



# PERRY JOHNSON LABORATORY ACCREDITATION, INC.

## *Certificate of Accreditation*

*Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:*

### ***Naval Systems Inc.***

***8551-1 Westside Industrial Dr., Jacksonville, FL 32219***

*(Hereinafter called the Organization) and hereby declares that Organization is accredited  
in accordance with the recognized International Standard:*

### **ISO/IEC 17025:2005**

This accreditation demonstrates technical competence for a defined scope and  
the operation of a laboratory quality management system  
(as outlined by the joint ISO-ILAC-IAF Communiqué dated January 2009):

***Calibration of Dimensional, Electrical, Frequency, Mass, Force,  
Mechanical, and Thermodynamic Measuring Devices  
(As detailed in the supplement)***

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen  
President/Operations Manager

Perry Johnson Laboratory  
Accreditation, Inc. (PJLA)  
755 W. Big Beaver, Suite 1325  
Troy, Michigan 48084

<i>Initial Accreditation Date:</i>	<i>Issue Date:</i>	<i>Accreditation No.:</i>	<i>Certificate No.:</i>
February 14, 2009	June 20, 2011	60048	L11-104

*The validity of this certificate is maintained through ongoing assessments based  
on a continuous accreditation cycle. The validity of this certificate should be  
confirmed through the PJLA website [www.pjlabs.com](http://www.pjlabs.com)*



# Certificate of Accreditation: Supplement

## Naval Systems Inc.

8551-1 Westside Industrial Dr., Jacksonville, FL 32219

David Rini Phone: 904-248-4325

*Accreditation is granted to the facility to perform the following calibration:*

### Dimensional

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Micrometer	25 mm to 330 mm	$(1.25 + 0.017L) \mu\text{m}$	Pratt & Whiney Lab Master Universal
	331 mm to 570 mm	$(9.63 + 0.048L) \mu\text{m}$	Gage Blocks ASME B89.1.9 Grade 0
Gage Blocks	0.5 mm to 100 mm	$(0.46 + 0.002L) \mu\text{m}$	Pratt & Whiney Lab Master Universal
	101 mm to 305 mm	$(0.21 + 0.006L) \mu\text{m}$	Pratt & Whiney Lab Master Universal
Cylindrical Rings	10 mm to 330 mm	$(0.05 + 0.012L) \mu\text{m}$	Pratt & Whiney Lab Master Universal
Cylindrical Plug and Discs	0.25 mm to 305 mm	$(0.35 + 0.012L) \mu\text{m}$	Pratt & Whiney Lab Master Universal
Pin Gages	0.25 mm to 330 mm	$(0.35 + 0.012L) \mu\text{m}$	Pratt & Whiney Lab Master Universal
Micrometer Standards	25 mm to 305 mm	$(0.33 + 0.005L) \mu\text{m}$	Pratt & Whiney Lab Master Universal
	331 mm to 600 mm	$6.35 \mu\text{m}$	Fowler Z Cal 600 XT
Bore Gauges	6 mm to 300 mm	$25 \mu\text{m}$	Master Rings & Gauge Blocks
Calipers	25 mm to 305 mm	$(9.0 + 0.04L) \mu\text{m}$	Pratt & Whiney Lab Master Universal
	331 mm to 610 mm	$21 \mu\text{m}$	Fowler Z_Cal 600 XT
	610 mm to 2540 mm	$127 \mu\text{m}$	Gage Blocks ASME B89.1.9 Grade 0
Indicators	0.05 mm to 100 mm	$3.0 \mu\text{m}$	Pratt & Whiney Lab Master Universal
Height Gages	25 mm to 1 000 mm	$(5.3 + 0.026L) \mu\text{m}$	Gage Blocks ASME B89.1.9 Grade 0
Steel Rules	25 mm to 914 mm	$397 \mu\text{m}$	Gage Blocks ASME B89.1.9 Grade 2
Steel Tapes	25 mm to 3 650 mm	$500 \mu\text{m}$	Gage Blocks ASME B89.1.9 Grade 2



