

Customer	Magellan
Location	Grand Forks, ND
Designation	Truck Rack
Serial	96647
Prover Type	Atmospheric Tank
Date Completed	8/11/2014

## Certificate of Calibration

8/11/2014

This is to certify that Meter Engineers, Inc. calibrated subject Atmospheric Tank meter prover and established the volume at 60 degrees fahrenheit and atmospheric pressure, to be:

**New Prover Volume**

If No corrections Needed	WITH Corrections
Tank Volume gal <span style="float: right;">999.958</span>	Tank Volume gal
Tank Volume inches <span style="float: right;">230,990.281</span>	Tank Volume inches
Tank Volume barrels <span style="float: right;">23.809</span>	Tank Volume barrels

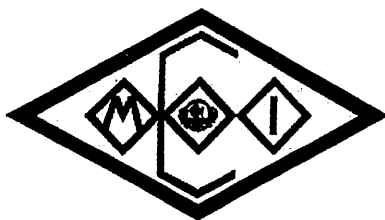
The calibrating medium used was water and the calibration was performed in accordance with the latest edition of the API Standards Chapters 4, 11, & 12 by Gary Clark and certified by the undersigned. Test performed using trailer unit number 134.

**Certified Test Measures Used:**

Measure #	Gal	NIST #
1	100	7241
2	100	7240
3	50	7242

Signed \_\_\_\_\_

*Deb Jacks*



Customer	Magellan
Location	Grand Forks, ND
Designation	Truck Rack
Serial	96647
Prover Type	Atmospheric Tank
Date Completed	8/11/2014

## Tank Run Comparisons

### Established Prover Volume

Tank Volume gal	1000
Tank Volume inches	231000
Tank Volume barrels	23.8095238

These values represent the design or initial volumes before any needed corrections.

### Check Runs

Run 1 = 230,990.8847	}	0.0005 %		Avg		Volume Diff 1 & 2 to Established %
Run 2 = 230,989.6769		230,990.281	-0.0042 %			

### Calibration Calculations

Established Vol	Avg Run Volume	Linear Measurement of Scale	
231000	-	230990.281	<b>X</b>
			= ?

Scale Reading

Temp of Can

Scale was moved up ? inches which corresponds to the prover volume correction needed of 9.7192 cubic inches. Measure volume of can is temperature compensated.

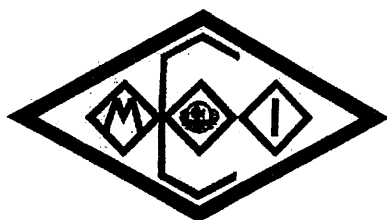
### Verification Runs (After Correction if any)

Run =	}		Avg		Volume Diff & to Established %
Run =		-100 %			

### New Prover Volume

If No corrections Needed	
Tank Volume gal	999.958
Tank Volume inches	230,990.281
Tank Volume barrels	23.809

WITH Corrections	
Tank Volume gal	
Tank Volume inches	
Tank Volume barrels	



Customer	Magellan
Location	Grand Forks, ND
Designation	Truck Rack
Serial	96647
Prover Type	Atmospheric Tank

## Prover Information

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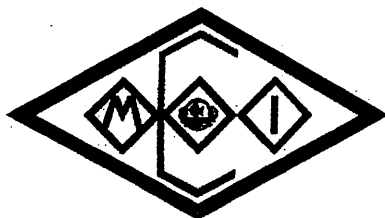
Prover Type	Atmospheric Tank
Designation	Truck Rack
Serial	96647
Mfg of Prover	Brown Tank Co.
Coated?	No
Insulated?	No
Metallic Composition	Carbon Steel
Coefficient of Cubical Expansion	.0000186
Modulus of Elasticity	30000000
Unit Number	
Notes	Moved scale 0.26 inches up resealed with #0125

### Methodology

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CTL Temperature Correction Factor is based on API Petroleum Measurement manual Chapter 11.2.1

CTS Metal Correction Factor =  $(1 + ((\text{Can Temp in F} - 60) \text{ times the Can Coefficient of Expansion}))$   
 divided by  $(1 + ((\text{Prover Temp in F} - 60) \text{ times the Prover Coefficient of Expansion}))$



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Location	Grand Forks, ND
Designation	Truck Rack
Serial	96647
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Date Completed	8/11/2014

