

# Composite Water Meters: Setting the Standard

## White Paper

For the past 150 years, Sensus has brought water metrology products to market that have led the industry in technology, efficiency and accuracy. Today is no different as environmental regulations and sustainable technologies are key concerns for water utilities. Sensus is on the leading edge of these concerns and offers products constructed with durable composite materials that create a new standard in the water metering industry. As environmental responsibility is increasingly mandated, the entire industry is evolving the way it approaches intelligent water distribution systems.



Sensus made a conscious decision to develop composite materials for its residential water meters, making them stronger and more durable. The new composite meters have been successfully launched in Europe where they have met with widespread acceptance. Composite meters were introduced in North America in 2010 with the launch of the Sensus iPERL™ residential water meter.

**Composite materials are much lighter than their bronze counterparts and require less energy to manufacture and ship.**

The iPERL intelligent water management system features a construction with zero lead in the flowtube, comprised of a long-fiber-reinforced polyamide composite material. The Sensus accuSTREAM™ positive displacement meter is comprised of a fiber reinforced thermoplastic material.

### Composite Meters Have History

In 2009, Sensus launched the 620C composite body meter in Europe. The meter was developed due to demand from utilities and end users for meters that were better for the environment. The composite meter contributes to sustainability plans of European utilities without compromising on quality, security or meter reading accuracy.

The composite material used in these meters is a semi-crystalline polyamide reinforced with long glass fiber, which has already proved its merit in the automotive and valve industries. Besides guaranteeing durability, the polyamide material meets the most stringent European drinking water requirements. It resists corrosion from aggressive water and from the chlorinated chemicals used to make the water drinkable. No heavy metals enter into the makeup of the composite, which is also easily recycled.

Sensus subjected the 620C meter to an environmental impact study, showing that its entire production cycle, including polymer production and injection, consumes only about one-third as much energy as the bronze meter – 45 megajoules, as compared to 150. The injection processing temperature is about 280°C, compared to 1,000°C for casting the bronze materials. Injection forming is a very controlled process, and it produces net shapes that require no additional machining, even the threaded joints. The meter can withstand over 1,100 pounds per square inch (psi) of static pressure and more than 150,000 pressure shock cycles (water hammer) at more than 1,400 psi, without damage.

### Composite Meters are Strong

When evaluating alternate materials to replace traditional bronze, Sensus considered many criteria including conductivity, thermal coefficient of expansion, tension strength and compression strength.

Yield strength measures the stress point at which a material begins to deform plastically. Prior to the yield point, material will deform elastically and will return to its original shape once the applied stress is removed. Once the yield point is passed, some fraction of the deformation will be permanent. Elongation is calculated as a percentage and is based on the deformation or stretching of a material under stress. The yield strength and elongation material characteristics are important factors in determining suitable materials for use in a water utility system due to the pressurized water systems to which these products are subjected.

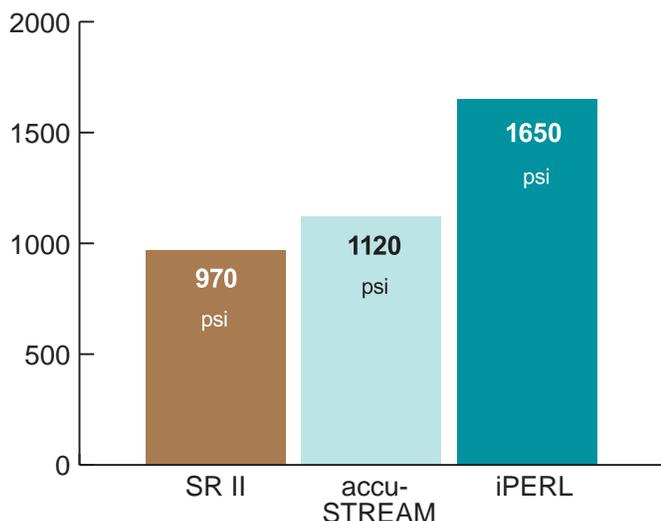
	Bronze Maincase			Composite Material	
	81-Metal	Low-lead Envirobrass II	Bialloy	iPERL flowtube	accuSTREAM maincase
Yield strength (psi)	13,000	17,000	18,000	20,300	31,900
Elongation (%)	1	6	30	2	2.5

Figure 1: Yield Strength and Elongation Comparisons

The iPERL and accuSTREAM products are composed of a zero lead composite alloy and have undergone comprehensive design and validation testing which proved that the materials significantly surpassed the pressure tolerance levels of conventional bronze alloy meters.