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### Electrical

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Equipment to Measure DC Voltage	23 $\mu$ V to 329.999 9 mV	20 $\mu$ V/V + 1 $\mu$ V	Fluke 5520A
	330 mV to 3.299 99 V	11 $\mu$ V/V + 2 $\mu$ V	
	3.3 V to 32.999 99 V	12 $\mu$ V/V + 20 $\mu$ V	
	30 V to 329.999 9 V	18 $\mu$ V/V + 150 $\mu$ V	
	100 V to 1 000.000 V	18 $\mu$ V/V + 1.5 mV	
Equipment to Output DC Voltage	0.3 $\mu$ V to 200 mV	5.0 $\mu$ V/V + 0.1 $\mu$ V	Fluke 8508A
	200 mV to 2 V	3.5 $\mu$ V/V + 0.4 $\mu$ V	
	2 V to 20 V	3.5 $\mu$ V/V + 4.0 $\mu$ V	
	20 V to 200 V	5.5 $\mu$ V/V + 40.0 $\mu$ V	
	200 V to 1 000 V	5.5 $\mu$ V/V + 500 $\mu$ V	
Equipment to Measure DC Current	0.06 $\mu$ A to 329.999 9 $\mu$ A	0.15 mA/A + 0.02 $\mu$ A	Fluke 5520A
	330 $\mu$ A to 3.299 99 mA	0.10 mA/A + 0.05 $\mu$ A	
	3.3 mA to 32.999 9 mA	0.10 mA/A + 0.25 $\mu$ A	
	33 mA to 329.999 mA	0.10 mA/A + 2.5 $\mu$ A	
	330 A 1.099 99 A	0.20 mA/A + 40 $\mu$ A	
	1.1 A to 2.999 99 A	0.38 mA/A + 40 $\mu$ A	
	3 A to 10.999 9 A	0.50 mA/A + 500 $\mu$ A	
	11 A to 20.5 A	1.0 mA/A + 750 $\mu$ A	
Equipment to Output DC Current	1.25 nA to 200 $\mu$ A	12 $\mu$ A/A + 0.4 nA	Fluke 8508A
	200 $\mu$ A to 2 mA	12 $\mu$ A/A + 4 nA	
	2 mA to 20 mA	14 $\mu$ A/A + 40 nA	
	20 mA to 200 mA	48 $\mu$ A/A + 8 $\mu$ A	
	20 mA to 2 A	185 $\mu$ A/A + 16 $\mu$ A	
	2 A to 20 A	0.4 mA/A + 400 $\mu$ A	
Equipment to Measure AC Voltage At the listed frequencies			Fluke 5520A
10 Hz to 45 Hz	1.0 mV to 32.999 mV	0.80 mV/V + 6 $\mu$ V	
45 Hz to 10 kHz	1.0 mV to 32.999 mV	0.15 mV/V + 6 $\mu$ V	
10 kHz to 20 kHz	1.0 mV to 32.999 mV	0.20 mV/V + 6 $\mu$ V	
20 kHz to 50 kHz	1.0 mV to 32.999 mV	1.0 mV/V + 6 $\mu$ V	
50 kHz to 100 kHz	1.0 mV to 32.999 mV	3.5 mV/V + 12 $\mu$ V	
100 kHz to 500 kHz	1.0 mV to 32.999 mV	8.0 mV/V + 50 $\mu$ V	



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Equipment to Measure AC Voltage At the listed frequencies			Fluke 5520A
10 Hz to 45 Hz	33 mV to 329.999 mV	0.30 mV/V + 8 μV	
45 Hz to 10 kHz	33 mV to 329.999 mV	0.15 mV/V + 8 μV	
10 kHz to 20 kHz	33 mV to 329.999 mV	0.16 mV/V + 8 μV	
20 kHz to 50 kHz	33 mV to 329.999 mV	0.35 mV/V + 8 μV	
50 kHz to 100 kHz	33 mV to 329.999 mV	0.80 mV/V + 32 μV	
100 kHz to 500 kHz	33 mV to 329.999 mV	2.0 mV/V + 70 μV	
Equipment to Measure AC Voltage At the listed frequencies			
10 Hz to 45 Hz	0.33 V to 3.299 99 V	0.30 mV/V + 50 μV	
45 Hz to 10 kHz	0.33 V to 3.299 99 V	0.15 mV/V + 60 μV	
10 kHz to 20 kHz	0.33 V to 3.299 99 V	0.19 mV/V + 60 μV	
20 kHz to 50 kHz	0.33 V to 3.299 99 V	0.30 mV/V + 50 μV	
50 kHz to 100 kHz	0.33 V to 3.299 99 V	0.70 mV/V + 130 μV	
100 kHz to 500 kHz	0.33 V to 3.299 99 V	2.4 mV/V + 600 μV	
Equipment to Measure AC Voltage At the listed frequencies			
10 Hz to 45 Hz	3.3 V to 32.999 9 V	0.30 mV/V + 650 μV	
45 Hz to 10 kHz	3.3 V to 32.999 9 V	1.50 mV/V + 600 μV	
10 kHz to 20 kHz	3.3 V to 32.999 9 V	0.24 mV/V + 600 μV	
20 kHz to 50 kHz	3.3 V to 32.999 9 V	0.35 mV/V + 600 μV	
50 kHz to 100 kHz	3.3 V to 32.999 9 V	0.90 mV/V + 1.6 mV	
Equipment to Measure AC Voltage At the listed frequencies			
10 Hz to 45 Hz	33 V to 329.999 V	0.19 mV/V + 2.0 mV	
45 Hz to 10 kHz	33 V to 329.999 V	0.20 mV/V + 6.0 mV	
10 kHz to 20 kHz	33 V to 329.999 V	0.25 mV/V + 6.0 mV	
20 kHz to 50 kHz	33 V to 329.999 V	0.30 mV/V + 6.0 mV	
50 kHz to 100 kHz	33 V to 329.999 V	2.0 mV/V + 50.0 mV	



