APPLIED ACOUSTICS
Underwater Technology

Dura-Spark
Operation Manual

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Revision History

Issue	Change No.	Reason for change	Date
A	n/a	Draft	14/08/13
B	n/a	Addition of Dura Spark 400 and other amendments.	02/12/14
1	n/a	Manual diagrams updated	05/12/14
2	1554	Diagram references updated. Sparker array configurations added.	23/12/14

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Thank you for choosing Applied Acoustic Engineering as one of your subsea equipment suppliers. We hope you experience many years of reliable operational use from our products.

If you do encounter any technical issues with any of our products then please don't hesitate to contact our Technical Team via the following methods.

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Applied Acoustic Engineering Ltd has made every effort to ensure that the information contained in this manual is correct at time of print. However our policy of continual product improvement means that we cannot assume liability for any errors which may occur.

These written instructions must be followed fully for reliable and safe operation of the equipment that this manual refers to. Applied Acoustic Engineering Ltd cannot be held responsible for any issues arising from the improper use or maintenance of equipment referred to in this manual or failure of the operator to adhere to the instructions laid out in this manual. The user must be familiar with the contents of this manual before use or operation.

1. Introduction to the Dura Spark Sound Source

The Dura-Spark has been designed to provide a stable, repeatable sound source for sub-bottom geophysical surveys. The long life, durable electrodes produce a consistent pulse signature and keep operational maintenance to a minimum. This provides increased survey efficiency and equipment reliability as the sparker tips rarely need replacement.

The Dura-Spark 240 is based on the CAT300 catamaran, providing a stable platform whilst under tow. The catamaran has robust solid floatation and is easily deployed from all survey vessels. The Dura-Spark 240 consists of 3 arrays of 80 tips allowing the operator to tune the source from the vessel to its application. This flexibility, together with selectable source depth, allows the sound source to be used in both shallow and deep waters.

The typical operational bandwidth of the Dura-Spark 240 is 300Hz to 1.2KHz. When coupled with the CSP-N Seismic Power Supply the system offers 2000J/s peak discharge rate, as well as industry leading design and safety standards.

2. Components

- Dura Spark Catamaran complete with 3 x80 Tip Long Life Sparker Arrays.
- HVC3500 High Voltage Cable complete with HV 3000 Junction Box.

3. Theory of Operation

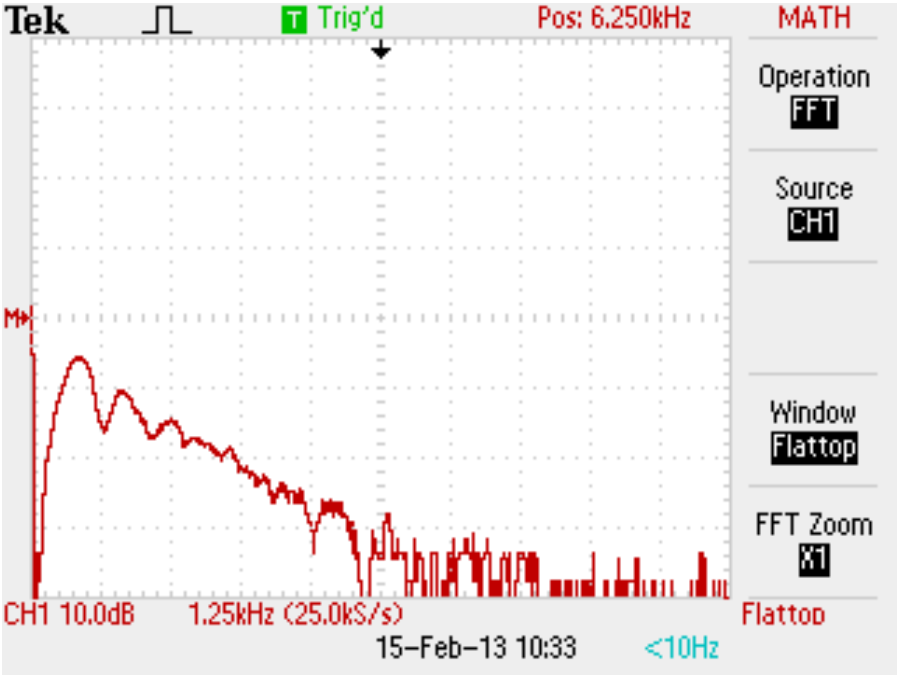
The sound wave is generated by the electrical energy in the capacitors of the CSP-N discharging across the sparker tips to the earth of the tow-body, through the sea water to produce a pressure wave.

For example with the Dura 240 varying the energy level and depth the array can be ‘tuned’, for example to achieve a high resolution source use a single array (80 tips) towed shallow firing at 200J to 300J. If greater penetration is required the other 2 arrays can be connected (240 tips) to increase the directivity index (DI) and SPL firing at energy levels typically 8 to 1200J.

- 240 Tips – max power 1200J, typical 1000J.
- 160 Tips – max power 800J, typical 500J.
- 80 Tips – max power 400J, typical 200-300J.

With increased energy levels a secondary discharge pulse is generated after the initial discharge. The time delay between initial and secondary is proportional to the level of energy being discharged. The secondary pulse is commonly known as the ‘bubble pulse’.

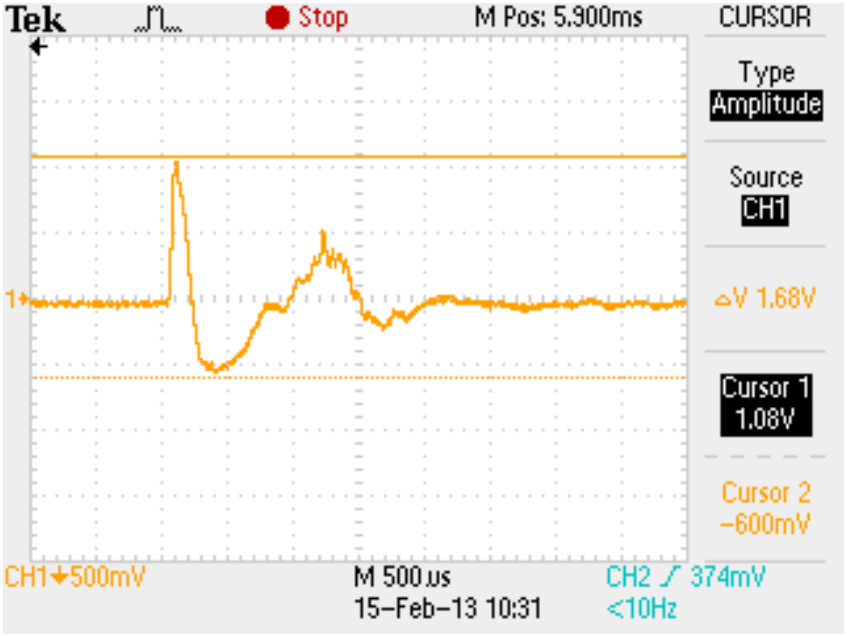
NOTE: - To prevent the bubble pulse the tip to power ratio should not exceed 5J per tip.