# Run Calculation Summary

Gary Clark

## Run # 1

Measure	Certified Volume	Scale Reading	Actual Volume	Prover Temp	Can Temp	CTL Temp Correction	CTS Metal Correction	Adjusted Volume
Can # 1 100 gal	23,093.63	0	23,093.63	69.8	70.2	0.999951	1.000088	23,094.5306
Can # 2 100 gal	23,092.99	0	23,092.99	69.8	70	0.999976	1.000083	23,094.3524
Can # 3 50 gal	11,548.56	0	11,548.56	69.8	70	0.999976	1.000083	11,549.2413
Can # 1 100 gal	23,093.63	0	23,093.63	69.8	69.9	0.999988	1.000080	23,095.2003
Can # 2 100 gal	23,092.99	0	23,092.99	69.8	69.9	0.999988	1.000080	23,094.5603
Can # 3 50 gal	11,548.56	0	11,548.56	69.8	70	0.999976	1.000083	11,549.2413
Can # 1 100 gal	23,093.63	0	23,093.63	69.8	69.9	0.999988	1.000080	23,095.2003
Can # 2 100 gal	23,092.99	0	23,092.99	69.8	70	0.999976	1.000083	23,094.3524
Can # 3 50 gal	11,548.56	0	11,548.56	69.8	70.1	0.999964	1.000086	11,549.1374
Can # 1 100 gal	23,093.63	-5	23,088.63	69.8	70.1	0.999964	1.000086	23,089.7844
Can # 2 100 gal	23,092.99	-3	23,089.99	69.8	70.1	0.999964	1.000086	23,091.1444
Can # 3 50 gal	11,548.56	45	11,593.56	69.8	70.1	0.999964	1.000086	11,594.1396

Volume This Run 230,990.8847  
 Divided by CPS ?  
 Divided by CPL

Pressure & Temperature Adjusted Volume This Run ?

## Run # 2

Measure	Certified Volume	Scale Reading	Actual Volume	Prover Temp	Can Temp	CTL Temp Correction	CTS Metal Correction	Adjusted Volume
Can # 1 100 gal	23,093.63	0	23,093.63	70.5	71.1	0.999926	1.000099	23,094.2072
Can # 2 100 gal	23,092.99	0	23,092.99	70.5	70.8	0.999963	1.000091	23,094.2369
Can # 3 50 gal	11,548.56	0	11,548.56	70.5	70.8	0.999963	1.000091	11,549.1836

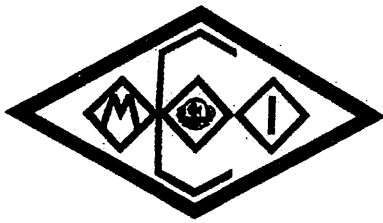
## Run Calculation Summary (cont)

Can # 1 100 gal	23,093.63	0	23,093.63	70.5	70.7	0.999975	1.000089	23,095.1079
Can # 2 100 gal	23,092.99	0	23,092.99	70.5	70.8	0.999963	1.000091	23,094.2369
Can # 3 50 gal	11,548.56	0	11,548.56	70.5	70.8	0.999963	1.000091	11,549.1836
Can # 1 100 gal	23,093.63	0	23,093.63	70.5	70.7	0.999975	1.000089	23,095.1079
Can # 2 100 gal	23,092.99	0	23,092.99	70.5	70.7	0.999975	1.000089	23,094.4679
Can # 3 50 gal	11,548.56	0	11,548.56	70.5	70.8	0.999963	1.000091	11,549.1836
Can # 1 100 gal	23,093.63	1	23,094.63	70.5	70.7	0.999975	1.000089	23,096.1080
Can # 2 100 gal	23,092.99	0	23,092.99	70.5	70.7	0.999975	1.000089	23,094.4679
Can # 3 50 gal	11,548.56	35	11,583.56	70.5	70.8	0.999963	1.000091	11,584.1855

Volume This Run	230,989.6769
Divided by CPS	?
Divided by CPL	?

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Pressure & Temperature Adjusted Volume This Run      ?



# WaterDraw Calibration Worksheet

Customer | Magellan  
 Location | Grand Forks, ND  
 Designation | Truck Rack  
 Serial | 96647  
 Prover Type | Atmospheric Tank

Technician: Gary Clark  
 Scale Reading: 59.3 cubic inches  
 Tolerance: 46.2 cubic inches

Date: 8-11-14      1 69.8      2 70.5

Measure	Run	Prv	Temp	Pres	Time	Run	Prv	Temp	Pres	Time	Run	Prv	Temp	Pres	Time
Can # 1 100 gal	1	∅	70.2			1	<del>71.1</del> ∅	71.0			1				
Can # 2 100 gal	2	∅	70.0			2	∅	70.8			2				
Can # 3 50 gal	3	∅	70.0			3	∅	70.8			3				
Can # 1 100 gal	1	∅	69.9			1	∅	70.7			1				
Can # 2 100 gal	2	∅	69.9			2	∅	70.8			2				
Can # 3 50 gal	3	∅	70.0			3	∅	70.8			3				
Can # 1 100 gal	1	∅	69.9			1	∅	70.7			1				
Can # 2 100 gal	2	∅	70.0			2	∅	70.7			2				
Can # 3 50 gal	3	∅	70.1			3	∅	70.8			3				
Can # 1 100 gal	1	-5	70.1			1	1	70.7			1				
Can # 2 100 gal	2	-3	70.1			2	0	70.7			2				
Can # 3 50 gal	3	45	70.1			3	35	70.8			3				

37 Total      36 Total      \_\_\_\_\_ Total

Thermometer Numbers: 1630273 41-2158

Witnesses: [Signature] (Company) MET

Witnesses: \_\_\_\_\_ (Company)