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Equipment to Measure AC Voltage At the listed frequencies			Fluke 5520A
45 Hz to 1 kHz	330 V to 1 020 V	0.30 mV/V + 10 mV	
1 kHz to 5 kHz	330 V to 1 020 V	0.25 mV/V + 10 mV	
5 kHz to 10 kHz	330 V to 1 020 V	0.30 mV/V + 10 mV	
Equipment to Output AC Voltage At the listed frequencies			Fluke 8508A
1 Hz to 10 Hz	42.1 μV to 200 mV	0.165 mV/V + 14 μV	
10 Hz to 40 Hz	12.0 μV to 200 mV	0.140 mV/V + 4 μV	
40 Hz to 100 Hz	12.0 μV to 200 mV	0.115 mV/V + 4 μV	
100 Hz to 2 kHz	6.0 μV to 200 mV	0.110 mV/V + 2 μV	
2 kHz to 10 kHz	12.0 μV to 200 mV	0.135 mV/V + 4 μV	
10 kHz to 30 kHz	24.0μV to 200 mV	0.340 mV/V + 8 μV	
30 kHz to 100 kHz	60.0 μV to 200 mV	0.765 mV/V + 20 μV	
Equipment to Output AC Voltage At the listed frequencies			
1 Hz to 10 Hz	200 mV to 2 V	0.15 mV/V + 120 μV	
10 Hz to 40 Hz	200 mV to 2 V	0.115 mV/V + 20 μV	
40 Hz to 100 Hz	200 mV to 2 V	0.09 mV/V + 20 μV	
100 Hz to 2 kHz	200 mV to 2 V	0.075 mV/V + 20 μV	
2 kHz to 10 kHz	200 mV to 2 V	0.11 mV/V + 20 μV	
10 kHz to 30 kHz	200 mV to 2 V	0.22 mV/V + 40 μV	
30 kHz to 100 kHz	200 mV to 2 V	0.57 mV/V + 200 μV	
100 kHz to 300 kHz	200 mV to 2 V	3.0 mV/V + 2 mV	
300 kHz to 1 MHz	200 mV to 2 V	0.057 mV/V + 20 mV	
Equipment to Output AC Voltage At the listed frequencies			
1 Hz to 10 Hz	2 V to 20 V	0.15 mV/V + 1.2 mV	
10 Hz to 40 Hz	2 V to 20 V	0.115 mV/V + 200 μV	
40 Hz to 100 Hz	2 V to 20 V	0.09 mV/V + 200 μV	
100 Hz to 2 kHz	2 V to 20 V	0.075 mV/V + 200 μV	
2 kHz to 10 kHz	2 V to 20 V	0.11 mV/V + 200 μV	
10 kHz to 30 kHz	2 V to 20 V	0.22 mV/V + 400 μV	
30 kHz to 100 kHz	2 V to 20 V	0.57 mV/V + 2 mV	



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Equipment to Output AC Voltage At the listed frequencies			Fluke 8508A
100 kHz to 300 kHz	2 V to 20 V	3.0 mV/V + 20 mV	
300 kHz to 1 MHz	2 V to 20 V	20 mV/V + 200 mV	
Equipment to Output AC Voltage At the listed frequencies			
1 Hz to 10 Hz	200 V to 1 000 V	0.15 mV/V + 70 mV	
10 Hz to 40 Hz	200 V to 1 000 V	0.12 mV/V + 20 mV	
40 Hz to 100 Hz	200 V to 1 000 V	0.115 mV/V + 20 mV	
10 kHz to 30 kHz	200 V to 1 000 V	0.225 mV/V + 40 mV	Fluke 5520A
30 kHz to 100 kHz	200 V to 1 000 V	0.58 mV/V + 200 mV	
Equipment to Measure AC Current At the listed frequencies			
10 Hz to 20 Hz	29 µA to 329.99 µA	2.0 mA/A + 0.1 µA	
20 Hz to 45 Hz	29 µA to 329.99 µA	1.5 mA/A + 0.1 µA	
45 Hz to 1 kHz	29 µA to 329.99 µA	1.25 mA/A + 0.1 µA	
1 kHz to 5 kHz	29 µA to 329.99 µA	3.0 mA/A + 0.15 µA	
5 kHz to 10 kHz	29 µA to 329.99 µA	8.0 mA/A + 0.2 µA	
10 kHz to 30 kHz	29 µA to 329.99 µA	16 mA/A + 0.4 µA	
Equipment to Measure AC Current At the listed frequencies			
10 Hz to 20 Hz	0.33 mA to 3.299 9 mA	2.0 mA/A + 0.15 µA	
20 Hz to 45 Hz	0.33 mA to 3.299 9 mA	1.25 mA/A + 0.15 µA	
45 Hz to 1 kHz	0.33 mA to 3.299 9 mA	1.0 mA/A + 0.15 µA	
1 kHz to 5 kHz	0.33 mA to 3.299 9 mA	2.0 mA/A + 0.2 µA	
5 kHz to 10 kHz	0.33 mA to 3.299 9 mA	5.0 mA/A + 0.3 µA	
10 kHz to 30 kHz	0.33 mA to 3.299 9 mA	10 mA/A + 0.6 µA	