Dura Spark Typical Frequency Response

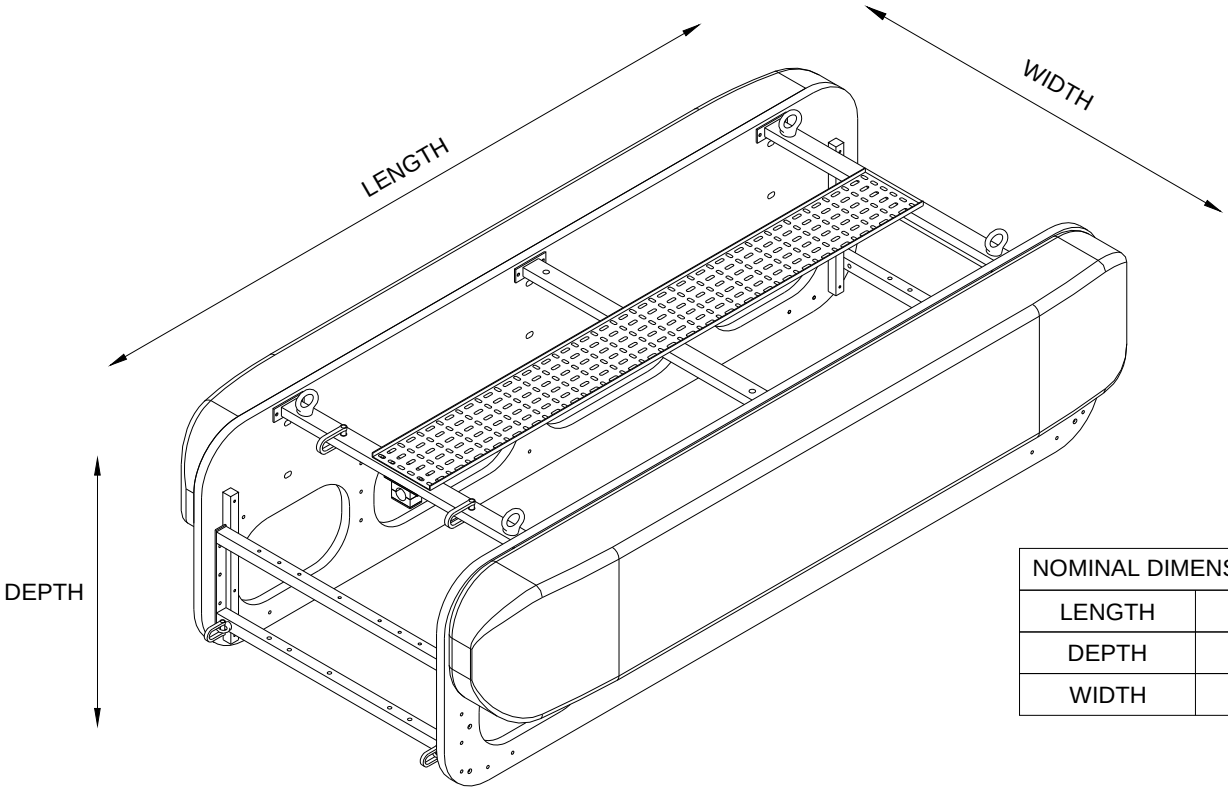
4. Pulse Signature

Typical Dura Spark Pulse Signature at 1000J



Pulse Width =	700	uSec	
V peak to peak =	1.86	V	
Source Level =	1.72661	V/Bar	At 1M
	224.744	dB re 1.0V/uPa	At 1M

5. Dimensions



NOMINAL DIMENSIONS (mm)	
LENGTH	1700
DEPTH	500
WIDTH	960

FOR THIS DIAGRAM SOME COMPONENTS HAVE BEEN REMOVED FOR CLARITY.

6. Dura Spark Power Levels

	80 Tips	160 Tips	240 Tips	400 Tips
Min	100J	300J	500J	500J
Max	400J	800J	1200J	2400J
Typical	200J	500J	1000J	2000J

7. Configuration

The sparker arrays are configured in a planar array and identified through the HV3500 cabling to the HV3001 Junction Box by colour code.

Port (left) = BLUE
Middle = YELLOW
Starboard (right) = RED

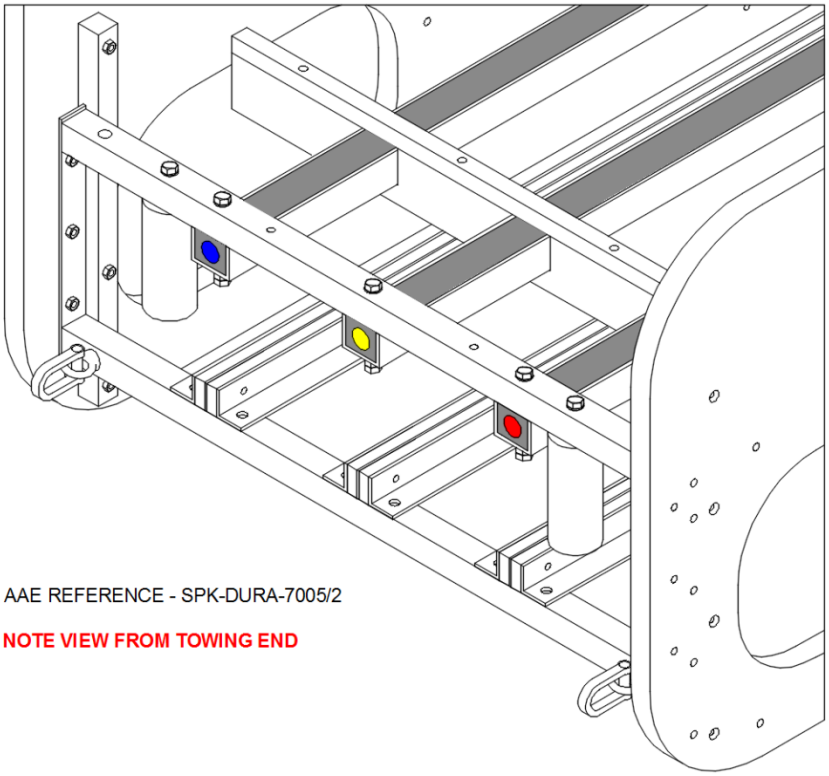
The Dura Spark can be configured from the HV 3001 Junction Box to use 1, 2 or 3 of the array's allowing the operator to select 80, 160 or 240 tips.

