



GW Allen Prover Inspection and Test Certification Package – GWP08

Updated: 2/17/2025



Gage Western Prover Inspection and Test Certification Package - GWP08

Updated: 2/17/2025

Prover Name: GW_FMD_025_06_P

Certification Date: 7/9/2024

Certification Due: 7/9/2027

Serial Number: 000987

Date of Fabrication: 09/2020

Max Working Pressure: 285 PSIG

Nominal Flow Rate: 2,500 GPM

Package Contents:

1. Cover Sheet
2. Table of Contents
3. Primary Waterdraw
4. Secondary Waterdraw
5. Tertiary Waterdraw
6. Pressure Transmitter
7. Temperature Transmitter
8. Temperature Transmitter
9. Tube RTD
10. Switch Bar RTD
11. Temperature Transmitter

General Information

Owner: Gage Western
 Geographic Location: Meter Engineers Inc. @ Kechi, KS
 Calibration Date: 9-Jul-2024
 Calibration Report No: 07092023P
 Calibration Technician: Nathan Wilson
 Calibration Company: Meter Engineers Inc.



Elevation, Air Density, Test Weights, and Base Conditions

feet	1,300	Elevation	Density of Reference Test Weights, ρ_{ref}	8.00	gm/cm ³ , gm/cc, gm/mL
°F	79.00	Lab Room Temperature	Density of Field Test Weights, ρ_{fld}	7.85	gm/cm ³ , gm/cc, gm/mL
%	56.0	Humidity	Base Temperature, T_b	60.0	°F
mm/Hg	28.8	Barometric Pressure	Base Pressure, P_b	0.0	psig

Prover Information

Prover Manufacturer: Meter Engineers, INC
 Prover Model Number: FMD 625
 Prover Serial Number: 987
 Internal Diameter (ID): 17.002 0 inches
 Wall Thickness (WT): 0.943 0 inches
 Detector Switches: 0.000 0
 Previous Base Prover Volume (BPV): 4,618.0600 in³ @ 60°F and 0 psig
 Coefficient of Linear Expansion, CLP: 0.000 009 60 per °F - 304 stainless steel
 Linear Expansion of External Rod, GLD: 0.000 009 60 per °F - 304 Stainless steel
 Modulus of Elasticity, Ep: 028 000 000 per psi - 304 stainless steel

Air Density Method - Elevation, Tair

Fixed Compressibility Method

Displacement Prover - Unidirectional Flow Design

Captive Displacer

Detectors Mounted on External Shaft

Calibration Summary

	Weight "out"		Weight "back"		CPV		K_{wv}	Q_v
	in ³	mL	in ³	mL	in ³	mL	$\mu\text{S/cc}$	gpm
Run 1	4,618.331 4	75,660.693			4,618.331 4	75,660.693	1.5	20.68
Run 2	4,618.272 3	75,679.924			4,618.272 3	75,679.924	1.5	11.11
Run 3	4,618.565 0	75,684.720			4,618.565 0	75,684.720	1.2	19.99
Run 4	4,618.593 2	75,685.182			4,618.593 2	75,685.182	1.1	11.11
Run 5	4,618.756 4	75,687.856			4,618.756 4	75,687.856	1.0	19.04
Average	4,618.503 7	75,683.715	NA	NA	4,618.503 7	75,683.715	1.3	16.39
R (%)	0.010 5	0.010 5	NA	NA	0.010 5	0.010 5	0.5	88.14

R (%) ≤ 0.020 ?

"Out" Criteria? Pass
 "Back" Criteria? NA
 CPV Criteria? Pass

Previous BPV: 4,618.060 0 in³ @ 60°F and 0 psig
 New BPV Larger / (Smaller): 0.443 7 in³ @ 60°F and 0 psig
 New BPV Larger / (Smaller): 0.009 6 %

K_{wv} range within 200, max value less than 1,000? Pass
 ΔQ_{wv} at least 25% between successive runs? Pass

New BPV: 4,618.503 7 in³ @ 60°F and 0 psig
 New BPV: 75,683.715 mL @ 60°F and 0 psig

T_b of 60.0 °F, P_b of 0.0 psig			T_b of 15.0 °C, P_b of 0.0 kPag	
U.S. Gallons	Barrels	Cubic Feet	Liters	Cubic Meters
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
19.993 500	0.476 036	2.672 750	75.681 500	-
-	-	-	-	0.075 682

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Signature	Date	Company
<i>Deb Jacobs</i>	7-9-24	Meter Engineers Inc. Representative

General Information

Owner Gage Western
 Geographic Location Meter Engineers Inc. @ Kachi, KS
 Calibration Date 9-Jul-2024
 Calibration Report No. 070920255
 Calibration Technician Nathan Wilson
 Calibration Company Meter Engineers Inc.