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Equipment to Measure AC Current At the listed frequencies			Fluke 5520A
10 Hz to 20 Hz	3.3 mA to 32.999 mA	1.8 mA/A + 2 µA	
20 Hz to 45 Hz	3.3 mA to 32.999 mA	0.9 mA/A + 2 µA	
45 Hz to 1 kHz	3.3 mA to 32.999 mA	0.4 mA/A + 2 µA	
1 kHz to 5 kHz	3.3 mA to 32.999 mA	0.8 mA/A + 2 µA	
5 kHz to 10 kHz	3.3 mA to 32.999 mA	2.0 mA/A + 3 µA	
10 kHz to 30 kHz	3.3 mA to 32.999 mA	4.0 mA/A + 4 µA	
Equipment to Measure AC Current At the listed frequencies			
10 Hz to 20 Hz	33 mA to 329.99 mA	1.8 mA/A + 20 µA	
20 Hz to 45 Hz	33 mA to 329.99 mA	0.9 mA/A + 20 µA	
45 Hz to 1 kHz	33 mA to 329.99 mA	0.4 mA/A + 20 µA	
1 kHz to 5 kHz	33 mA to 329.99 mA	1.0 mA/A + 50 µA	
5 kHz to 10 kHz	33 mA to 329.99 mA	2.0 mA/A + 100 µA	
10 kHz to 30 kHz	33 mA to 329.99 mA	4.0 mA/A + 200 µA	
Equipment to Measure AC Current At the listed frequencies			
10 Hz to 45 Hz	0.33 A to 1.099 99 A	1.8 mA/A + 100 µA	
45 Hz to 1 kHz	0.33 A to 1.099 99 A	0.5 mA/A + 100 µA	
1 kHz to 5 kHz	0.33 A to 1.099 99 A	6.0 mA/A + 1.0 mA	
5 kHz to 10 kHz	0.33 A to 1.099 99 A	25 mA/A + 5.0 mA	
Equipment to Measure AC Current At the listed frequencies			
10 Hz to 45 Hz	1.1 A to 2.999 99 A	1.8 mA/A + 100 µA	
45 Hz to 1 kHz	1.1 A to 2.999 99 A	0.6 mA/A + 100 µA	
1 kHz to 5 kHz	1.1 A to 2.999 99 A	6.0 mA/A + 1.0 mA	
5 kHz to 10 kHz	1.1 A to 2.999 99 A	25 mA/A + 5.0 mA	
Equipment to Measure AC Current At the listed frequencies			
45 Hz to 100 Hz	3 A to 10.999 99A	0.6 mA/A + 2.0 mA	
100 Hz to 1 kHz	3 A to 10.999 99A	1.0 mA/A + 2.0 mA	
1 kHz to 5 kHz	3 A to 10.999 99A	30 mA/A + 2.0 mA	



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Equipment to Measure AC Current At the listed frequencies			Fluke 5520A
45 Hz to 100 Hz	11 A to 20.5 A	1.2 mA/A + 5.0 mA	
100 Hz to 1 kHz	11 A to 20.5 A	1.5 mA/A + 5.0 mA	
1 kHz to 5 kHz	11 A to 20.5 A	31 mA/A + 5.0 mA	
Equipment to Output AC Current At the listed frequencies			Fluke 8508A
1 Hz to 10 Hz	12 $\mu$ A to 200 $\mu$ A	0.5 mA/A + 0.02 $\mu$ A	
10 Hz to 10 kHz	12 $\mu$ A to 200 $\mu$ A	0.5 mA/A + 0.02 $\mu$ A	
10 kHz to 30 kHz	12 $\mu$ A to 200 $\mu$ A	0.71 mA/A + 0.02 $\mu$ A	
30 kHz to 100 kHz	12 $\mu$ A to 200 $\mu$ A	4.0 mA/A + 0.02 $\mu$ A	
Equipment to Output AC Current At the listed frequencies			
1 Hz to 10 Hz	200 $\mu$ A to 2 mA	0.31mA/A + 0.2 $\mu$ A	
10 Hz to 10 kHz	200 $\mu$ A to 2 mA	0.30 mA/A + 0.2 $\mu$ A	
10 kHz to 30 kHz	200 $\mu$ A to 2 mA	0.71 mA/A + 0.2 $\mu$ A	
30 kHz to 100 kHz	200 $\mu$ A to 2 mA	4.0 mA/A + 0.2 $\mu$ A	
Equipment to Output AC Current At the listed frequencies			
1 Hz to 10 Hz	2 mA to 20 mA	0.31mA/A + 2 $\mu$ A	
10 Hz to 10 kHz	2 mA to 20 mA	0.30 mA/A + 2 $\mu$ A	
10 kHz to 30 kHz	2 mA to 20 mA	0.71 mA/A + 2 $\mu$ A	
30 kHz to 100 kHz	2 mA to 20 mA	4.0 mA/A + 2 $\mu$ A	
Equipment to Output AC Current At the listed frequencies			
1 Hz to 10 Hz	20 mA to 200 mA	0.31 mA/A + 20 $\mu$ A	
10 Hz to 10 kHz	20 mA to 200 mA	0.29 mA/A + 20 $\mu$ A	
10 kHz to 30 kHz	20 mA to 200 mA	0.625 mA/A + 20 $\mu$ A	
Equipment to Output AC Current At the listed frequencies			
10 Hz to 2 kHz	200 mA to 2 A	0.62 mA/A + 0.20 mA	
2 kHz to 10 kHz	200 mA to 2 A	0.735 mA/A + 0.20 mA	
10 kHz to 30 kHz	200 mA to 2 A	3.0 mA/A + 0.20 mA	





