



## 12 reasons for element 12

Magnesium is cool – and we don't just mean that in an aesthetic sense. Cool technologies make magnesium useful for the twenty-first century. Cool geometries make it fit like a glove. Its metallurgical structure benefits the user for cool, crisp communication. And its abundance, non-toxic extraction and high thermal conductivity keep your computer – and the planet – cooler.

The twelfth element on the periodic chart – magnesium – is one of the most abundant elements on the planet. It comprises 2.5 percent of the earth's crust and is the third most abundant dissolved element in seawater – one cubic mile of seawater contains a whopping 12 *billion* pounds of magnesium.

And good thing, too, because magnesium is rapidly becoming an in-demand element for a number of cool industries including the aerospace, medical, computer, consumer electronics and – of particular interest – automotive sectors.

### A cool, new application for magnesium

Gamber-Johnson, renowned manufacturer of rugged docking stations, introduces the new high performance, aesthetically pleasing, sleek magnesium Panasonic Toughbook CF30 Docking Station, comprised of the high purity magnesium alloy AZ-91D. We can sum up the benefits of a magnesium alloy docking station – and answer your questions – with a dozen reasons.

#### 1. Why make the move to magnesium now?

Magnesium's growing popularity is due, in large part, to simply gaining a better understanding of the element, its abundance and its uses. In addition, magnesium's reputation as a highly flammable entity has cooled. Yes – powdered, shaved or thin strip magnesium is easy to ignite, but try to do the same to magnesium in mass or bulk.

Because magnesium alloys for die-casting have an ignition temperature of 850°F, a cast magnesium component is usually the last thing to ignite in a fire. And because magnesium has such good conductivity, a high-energy source and an ample supply of air are needed to even reach this ignition temperature. Tests have shown that flames consume a vehicle before magnesium parts even burn in a car fire. Magnesium keeps its cool.

#### 2. What are the main advantages of a magnesium docking station for the consumer?

Low density. Magnesium is 33 percent lighter than aluminum, 62 percent lighter than titanium, approximately one-quarter the weight of zinc, and has a relative density only 1.7 times that of water. Steel and iron are four times heavier than magnesium.

The new CF30 weighs approximately six pounds. By taking weight out of the dock the entire mounting system is less top heavy, which decreases vibration – making the mount sturdier, decreasing wear and tear on the computer and motion attachment, improving the integrity of connections, and leading to higher performance of the mount and more reliable performance of the computer.

This also translates to a decrease in your carbon footprint. Every pound counts when it comes to increasing fuel efficiencies. Car manufacturers are steadily increasing their use of magnesium alloys for parts to decrease the weight of automobiles. Gamber-Johnson has joined the effort to keep the planet cool.

The low density of magnesium alloy has another distinct advantage - affordability. High purity AZ91-D alloy can be machined faster, with less waste and energy. This cost savings is transferred to the end-user – exceptional performance at a competitive price.

### **3. How strong is magnesium?**

Magnesium has the highest strength-to-weight ratio of all structural metals, except for titanium. Its strength is also better than most other engineering materials or plastics. While pure magnesium is too soft for most structural applications, magnesium alloys combine the best characteristics of magnesium (proportionate strength, malleability, conductivity and dimensional stability) with the corrosion resistance and strength of other metals. The result is an alloy that is strong, yet light.

The CF30 is composed of the magnesium alloy AZ-91D. The A and Z represent aluminum and zinc; the numerals indicate the percentage by weight of each – 9 percent and 1 percent, respectively. Aluminum and zinc add strength and corrosion properties.

### **4. Can a magnesium docking station withstand rugged use?**

Yes. Magnesium has a greater stiffness – and is less dense – than all other common engineering materials, making it ideal for the rugged wear and tear the CF30 is exposed to. It is also highly dent and impact resistant. Because magnesium doesn't lose its shape under stress, the lightweight CF30 can withstand the off-road driving of utility and telecommunications vehicles, the high speed chases of public safety vehicles, or the unexpected weighty leaps and bounds of a K9 unit. That means the CF30 doesn't simply cradle the computer, it helps to ensure better performance of the computer because wires don't come loose and the expensive innards of the computer are subject to less vibration.

