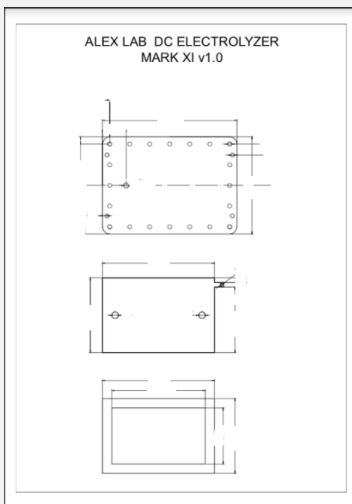


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#0001 Laboratory electrolyser

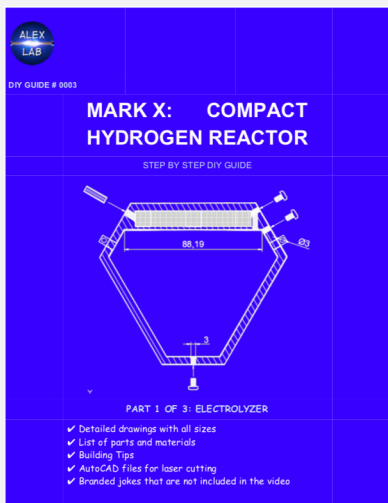
Blueprints of the body, plates and rubber gaskets of the laboratory electrolyser.

Gas generation rate is 1-3 liters per minute.

Power 100-300 W.

Detailed instructions for the manufacture and assembly of similar electrolyzers can be found in the following parts #0006 #0011 #0012.

#0002 PDF guide was vanished.

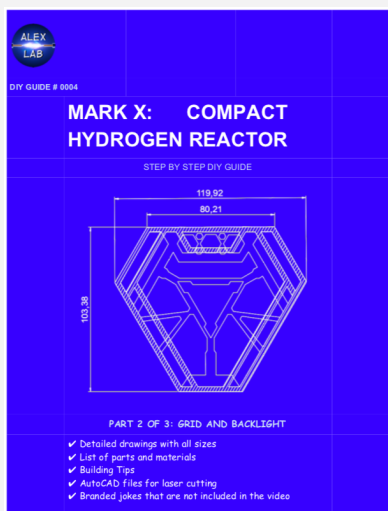
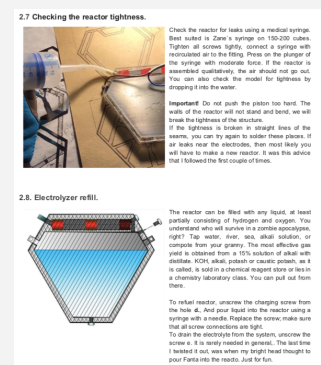
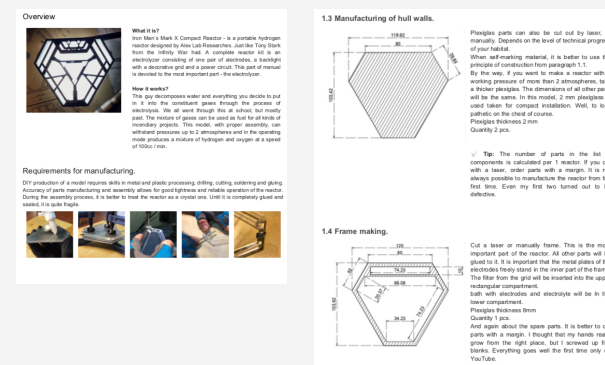


#0003 Compact electrolyser Mark X

Iron Man Nano Reactor) Portable electrolyzer with one pair of plates in a plexiglass housing. Productivity is 0.5-1 liters of Brown Gas per minute.

Power up to 100W. The construction includes a stainless steel foam filter.