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Equipment to Output AC Current At the listed frequencies			Fluke 8508A
10 Hz to 2 kHz	2 A to 20 A	0.82 mA/A + 2 mA	
2 kHz to 10 kHz	2 A to 20 A	2.5 mA/A + 2 mA	
Equipment to Measure Resistance	3 m $\Omega$ to 10.999 9 $\Omega$	40 $\mu\Omega/\Omega$ + 1 m $\Omega$	Fluke 5520A
	11 $\Omega$ to 32.999 9 $\Omega$	30 $\mu\Omega/\Omega$ + 1.5 m $\Omega$	
	33 $\Omega$ to 109.999 9 $\Omega$	28 $\mu\Omega/\Omega$ + 1.4 m $\Omega$	
	110 $\Omega$ to 329.999 9 $\Omega$	28 $\mu\Omega/\Omega$ + 2 m $\Omega$	
	330 $\Omega$ to 1.099 999 k $\Omega$	28 $\mu\Omega/\Omega$ + 2 m $\Omega$	
	1.1 k $\Omega$ to 3.2999 999 k $\Omega$	28 $\mu\Omega/\Omega$ + 20 m $\Omega$	
	3.3 k $\Omega$ to 10.999 99 k $\Omega$	28 $\mu\Omega/\Omega$ + 20 m $\Omega$	
	11 k $\Omega$ to 32.999 99 k $\Omega$	28 $\mu\Omega/\Omega$ + 0.2 $\Omega$	
	33 k $\Omega$ to 109.999 9 k $\Omega$	28 $\mu\Omega/\Omega$ + 0.2 $\Omega$	
	110 k $\Omega$ to 329.999 9 k $\Omega$	32 $\mu\Omega/\Omega$ + 2 $\Omega$	
	330 k $\Omega$ to 1.099 99 k $\Omega$	32 $\mu\Omega/\Omega$ + 2 $\Omega$	
	1.1 M $\Omega$ to 3.299 999 M $\Omega$	60 $\mu\Omega/\Omega$ + 30 $\Omega$	
	3.3 M $\Omega$ to 10.999 99 M $\Omega$	0.13 m $\Omega/\Omega$ + 50 $\Omega$	
	11 M $\Omega$ to 32.999 99 M $\Omega$	0.25 m $\Omega/\Omega$ + 2.5 k $\Omega$	
	33 M $\Omega$ to 109.999 9 M $\Omega$	0.50 m $\Omega/\Omega$ + 3 k $\Omega$	
	110 M $\Omega$ to 329.999 9 M $\Omega$	3 m $\Omega/\Omega$ + 100 k $\Omega$	
	330 M $\Omega$ to 1 110 M $\Omega$	15 m $\Omega/\Omega$ + 500 k $\Omega$	
Equipment to Output Resistance	12 $\mu\Omega$ to 2 $\Omega$	17 $\mu\Omega/\Omega$ + 4.0 $\mu\Omega$	Fluke 8508A - Normal
	2 $\Omega$ to 20 $\Omega$	9.5 $\mu\Omega/\Omega$ + 14 $\mu\Omega$	
	20 $\Omega$ to 2 k $\Omega$	8 $\mu\Omega/\Omega$ + 0.5 m $\Omega$	
	2 k $\Omega$ to 20 k $\Omega$	8 $\mu\Omega/\Omega$ + 5.0 m $\Omega$	
	20 k $\Omega$ to 200 k $\Omega$	8 $\mu\Omega/\Omega$ + 50 m $\Omega$	
	200 k $\Omega$ to 2 M $\Omega$	9 $\mu\Omega/\Omega$ + 1.0 $\Omega$	
	2 M $\Omega$ to 20 M $\Omega$	20 $\mu\Omega/\Omega$ + 100 $\Omega$	
	20 M $\Omega$ to 200 M $\Omega$	120 $\mu\Omega/\Omega$ + 10 k $\Omega$	
	200 M $\Omega$ to 2 G $\Omega$	1.51 m $\Omega/\Omega$ + 1 M $\Omega$	



