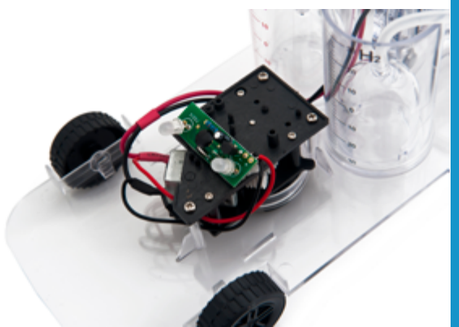
FCJJ-11
FUEL CELL CAR SCIENCE KIT

- ✓ Investigate reaction yields, reduction and oxidation, and other chemistry concepts by performing electrolysis reactions.
- ✓ Learn about conservation of energy, electric power, and other physics concepts by modifying your fuel cell car.

*Dimensions (LxWxH): 30x21 x9. 7cm. Weight (kg/lbs) 1. 75/3.87

9 5





PBL UNIT

9 5

STEM KITS

FUEL CELL CARS

PRODUCT CODE:

FCJJ-30
ELECTRIC MOBILITY EXPERIMENT SET

- ✓ Full PBL unit on sustainable transportation technologies includes an investigation of the causes of global climate change.
- ✓ Hands-on activities center on designing and building a car that can accelerate quickly and run for a long time.
- ✓ Complete student and teacher materials for up to 10 class periods of activities.

*Dimensions (LxWxH): 43x33.5x23.5cm. Weight (kg/lbs) 2.0514.52

PRODUCT CODE:

FCJJ-23
H-RACER 2.0

The kit consists of a remote control, car and hydrogen station in which an electrolyzer can separate hydrogen from destilled water. Hydrogen flowing from the station to the car via transparent house reminds filling the car tank at real petrol station.

Dimensions (LxWxH): 30x21x10cm. Weight (kg/lbs) 0.76kg, 1.7lbs

PROJECT-BASED LEARNING

A Project-Based Learning (PBL) Unit allows students to deeply explore a wide variety of content while creating a final product that connects them to realworld issues. They begin by investigating a realworld problem or question and then engage in a series of hands-on and research activities that introduce them to different aspects of the issue at hand. Their final product sums up everything they've learned in a creative manner such as a video, portfolio, technical paper, or news article.

STEM KITS

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PRODUCT CODE:
FCJJ-40

HORIZON ENERGY BOX

IDEAL FOR:

HS CHEMISTRY
NUMBER OF EXPERIMENTS 15

HS PHYSICS
NUMBER OF EXPERIMENTS 21

PROBLEM BASED LEARN-
UNIT

RENEWABLE ENERGY

The renewable energy box allows students to compare a wide variety of fuel cells including a PEM hydrogen fuel cell, a saltwater fuel cell and a direct ethanol fuel cell. Countless experiments, so many scientific principles at work and plenty of space for creativity.

- ✓ Investigate reaction yields, reduction and oxidation, and other chemistry concepts by performing electrolysis reactions.
- ✓ Learn about conservation of energy, electric power, and other physics concepts by modifying your fuel cell car.

**Dimensions (LxWxH): 30x21 x9. 7cm. Weight (kg/lbs) 1. 75/3.87*

- ✓ Full PBL units on sustainable transportation, clean power generation, and more include multiple ways to learn about climate change.
- ✓ Hands-on activities including renewable energy sources, alternative fuels for transportation, and more.
- ✓ Complete student and teacher materials for up to 20 class periods of activities.

HYDROGEN ON DEMAND

DESKTOP REFUELING STATION DESIGNED FOR EASY AND AUTOMATIC REFILLING

PRODUCT CODE:
LWH22-10L

HYDROSTIK PRO

capacity	10 l hydrogen
hydrogen purity	≥99.995%
cartridge size	ø22x88mm
weight	approx. 105g
storage material	AB5 metal hydride
rated charging pressure	3.0MPa
working	0-55°C (0-131°F)
service life	10 years

PRODUCT CODE:
FCH-20

HYDROFILL PRO

stack type	PEM electrolysis cell
dimensions (WxDxH)	145x153x208mm (5.7x6x8.2in)
weight	1.8kg ±5% (3.9Lbs ±5%)
rated power	≥23W
input voltage	DC:10V-19V
water input	de-ionized or destille water
water temperature	10-40°C (50-104°F)
water consumption	approx. 20ml/hr (1.2in/3hr)
H2 output pressure	0-3.0 MPaG (0-435.11 PSI)
H2 generation capacity	up to 3 l/hr (0-183 in/hr)
purity	99.995%
compatible cartridges	HYDROSTIK PRO
refilling time (cartridge)	around 4 hours (at 25°C)
stack weight (with fan & casing)	90g (±10g)