Dura Spark 240			
80 Tips	Red		
160 Tips	Red	Yellow	
240 Tips	Red	Yellow	Blue

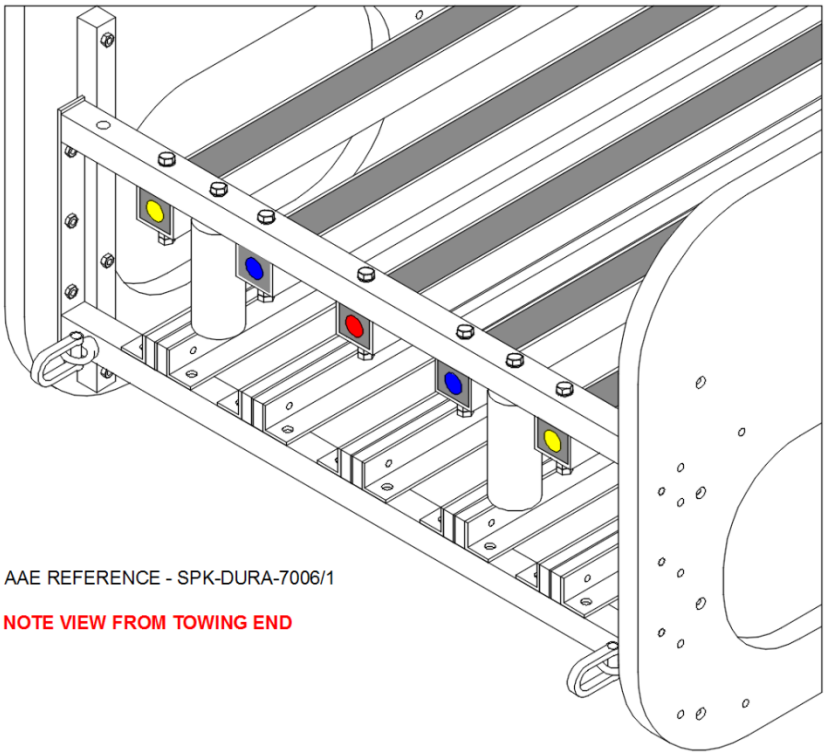
Dura Spark 400			
80 Tips	Red		
240 Tips	Red	Yellow	
400 Tips	Red	Yellow	Blue