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Equipment to Measure Capacitance At the listed frequencies 10 Hz to 10 kHz	0.19 nF to 0.399 9 nF	5 mF/F + 0.01 nF	Fluke 5520A
	0.4 nF to 1.099 9 nF	5 mF/F + 0.01 nF	
Equipment to Measure Capacitance At the listed frequencies 10 Hz to 3 kHz	0.1.1 nF to 3.299 9 nF	5 mF/F + 0.01 nF	
Equipment to Measure Capacitance At the listed frequencies 10 Hz to 1kHz	3.3 nF to 10.999 9 nF	2.5 mF/F + 0.01 nF	
	11 nF to 32.999 9 nF	2.5 mF/F + 0.1 nF	
	33 nF to 109.999 nF	2.5 mF/F + 0.1 nF	
	110 nF to 329.999 nF	2.5 mF/F + 0.3 nF	
Equipment to Measure Capacitance At the listed frequencies 10 Hz to 600 Hz	0.33 $\mu$ F to 1.099 99 $\mu$ F	2.5 mF/F + 1 nF	
Equipment to Measure Capacitance At the listed frequencies 10 Hz to 300 Hz	1.1 $\mu$ F to 3.29 999 $\mu$ F	2.5 mF/F + 3 nF	
Equipment to Measure Capacitance At the listed frequencies 10 Hz to 150 Hz	3.3 $\mu$ F to 10.999 9 $\mu$ F	2.5 mF/F + 10 nF	
Equipment to Measure Capacitance At the listed frequencies 10 Hz to 120 Hz	11 $\mu$ F to 32.999 9 $\mu$ F	4 mF/F + 30 nF	
Equipment to Measure Capacitance At the listed frequencies 10 Hz to 80 Hz	33 $\mu$ F to 109.999 $\mu$ F	4.5 mF/F + 100 nF	
Equipment to Measure Capacitance At the listed frequencies 0 Hz to 50 Hz	110 $\mu$ F to 329.999 $\mu$ F	4.5 mF/F + 300 nF	



# Certificate of Accreditation: Supplement

## Naval Systems Inc.

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### Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Measure Capacitance At the listed frequencies 0 Hz to 20 Hz	0.33 mF to 1.099 99 mF	4.5 mF/F + 1 $\mu$ F	Fluke 5520A
Equipment to Measure Capacitance At the listed frequencies 0 Hz to 6 Hz	1.1 mF to 3.299 9 mF	4.5 mF/F + 3 $\mu$ F	
Equipment to Measure Capacitance At the listed frequencies 0 Hz to 2 Hz	3.3 mF to 10.999 9 mF	4.5 mF/F + 10 $\mu$ F	
Equipment to Measure Capacitance At the listed frequencies 0 Hz to 0.6 Hz	11 mF to 32.999 9 mF	7.5 mF/F + 30 $\mu$ F	
Equipment to Measure Capacitance At the listed frequencies 0 Hz to 0.2 Hz	33 mF to 110 mF	11 mF/F + 100 $\mu$ F	
Equipment to Measure Power At the listed frequencies 10 Hz to 20 kHz	100 mW to 250 mW	11.5 mW/W	Fluke 9640A
	25 mW to 100 mW	11.5 mW/W	
	20 $\mu$ W to 25 mW	11.6 mW/W	
	16 nW to 20 $\mu$ W	11.6 mW/W	
Equipment to Measure Power At the listed frequencies 20 kHz to 100 kHz	100 mW to 250 mW	11.5 mW/W	
	25 mW to 100 mW	11.5 mW/W	
	20 $\mu$ W to 25 mW	11.6 mW/W	
	16 nW to 20 $\mu$ W	11.6 mW/W	
Equipment to Measure Power At the listed frequencies 100 kHz to 10 MHz	100 mW to 250 mW	11.5 mW/W	
	25 mW to 100 mW	11.5 mW/W	
	20 $\mu$ W to 25 mW	11.6 mW/W	
	16 nW to 20 $\mu$ W	11.6 mW/W	
	40 pW to 16 nW	47.1 mW/W	
	4 pW to 40 pW	122.0 mW/W	
	0.4 pW to 4 pW	122.0mW/W	



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### Electrical

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Equipment to Measure Power At the listed frequencies 10 MHz to 125 MHz	100 mW to 250 mW	11.5 mW/W	Fluke 9640A
	25 mW to 100 mW	11.5 mW/W	
	20 $\mu$ W to 25 mW	11.6 mW/W	
	16 nW to 20 $\mu$ W	11.6 mW/W	
	40 pW to 16 nW	47.1 mW/W	
Equipment to Measure Power At the listed frequencies 10 MHz to 125 MHz	4 pW to 40 pW	122.0 mW/W	
	0.4 pW to 4 pW	122.0 mW/W	
	1 fW to 0.4 pW	412.5 mW/W	
Equipment to Measure Power At the listed frequencies 10 MHz to 125 MHz	100 mW to 250 mW	11.5 mW/W	
	25 mW to 100 m	11.5 mW/W	
	20 $\mu$ W to 25 mW	11.6 mW/W	
	16 nW to 20 $\mu$ W	11.6 mW/W	
	40 pW to 16 nW	47.1 mW/W	
	4 pW to 40 pW	122.0 mW/W	
	0.4 pW to 4 pW	122.0 mW/W	
	1 fW to 0.4 pW	412.5 mW/W	
Equipment to Measure Power At the listed frequencies 125 MHz to 300 MHz	25 mW to 100 mW	23.3 mW/W	
	20 $\mu$ W to 25 mW	23.3 mW/W	
	16 nW to 20 $\mu$ W	23.3 mW/W	
	40 pW to 16 nW	47.1 mW/W	
	4 pW to 40 pW	122.0 mW/W	
	0.4 pW to 4 pW	122.0 mW/W	
	1 fW to 0.4 pW	412.5 mW/W	
Equipment to Measure Power At the listed frequencies 300 MHz to 1.4 GHz	25 mW to 100 mW	59.3 mW/W	
	20 $\mu$ W to 25 mW	59.3 mW/W	
	16 nW to 20 $\mu$ W	122.0 mW/W	
	40 pW to 16 nW	122.0 mW/W	
	4 pW to 40 pW	258.9 mW/W	
	0.4 pW to 4 pW	258.9 mW/W	
	1 fW to 0.4 pW	412.5 mW/W	