- ✓ Refill HYDROSTIK PRO with a tabletop electrolyzer
- ✓ Generate 1 O Lof H2 in as little as 4 hrs
- ✓ Create 99.99% pure H2 from distilled water
- ✓ Link to solar or wind for totally clean power
- ✓ Recharge HYDROSTIK PRO for diverse lab uses

**Dimensions (LxWxH): 20.9x15x10.3cm. Weight (kg/lbs) 0.36/0. 79*
Note: Hydrostik Pro is not included.

STEM KITS

Cienytec — Ciencia y Técnica — Tecnologías para Educación

WIND ENERGY

PRODUCT CODE:
FCJJ-37
RENEWABLE ENERGY
EDUCATION SET

HS CHEMISTRY — NUMBER OF EXPERIMENTS 10
HS PHYSICS — NUMBER OF EXPERIMENTS 6
PROBLEM BASED LEARNING UNIT

- ✓ Full PBL unit on clean power generation includes an exploration of the environmental effects of atmospheric carbon dioxide.
- ✓ Hands-on activities center on complementary attributes of different renewable energy sources.
- ✓ Complete student and teacher materials for up to 1 O class periods of activities.

Dimensions (LxWxH): 44x33x11 cm. Weight (kg/lbs) 2.0514.52

PRODUCT CODE:
FCJJ-37
HORIZON ENERGY MONITOR

ADD-ON

- ✓ Gather data from different energy sources
- ✓ Analyze results of multiple experiments
- ✓ Record real-time information
- ✓ Learn about Ohm's Law and electric circuits
- ✓ Measure amps, volts, watts, ohms, and more

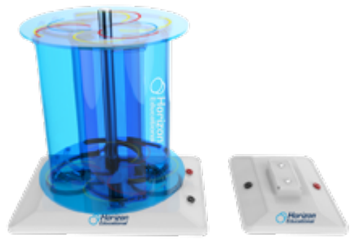
Dimensions (LxWxH): 14. 7x21 x10cm. Weight (kgllbs) 0.4310.95. Note: computer is not included.

PRODUCT CODE:
DA-100
DIGITAL ANEMOMETER

ADD-ON

- ✓ Air Velocity Measurement Range: 0.3 to 30m/s (±5%)
- ✓ Temperature Measurement Range: -10 to 50°C (±1°C)
- ✓ Humidity Measurement Range: 0%-99% (±5% at 20% -90%)
- ✓ Air Velocity Unit Selection: m/s, ft/min, knots, km/h, mph
- ✓ Resolution: 0.1 m/s, 1 %, 0.1
- ✓ Max/Min/Avg Reading Selection
- ✓ Auto Power Off (with override function)
- ✓ °C/°F selection
- ✓ Hold Function
- ✓ Wind-chill Indication
- ✓ Low Battery Warning
- ✓ Beaufort scale
- ✓ Calibration Function

Dimensions (LxWxH): 11.5x4x2cm. Weight (kgllbs) 0,06kg, 0.027/bs



PRODUCT CODE:
FCJJ-56
4 6
WIND TO HYDROGEN
EDUCATION KIT

- ✓ Explore stoichiometry, reaction rates, and other chemistry concepts by generating hydrogen from wind power.
- ✓ Use angular velocity, drag force, and other physics concepts to design and build an efficient wind turbine .

Dimensions (LxWxH): 32x23.5x14cm. Weight (kgllbs) 1.28/2.82

PRODUCT CODE:
FCJJ-39
4 6
WIND ENERGY
SCIENCE KIT

- ✓ Uniquely designed blade profile based on NASA aeronautics
- ✓ Most realistic wind turbine experimentation available on the market

Dimensions (LxWxH): 31x15.3x5.5cm. Weight (kg!lbs) 0.7/1.54

PRODUCT CODE:
RESK-01
2
VERTICAL AXIS WIND TURBINE
STEM KIT

- ✓ 3 different blade configurations
- ✓ More than 25 hours of activities covering physics and earth/environmental science
- ✓ Discover cutting-edge wind turbine technology

Dimensions (LxWxH): 20.9x15x10.3cm. Weight (kgllbs) Product assembled: 600g

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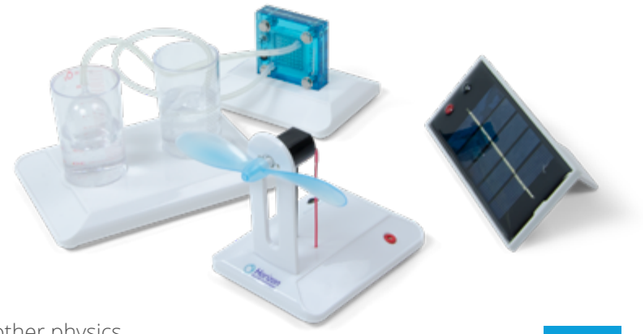
SMALL STEM KITS

HS CHEMISTRY NUMBER OF EXPERIMENTS 4

HS PHYSICS NUMBER OF EXPERIMENTS 6



PRODUCT CODE:
FCJJ-16
SOLAR HYDROGEN SCIENCE KIT

- ✓ Explore series and parallel circuits and other physics concepts with renewable energy power from a fuel cell and solar panel.
- ✓ Use the power of the Sun to split water and generate hydrogen gas while learning about chemistry concepts.