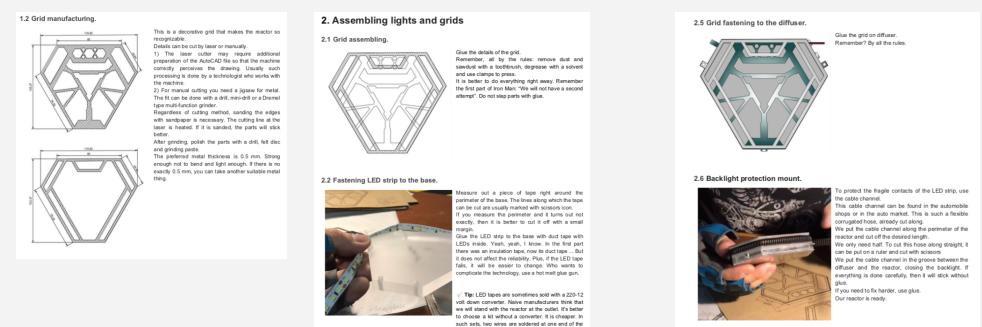
.dwg files for laser cutting of parts are attached



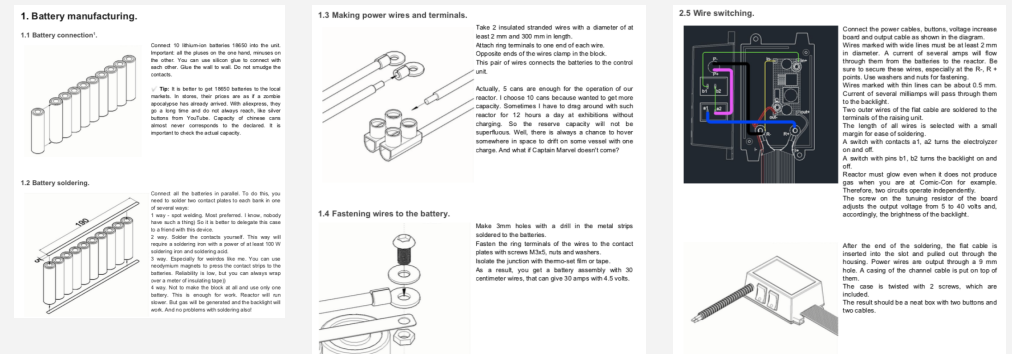
#0004 Grid and lights for Mark X electrolyzer

Instructions for making authentic decorative two-layer grating for the Iron Man reactor and lighting for it.

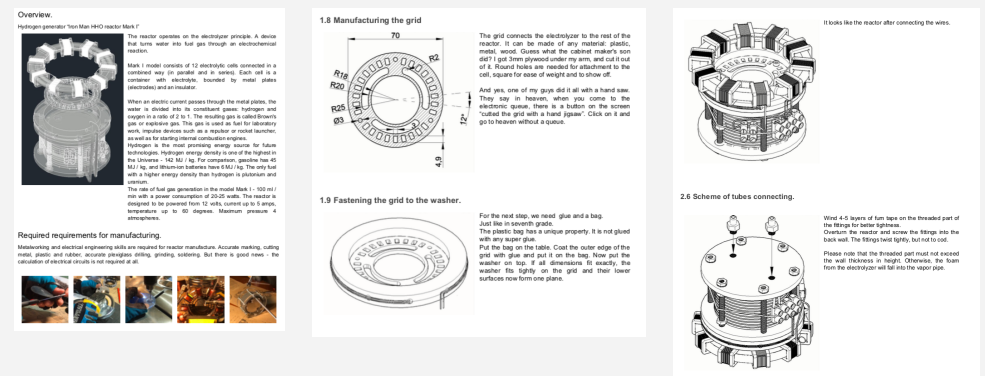
.dwg files for laser cutting of parts are attached



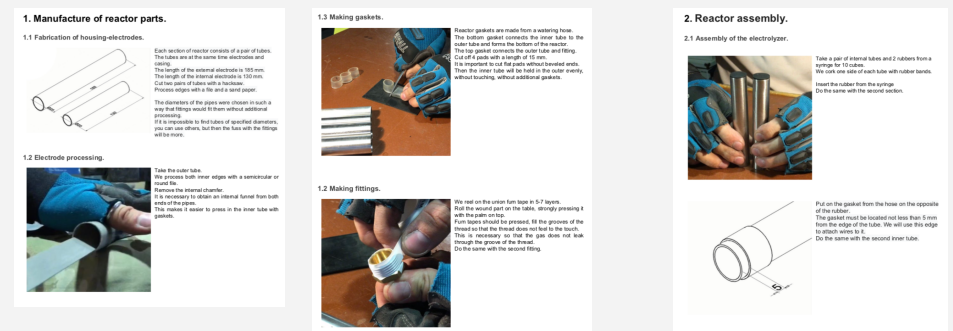
Instructions for making a portable power supply for the Mark X.
The electrolyser and lightning have different supply voltages. This shows
how to assemble and connect the entire load from one battery block.