UNITED STATES DEPARTMENT OF COMMERCE  
National Institute of Standards and Technology  
Gaithersburg, Maryland 20899-8361

# REPORT OF CALIBRATION

FOR

A ONE HUNDRED (100) GALLON VOLUME PROVER  
(Graduated Neck Type)

February 25, 2014

Manufacturer: Seraphin  
Rancocas, NJ

NIST Seal Number: 7241  
NIST Valve Seal No.: 001059  
Material: Stainless Steel  
Serial Number: 2470-A

submitted by

Meter Engineers, Inc.  
7718 W. 53<sup>rd</sup> St. N  
Maize, KS 67101

(Reference: Purchase Order Number 007468; dated February 4, 2014)

The volume of the prover described above was measured by the gravimetric method [1] and the standards used in this calibration are traceable to the System International through national standards. The gravimetric method uses the weight of the fluid necessary to fill the prover and the fluid density to calculate the volume. The fluid used was water from a reverse osmosis system and the prover was leveled using the vertical surface of the neck.<sup>#</sup>

The contained volume was drained from the prover by opening the valve at the bottom of the vessel. When this flow finished, the valve was held open for 30 seconds to complete the drain procedure. The delivered volume is for the scale reading of zero (0) and has been corrected for the reference temperature in Table 1 assuming a volumetric coefficient of expansion of 0.0000477 per °C (0.0000265 per °F) for the prover material.

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1 Bean, V. E., Espina, P. I., Wright, J. D., Houser, J. F., Sheckels, S. D., and Johnson, A. N., "NIST Calibration Services for Liquid Volume," NIST Special Publication 250-72, National Institute of Standards and Technology, November 24, 2009.

<sup>#</sup> One level indication was made in line with the neck scale and the other 90° to that indication, as stated in API MPMS Chapter 4.7. The levels on the can were not used.

Table 1. Delivered volume for the tested vessel for a scale reading of zero.

	Volume Delivered
gal at 60 °F	99.9724
in <sup>3</sup> at 60 °F	23093.63

The volume measurement procedure was repeated 5 times with the neck scale filled approximately to zero each time. The repeatability of the 5 measurements was 23 parts in 10<sup>6</sup> and the expanded uncertainty in the measured volume is  $\pm 0.008\%$ . It was calculated according to References [1] and [2] with a 95 % confidence level<sup>†</sup> and is traceable to NIST mass, temperature, pressure, and humidity standards, and a NIST water density determination.

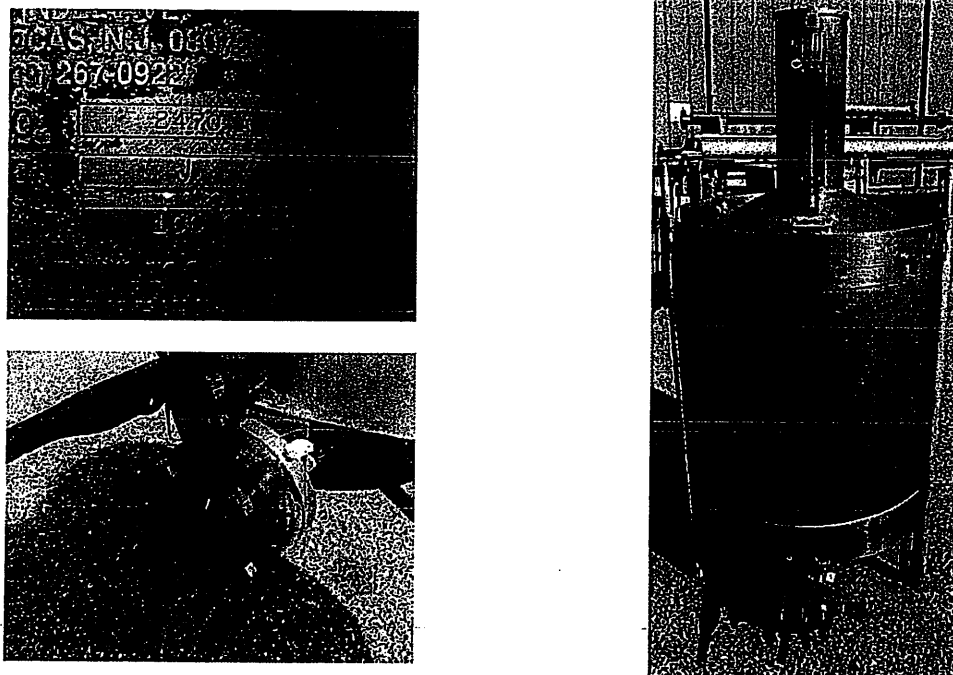


Figure 1. Photographs of the volume prover.

The input data used for calculation of the prover volume are given in the spreadsheet attached to this report. The calibration and uncertainties presented here are only valid over the range of the

<sup>2</sup> Taylor, B. N. and Kuyatt, C. E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results," NIST Technical Note 1297, National Institute of Standards and Technology (January 1993).

<sup>†</sup> Coverage factor of 2.09 for 21 effective degrees of freedom.