**Dimensions (LxWxH): 63x44x35cm. Weight (kg//bs) 0.56/1.23*

PRODUCT CODE:
FCJJ-44 MICRO FUEL CELL SCIENCE KIT

- ✓ Power a mini turbine by converting solid state hydrogen into electrical energy
- ✓ Explore the effect as the hydride slowly cools and releases hydrogen into the fuel cell

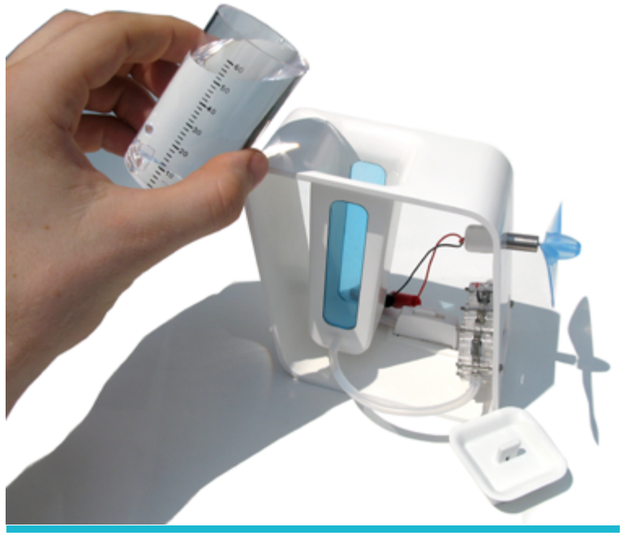
**Dimensions (LxWxH): 21x15x10cm. Weight (kgllbs) 0.41 0.88*

6

PRODUCT CODE:
FCJJ-38 THERMAL POWER SCIENCE KIT

- ✓ Discover the thermoelectric effect and the materials that cause it while performing experiments with a unique generator.
- ✓ Create an electric current using nothing more than temperature differences while investigating physics concepts.

**Dimensions (LxWxH): 29. 7x20.6x9. 7cm. Weight (kg/lbs) 0.64/1.40*



4

PRODUCT CODE:
FCJJ-34
SALT WATER FUEL CELL SCIENCE KIT

- ✓ Find aut how solution concentration can affect reaction rates using electricity and a salt water electrochemical cell.
- ✓ Experiment with electrochemistry processes and measure the output of your generator.

**Dimensions (LxWxH): 20.9x15x10.3cm. Weight (kgllbs) 0.3610.79*

PRODUCT CODE:
FCJJ-22
BIO-ENERGY EDUCATION SCIENCE KIT

4

- ✓ Understand the principles behind ethanol fuel cell technology
- ✓ Includes pH pa per to shows the change in the physical properties of the consumed ethanol fuel.

**Dimensions (LxWxH): 15x21 x1 O cm. Weight (kg!lbs) 0.3810.84*

PRODUCT CODE:
FCJJ-42
ETHANOL FUEL CELL SCIENCE KIT

3 3

- ✓ Investigate chemistry concepts such as pH and oxidation while running an ethanol fuel cell.
- ✓ Determine how to change the products of a combustion reaction involving ethanol.

**Dimensions (LxWxH): 30x21 x9. 7cm. Weight (kgllbs) 0.50/1.10*

PRODUCT CODE:
FCJJ-35 SUPERCAPACITOR SCIENCE KIT

- ✓ Discover the science behind capacitors and generators by using them to power simple electric circuits.
- ✓ Understand electric charge, electric current, and other physics concepts while using a generator to charge a capacitor.

**Dimensions (LxWxH): 30x21 x9. 7cm. Weight (kg/lbs) 0.59/1.30*

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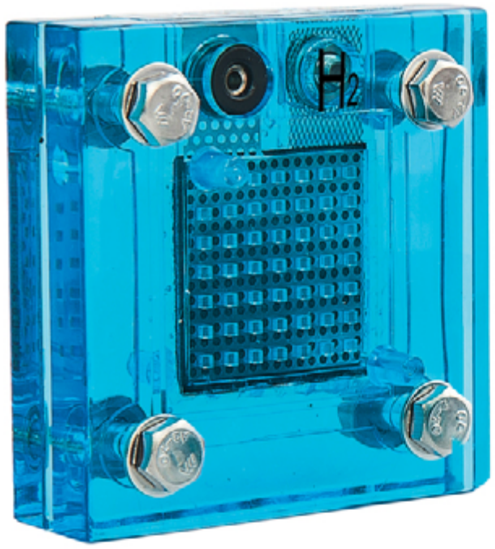
Tecnologías para Educación

PEM
FUEL CELLS



PRODUCT CODE:
FCSU-023B/023
PEM BLUE/TRANSPARENT
REVERSIBLE FUEL CELL

High performance reversible PEM fuel cell.