Sparker Array Configurations

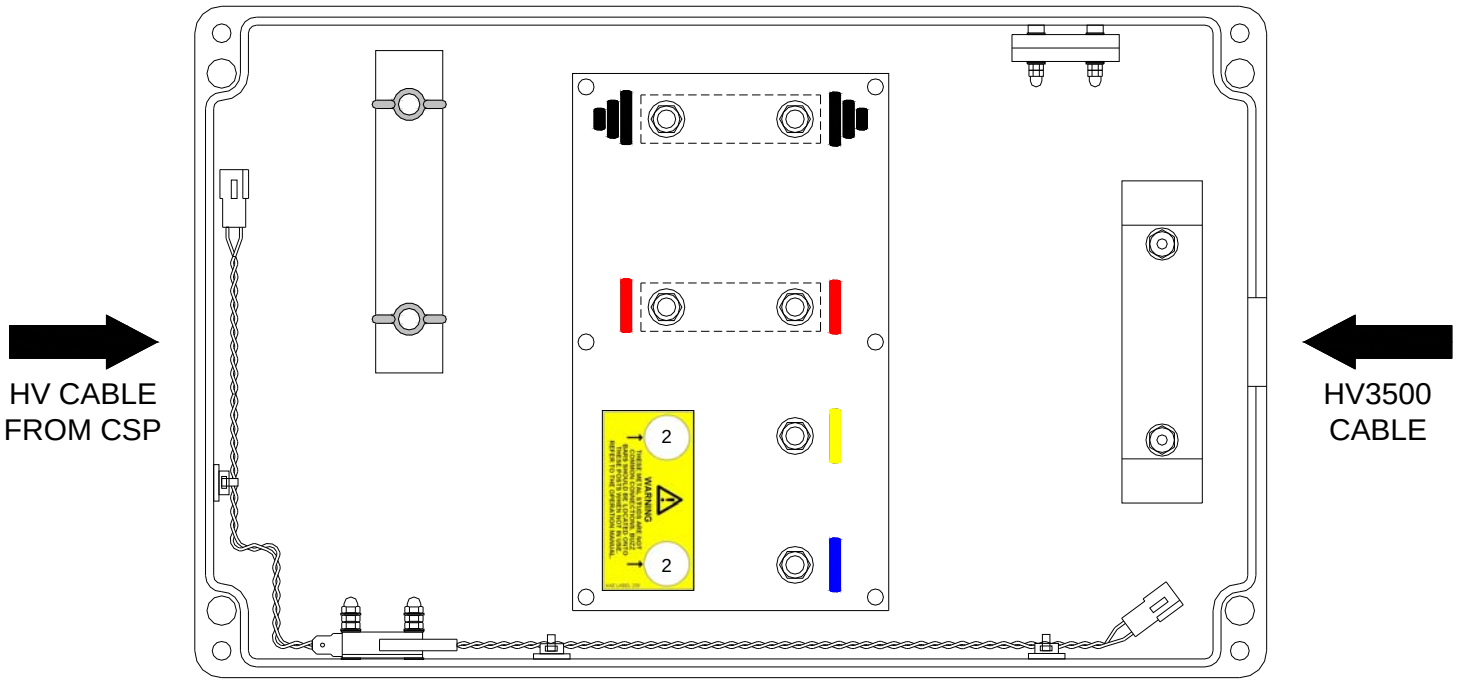
Dura Spark 240



Dura Spark 400



HV3000 Junction Box Layout



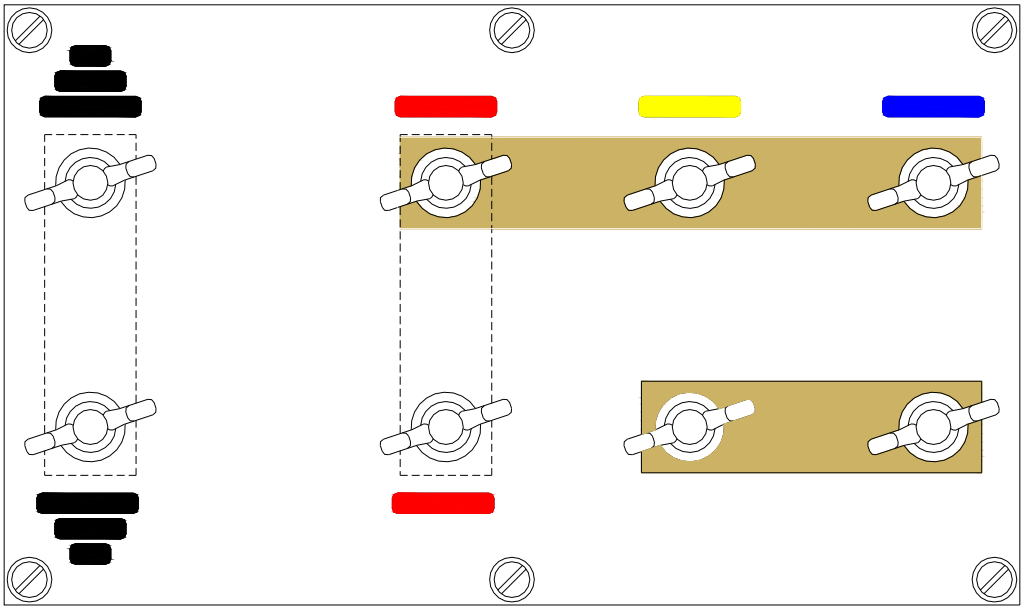
AAE REFERENCE - HVJ-3001-7000/2

HV3001 Junction Box Buzz Bar Arrangement

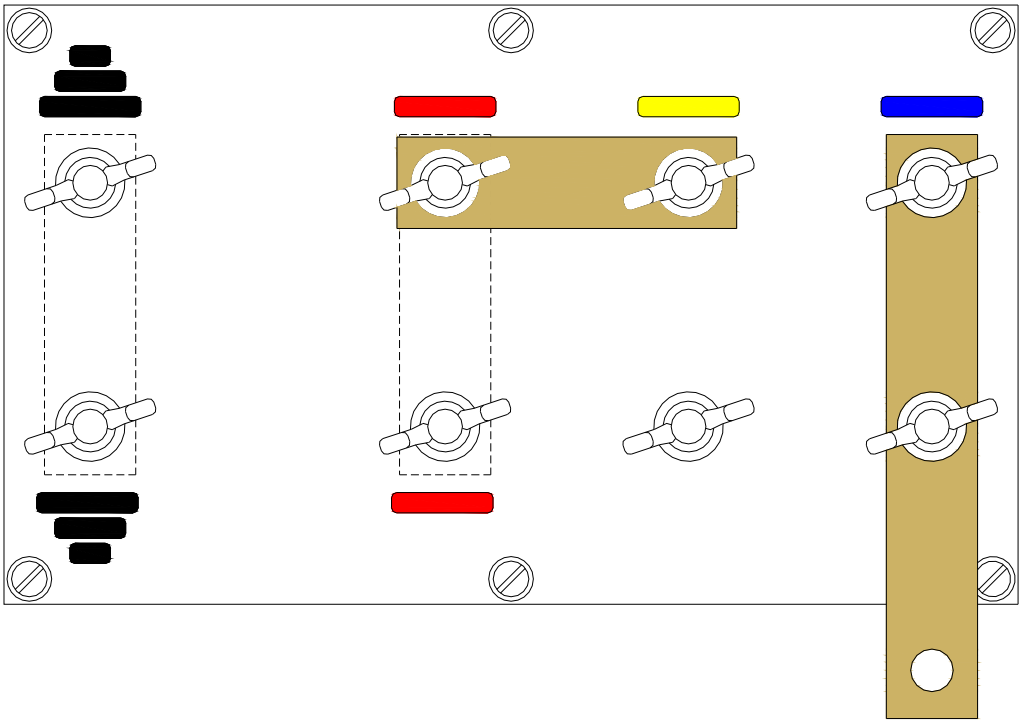
Before attempting to configure the HV3001 junction box with any of the following arrangements, ensure that all HV equipment is turned off and the HV cable from the CSP unit is disconnected.

Please note that the two bottom right studs are not common connections and must be used to store the HV buzz bars when not in use.