Legendary Iron Man electrolyser reactor. Power 100-300 W. Productivity is 1-3 liters of Brown Gas per minute. Suitable for powering Iron Man Repulsor, gauntlet rocket launcher, artificial muscles and other gadgets. Perfect model for practicing metal & electrical parts manufacturing skills, and electrolyzers production
.dwg files for laser cutting of are attached



Electrolyzer model from a pair of coaxial tubes. Low productivity is compensated by simplicity of manufacture)
If it were necessary to make an electrolyzer in the conditions of a zombie apocalypse, then it would look exactly like this.

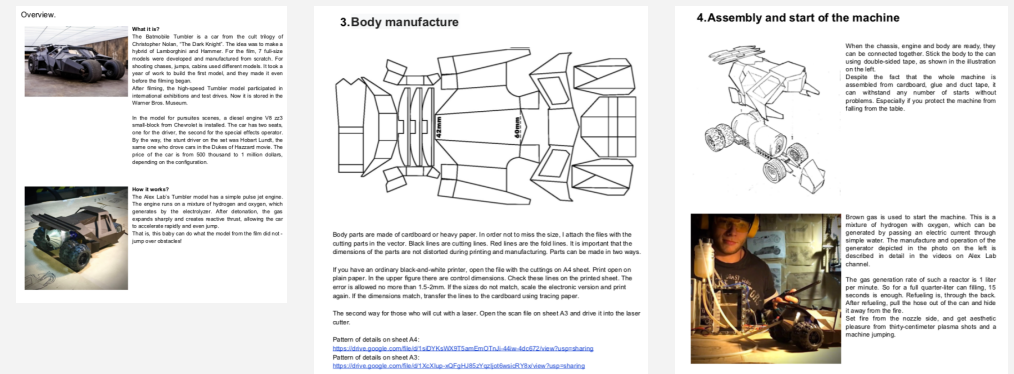


#0008 Jet Batmobile Tumbler



How to make a model of an epic Batmobile with the simplest pulsating jet engine from improvised means. Fueled with hydrogen, powered by any of the electrolyzers.

.cdr files for cutting paper parts are nested.

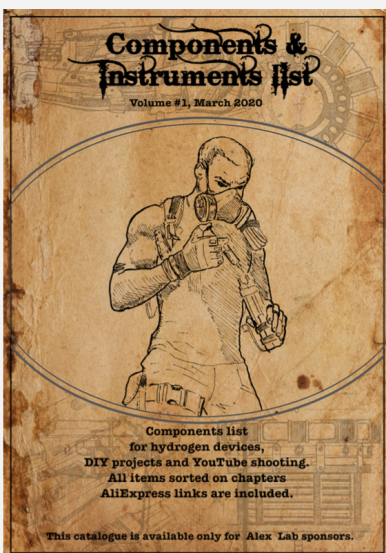
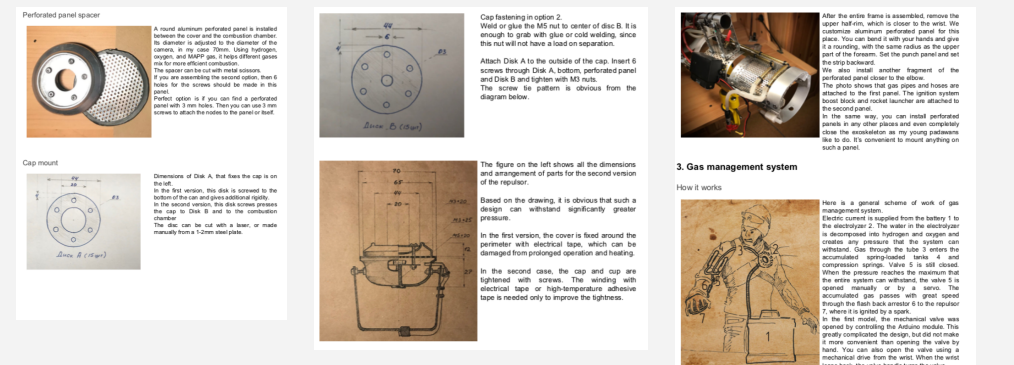
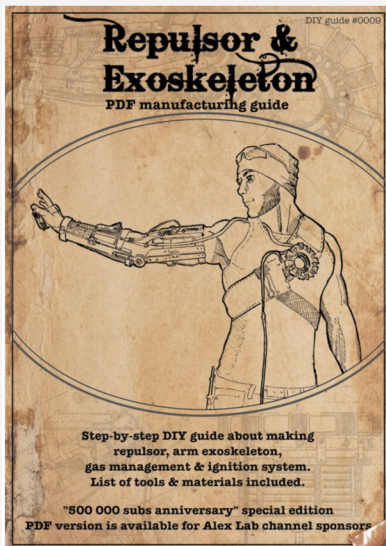