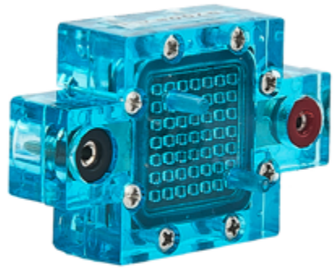
Dimensions (LxWxH): 21x15x10cm. Weight (kg/lbs) 0.61kg, 1.3lbs

Electrolyzer function:

- ✓ Input Voltage: 1.8V ~ 3V (DC)
- ✓ Input Current: ¬0.7A
- ✓ Hydrogen production rate: 7ml per minute at 1A
- ✓ Oxygen production rate: 3.5ml per minute at 1A

Fuel cell function:

- ✓ Iutput Power: 210mW
- ✓ Output Voltage: 0.6V (DC)
- ✓ Output Current: 360mA
- ✓ Oxygen production rate: 3.5ml per minute at 1A

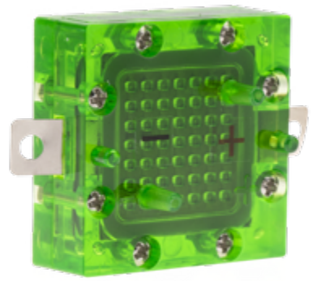


PRODUCT CODE:
FCSU-010B
PEM BLUE MINI FUEL CELL

High performance PEM fuel cell.

- ✓ Output Power: 270mW
- ✓ Output Voltage: 0.6V (DC)
- ✓ Output Current: 0.45A

Dimensions (LxWxH): 21x15x10cm. Weight (kg/lbs) 0.41kg, 0.9lbs



PRODUCT CODE:
FCSU-012G
PEM GREEN MINI FUEL CELL

PEM fuel cell, part of H-racer 2.0.

- ✓ Output Power: 270mW
- ✓ Output Voltage: 0.6V (DC)
- ✓ Output Current: 0.45A

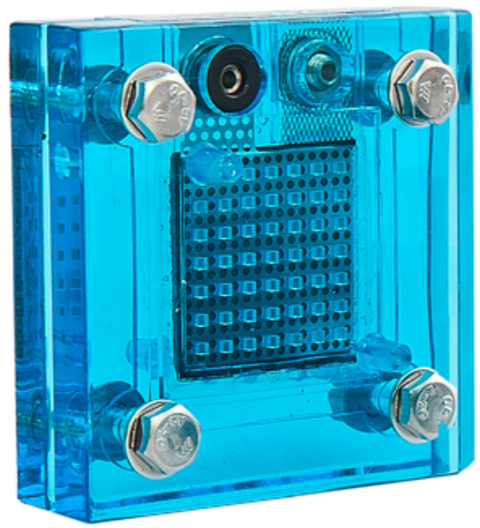
Dimensions (LxWxH): 21x15x10cm. Weight (kg/lbs) 0.37kg, 0.8lbs

PRODUCT CODE:
FCSU-012B
PEM BLUE
ELECTROLYZER

When applying an electrical current (solar or DC power) the electrolyzer produces hydrogen and oxygen from water.

- ✓ Input Voltage: 1.8V ~ 3V (DC)
- ✓ Hydrogen production rate: 7ml per minute at 1A
- ✓ Oxygen production rate: 3.5ml per minute at 1A