NIST calibration of this test measure. When the test measure is applied by the customer to measure liquid volume, uncertainties beyond the NIST calibration must be considered, for example: leveling of the test measure, reading the meniscus, cleanliness of the test measure interior, drainage effects due to liquid viscosity, etc.

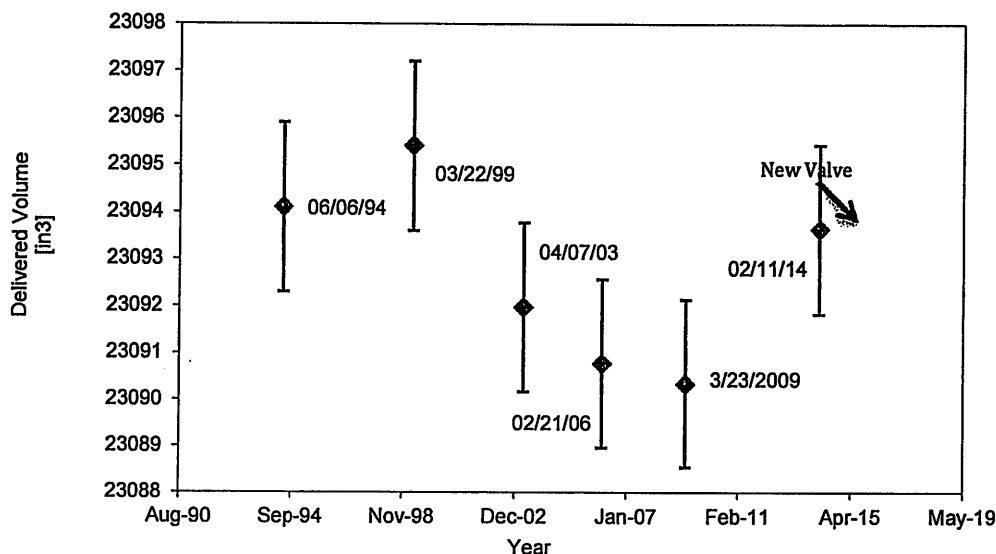


Figure 2. Calibration control chart for 100 gallon graduated neck test measure SN 2470-A

Table 2. Results of prior calibrations for the delivered volume.

Date	Delivered Volume [in <sup>3</sup> ]	Difference from Prior [in <sup>3</sup> ]	Degree of Equivalence [-]
02/11/14	23093.63	2.86	0.49
03/23/09	23090.34	-0.43	-0.07
02/21/06	23090.77	-1.20	-0.20
04/07/03	23091.97	-3.43	-0.58
03/22/99	23095.40	1.30	0.22
06/06/94	23094.10	-	-

For the Director,  
National Institute of Standards and Technology

Dr. John D. Wright  
Project Leader  
Fluid Metrology Group  
Physical Measurement Laboratory  
National Institute of Standards and Technology

Sherry Sheckels  
Calibration Technician  
Fluid Metrology Group  
Physical Measurement Laboratory  
National Institute of Standards and Technology



UNITED STATES DEPARTMENT OF COMMERCE  
National Institute of Standards and Technology  
Gaithersburg, Maryland 20899-8361

# REPORT OF CALIBRATION

FOR

A ONE HUNDRED (100) GALLON VOLUME PROVER  
(Graduated Neck Type)

February 25, 2014

Manufacturer: Seraphin  
Rancocas, NJ

NIST Seal Number: 7240  
NIST Valve Seal No.: 001058  
Material: Stainless Steel  
Serial Number: 2470-B

submitted by

Meter Engineers, Inc.  
7718 W. 53<sup>rd</sup> St. N  
Maize, KS 67101

(Reference: Purchase Order Number 007468; dated February 4, 2014)

The volume of the prover described above was measured by the gravimetric method [1] and the standards used in this calibration are traceable to the System International through national standards. The gravimetric method uses the weight of the fluid necessary to fill the prover and the fluid density to calculate the volume. The fluid used was water from a reverse osmosis system and the prover was leveled using the vertical surface of the neck.<sup>#</sup>

The contained volume was drained from the prover by opening the valve at the bottom of the vessel. When this flow finished, the valve was held open for 30 seconds to complete the drain procedure. The delivered volume is for the scale reading of zero (0) and has been corrected for the reference temperature in Table 1 assuming a volumetric coefficient of expansion of 0.0000477 per °C (0.0000265 per °F) for the prover material.

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<sup>1</sup> Bean, V. E., Espina, P. I., Wright, J. D., Houser, J. F., Sheckels, S. D., and Johnson, A. N., "NIST Calibration Services for Liquid Volume," NIST Special Publication 250-72, National Institute of Standards and Technology, November 24, 2009.

<sup>#</sup> One level indication was made in line with the neck scale and the other 90° to that indication, as stated in API MPMS Chapter 4.7. The levels on the can were not used.

Table 1. Delivered volume for the tested vessel for a scale reading of zero.