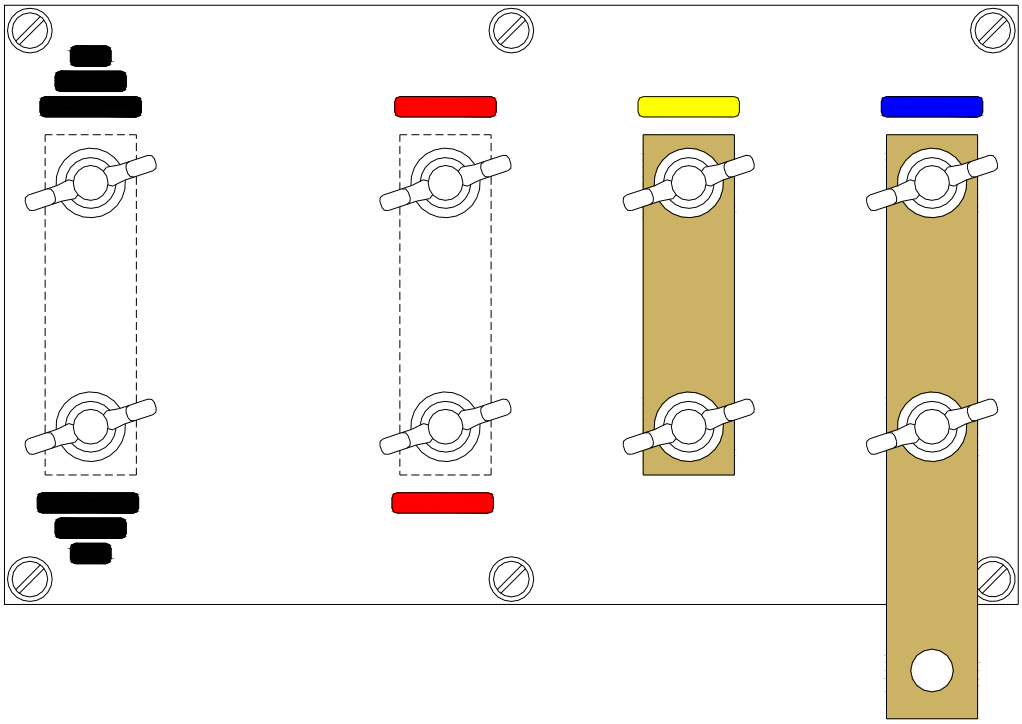
Dura Spark 240 – 240 Tip Arrangement



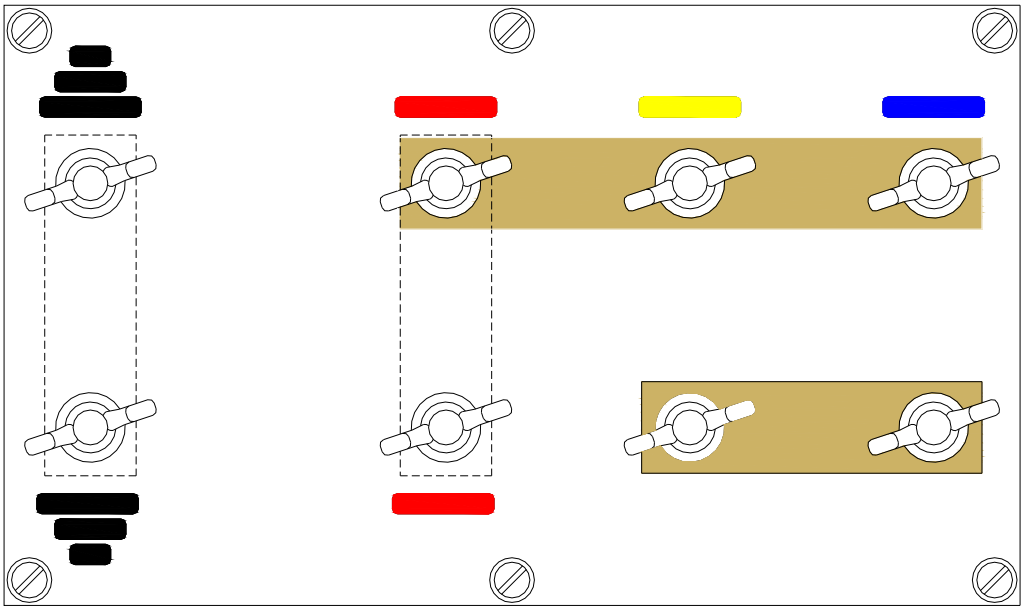
Dura Spark 240 - 160 Tip Arrangement



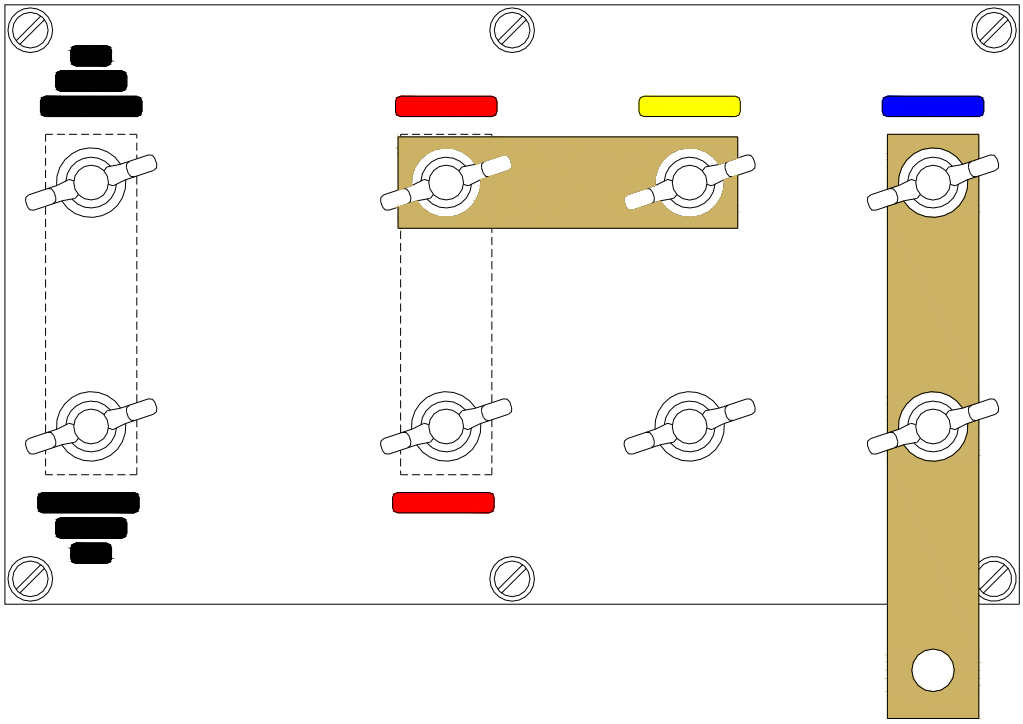
Dura Spark 240 - 80 Tip Arrangement



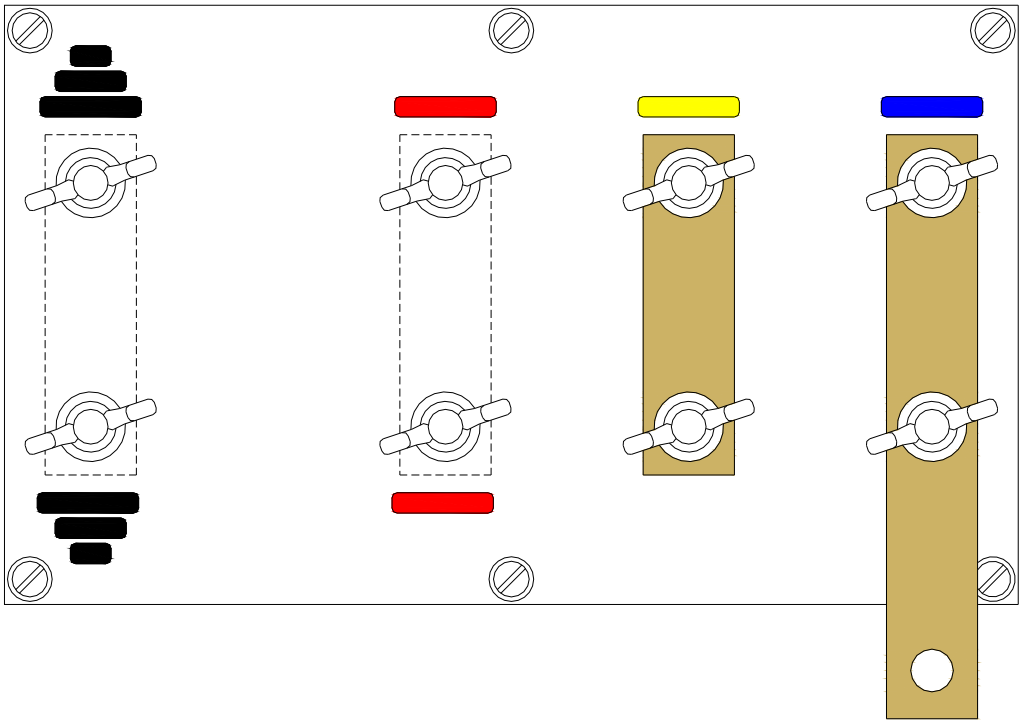
Dura Spark 400 – 400 Tip Arrangement



Dura Spark 400 - 240 Tip Arrangement

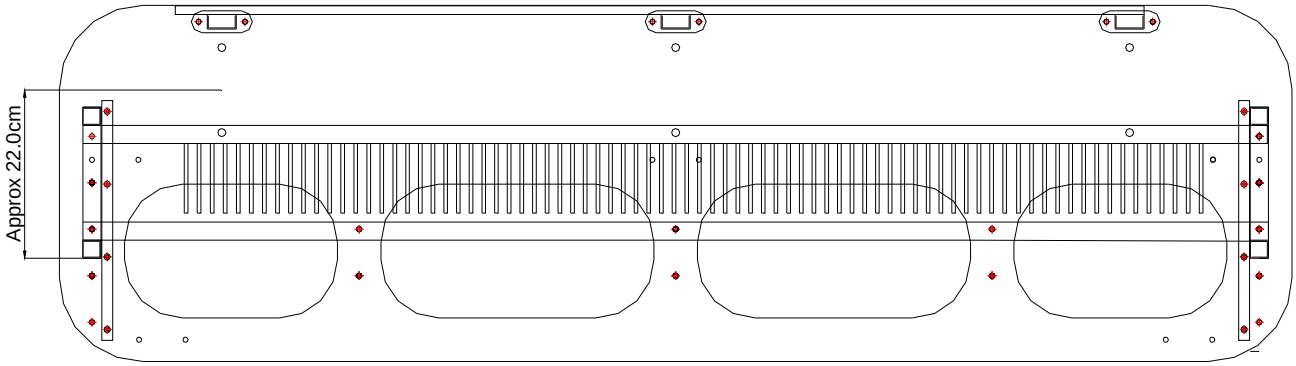