Dimensions (LxWxH): 21x15x10cm. Weight (kg/lbs) 0.41kg, 0.9lbs



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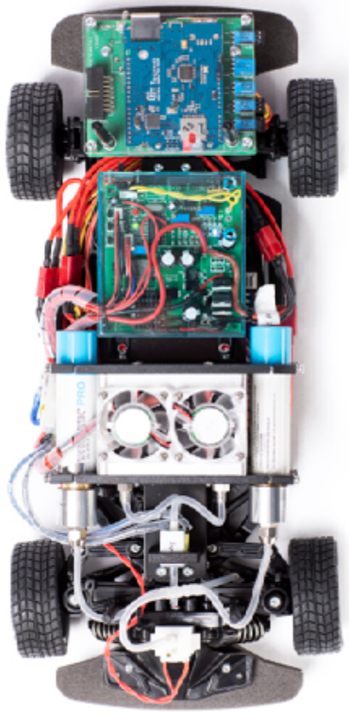
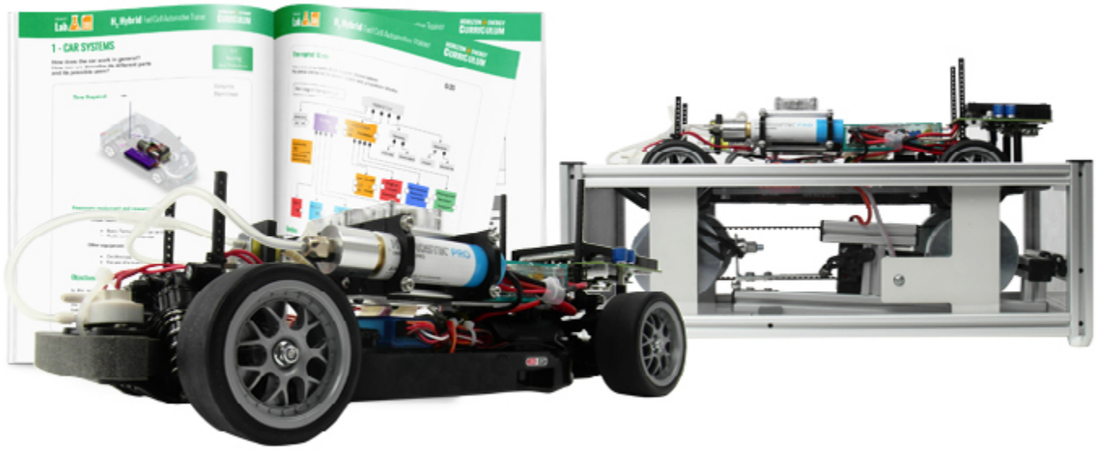
TECHNICAL
EDUCATION

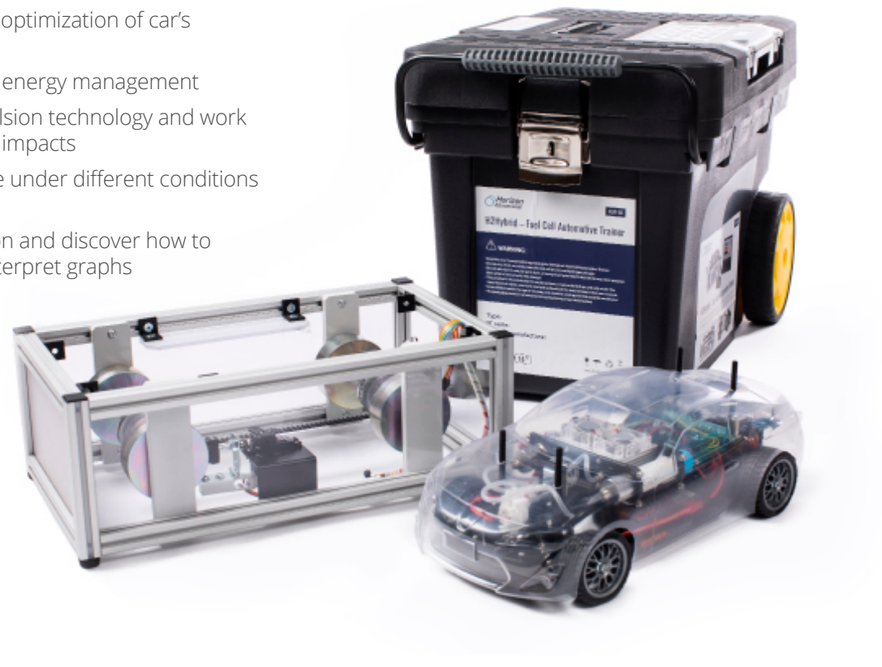




PRODUCT CODE:
FCAT-30

H2-HYBRID
FUEL CELL AUTOMOTIVE TRAINER

- ✓ Explore the difference between expected performance and experimental results
- ✓ Engineer new solutions for optimization of car's performance
- ✓ Examine the three fields of energy management
- ✓ Comprehend hybrid propulsion technology and work to minimize environmental impacts
- ✓ Measure the breaking force under different conditions with the roller test bench
- ✓ Learn about data acquisition and discover how to manipulate, analyze and interpret graphs



25+ LESSONS

COMPLETE RESOURCES FOR ADVANCED EXPERIMENTS

CAR SYSTEMS
1.1. Steering and Propulsion
1.2. Using Electrical Energy to Power the Vehicle
1.3. Transmitting Mechanical Energy
1.4. Speed and Consumption of Energy
1.5. Measuring Changes in Electrical Energy

THE ROLE OF HYDROGEN
2.1. Understanding the hydrogen fuel cell
2.2. Understanding modern batteries
2.3. Comparing sources of electricity

ENERGY NEEDS
3.1. Using models to describe the car's motion
3.2. MATLAB: Simulating the car's motion
3.2. OpenModelica: Simulating the car's motion
3.3. Making measurements on the track
3.4. Making measurements on the charging bench

