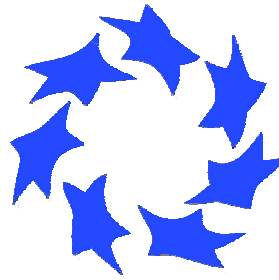


# SevenStar Electronics



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**To Whom It May Concern**

**Date: 20<sup>th</sup> Jan 2004**

**Regarding:**

**The properties of Styrosun thermoplastic mouldings, as used in the S.701 SART from SevenStar Electronics Ltd., with respect to the requirements of IEC 61097-1 and IEC 90645 4<sup>th</sup> edition, as repeated hereunder:**

1. IEC 61097-1 para 3.2.11 states that the unit shall “**be not unduly affected by seawater or oil**”. Under Methods of Testing, para 6.2.11 states that it “shall comply with 16.9 of IEC 945. In addition, shall comply with SOLAS Chap III, Regulation 30.2.4”. IEC60945 states in para’s 8.11.1 and 8.12.1, that the requirement for oil and salt mist tests “shall be waived for portable equipment where the manufacturer is able to provide evidence that the components, materials and finishes employed in the equipment would satisfy the test”.
2. IEC 61097-1 para 3.2.12 states that the unit shall “**be resistant to deterioration in prolonged exposure to sunlight**”. Under Methods of Testing, para 6.2.12 states this shall be done “By inspection. The manufacturer shall be required to produce evidence that the materials used ... are unlikely to be affected adversely by prolonged exposure to sunlight”. IEC 60945 states in para 8.10.1 that the requirement for solar radiation testing “shall be waived where the manufacturer is able to produce evidence that the components, materials and finishes employed in the equipment would satisfy the test”.

**Text:**

- I. SevenStar has specifically chosen ‘Styrosun’ high impact polystyrene from Nova Chemicals because of its excellent properties in external environments. I quote: “Nova Chemical’s Styrosun resins are weatherable, high-impact styrenic polymers specifically designed for use in outdoor applications. Resistant to the effects of sunlight, Styrosun resins maintain significant physical properties after weathering. The weather resistant properties of Styrosun resins are achieved by combining proprietary UV-stabilization technology with inherently UV-stable impact modifier.”
- II. In addition to its **excellent physical properties**, Styrosun resins offer **low dielectric loss** that also recommends its use for radio and radar equipment, satellite antennas, and other items for an external environment.



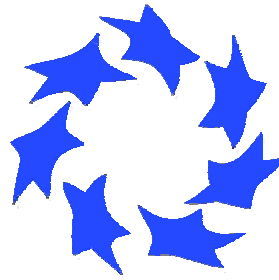
Co. Registration No: 4482935

1

VAT Registration No: 824 5627 23



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- III. “STYROSUN is an EPDM rubber-modified, high-impact polystyrene that exhibits higher resistance to ultraviolet (UV) rays and oxidative deterioration than traditional styrenic polymers. STYROSUN is currently used in numerous outdoor applications including telecommunications equipment, transportation and recreational vehicles, household appliances, placards and billboards and building and construction elements.”
- IV. **SUN LIGHT.** “Data collected from an extensive alpine outdoor weathering test revealed that UV-stabilized ABS and UV-stabilized high-impact polystyrene experienced twice as much yellowing from UV rays as STYROSUN. In addition, the impact property retention of STYROSUN was much better than other styrenic polymers such as UV-stabilized high-impact polystyrene and UV-stabilized ABS, and similar to acrylonitrile styrene acrylate (ASA).” **Data from alpine weathering tests is reproduced in the data that accompanies this statement.**
- V. **SALT WATER.** With the exception of a single A4 grade stainless steel socket-head bolt head, which is itself recessed some 30mm upwards in a cavity; there is **no exposed metal** outside the body of the S.701 SART. It is therefore unaffected by the corrosive action of salt water. *(Most of the properties of a thermoplastic resin are set by the basic polymer properties. Thermoplastics in general, including polystyrenes, exhibit excellent resistance to salt water. “Styrosun exhibits standard polystyrene resistance to salt water, and would be expected to perform equal to regular HIPS (high impact polystyrene) in any salt water applications.”)* **No salt spray testing was therefore deemed necessary.**
- VI. **OIL.** Virtually all thermoplastics can be affected by *long-term immersion* in oil or petroleum derivatives. However, in this environment, as specified within IEC 61097-1 and IEC 60945, the SART will NOT be continuously immersed in petroleum or its derivatives. Styrosun will perform *more than adequately* for occasional contact in a maritime environment.

TEST PERFORMED: As per IEC 60945 para 8.11, a sample SART was immersed in mineral oil ‘ISO no 1’ at 20 °C for 3 hours. The sample was then cleaned and inspected. The unit showed no sign of staining, shrinking, crazing, swelling or cracking, or other physical degradation whatsoever. It passed the performance check with no detectable change from before the test. By inspection, there was no noticeable change in the physical properties of the plastic. (Test performed on 15.1.2004 at SevenStar premises by Quality Manager, witnessed by Internal Quality Auditor.) **Test Passed.**



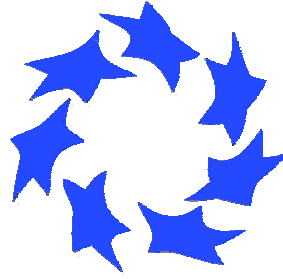
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## SUMMARY

In view of the above, SevenStar believes that Styrosun is an excellent choice for use in a Marine Search & Rescue Transponder as specified by IEC 61097-1. Its resistance to seawater and oil are as good as standard HIPS, and it has been specifically formulated to offer superior resistance to deterioration due to prolonged sunlight exposure. It already has numerous applications worldwide in harsh external environments, and is manufactured by a well-established Chemical company with global resources and a professional reputation.

C.R.Watts  
Managing Director  
SevenStar Electronics Ltd

## Supporting Documentation:

- Brochure “Styrosun Weatherable Polymers” from Nova Chemicals
- Presentation “Weather Resistant High Impact Polystyrene – for the Tough Outdoors” from Nova Chemicals. (Includes graphs and figures from alpine weathering tests.)
- Press release May 2002
- Extracts from previous product documentation.



Co. Registration No: 4482935

3

VAT Registration No: 824 5627 23



To : Mr. Colin Watts,  
Seven Star Electronics Ltd

From: C. Hamelink,

Ref: Styrosun

Breda, January 27 2004

Dear Mr. Watts,

You have requested some information on Styrosun performance relative to impact Polystyrene, particularly in the areas of resistance to salt, oil and petroleum.

As discussed, we do not have the capability to do specific testing on finished parts made from Styrosun. We are, however, able to provide the following general information on Styrosun characteristics. If you require a higher level of comfort, we will need to have further discussions.

Styrosun is a High Impact Polystyrene (HIPS) using EPDM rubber, rather than Butadiene rubber, to improve impact qualities. Due to this composition, Styrosun has impact resistance values comparable to regular HIPS.

The composition of Styrosun, together with a package of additives containing so-called UV additives, gives Styrosun improved resistance to sunlight compared with regular HIPS. Please reference our brochure for further information on the UV-resistant characteristics of Styrosun.

Styrosun exhibits standard polystyrene resistance to salt water, and would be expected to perform equal to regular HIPS in any salt water applications. Styrosun exhibits standard polystyrene resistance to petroleum and oil, and again would be expected to perform equal to regular HIPS in such applications. Please call me if you would like to discuss further.

Sincerely yours

C.P. Hamelink,  
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