Dura Spark 400 - 80 Tip Arrangement

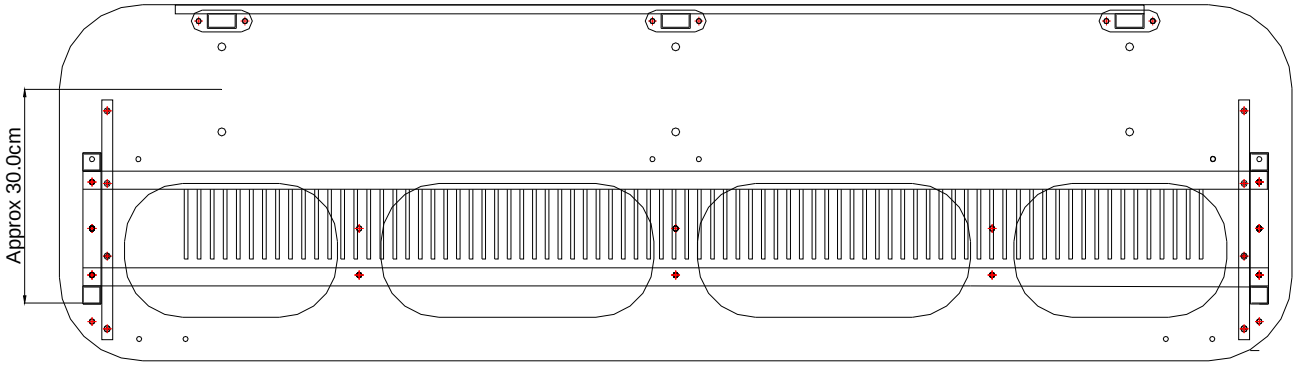


Tow Depth

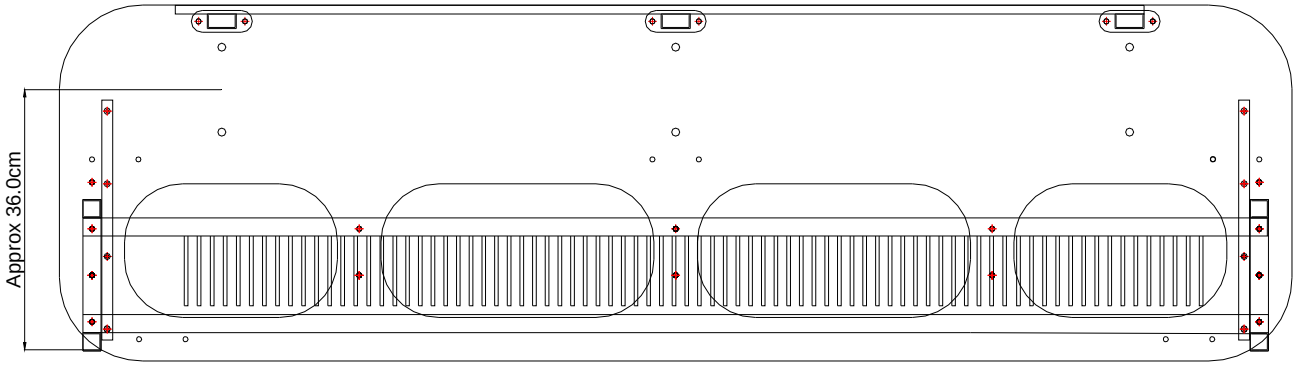
Shallow



Standard



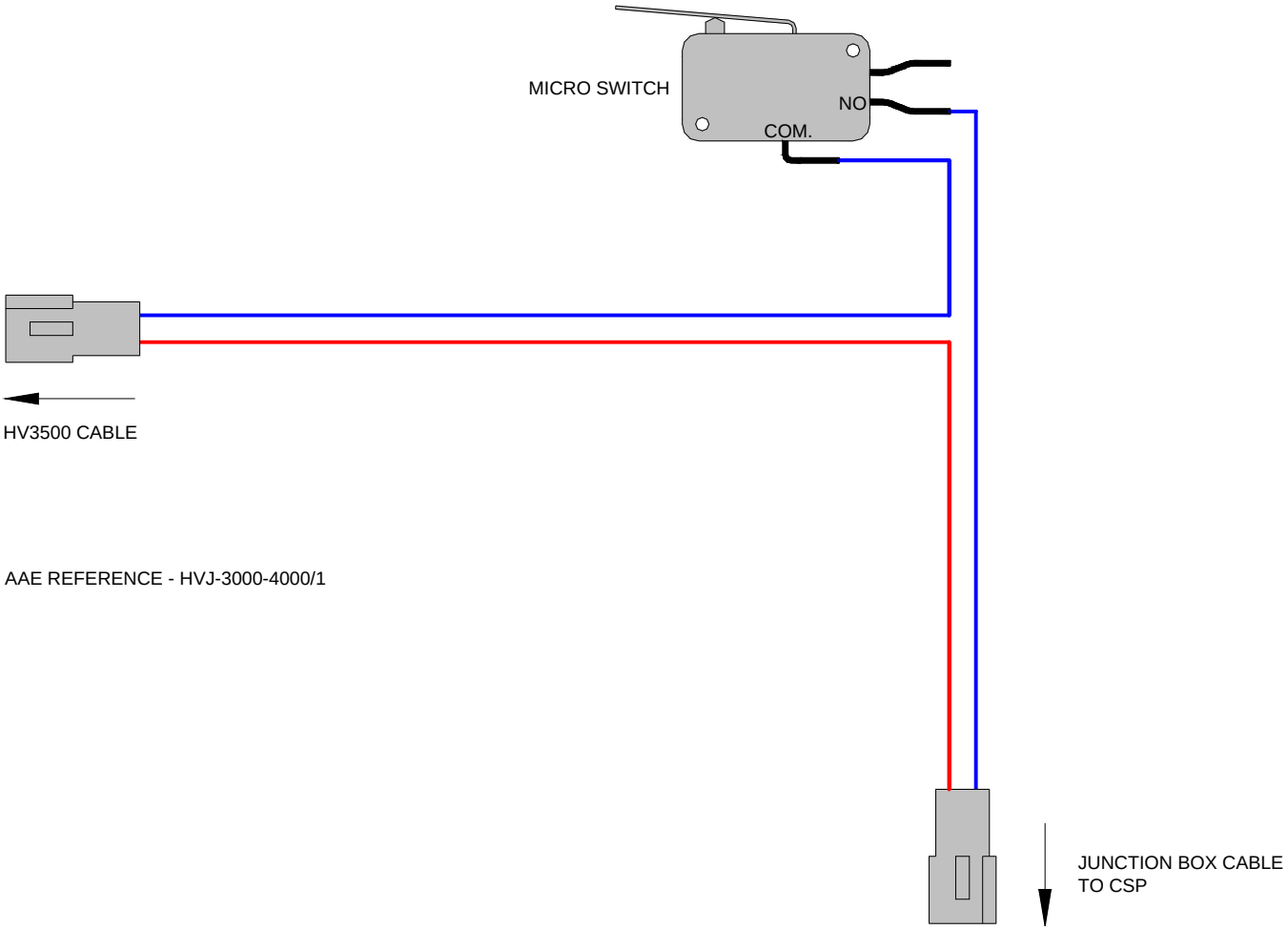
Deep



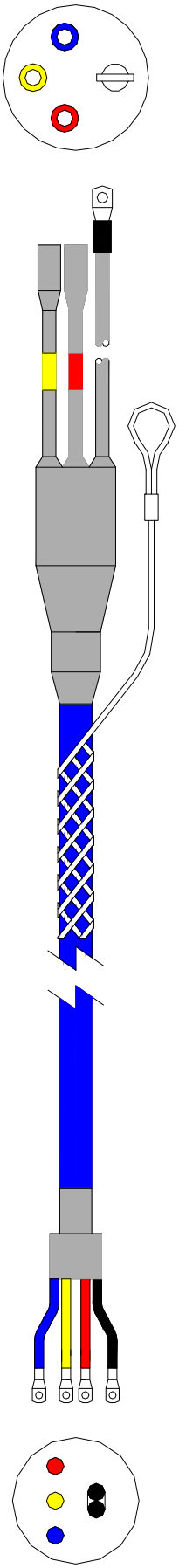
8. Cabling

HV3000 Junction Box Interlock Wiring

NOTE: When used with the Dura Spark the subsea interlock is by-passed using the link provided.



HVC3500 Cable



	A	B	C	D
1	WIRING TABLE			
2	DRY END	CABLE	WET END	*ID COLOUR
3	BLACK (GND)	BLUE 10mm² BLUE 10mm²	35mm² WELDING CABLE	N/A
4	RED (LIVE) YELLOW (LIVE) BLUE (LIVE)	YELLOW 10mm² YELLOW 10mm² YELLOW 10mm²	FEMALE RMK 1/0 FEMALE RMK 1/0 FEMALE RMK 1/0	RED YELLOW BLUE
5	N/C	TWP 1 - SCRN TWP 1 - RED TWP 1 - BLACK	N/C	N/A
6	N/C	TWP 2 - SCRN TWP 2 - RED TWP 2 - BLACK	N/C	N/A