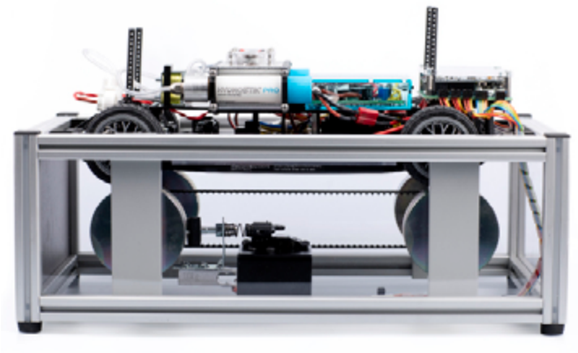
SYSTEM ADAPTABILITY
4.1. Providing power
4.2. H-Cell power
4.3. Influence of the arrangement of the components of the fuel cellr
4.4. Effects of the arrangement of the Hydrostiks

MANUFACTURER'S DECISIONS
5.1. Making measurements on the track
5.2. Making measurements on the charging bench
5.3. Energy consumption
5.4. Sustainable development

CUSTOMIZING YOUR CAR
6.1. Changing how you drive
6.2. Changing the components of the energy system of the car
6.3. Reducing various forms of resistance to motion
6.4. Changing the mode of hydrogen production

LESSON PLANS

- ✓ 6 months of curriculum in physics, chemistry and engineering
- ✓ Students and teachers' material
- ✓ Hands-on experiments and problem based



FUEL CELL STACKS

We offer the widest range of standard “off-the- shelf” PEM fuel cell systems today from 10W to 5 kW (deliverable within 1 to 4 weeks), as well as customized fuel cell system configurations up to 30kW.

Our standard systems are modular, simple, efficient, and feature one of the highest power densities available in the world opening new possibilities for integration & commercialization.

12W

PRODUCT CODE:

FCS-B12

- ✓ Integrated fan and casing 12W stack with blower
- ✓ 12W stack with blower

**Dimensions (LxWxH): 7.5x4. 7x7cm.*
Weight (kg!lbs) 0.2710.60

30W

PRODUCT CODE:

FCS-B30

- ✓ Miniature electronic valve
- ✓ Control electronics
- ✓ Integrated fan and casing
- ✓ Low voltage protection
- ✓ 30W stack with blower

**Dimensions (LxWxHJ: 8x4. 7x7.5cm.*
Weight (kg/lbs) 0.27/0.60

20W

PRODUCT CODE:

FCS-B20

- ✓ Miniature electronic valve
- ✓ Control electronics
- ✓ Integrated fan and casing
- ✓ Low voltage protection
- ✓ 20W stack with blower

**Dimensions (LxWxH): 7.5x4. 7x7cm.*
Weight (kg!lbs) 0.2710.60

	12 W	20 W	30 W
Type of fuel cell	PEM	PEM	PEM
Number of cells	13	13	14
Rated power	12W	20W	30W
Rated performance	7.8V@1.5A	7.8V@2.6A	8.4V@3.6A
Purging valve voltage	6V	6V	6V
Blower voltage	5V	5V	5V
Reactants	Hydrogen and Air	Hydrogen and Air	Hydrogen and Air
Ambient temperature	5-30°C (41-86°F)	5-30°C (41-86°F)	5-30°C (41-86°F)
Max stack temperature	55°C(131°F)	55°C(131°F)	55°C(131°F)
Hydrogen pressure	0.45-0.55Bar	0.45-0.55Bar	0.45-0.55Bar
Humidification	Self-humidified	Self-humidified	Self-humidified
Cooling	Air (integrated cooling fan)	Air (integrated cooling fan)	Air (integrated cooling fan)
Stack weight (with fan & casing)	275g(±30g)	275g(±30g)	280g(±30g)
Controller weight	90g(±10g)	90g(±10g)	90g(±10g)
Stack size	75x47x70mm	75x47x70mm	80x47x75mm
Flow rate at max output	0.18L/min	0.28L/min	0.42L/min
Hydrogen purity	≥99.995% dry H_2	≥99.995% dry H_2	≥99.995% dry H_2
Start up time	≤30s (ambient temp.)	≤30s (ambient temp.)	≤30s (ambient temp.)
Efficiency of system	40% at full power	40% at full power	40% at full power

PRODUCT CODE:

FCS -C100 100W

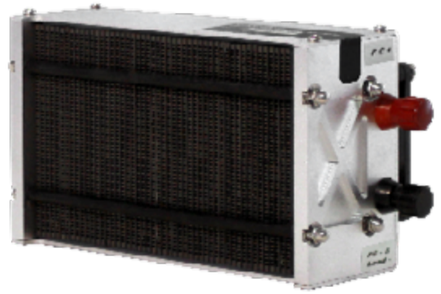
FCS – C60 60W ON DEMAND

- ✓ Connections/Tubing
- ✓ Electronic valves
- ✓ Electronic control box
- ✓ 100W stack with blower
- ✓ Fuel cell ON/OFF switch
- ✓ SCU ON/OFF switch