	Volume Delivered
gal at 60 °F	99.9696
in <sup>3</sup> at 60 °F	23092.99

The volume measurement procedure was repeated 5 times with the neck scale filled approximately to zero each time. The repeatability of the 5 measurements was 30 parts in 10<sup>6</sup> and the expanded uncertainty in the measured volume is ±0.009%. It was calculated according to References [1] and [2] with a 95 % confidence level<sup>†</sup> and is traceable to NIST mass, temperature, pressure, and humidity standards, and a NIST water density determination.

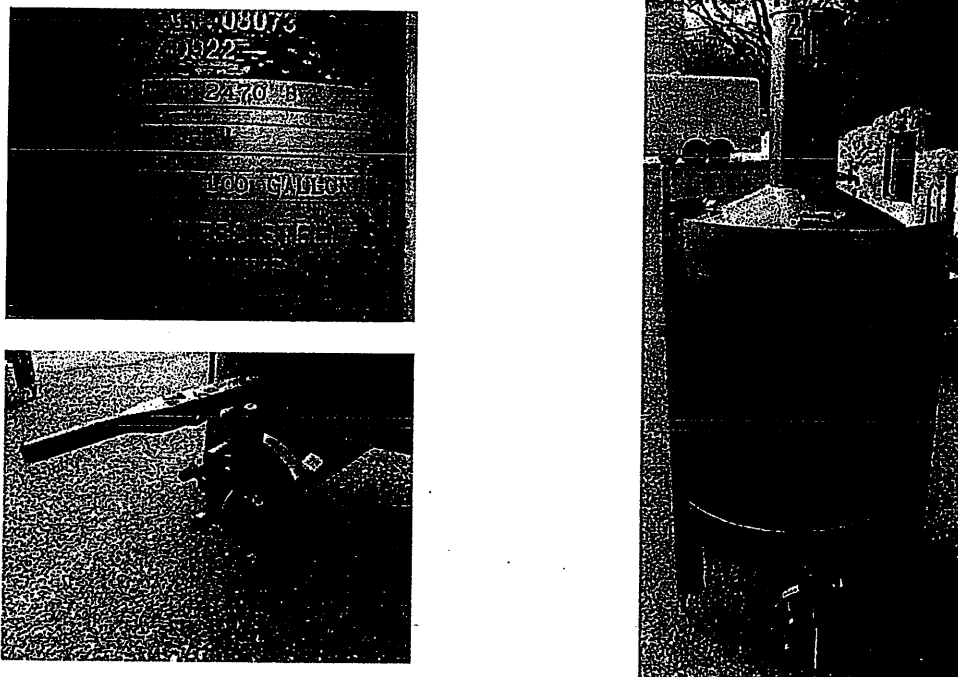


Figure 1. Photographs of the volume prover.

The input data used for calculation of the prover volume are given in the spreadsheet attached to this report. The calibration and uncertainties presented here are only valid over the range of the

<sup>2</sup> Taylor, B. N. and Kuyatt, C. E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results," NIST Technical Note 1297, National Institute of Standards and Technology (January 1993).

<sup>†</sup> Coverage factor of 2.12 for 16 effective degrees of freedom.

NIST calibration of this test measure. When the test measure is applied by the customer to measure liquid volume, uncertainties beyond the NIST calibration must be considered, for example: leveling of the test measure, reading the meniscus, cleanliness of the test measure interior, drainage effects due to liquid viscosity, etc.

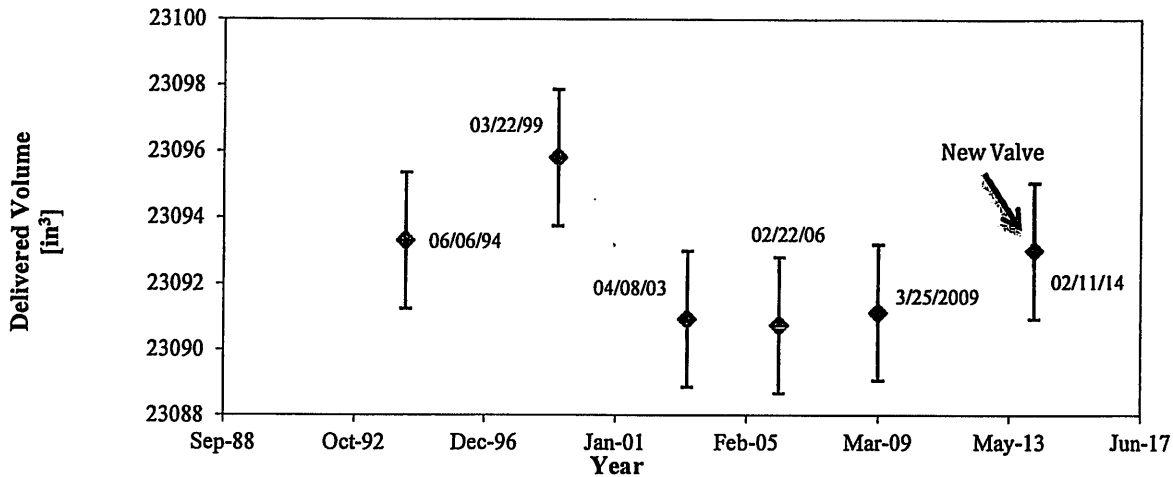


Figure 2. Calibration control chart for 100 gallon graduated neck test measure SN 2470-B

Table 2. Results of prior calibrations for the delivered volume.