#0009 Iron Man Repulsor and Exoskeleton

Coming to the most epic gadgets! Plasma Burst Repulsor and part of Alex Lab's Iron Man Exosuit (gauntlet). Tools and materials, parts and step-by-step manufacturing guide.

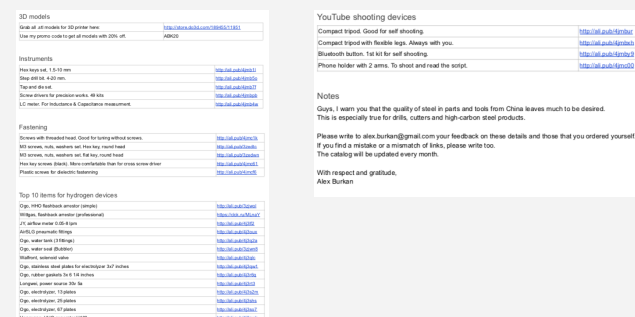
The best project for practicing metalworking and electrical skills.

The device is powered by Iron Man's reactor # 0006



#0010 Alex Lab tools and parts catalog

List of hand and power tools, materials, parts, spare parts, equipment for shooting, etc. You will save weeks of your life if you use this file) The catalog is regularly updated.

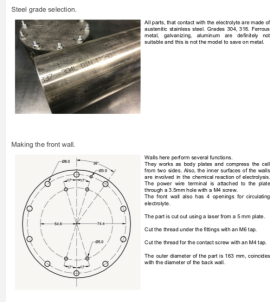


#0011 High pressure electrolyser

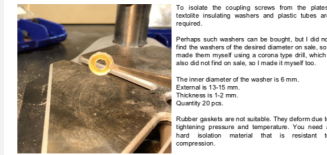


Device for generating Brown Gas under high pressure. This cell was used as a hydrogen accelerator for a pit bike. Circulation tank is also described. .dwg files for laser cutting are attached

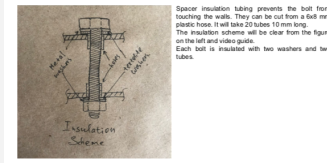
1. The manufacture of electrolytic cell parts.



Making of insulating spacers.

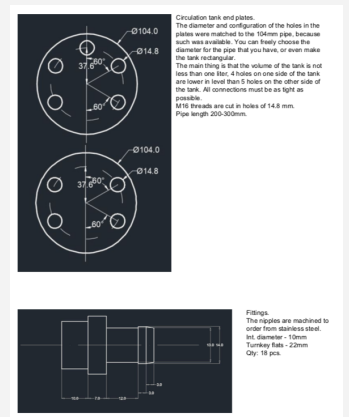
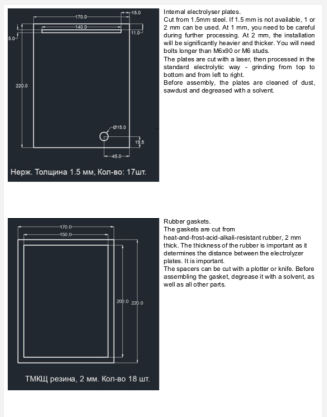
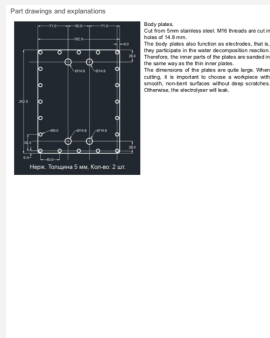
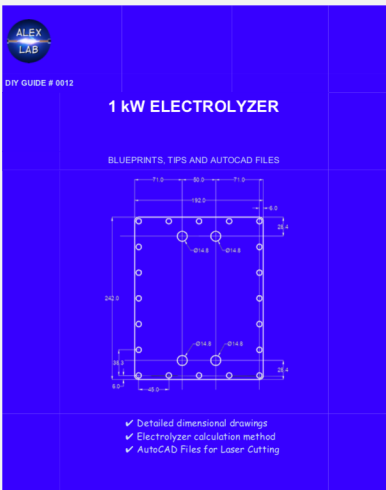