AAE REFERENCE - HVC-3500-4000/5

9. Deployment / Installation

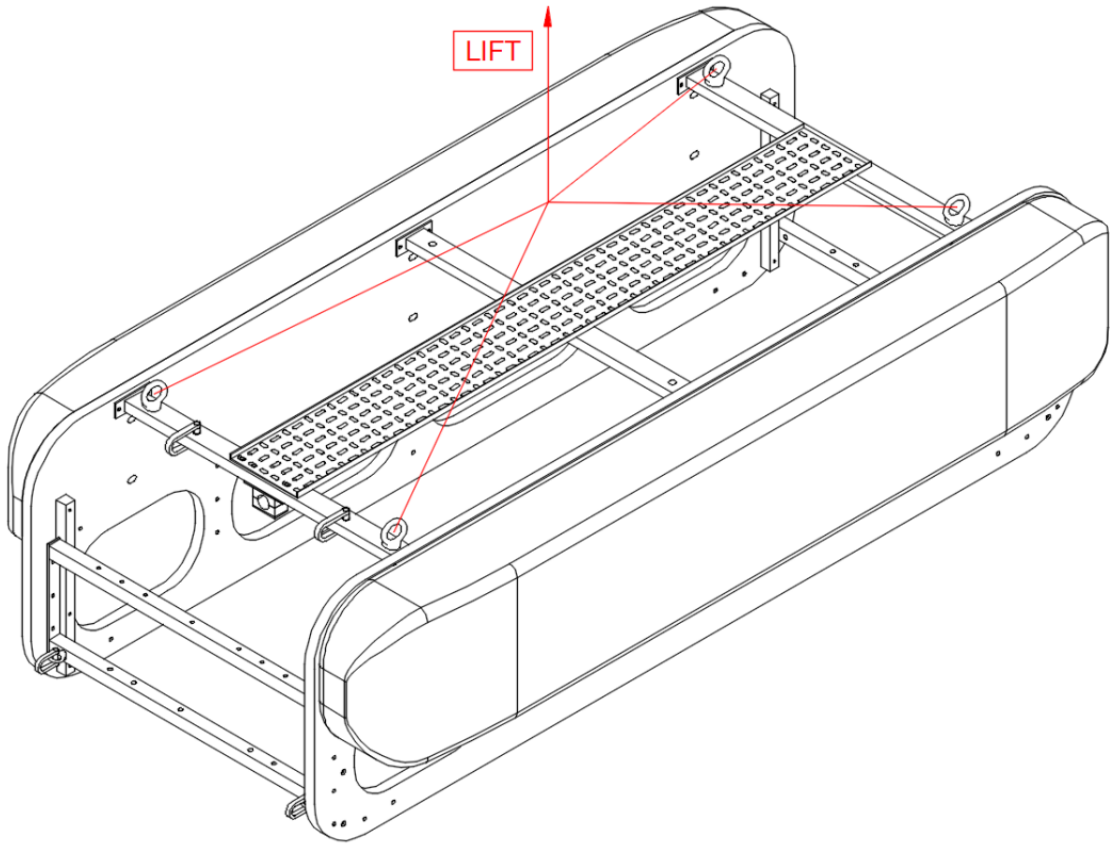
The towing bridle should be secured to the catamaran using two stainless shackles on the two tow points.

NOTE: No stress should be applied to the electrical connections whilst the unit is undertow as this may cause failure during operation.

The HV Cable Grip should be connected to the tow points and adjusted so that in case of tow rope failure no load is applied to the electrical connections or cable clamp.

A quick sea trial should be undertaken to check the floatation / towing characteristics of the catamaran underway at roughly 3-5 Knots.

Lifting Arrangement



AAE REFERENCE - SPK-DURA-7005/2

FOR THIS DIAGRAM SOME COMPONENTS HAVE BEEN REMOVED FOR CLARITY.

The above diagram shows the recommended lifting arrangement using 4 lifting eyes in a 4 point lift.

This arrangement has been tested to the following specification.

Tare Weight	125kg
SWL Weight	75kg
Gross Weight	200kg

NOTE: A 75m HVC3500 Cable can be included within the lift.

The lifting eyes (and any additional lifting accessories used) are subject to the end users own country's lifting equipment regulations and should be thoroughly examined at regular intervals. For users in the UK, this is a six month interval.

10. Maintenance Procedures

Tip Wear

Although Sparker tip wear is very low the sparker tips should be inspected prior to deployment to ensure tip spacing is secure and electrode insulation is adequate. If insulation has deteriorated remove excess tip and re-align tip.

Mechanical

The below procedures are advisory guidelines that are recommended.

Pre-Deployment:

- The recommended interval for a visual inspection is on every deployment of the catamaran.

Visual Inspection (Pre Deployment)

- Check Electrical Connections are secure.
- Check Earth Connection to frame.
- Check for mechanical damage to fastenings and tow points.
- Check the floats.
- Check condition of anodes, replace if expired.

The Applied Acoustic Engineering Dura Spark does not require regular servicing with the exception above operational inspections.

NOTE: - When storing for long periods it is recommended the catamaran is cleaned with fresh water.

11. End of Life Recycling / Disposal

Within the EU all electronic components and batteries must be taken for separate collection at the end of their working life under EU WEEE directives. Applied Acoustics as a manufacturer within the EU will responsibly dispose of any returned end of life Applied Acoustics components / batteries through a registered WEEE scheme. In order to prevent uncontrolled waste disposal and promote re-cycling please return any end of life Applied Acoustic components postage paid by sender to our UK head office. Please contact Tech Support for a RMA number prior to shipping.

12. Specification

Physical

Dura-Spark 240	Length 1700mm Height 490mm Width 660mm Frame 876mm including floatation Weight 60kg
Dura-Spark 400	Length 1700mm Height 490mm Width 660mm Frame 876mm including floatation Weight 70kg

Electrical Specification

Dura-Spark 240	1000J, 5J per tip to minimise bubble collapse component 1250J Maximum
Dura-Spark 400	2000J, 5J per tip to minimise bubble collapse component 2400J Maximum

Compatibility

Source	Seismic Power Supply	HV Cable
Dura-Spark 240	CSP-N 1200 Negative	HVC-3500
Dura-Spark 400	CSP-N 2400 Negative	HVC-3500

Performance

Sound Output	240 Tip 400 Tip	223dB Typical 226dB Typical
Pulse Length	0.5 to 1.5mS depending on power	
Number of Tips	240 Total. 3 x 80. 400 Total. 5 x 80 0	80 // 160 // 240 80 // 240 // 400
Connector Type	RMK 1/0	

Note: Specification is subject to change without notice

Applied Acoustic Engineering is a leading company in the design and manufacture of a wide range of subsea navigation and positioning products, and marine seismic survey equipment.

The extensive product range includes the innovative USBL tracking system, Easytrak, a variety of positioning and release beacons and seismic devices for offshore geotechnical and seabed analysis known as sub-bottom profiling.

All products use acoustics, underwater sound waves, in location, positioning, navigation and data acquisition applications.system, Easytrak, a variety of positioning and release beacons and seismic devices for offshore geotechnical and seabed analysis known as sub-bottom profiling.

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Due to continual product improvement, specification information may be subject to change without notice.