Date	Delivered Volume [in <sup>3</sup> ]	Difference from Prior [in <sup>3</sup> ]	Degree of Equivalence [-]
02/11/14	23092.99	2.26	0.38
03/25/09	23091.12	0.39	0.07
02/22/06	23090.74	-0.19	-0.03
04/08/03	23090.93	-4.87	-0.83
03/22/99	23095.80	2.50	0.42
06/06/94	23093.30	-	-

For the Director,  
National Institute of Standards and Technology

*John D. Wright*

Dr. John D. Wright  
Project Leader  
Fluid Metrology Group  
Physical Measurement Laboratory  
National Institute of Standards and Technology

*Sherry Sheckels*

Sherry Sheckels  
Calibration Technician  
Fluid Metrology Group  
Physical Measurement Laboratory  
National Institute of Standards and Technology



UNITED STATES DEPARTMENT OF COMMERCE  
National Institute of Standards and Technology  
Gaithersburg, Maryland 20899-8361

# REPORT OF CALIBRATION

FOR

A FIFTY (50) GALLON VOLUME PROVER  
(Graduated Neck Type)

February 25, 2014

Manufacturer: Seraphin	NIST Seal Number: 7242
Rancocas, NJ	NIST Valve Seal No.: 001060
	Material: Stainless Steel
	Serial Number: 7293-C

submitted by

Meter Engineers, Inc.  
7718 W. 53<sup>rd</sup> St. N  
Maize, KS 67101

(Reference: Purchase Order Number 007468; dated February 4, 2014)

The volume of the prover described above was measured by the gravimetric method [1] and the standards used in this calibration are traceable to the System International through national standards. The gravimetric method uses the weight of the fluid necessary to fill the prover and the fluid density to calculate the volume. The fluid used was water from a reverse osmosis system and the prover was leveled using the vertical surface of the neck.<sup>#</sup>

The contained volume was drained from the prover by opening the valve at the bottom of the vessel. When this flow finished, the valve was held open for 30 seconds to complete the drain procedure. The delivered volume is for the scale reading of zero (0) and has been corrected for the reference temperature in Table 1 assuming a volumetric coefficient of expansion of 0.0000477 per °C (0.0000265 per °F) for the prover material.

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<sup>1</sup> Bean, V. E., Espina, P. I., Wright, J. D., Houser, J. F., Sheckels, S. D., and Johnson, A. N., "NIST Calibration Services for Liquid Volume," NIST Special Publication 250-72, National Institute of Standards and Technology, November 24, 2009.

<sup>#</sup> One level indication was made in line with the neck scale and the other 90° to that indication, as stated in API MPMS Chapter 4.7. The levels on the can were not used.

Table 1. Delivered volume for the tested vessel for a scale reading of zero.

	Volume Delivered
gal at 60 °F	49.9937
in <sup>3</sup> at 60 °F	11548.56

The volume measurement procedure was repeated 5 times with the neck scale filled approximately to zero each time. The repeatability of the 5 measurements was 17 parts in 10<sup>6</sup> and the expanded uncertainty in the measured volume is  $\pm 0.010\%$ . It was calculated according to References [1] and [2] with a 95 % confidence level<sup>†</sup> and is traceable to NIST mass, temperature, pressure, and humidity standards, and a NIST water density determination.

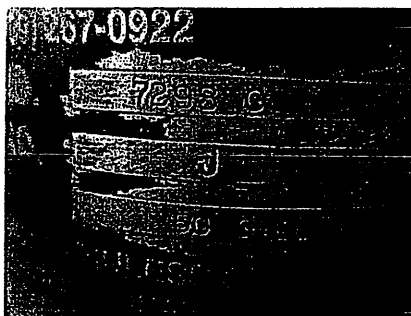


Figure 1. Photographs of the volume prover.

The input data used for calculation of the prover volume are given in the spreadsheet attached to this report. The calibration and uncertainties presented here are only valid over the range of the

<sup>2</sup> Taylor, B. N. and Kuyatt, C. E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results," NIST Technical Note 1297, National Institute of Standards and Technology (January 1993).

<sup>†</sup> Coverage factor of 1.97 for 339 effective degrees of freedom.

NIST calibration of this test measure. When the test measure is applied by the customer to measure liquid volume, uncertainties beyond the NIST calibration must be considered, for example: leveling of the test measure, reading the meniscus, cleanliness of the test measure interior, drainage effects due to liquid viscosity, etc.