### **5. Does magnesium curtail precise design?**

Certainly not. In fact, magnesium alloy has such a high fluidity and superior dimensional stability that the docking station can be die cast in one piece to very exacting tolerances. Magnesium alloys can be cast in very intricate geometric structures – therefore, the CF30 hugs every line of your computer, protecting the hub of communications and performance within the mobile office. The result is a docking station with improved reliability, fewer joints and external components, and reduced waste from the die cast processing.

### **6. Does the CF30 need to be constructed of a thicker gage because of the lightweight nature of magnesium?**

No – just the opposite. Because of magnesium alloy's high strength-to-weight ratio, thinner gages can be used without the alloy losing its ruggedness. The CF30's thin gage magnesium alloy construction serves the same purpose without the need for layering required by other metals.

This contributes to sleek design simplification. Because thin gage magnesium alloy remains resistant to denting and bending, it is much easier to work with when designing a docking station. The design needn't be fortified in order to make it rugged. The result is a lightweight docking station with greater ruggedness for longer life, greater stiffness, better denting resistance, and a smoother surface for improved appearance and function. The CF30's MAG Dock high performance is matched by its attractive appearance.

### **7. How well does magnesium absorb vibration?**

Magnesium alloy has very high energy absorbing characteristics – that means it excels at dampening vibration. According to the Co-operative Research Centre for Cast Metals Manufacturing, magnesium alloy is significantly better at dampening vibration than aluminum and steel on an equal weight basis.

Think of the CF30 docking station as one of the latest in magnesium alloy mountain bikes – the aluminum alloy absorbs shocks and stress – sparing the rider – *and* allows the rider greater ease of movement because of the lightweight alloy. A computer housed in the CF30 will reap the same

benefits. The user benefits from secure connections that won't vibrate loose, knowing the computer is housed in a sturdy and steady docking station, and noise reduction as well.

**8. Is magnesium use and extraction an eco-friendly process?**

Yes. Magnesium is an excellent "green" material – it is readily recyclable, die-casting is a high efficiency and low-waste process, and the nearly inexhaustible supply of magnesium is readily converted leaving only non-toxic and nonpolluting byproducts. Scrap and components can be recycled to the same high purity and quality standards as primary alloy. Long-term use has minimal environmental impact and significant energy savings.

In addition, the hot chamber die-casting method used to manufacture the CF30 allows for greater manufacturing efficiencies, less waste, a faster casting cycle time, and the use of less energy. Hot process, cool planet. Low waste and energy use, high performance.

**9. Can magnesium handle the elevated temperatures that some laptop computers generate?**

Yes. Because of magnesium's high thermal conductivity, it readily and effectively dissipates heat generated by a laptop computer - keeping it cooler and ensuring better software and hardware performance.

**10. Can magnesium be cast into user-friendly docking stations?**

Magnesium has a better surface finish than plastic molded parts and a smooth surface that gives docking stations a cool, rich finish, and allows for user comfort with rounded edges and sleek design.

**11. Can magnesium shield electromagnetic interference (EMI)?**

Like most metals, magnesium is inherently conductive and shields out EMI. But it has an advantage over most other alloys because of its fluidity – the thinner the gage, the better it blocks higher frequency EMI used for commercial applications. This equates to high performance, reliable and improved communication for users of the CF30.

**12. Has Gamber-Johnson tested the magnesium alloy CF30?**

Yes. For over a year, Gamber-Johnson has conducted engineering, materials, design and production methods to bring about an evolution in design that benefits the consumer without additional cost. The CF30 has been tested by a third party and meets both FCC and MIL-STD-810f test procedures. In addition, the CF30 has undergone shake and vibration tests in accordance with Panasonic Toughbook Testing and approval is pending.