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Equipment to Measure Power At the listed frequencies 1.4 GHz to 3 GHz	20 $\mu$ W to 25 mW	71.5 mW/W	Fluke 9640A
	16 nW to 20 $\mu$ W	122.0 mW/W	
	4 pW to 40 pW	258.9 mW/W	
	0.4 pW to 4 pW	258.9 mW/W	
	1 fW to 0.4 pW	412.5 mW/W	
Equipment to Measure Power At the listed frequencies 3 GHz to 4 GHz	20 $\mu$ W to 25 mW	122.0 mW/W	
	16 nW to 20 $\mu$ W	122.0 mW/W	
	40 pW to 16 nW	122.0 mW/W	
	4 pW to 40 pW	258.9 mW/W	
Equipment to Output Power At the listed frequencies 9 kHz to 6 GHz	1 nW to 100 mW	3 % of reading	Agilent U2004A
Equipment to Output Power At the listed frequencies 100 kHz to 2.6 GHz	10 $\mu$ W to 1.0 W	122.0 mW/W	Hewlett Packard 8901B with 11722A
Equipment to Output Power At the listed frequencies 10 MHz to 18 GHz	1.0 $\mu$ W to 100 mW	122.0 mW/W	Hewlett Packard 437B with 8181 A
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type B	600 °C to 800 °C	0.44 °C	Electrical Simulation of Thermocouple Output Fluke 5520A
	800 °C to 1 000 °C	0.34 °C	
	1 000 °C to 1 550 °C	0.30 °C	
	1 550 °C to 1 820 °C	0.33 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type C	0 °C to 150 °C	0.30 °C	
	150 °C to 650 °C	0.26 °C	
	650 °C to 1 000 °C	0.31 °C	
	1 000 °C to 1 800 °C	0.50 °C	
	1 800 °C to 2 316 °C	0.84 °C	



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### Electrical

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Temperature Calibration, Indication and Control Equipment used with Thermocouple Type E	-250 °C to -100 °C	0.50 °C	Electrical Simulation of Thermocouple Output Fluke 5520A
	-100 °C to -25 °C	0.16 °C	
	-25 °C to 350 °C	0.14 °C	
	350 °C to 650 °C	0.17 °C	
	650 °C to 1 000 °C	0.24 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type J	-210 °C to -100 °C	0.27 °C	
	-100 °C to -25 °C	0.16 °C	
	-30 °C to 150 °C	0.14 °C	
	150 °C to 760 °C	0.18 °C	
	760 °C to 1 200 °C	0.24 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type K	-200 °C to -100 °C	0.33 °C	
	-100 °C to -25 °C	0.18 °C	
	-25 °C to 120 °C	0.16 °C	
	120 °C to 1 000 °C	0.26 °C	
	1 000 °C to 1 372 °C	0.40 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type N	-200 °C to -100 °C	0.40 °C	
	-100 °C to -25 °C	0.22 °C	
	-125 °C to 120 °C	0.19 °C	
	120 °C to 410 °C	0.18 °C	
	410 °C to 1 300 °C	0.27 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type R	0 °C to 250 °C	0.57 °C	
	250 °C to 400 °C	0.35 °C	
	400 °C to 1 000 °C	0.33 °C	
	1 000 °C to 1 767 °C	0.40 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type T	-250 °C to -15 °C	0.63 °C	
	-150 °C to 0 °C	0.24 °C	
	0 °C to 120 °C	0.16 °C	
	120 °C to 400 °C	0.14 °C	





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### Mass, Force, and Weighing Devices

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Mass ANSI/ASTM Class 7	0.05 g to 61 g	0.000 5 g	Denver TL-64
	61 g to 4 100 g	0.05 g	Ohaus E1D120
	4.1 kg to 15 kg	0.49 g	Fairbanks 70-6115
Force-Tension & Compression, Forces Gages and Load Cell Based Devices	2 N to 445 N	0.4 N	Omega LC101-100 with DPM-3
	445 N to 2 225 N	1.35 N	Omega LC101-500 with DPM-3
	2 225 N to 9 000 N	4.9 N	Omega LC101-2K with DPM-3
	9 000 N to 45 000 N	22 N	Omega LC101-10K with DPM-3
	45 000 N to 177 000 N	279 N	Omega LC101-40K with DPM-3
Force- Compression	44 500 N to 450 000 N	268 N	OmegaDyne LC1102-100K with Transducer Techniques DPM-3