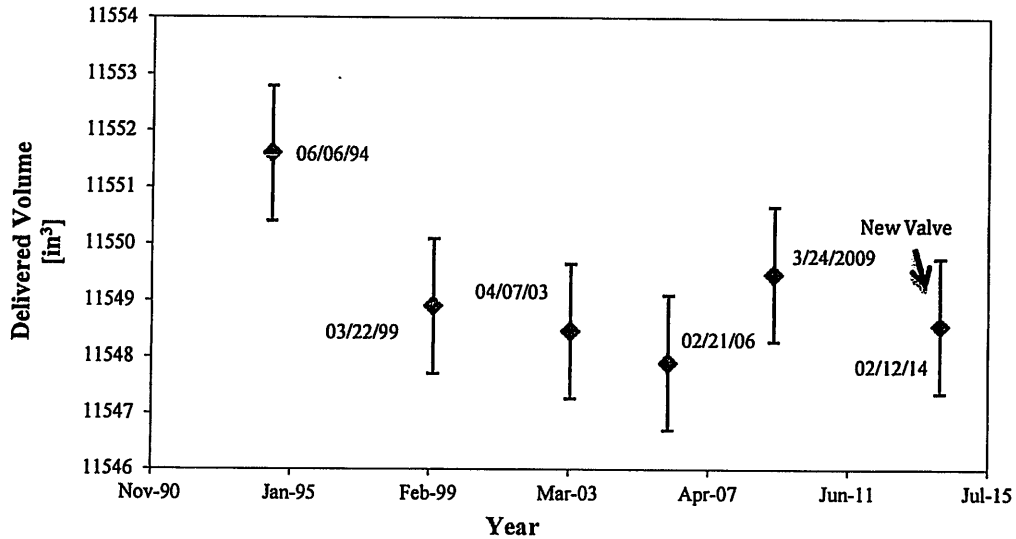


Figure 2. Calibration control chart for 50 gallon graduated neck test measure SN 7293-C

Table 2. Results of prior calibrations for the delivered volume.

Date	Delivered Volume [in <sup>3</sup> ]	Difference from Prior [in <sup>3</sup> ]	Degree of Equivalence [-]
02/12/14	11548.56	-0.91	-0.26
03/24/09	11549.47	1.57	0.18
02/21/06	11547.90	-0.56	-0.24
04/07/03	11548.46	-0.44	0.27
03/22/99	11548.90	-2.70	-0.67
06/06/94	11551.60	0.00	0.00

For the Director,  
National Institute of Standards and Technology

Dr. John D. Wright  
Project Leader  
Fluid Metrology Group  
Physical Measurement Laboratory  
National Institute of Standards and Technology

Sherry Sheckels  
Calibration Technician  
Fluid Metrology Group  
Physical Measurement Laboratory  
National Institute of Standards and Technology

Unit # 134

# Johnson Gage and Inspection, Inc.

5920 W 21st St. N., Wichita, KS 67205  
Phone 316.943.7532; Fax 316.944.6256



## Certificate of Calibration

Report Number: 141195  
Customer: METER ENGINEERS, INC.

Page 1 of 1

Form 2511  
REV C 12-01-11

7718 W. 53rd ST. NORTH  
MAIZE KS 67101

Item: DIGITAL THERMOMETER  
Unit Number: 1630273  
Model Number: MARTEL BETA PROBE T1  
Serial Number: 1630273  
Location: PRODUCTION

Inspector: PK  
Date Calibrated: Feb 3, 2014  
Recalibration Date: Feb 3, 2015  
Temperature: 73.3 °F  
Relative Humidity: 22 %

\*\*\*\*\*

Item Range: -58°F to 320°F Resolution: Adjustable from 0.1°F to 0.001°F  
Tolerance: ±0.2°F Class: N/A

Controlling Specification(s): ISO 10012, ANSI/NCSL Z540-1  
Calibration/Inspection Procedure(s): WP4001 Tolerance Source: C See Below

\*\*\*\*\*

Standard Value	Test Result	Deviation	Uncertainty @k=2
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32.00°F	31.96°F	-0.04°F	0.12°F
76.00°F	75.98°F	-0.02°F	0.12°F
120.00°F	119.98°F	-0.02°F	0.12°F

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%. This estimate was performed in accordance with guidelines set forth in ANSI/NCSL Z540-2. The acceptance or rejection of the item(s) is based on the actual test values shown, without adjustment for measurement uncertainty. All testing performed using standards traceable to NIST or to intrinsic standards. This document shall not be reproduced except in full, without the written permission of Johnson Gage and Inspection. Tolerance source key: C = Customer; S = Specification; M = Manufacturer; R = JGI Recommended.

\*\*\*\*\*  
Comments: FOUND IN TOLERANCE. NO ADJUSTMENT REQUIRED.

Note: CERTIFIED AT TEST POINTS SHOWN PER CUSTOMER REQUEST.

Additional Standard Used: HP34420A; SN: US36001770; CERTIFIED: 12-31-13; DUE: 12-31-14; TN: 60911AT

Condition: USED

RESULTS: ACCEPTED AS NOTED

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### CALIBRATION STANDARD

Manufacturer/type: BURNS ENGINEERING PRT Model Number: 3925  
Date Certified: Aug 6, 2013 Serial Number: 496142  
Date Due: Aug 6, 2015 TRACEABILITY NUMBER: W207672

Approved by: *[Signature]* EM 24.14



# Johnson Gage and Inspection, Inc.

5920 W 21st St. N., Wichita, KS 67205  
Phone 316.943.7532; Fax 316.944.6256



## Certificate of Calibration

Report Number: 140072C  
Customer: METER ENGINEERS, INC.