Making spacer tubes.



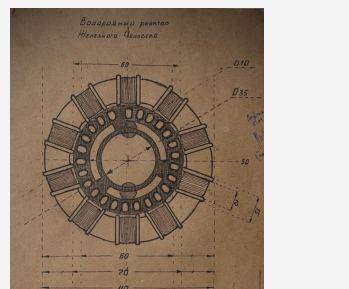
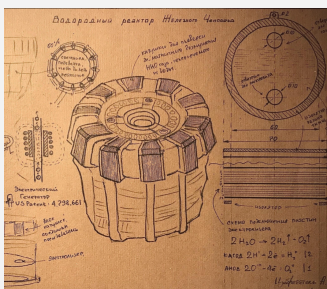
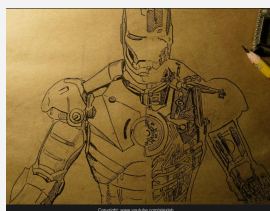
#0012 1kW Electrolyzer

Powerful electrolyzer for 1-2 kW, gas generating rate up to 20 liters per minute. Suitable for hydrogen cutting, welding, car engine cleaning and other purposes where a high rate of hydrogen and oxygen generation is required.

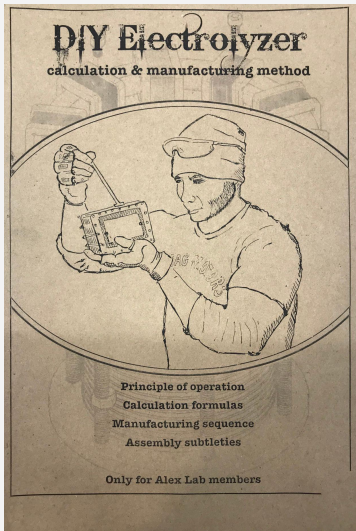


#0013 Iron Man suit Sketches

Craft sketches and drawings of the Iron Man exosuit, reactor and repulsor in good quality.



#0014 Methodology for calculating and manufacturing electrolyzers



In this work, I summarize the knowledge and skills for building electrolyzers. Principles of operation, method of calculating the power and rate of gas generation, production sequence. The manual is regularly updated with new editions.

THEORY THE ELECTROLYZER OPERATION

Electrolysis, General information

What is electrolysis



Electrolysis is a physical and chemical process when an electric current is passed through different liquids. This is done for various good deeds.

Sometimes it is necessary to transfer the necessary substances from the solution and separate them from others. Sometimes, to cover the pieces of iron with some kind of coating, for example, liquid or copper.

In our efforts and in this manual, we are considering a specific case of electrolysis - electrolysis of water and dilute solutions.

to do this in order to obtain fuel gas.

What is an electrolyzer



An electrolyzer is a device in which the very process of electrolysis takes place. The simplest electrolyzer can be obtained from a glass of water and a simple energy source (cell). This is exactly what Michael Faraday did in 1800, only instead of the salt shaker, he used huge chemical batteries.

In short, this is the main thing that we need to know for our work. An electrolyzer is a device that converts water or a light alkaline solution into a flammable gas.

The electrolyzer does not require energy in itself, only direct current electricity. It just converts electrical energy into energy of combustible gases with greater or lesser efficiency. The rest of the labor is devoted to how to get the most out of this process and build a safe for this.

