(MF-KIT) INSTRUCTIONS FOR MAKING LOW AMP HIGH TEMP MAGFIRE ELECTRIC MATCHES

CAUTION:

Making electric matches is a dangerous activity.
If you do it wrong, you could hurt yourself very badly or start a fire.
<u>Before you start</u> read the instructions completely.

- First and foremost, think safety. The attitude to have is that *there could* be an accident. Think about what could go wrong, about what you could do to prevent that from happening, and what you would do if something did go wrong. For instance, if there were a fire, where would you go to escape? **Never attempt to extinguish a magnesium fire!!!!**
- You should only mix these chemicals in a well-ventilated area away from any heat source or sparks.
- Your kit comes with several jars of chemicals. To maintain a good seal on the jars keep their lids screwed on tight. Keep the inside of the lids and the lips of the jars clean and free from any unused pyrogen.
- Wear a long sleeve cotton shirt, and long cotton pants. In the event of a flash fire, cotton garments will protect your skin. Do NOT wear synthetics. In a flash fire, they will melt to your skin.
- Use eye protection. Plastic safety goggles will protect your eyes in the event of a flash fire.
- Do not allow small children near these chemicals.
- Never stare directly at a burning electric match without the aid of welding goggles.
- Do not store any mixed chemicals or finished electric matches in an inhabited building.
- Store this product in an environment that will be maintained at a temperature between -20 to 140 degrees F.
- Wash hands thoroughly after each use.
- Dispose of any leftover or unwanted pyrogen in accordance with all applicable laws. We recommend that you burn it. Storage life of unused pyrogen has not been determined at this time.

Electric matches (often called e-matches) are used to ignite the ejection charge for the recovery parachute on rockets. Unlike most other brands our electric match can also be used to ignite 24 or 29mm rocket motors. Once they are made, they are fairly safe to use and handle. The small explosion made by an e-match is about the same power as a toy cap. But they are friction and impact sensitive, so some care should be taken in using them around black powder ejection charges or other explosive compositions. Because we use magnesium these matches give off a tremendous volume of thermal energy.

An e-match can be used only one time. They work this way. At the heart of each e-match is a very thin nichrome wire bridging a small gap on the leading edge of the MF-12. This nichrome wire is soldered at both ends to ensure good contact. When an electrical current is introduced to the wire, it heats up and melts. The heat from the melting wire then ignites the pyrotechnic material ("pyrogen") coating the tip of the e-match. It is this ignition, which creates the characteristic pop or snap sound of the e-match explosion. This e-match can be ignited using a single Duracell 1.5 volt AA battery**. NOTE: Capacitive Discharge ignition systems ARE NOT RECOMMENDED and will most likely fail to properly ignite this match.**

The MagFire kit has been designed to make it easy for you to make electric matches. All the materials have been pre-measured for you. To maintain the highest possible reliability we do not recommend using the MagFire kit with anything other than our MF-12 wire. Because there are so many variables in making e-matches, we cannot guarantee your success with them. **NOTE: WE STRONGLY RECOMMEND THE USE OF ONLY ONE E-MATCH PER EJECTION CHARGE**. By following the steps on the backside of this page, you should be able to make hundreds of very reliable e-matches, which will ignite just about any kind of explosive composition or fuse.

How to Make Electric Matches

1. Using a digital ohm meter test each MF-12 for continuity prior to dipping them into the pyrogen. The resistance reading should be approximately 1.0 ohm (+) or (-) 0.2 of an ohm. If your ohm meter shows that the MF-12 is open or a very low resistance is indicated (short) **DO NOT USE** the MF-12 as it will fail to ignite the pyrogen. Notify us of the defective item so that we may replace it free of charge. Throw the defective match away so that you do not mistakenly end up using it.

2. Shake bottle **A** containing the wet inactive pyrogen back and forth for several seconds. Place the bottle on a flat level surface and remove the cap. Use the wooden coffee stir in your kit to mix the contents until you achieve a smooth consistency. Never use a metal object to stir any of the bottles in your ematch dip kit.

3. Shake bottle **B** containing the white powdery oxidizer for several seconds. Then place on a flat level surface and remove the cap. Next, cut about a 1/2 inch off the bottom of the provided paper cup. Use this as a funnel. Place the funnel into bottle **A** and add about 1/2 of the dry contents of bottle **B**, mixing it into the pyrogen in bottle **A**, repeat this procedure until nearly all the contents in bottle **B** have been added to bottle **A**. Some clinging of the contents in bottle **B** may occur and is normal. Continue stirring until well mixed.

4. The pyrogen is now activated. It should have the consistency of Hershey's chocolate syrup at room temperature. When you remove the wooden coffee stirrer, the pyrogen clinging to it should slowly run off. If the pyrogen is too thick, take the provided pipette and draw up a few drops of thinner (**MEK)** (in bottle **D*)** and stir it into the mixture. Keep adding a few drops at a time until the pyrogen reaches the proper consistency. If you add too much MEK and the pyrogen becomes too thin or runny, just leave the lid off of the pyrogen bottle for a while for the solvent to evaporate. Stir the pyrogen mixture occasionally, until it thickens to the right consistency. ***Do not use anything other than MEK (Methyl Ethyl Ketone) to thin this mix**. **CAUTION: Never use the same end of the stir stick when mixing or thinning pyrogen and sealer. The point is, do not allow the sealer to become contaminated with the pyrogen or the pyrogen to become contaminated with the sealer.**

5. Next, lower the element wire end of the MF-12 into the pyrogen until the pyrogen completely coats the exposed element wire. Now lift the electric match slowly out of the pyrogen. Once you have cleared the pyrogen in the bottle gently shake the wire up and down in a rapid fashion to remove any excess pyrogen. If you end up removing too much pyrogen just re-dip the match. ***Note: You should stir the pyrogen every 5 minutes during the dipping process to prevent any settling of the contents.*** If you're only making a few e-matches you can use a board with tiny nails on it spaced 3 inches apart and hang the matches on the nails with the match head pointing downward while they dry. If your going to make many e-matches we recommend you suspend a long wire between two objects and hang your e-matches on this wire to dry. Allow 1/2 hour (70F, 50% RH) to 1 hour (50F, 70% RH) drying time, depending on the temperature and humidity. If in doubt, allow a longer dry time.

6. **CRITICAL:** You must finish your ematch with the red sealer in bottle **C**. This sealer is compatible with the match composition. Once applied, it provides a necessary waterproof seal. It also reduces the e-match's sensitivity to friction. This helps to reduce the chance of accidental ignition. The sealer also ensures proper ignition of the pyrogen on the match head. Open the lid on bottle **C** and place it on a flat surface. Next, lower the finished match head into the waterproofing sealer so that the sealer covers all of the pyrogen and then just a little more. Remove the match slowly. Allow the excess sealer to drip back into the bottle, and then place the e-match back on the nail board with the match head pointing downward to dry. Allow 1/2 to 1 hour to dry, depending on the temperature and humidity. (*See step #5 for proper consistency and step #6 for proper drying times)*

7. After drying place your finished e-matches in a proper storage container such as a steel ammo box. You may want to test fire a few of your e-matches with the power source your going to use to fire them with just to make sure it can handle the current requirement. **NOTE: THE MATCH MUST BE PARTIALLY CONFINED TO FUNCTION PROPERLY.** If you should have any questions do not hesitate to contact us by logging onto our website at: www.rocketflite.com