Page 1 of 1

Form 2511  
REV C 12-01-11

7718 W. 53rd ST. NORTH  
MAIZE KS 67101

Item: MERCURY THERMOMETER  
Unit Number: 4L2158  
Model Number: MILLER & WEBER T-3426  
Serial Number: 4L2158  
Location: PRODUCTION

Inspector: WM  
Date Calibrated: Jan 22, 2014  
Recalibration Date: Jan 22, 2015  
Temperature: 73.6 °F  
Relative Humidity: 30 %

\*\*\*\*\*

Item Range: 30°F/124°F Resolution: 0:05°F  
Tolerance: ±0.2°F Class: N/A

Controlling Specification(s): ISO 10012, ANSI/NC SL Z540-1

Calibration/Inspection Procedure(s): WP4001

Tolerance Source: R See Below

\*\*\*\*\*

Standard Value	Test Result	Deviation	Uncertainty @k=2
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32.00°F	31.95°F	-0.05°F	0.12°F
76.00°F	76.00°F	NONE	0.12°F
120.00°F	120.00°F	NONE	0.12°F

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%. This estimate was performed in accordance with guidelines set forth in ANSI/NC SL Z540-2. The acceptance or rejection of the item(s) is based on the actual test values shown, without adjustment for measurement uncertainty. All testing performed using standards traceable to NIST or to intrinsic standards. This document shall not be reproduced except in full, without the written permission of Johnson Gage and Inspection. Tolerance source key: C = Customer; S = Specification; M = Manufacturer; R = JGI Recommended.

\*\*\*\*\*  
Comments: FOUND IN TOLERANCE. NO ADJUSTMENT REQUIRED.

ADDITIONAL STANDARD: HP34420A SN US36001770, CERTIFIED 12-31-13, DUE 12-31-14, TN 60911AT.

Condition: USED

RESULTS: ACCEPTED

\*\*\*\*\*

### CALIBRATION STANDARD

Manufacturer/type: BURNS ENGINEERING PRT

Model Number: 3925

Date Certified: Aug 6, 2013

Serial Number: 496142

Date Due: Aug 6, 2015

TRACEABILITY NUMBER: W207672

Approved by: *Johnson EM 1-23-14*

Unit 134

PO BOX 248  
WICHITA KS 67201-0248  
Phone: (316) 267-2893

# ARROW LABORATORY, INC.

## Metallurgical Analysis and Testing

1333 N MAIN ST  
WICHITA KS 67203  
Fax: (316) 267-0171

Attn: BRAD WILLIAMS  
METER ENGINEERS  
7718 W 53rd St North  
WICHITA KS 67101

01-02-14  
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LABORATORY REPORT #d90nm714

### PRESSURE GAGE CALIBRATION

One 4.5 inch Wika Xsel pressure gage, S/N 586, 0-60 psi capacity with 5 psi subdivisions, was received in usable condition and calibrated as shown below. The gage was checked with our Ashcroft dead weight gage tester. Testing was performed in accordance with ASME B40.100-2005, ISO 10012-2003, and ANSI/NCSL Z540.3-2006.

#### Calibration Data:

LOAD psi	Average GAGE READING as Left
5	4.8 psi
15	14.7
25	24.6
35	34.6
45	44.5
55	54.5

Maximum Error center 1/2 of scale: 0.9% of span  
 Max Error upper and lower 1/4 of scale: 0.9% of span  
 Maximum Friction: 0.3% of span  
 Repeatability: +/- 0.2% of span  
 Accuracy: +/- 0.9% of span  
 Adjustments: none      Limitations of use: none  
 Calibrated: 12-24-13      Temperature: 72°F  
 Client Provided Confirmation Interval: Annual

These results meet ASME B40.100 grade 1A accuracy requirements.

Ashcroft Gage Tester: S/N DWT 11436, Uncertainty: +/- 0.07%  
 Weights: Tester weights were compared with weights calibrated on NIST.  
 Test #'s 822/262551-0 and 822/268214-03. Cal Due: 5-31-14

#### Piston Assembly:

The piston diameter and cylinder bore were measured by Precision Metrology Test# 1001438847 and certified to +/- 0.05% using masters traceable to NIST. Cal Due: 4-30-15

DER/dr  
Rec'd 12-23-13

Project Supervisor

*Dale Roark*  
 Dale E. Roark

The sample or instrument was received in suitable condition for the tests performed except as noted above.  
 Chemical Analysis of Carbon & Sulfur: Combustion/IR, Silicon: grav., Others: ICP/AA.  
 Tensile per ASTM E 8-11, B 557-10, or A 370-12a. Hardness per ASTM E 10-12, E 18-12, E 384-11.  
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