**Dimensions (LxWxH): 118x104x94mm. Weight : 1460g (±50g))*

PRODUCT CODE:

FCS -C200 200W



**Dimensions (LxWxH): 118x183x94mm. Weight: 2230g (±50g)*

FUEL CELL STACKS FROM 60W TO 500W

PRODUCT CODE:

FCS -C300 300W

- ✓ Connections/Tubing
- ✓ Electronic valves
- ✓ Electronic control box
- ✓ 300W stack with blower
- ✓ Fuel cell ON/OFF switch
- ✓ SCU ON/OFF switch

**Dimensions (LxWxH): 118x262x94mm Weight: 3000g(±30g)*

PRODUCT CODE:

FCS -C500 500W

- ✓ Connections/Tubing
- ✓ Electronic valves
- ✓ Electronic control box
- ✓ 500W stack with blower
- ✓ Fuel cell ON/OFF switch
- ✓ SCU ON/OFF switch

**Dimensions (LxWxH): 130x268x123mm*
Weight: 3370g (±50g)

	100 W	200 W	300W	500W
Type of fuel cell	PEM	PEM	PEM	PEM
Number of cells	20	40	60	24
Rated power	100 W	200 W	300 W	500 W
Rated performance	12V@8,3A	24V@8.3A	36V@8.3A	14.4V at 35A
Purging valve voltage	12V	12V	12V	12V
Blower voltage	12V	12V	12V	12V
Reactants	Hydrogen and Air	Hydrogen and Air	Hydrogen and Air	Hydrogen and Air
Ambient temperature	5-30°C (41-86°F)	5-30°C (41-86°F)	5-30°C (41-86°F)	5-30°C (41-86°F)
Max stack temperature	65°C (149°F)	65°C (149°F)	65°C (149°F)	65°C (149°F)
Hydrogen pressure	0.45-0.55Bar	0.45-0.55Bar	0.45-0.55Bar	0.45-0.55Bar
Humidification	Self-humidified	Self-humidified	Self-humidified	Self-humidified
Cooling	Air (integrated cooling fan)	Air (integrated cooling fan)	Air (integrated cooling fan)	Air (integrated cooling fan)
Stack weight (with fan & casing)	1460g (±50g)	2230g (±50g)	3000g(±30g)	3370g (±50g)
Controller weight	400g (±30g)	400g (±30g)	400g (±30g)	627g (±30g)
Stack size	118x104x94mm	118x183x94mm	118x262x94mm	130x268x123mm
Flow rate at max output	1.3L/min	2.6L/min	0.42L/min	6.5L/min
Hydrogen purity	≥99.995% dry H_2	≥99.995% dry H_2	≥99.995% dry H_2	≥99.995% dry H_2
Start up time	≤30s (ambient temp.)	≤30s (ambient temp.)	≤30s (ambient temp.)	≤30s (ambient temp.)
Efficiency of system	40% @12V	40% @24V	40% at 36V	40% at 14.4V

FUEL CELL STACKS FROM 1KW TO 5KW

PRODUCT CODE:

FCS-C1000 1KW

- ✓ Connections/Tubing
- ✓ Electronic valves
- ✓ Electronic control box
- ✓ 1000W stack with blower
- ✓ Fuel cell ON/OFF switch
- ✓ SCU ON/OFF switch

Dimensions (LxWxH): 264x203x104mm. Weight: Approx. 5kg

PRODUCT CODE:

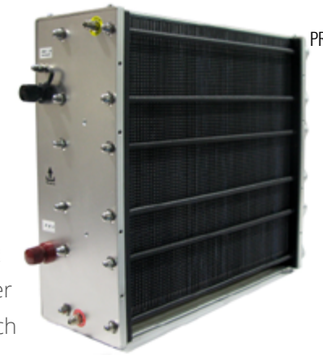
FCS-C2000 2KW

- ✓ Connections/Tubing
- ✓ Electronic valves
- ✓ Electronic control box
- ✓ 2 KW stack with blower
- ✓ Fuel cell ON/OFF switch
- ✓ SCU ON/OFF switch

Dimensions (LxWxH): 303x350x183mm. Weight: 2500g (±100g)

PRODUCT CODE:

FCS-C3000 3KW



- ✓ Connections/Tubing
- ✓ Electronic valves
- ✓ Electronic control box
- ✓ 3 KW stack with blower
- ✓ Fuel cell ON/OFF switch
- ✓ SCU ON/OFF switch

Dimensions (LxWxH): 418x350x183mm. Weight: 2500g (±100g)

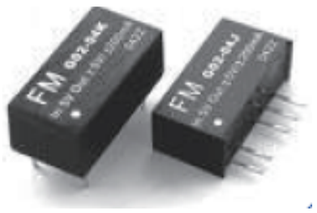
PRODUCT CODE:

FCS-C5000 5KW

PRODUCT CODE:

