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## **Lifesaving Systems Corporation TRI-SAR HARNESS/SURFACE SWIMMER P/N #487-S PRODUCT DATA SHEET**



### **PRODUCT DESCRIPTION**

The **TRI-SAR SURFACE** is **LSC's** rescue harness designed for surface rescue swimmers with dual recovery capability. The TRI-SAR line of harnesses was the first harness designed to combine the security of a full body harness, comfort of a seat harness and safety of integrated flotation. The surface swimmer model includes a swimmer's attachment point V-Ring to secure vessel-based rescuers to a tender line for safety and recovery options.

The full body harness is constructed primarily of mil-spec type 8 and type 13 nylon webbing and features LSC's exclusive low profile, quick adjusting stainless steel hardware. The TRI-SAR incorporates LSC's operationally proven techniques in weight distribution for superior comfort without the use of heavy, bulky pads. The harness hoists in a seated position with the leg and waist straps supporting the rescuer, allowing them to have total use of both hands during rapid deployment type rescues in swift water, cold water, and cliff rescue missions.

The integrated flotation vest features a low profile easy to swim in design, with user variable buoyancy up to 35 lbs. Flotation cell is encased entirely in a heavy weight, puncture/abrasion-resistant nylon case. Due to its encased design, the cell requires no repacking after use; simply deflate. Inflated manually with CO<sub>2</sub> or orally with air. Generous storage pockets for critical rescue and emergency equipment are provided. Orange vest has SOLAS grade retro reflective panels. Utilizes a 33-gram CO<sub>2</sub> cylinder (LSC #484).

## **PRODUCT SPECIFICATIONS**

### **Materials (Structural)**

Nylon Webbing	MIL-SPEC, MIL-W-4088 Type 13, 1-3/4" @ 6,300 lb test
Nylon Webbing	MIL-SPEC, MIL-W-4088 Type 8, 1-3/4" @ 3,600 lb test
Nylon Webbing	MIL-SPEC, MIL-W-4088 Type 9, 3" @ 8,200 lb test
Lifting V-Ring	#487-13C Cast Titanium, breaking limit exceeds 10,000 lbs. <ul style="list-style-type: none"> <li>- HIP'd (Hot Isostatic Press).</li> <li>- Chemically milled to remove alpha casing.</li> <li>- Proof loaded to 3,300 lbs.</li> </ul>
Attachment V-Ring	#384 stainless steel, breaking limit 4,000 lb
Chest Buckle	#393 stainless steel QRSB buckle, breaking limit 1,000 lbs.
Adjustors	#451 stamped stainless steel adjustor, breaking limit 2,200 lbs.
Utility Hook	Wichard 3-5/32 inch stainless steel snap hook, non-locking design. Breaking limit 3,750 lbs.
Thread	TEX Size 270 (#3 Cord), twisted multifilament nylon (6,6). <ul style="list-style-type: none"> <li>- Contrasting color to webbing.</li> <li>- Used on all load bearing stitch patterns.</li> <li>- Average breaking strength approx. 35 lbs.</li> </ul>
Thread	TEX Size 70 (E cord), twisted multifilament nylon (6,6). <ul style="list-style-type: none"> <li>- Used in assembly of non-load bearing components.</li> </ul>
Thread	TEX Size 90 (F cord), twisted multifilament nylon (6,6). <ul style="list-style-type: none"> <li>- Used in assembly of non-load bearing components.</li> </ul>

### **Stitch Patterns (Structural)**

Primary Stitch Pattern 1.5" x 1.5", 6 pt Double "W"	Minimum breaking strength at 3,500. <ul style="list-style-type: none"> <li>- Forces applied in linear pull/shear.</li> <li>- Tex-210 nylon thread.</li> <li>- Pattern sewn in 2 layers Type 13 webbing.</li> </ul>
Leg Adjustor Pattern 5 pt Zig-Zag	Minimum breaking strength of 3000 lbs (calculated). <ul style="list-style-type: none"> <li>- Forces applied in linear pull/shear.</li> <li>- Tex-210 nylon thread</li> </ul>

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### **Hoisting Strap**

Constructed of one continuous piece of Type 13 nylon webbing. Forming the hoisting apex of the strap, the lifting V-ring is centered in the strap and anchored by a six-point double "W" pattern of Tex-210 nylon thread. A contiguous piece of Type 8 nylon webbing is used to secure the utility snap hook strap to middle bar of the V-ring. Using ten, 2-3/4 inch rows of #210 nylon thread, the strap anchors the stainless steel snap hook and lifting V-ring together. A pocket is attached to one side of the hoisting strap to stow the snap hook & strap when not in use. For leg strap adjustment, a stamped frame LSC #451 adjuster is attached to the each lower section of the hoisting strap with Type 8 nylon webbing and a five-point zig-zag pattern of Tex-210 nylon thread.