At the present stage of development of science and technology, the electrolyzer is used in industry, laboratory research and in independent research by scientists and enthusiasts around the world. In industry, water electrolysis is treated as one of the few ways to obtain highly-pure hydrogen ("Green" hydrogen). Laboratory researches of electrolyzers are mainly devoted to methods of increasing the yield of fuel gas with less energy consumption using pulsed currents, experiments with different catalysts, etc. Enthusiasts, enthusiasts and even "YouTubers" use the electrolyzer as a simple source of clean fuel that can be easily obtained in any quantity.

Electrolyzer calculation method

A rough estimate

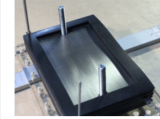
When calculating an electrolyzer and any other power equipment, the main thing is to start with the right questions. In terms of the electrolyzer, these questions are:

- What is the rate of gas generation needed?
- How much power is needed?
- Do I need to store gas under pressure?
- All other parameters, materials, dimensions and parts characteristics will depend on the answers to these questions. In general, the course of questions when calculating is as follows:
- What for do I need an electrolyzer? For experimentation or for a specific task?
- If for a specific task, then for which one? Jewelry welder? A motorcycle accelerator? Fuel source for the Iron Man suit? To power a robot, artificial muscle, robot launcher, or something else?
- This means that the more the generation rate is needed, the larger the plates and the electrolyzer itself will be. Then what is the ratio of these parameters?
- The greater the generation rate and size, the more current is needed, that is, power.
- In which mode do I want to use gas? Constant flow or accumulate under pressure? If you build up under pressure, then how much pressure is needed?
- And of course, the larger the installation, the more expensive it will be.

To help you navigate the parameters, see the table. The ratios are very approximate, but they will help you imagine the scale of a future installation.

Purpose of electrolyzer	Generation rate (electrochemical)	Approximate dimensions of the electrolyzer	Required power, in kW
Just for a small fan	any - 0.05	20-50 cm springs	0.001-0.05
Small bench from a medicine syringe	0.05-0.5	50-100 cm springs	0.05-0.5
Iron Man suit power	1	Iron Man reactor	0.1
4400 booster for car or bike	2-3	1 liter saucapump. More precisely, a cylinder with a diameter of 180mm and a height of 70mm	0.2-0.5 (depends on mode)
Hydrogen outlet for steel	5-10	Blue size 20x160x70 mm	0.3-1
Hydrogen Engine Chugging / Industrial Generation of "Brown Gas"	20	From size of a bathtub to the dimensions of a train car	from 20 and more

Separating a common bath. Calculation of supply voltage.



In an electrolyzer with a common bath, all contacts are in one container and have the only possible connection method - connect each plate. This means that the common bath must be divided into several, that is, to make sure that the water between the first and second plates does not contact (or almost does not contact) with water between the second and third plates. One of the ways is to separate the plates with rubber spacers. Then each two plates will form a separate cell.

In such a scheme, it is no longer necessary to connect each plate. You can connect the first and third. So, 3 plates form two separate cells. Each cell, regardless of size, needs a voltage of 2 volts. What voltage should be applied to the first and last plates? That's right, 4 volts. In this case, the current can remain the same. Now we can easily calculate the supply voltage of any electrolyzer. You need to take the number of cells and multiply this number by 2. But in practice, if we can make absolutely any number of cells, then it is more convenient to adjust their number to standard power supplies.

Standard voltage, in V	Number of cells and (plates)	Power supply
2	1 (2)	Lithium Ion 18650 Battery
4	2 (4)	9V battery
12	6 (12)	Standard on-board power supplies, motorcycle and car batteries
30-36	15 (30)	Assemblies of lithium-ion batteries for electric vehicles, batteries from scooters, etc.
110	55 (110)	US Standard Voltage
220	110 (111)	Standard voltage for non-US outlets

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Disclaimer #1.

Some of the devices described in these instructions may pose a danger to life and health if the safety rules are violated. Some devices are designed to generate and accumulate a highly flammable gas under pressure. The main difference between HHO (Brown Gas) and other fuel gases is that it contains both fuel and oxidizer in an ideal stoichiometric ratio for ignition. This means that if a flame enters the system, the system will no longer exist.

Please be careful and follow safety precautions when working.