- ✓ Connections/Tubing
- ✓ Electronic valves
- ✓ Electronic control box
- ✓ 5 KW stack with blower
- ✓ Fuel cell ON/OFF switch
- ✓ SCU ON/OFF switch

Dimensions (LxWxH): 650x350x212mm. Weight : 2500g (±100g)



	1 KW	2 KW	3 KW	5 KW
Type of fuel cell	PEM	PEM	PEM	
Number of cells	50	48	72	120
Rated power	1 KW	2 KW	3 KW	5 KW
Rated performance	30V at 33.5A	28.8V at 70A	43.2V at 70A	72V at 70A
Purging valve voltage	12V	12V	12V	12V
Blower voltage	12V	12V	12V	12V
Reactants	Hydrogen and Air	Hydrogen and Air	Hydrogen and Air	Hydrogen and Air
Ambient temperature	5 - 35°C (41-95°F)	5 - 35°C (41-95°F)	5 - 35°C (41-95°F)	5 - 35°C (41-95°F)
Max stack temperature	65°C (149°F)	65°C (149°F)	65°C (149°F)	65°C (149°F)
Hydrogen pressure	0.45-0.55Bar	0.45-0.55Bar	0.45-0.55Bar	0.45-0.55Bar
Humidification	Self-humidified	Self-humidified	Self-humidified	Self-humidified
Cooling	Air (integrated cooling fan)	Air (integrated cooling fan)	Air (integrated cooling fan)	Air (integrated cooling fan)
Stack weight (with fan & casing)	Approx. 5kg	14.1kg (±200g)	15kg (±200g)	30kg (±200g)
Controller weight	Approx.1.9kg	2500g (±100g)	2500g (±100g)	2500g (±100g)
Stack size	264x203x104mm	303x350x183mm	418x350x183mm	650x350x212mm
Flow rate at max output	12.5L/min	26L/min	39L/min	65L/min
Hydrogen purity	≥99.995% dry H_2	≥99.995% dry H_2	≥99.995% dry H_2	≥99.995% dry H_2
Start up time	≤30s (ambient temp.)	≤30s (ambient temp.)	≤30s (ambient temp.)	≤30s (ambient temp.)
Efficiency of system	48% at 30V LHV (net)	40% at 28.8V	40% at 43.2V	40% at 72V

NOTE!

Make contact with our team to explore accessories, new D/DC power conversion devices, H2 Sensor, Ultracapacitor and other system components you may need.

XP SERIES FUEL CELL **STACKS**

PRODUCT CODE:

H-1000 XP FUEL CELL STACK

Dimensions (LxWxH): 203x104x264mm. Weight : 5kg

PRODUCT CODE:

H-500/1000 XP FUEL CELL STACKS

Horizon's XP-series systems are the most fuel efficient available on the market - ideal for use in efficiency competitions such as Shell Ecomarathon.

- ✓ Connections/Tubing
- ✓ Electronic valves
- ✓ Electronic control box H-500/H-1000 stack with blower
- ✓ Stack holder
- ✓ LCD Display
- ✓ SCU ON/OFF switch
- ✓ Start up battery connector
- ✓ Ambient temperature sensor
- ✓ Blower controller

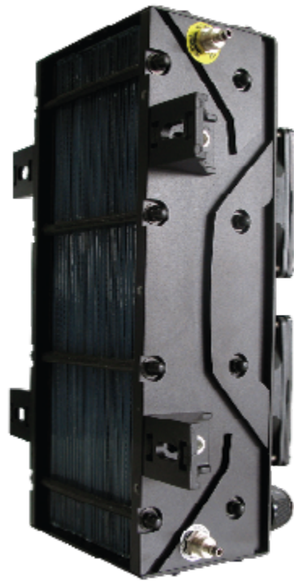
Optional components:

- ✓ Monitoring software
- ✓ Hydrogen sensor
- ✓ DC/DC converter
- ✓ Ultracapacitor bank

PRODUCT CODE:

H-500 XP FUEL CELL STACK

Dimensions (LxWxH): 130x203x52mm Weight : 3.9kg



	H-500	H-1000
Type of fuel cell	PEM	PEM
Number of cells	30	50
Rated power	500W	1000W
Rated performance	18V@27.8A	30V@33.5A
Reactants	Hydrogen and Air	Hydrogen and Air
External temperature	> 0 up to +35°C	5-35°C
Max stack temperature	63°C	65°C
Composition	99.99% dry H_2	99.99% dry H_2
H2 pressure	7.2-9.4 PSI	7.2-9.4 PSI
Humidification	Self-humidified	Self-humidified
Cooling	Air	Air
Weight	3.9kg	5kg
Dimensions	130x203x52mm	203x104x264mm
Flow rate at rated output	5.86L/min	15.5L/min
Peak efficiency of stack	56%	59%

OUR **TEAM**

COLOMBIA

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