### **Leg Straps**

Constructed of nylon Type 13, nylon Type 9, 3 inch 16 point polypropylene webbing, black 420-denier urethane coated nylon material, and 1.5" nylon pile tape. Leg straps are created by anchoring each end of the hoisting strap into the respective type 9 (3 inch) heavy duty nylon webbing leg strap using a six-point double "W" pattern of #210 nylon thread. A piece of type 13 nylon webbing is then attached to the opposite end of the 3 inch Type 9 nylon webbing using six-point double "W" pattern of #210 nylon thread. A piece of 3 inch polypropylene webbing is sewn to the 3 inch Type 9 nylon webbing between the two double "W" patterns with Tex-70 nylon thread to serve as a stiffener and provide a wide load bearing surface. The 420-denier nylon cover encases the leg strap using Tex-70 nylon thread. Hook and pile tape are sewn to ends of the leg straps with Tex-70 nylon thread.

### **Waist Strap**

Constructed of nylon Type 8, nylon Type 13, nylon Type 9, 3 inch 16 point polypropylene webbing, black 420-denier urethane coated nylon material, and 1.5" nylon pile tape. The waist strap is created by anchoring a piece of type 8 nylon webbing and #451 stainless steel adjuster at one end of nylon Type 9, 3 inch webbing using a six-point double "W" pattern of Tex-210 nylon thread. A piece of Type 13 nylon webbing is then attached to the opposite end of the 3 inch nylon webbing using a six-point double "W" pattern of Tex-210 nylon thread. A piece of 3 inch polypropylene webbing is sewn to the 3 inch nylon webbing between the two double "W" patterns with Tex-70 nylon thread to serve as a stiffener and provide a wide load bearing surface. A 420-denier nylon cover encases the waist strap using Tex-70 nylon thread. Hook and pile tape are sewn to the Type 13 nylon webbing with Tex-70 nylon thread. A Stowage strap is created using a piece of 2 inch polypropylene webbing, hook and pile tape, and sewn using Tex-90 nylon thread.

### **Shoulder & Riser Straps**

Constructed of Type 13 nylon webbing. The shoulder straps are anchored to the leg straps using a six-point double "W" pattern of Tex-210 nylon thread. The shoulder straps are also anchored to the waist strap for position purpose only using a "parallelogram" pattern with Tex-210 nylon thread. Crossing at the back, the shoulder straps are joined together using for position purpose only using a "diamond" pattern with Tex-210 nylon thread. LSC #393 QRSB buckle joins the two shoulder straps together at the wearer's chest. The buckle halves are attached to the shoulder straps with Type 8 nylon webbing sew using a six-point double "W" pattern of Tex-210 nylon thread. LSC #451 stainless steel adjuster is anchored to the bottom of each shoulder strap with a five point double "W" pattern of Tex-210 nylon thread. Two pieces of Type 13 nylon webbing serve as riser straps and join the front of the waist belt to the should straps by means of the #451 adjuster on the bottom of the shoulder,

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thereby allowing torso length adjustment. The riser straps are anchored to both the hoisting strap and waist strap using a six-point double "W" pattern of Tex-210 nylon thread.

### **Swimmer Attachment Point**

Constructed of Type 8 nylon webbing and a stainless steel V-Ring with webbing box (LSC #384) attached to the left-shoulder riser strap using two double-W stitch patterns of contrasting TEX 210 (3 cord) thread.

### **Construction Techniques**

All construction is controlled and monitored under the guidelines of the Lifesaving Systems Quality System, which meets or exceeds MIL-I-45208A requirements.

All sewing is performed on commercial 301 lock-stitch sewing machines to Fed. Std. 751. Patterns are sewn using computer controlled automated pattern tackers. Webbing is cut with an automated, hot-knife, cutter. All Material certifications are on file.

### **Harness Load Bearing Capability**

The TRI-SAR is design from a system perspective, which includes attachment to the helicopter hoist system. The harness has significant safety factor and is designed such that other components in the system (specifically the helicopter hoist cable) will fail well before the design capabilities of the TRI-SAR harness are exceeded.

The design and construction of the TRI-SAR is such that the primary load is carried by the main hoisting (lifting) strap and transferred into the leg straps. The weakest point in the system becomes the stainless steel adjusting hardware on the leg straps. As noted in the material listing, the adjustors have a breaking limit of 2,200 lbs. However, each adjustor is subjected to  $\frac{1}{4}$  of the total load applied to the lifting v-ring. When properly worn and adjusted each leg carries  $\frac{1}{2}$  of the total load subjected to the harness. Further, since each leg strap forms a loop, each side of the loop carries  $\frac{1}{2}$  of the load subjected to that leg strap assembly. Therefore the adjustor hardware in each leg strap will only be subjected to  $\frac{1}{4}$  ( $\frac{1}{2} \times \frac{1}{2}$ ) of the total load placed on the harness when properly fitted.

This provides for a calculated ultimate load bearing capability of the harness at approx. 8,800 lbs. A safety factory of 29+ is achieved for a person weighing 300 lbs or less. Additionally, the ultimate load bearing capability exceeds the breaking limit of the hoist cable which is rated at 3,300 lbs breaking strength.

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