**Composite materials are stronger than plastic because they're made from two or more materials with different physical or chemical properties which when combined create a superior-strength material.**

### Sensus Meter Burst Pressures



### Composite Meters Meet Environmental Standards

On January 4, 2011 President Obama signed the Reduction of Lead in Drinking Water Act, an amendment to the Safe Drinking Water Act. The goal of this legislation is to strengthen and clarify standards to protect the public from toxic lead in drinking water by uniformly reducing the allowable lead content in drinking water pipes, pipe fittings and plumbing fixtures.

The legislation reduces the limit on lead from 8 percent to 0.25 percent for wetted surfaces of pipe, pipe fittings and plumbing fittings and fixtures and to 0.2 percent for solder and flux. The new regulation goes into effect on January 4, 2014 (three years from the date of passage).

Low-Lead Requirements for Water Meters		
Legislation	Description	Effective Date
NSF/ANSI Standard 372	New lead content only approval standard that uses the requirements in NSF/ANSI Standard 61, Annex G.  NSF standard in accordance with California AB1953 and new national lead-free law requiring a 0.25% (15 ppb) maximum lead content for all wetted components.	Oct. 1, 2010
NSF/ANSI Standard 61 (Annex F)	Reduces the allowable lead leach maximum limit to 5 ppb for all NSF Standard 61 certified products.  All existing NSF Standard 61 approved products will be reviewed to ensure compliance with the new requirement in order to maintain NSF Standard 61 approval.	July 1, 2012
Reduction of Lead in Drinking Water Act (S.3874)	New national law (amending the Safe Drinking Water Act or SDWA) requiring products in contact with drinking water to a 0.25% (15 ppb) maximum lead content for all wetted components using a surface based averaging formula.  The new NSF Standard 372 and NSF Standard 61, Annex G will provide independent third party verification to the law.	Jan. 4, 2014

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NSF/ANSI Standard 61 (NSF 61) requires all metallic products and components to be evaluated for the leaching of lead as well as other metal contaminants. The lead leach pass/fail criteria of 15 parts per billion (ppb) is scheduled to be reduced to 5 ppb per Annex F of NSF 61, effective July 1, 2012. Annex G of NSF 61 contains an optional lead content verification method. Pipes, fittings, valves and other mechanical devices are all tested with specially formulated waters.

The newest metrology products from Sensus comply with and exceed the requirements set by The Safe Drinking Water Act and NSF 61 Annex F and G by containing zero lead.

### Composite Meters are Easy to Install

Some manufacturers of composite meters have decided to attach metal threads to the material. To date, Sensus chose composite threads due to the strength of the composite materials and results from tests we conducted to compare the strength of composite threads with metal threads. Those tests revealed that the integrity of the bond between the composite and metal can be significantly influenced by seasonal temperatures as composite and metal materials expand and contract at different rates. Over time, this difference can cause the materials to separate from each other. Depending on the method used to attach the metal threads to the composite body, the separation may occur at installation (if high torque is applied) or a few years after installation (with the temperature changing over a period of time).

Composite threads eliminate the “friction feeling” typically experienced with metal threads and metal couplings, which facilitates easier product installation.

Some utilities are concerned about composite meters due to a potential interruption of a building’s electrical grounding circuit that may cause hazard to occupants and utility personnel alike. The 2011 National Electrical Code (NEC), paragraph 250.53 (D) (1) states “Continuity of the grounding path or the bonding connection to the interior piping shall not rely on water meters or filtering devices and similar equipment.” A suitable bonding jumper should be used. Thus, the grounding bypass requirements are no different with today’s composite meters than they were with the old bronze meters. In newer construction, plastic pipe is frequently replacing standard metal plumbing. Since plastic does not conduct electricity, it cannot be used as a grounding path.

### Summary

Sensus continually develops and delivers products that meet the highest standards for quality, reliability and innovation. New technology and materials enable us to provide our customers metrology products to meet low-lead regulations while maintaining and exceeding the product excellence Sensus customers have come to expect. In addition to improving the strength characteristics of products, composite materials enable a more stable pricing structure in the future that is not tied to fluctuating copper prices. Furthermore, because the EPA’s contaminant level goal for lead in drinking water is set at zero, by using alternative materials that contain zero lead, Sensus and its customers will continue to be in compliance with all future changes to the NSF standards and government laws regarding lead.