### Mechanical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Torque Wrenches	45.2 N•cm to 226 N•cm	0.59 % of Reading	Mountz S 320
	3.40 N•m to 16.9 N•m	0.77 % of Reading	AWS 3015
	3.00 N•m to 28.25 N•m	0.73 % of Reading	CDI 2502-I-DDT
	34.0 N•m to 340 N•m	0.65 % of Reading	Armstrong 64-646
	160 N•m to 813 N•m	1.0 % of Reading	Snap On TQTP 600
	150 N•m to 1 500 N•m	4.1 N•m	Transducer Techniques SWS-1k with Transducer Techniques DPM-3
Torque Analyzers	6.77 N•m to 339 N•m	0.065 % of Applied Load	TTP250with Class F weights
Equipment to Measure Pressure	5 kPa to 7 MPa (abs)	$(10 + 3.7 \times 10^{-5} P)$ Pa	DHI PG7601
	160 kPa to 52 000 kPa (rel. to atm)	52 kPa	Ashcroft ATE-100/AQS-2
	52 000 kPa to 280 000 kPa (rel. to atm)	$(62 + 5.7 \times 10^{-3} P)$ kPa	Ruska 2451 625-M100



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### Thermodynamic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Measure Temperature Thermistors	-45 °C to 140 °C	0.034 °C	Hart Scientific 9170, Hart Scientific 5616-12, and Fluke 8508A
RTDs	-45 °C to 140 °C	0.10 °C	Hart Scientific 9170, Hart Scientific 5616-12, and Fluke 8508A
	141 °C to 320 °C	0.59 °C	King Nutronics Drywell 3604, Hart Scientific 5616-12, and Fluke 8508A
	321 °C to 650 °C	(0.11 + 0.001 5Te) °C	King Nutronics Drywell 3604-1-101
Thermocouples	-45 °C to 140 °C	0.18 °C	Hart Scientific 9170, Hart Scientific 5616, and Fluke 8508A
	141 °C to 320 °C	0.61 °C	King Nutronics Drywell 3604, Hart Scientific 5616-12, and Fluke 8508A
	321 °C to 650 °C	(0.11 + 0.001 5Te) °C	King Nutronics Drywell 3604
Liquid in Glass Thermometers	-45 °C to 140 °C	0.31 °C	Hart Scientific 9170, Hart Scientific 5616, and Fluke 8508A
	141 °C to 320 °C	0.97 °C	King Nutronics Drywell 3604, Hart Scientific 5616-12, and Fluke 8508A
	321 °C to 650 °C	1.2 °C	King Nutronics Drywell 3604
IR Devices	50 °C to 121 °C	0.4 0.95 °C	Extech IRC350
	122 °C to 260 °C	1.34 °C	Hart Scientific 5616-12, and Fluke 8508A
	261 °C to 350 °C	2.03 °C	Hart Scientific 5616-12, and Fluke 8508A
Equipment to Source Temperature Bath and Block Calibrators	-196 °C to 125 °C	0.18 °C	Hart Scientific 5616 with Fluke 8508A
	125 °C to 420 °C	0.28 °C	Hart Scientific 5616 with Fluke 8508A



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#### Time and Frequency

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Measure Frequency	10 MHz	64 $\mu$ Hz	GPS Time Standard-Hewlett Packard Z3801A
	10 Hz to 4 GHz	160 $\mu$ Hz + 0.04 $\mu$ Hz/Hz	Fluke 9640A
	1 GHz to 20 GHz	3.7 $\mu$ Hz/Hz	Agilent 83731B-1E1 with Hewlett Packard Z3801A
Equipment to Output Frequency	10 Hz to 20 GHz Resolutions to 1 Hz	2 $\mu$ Hz/Hz	Hewlett Packard 5350B with Hewlett Packard Z3801A

1. The CMC (Calibration and Measurement Capability) stated for calibrations included on this scope of accreditation represent the smallest measurement uncertainties attainable by the laboratory when performing a more or less routine calibration of a nearly ideal device under nearly ideal conditions. It is expressed at a confidence level of 95 % using a coverage factor  $k$  (usually equal to 2). The actual measurement uncertainty associated with a specific calibration performed by the laboratory will typically be larger than the CMC for the same calibration since capability and performance of the device being calibrated and the conditions related to the calibration may reasonably be expected to deviate from ideal to some degree.
2. The laboratories range of calibration capability for all disciplines for which they are accredited is the interval from the smallest calibrated standard to the largest calibrated standard used in performing the calibration. The low end of this range must be an attainable value for which the laboratory has or has access to the standard referenced. Verification of an indicated value of zero in the absence of a standard is common practice in the procedure for many calibrations but by its definition it does not constitute calibration of zero capacity.
3. When calibrations are performed at customer locations the resulting measurement uncertainty associated with the calibration will typically be larger than the CMC stated on this scope of accreditation. This is due in large part to variation of environmental conditions at customer facilities, the effects of transport on any standards or equipment taken to customer sites and the resolution and repeatability unique to the device being calibrated.
4. The term L represents length in inches or millimeters appropriate to the uncertainty statement.
5. The term P represents pressure in Pascals or kPascals appropriate to the uncertainty statement.
6. The term T represents torque in Newton•meters.
7. The term F represents force in Newtons.
8. The term Te represents temperature in °C.