Elevation, Air Density, Test Weights, and Base Conditions

feet	1,300	Elevation	Density of Reference Test Weights, ρ_{ref}	8.00	gm/cm ³ , gm/cc, gm/mL
°F		Lab Room Temperature	Density of Field Test Weights, ρ_{ref}	7.85	gm/cm ³ , gm/cc, gm/mL
%		Humidity	Base Temperature, T_b	60.0	°F
mm/Hg		Barometric Pressure	Base Pressure, P_b	0.0	psig

Prover Information

Prover Manufacturer Meter Engineers, INC
 Prover Model Number FMD 025
 Prover Serial Number 987
 Internal Diameter (ID) 17.002 0 inches
 Wall Thickness (WT) 0.943 0 inches
 Detector Switches 0.000 0
 Previous Base Prover Volume (BPV) 3,463.4800 in³ @ 60°F and 0 psig
 Coefficient of Linear Expansion, GLP 0.000 009 60 per °F - 304 stainless steel
 Linear Expansion of External Rod, GLD 0.000 009 60 per °F - 304 Stainless steel
 Modulus of Elasticity, Ep 028 000 000 per psi - 304 stainless steel

Air Density Method - Elevation, Tair

Fixed Compressibility Method

Displacement Prover - Unidirectional Flow Design

Captive Displacer

Detectors Mounted on External Shaft

Calibration Summary

	W/Dish "out"		W/Dish "back"		CPV		K _W	Qv
	in ³	g	in ³	mL	in ³	mL	μS/cc	gpm
Run 1	3,464.668 3	56,775.741			3,464.668 3	56,775.741	1.2	19.58
Run 2	3,465.023 7	56,781.565			3,465.023 7	56,781.565	1.3	10.71
Run 3	3,464.904 2	56,779.607			3,464.904 2	56,779.607	1.2	18.37
Run 4	3,464.790 3	56,777.741			3,464.790 3	56,777.741	1.2	10.11
Run 5	3,465.145 9	56,783.567			3,465.145 9	56,783.567	1.2	19.15
Average	3,464.906 5	56,779.644	NA	NA	3,464.906 5	56,779.644	1.2	15.58
R (%)	0.013 8	0.013 8	NA	NA	0.013 8	0.013 8	0.1	93.47

R (%) ≤ 0.020 ?

"Out" Criteria?

Pass

"Back" Criteria?

NA

CPV Criteria?

Pass

Previous BPV

3,463.480 0

in³ @ 60°F and 0 psig

New BPV Larger / (Smaller)

1.426 5

in³ @ 60°F and 0 psig

New BPV Larger / (Smaller)

0.041 2

%

New BPV

3,464.906 5

in³ @ 60°F and 0 psig

Now BPV

56,779.644

mL @ 60°F and 0 psig

K_W range within 200, max value less than 1,000?

Pass

ΔQ_{KV} at least 25% between successive runs?

Pass

T _b of 60.0 °F, P _b of 0.0 psig			T _b of 15.0 °C, P _b of 0.0 kPag	
U.S. Gallons	Barrels	Cubic Feet	Liters	Cubic Meters
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
14 999 600	0.357 133	2 005 150	56 778 000	-
-	-	-	-	0.056 778

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Signature	Date	Company
<i>Nathan Wilson</i>	7-9-24	Meter Engineers Inc. Representative

General Information

Owner: Gage Western
 Geographic Location: Meter Engineers Inc. @ Kechi, KS
 Calibration Date: 9-Jul-2024
 Calibration Report No.: 07092025T
 Calibration Technician: Nathan Wilson
 Calibration Company: Meter Engineers Inc.



Elevation, Air Density, Test Weights, and Base Conditions

feet	1,300	Elevation	Density of Reference Test Weights, ρ_{ref}	8.00	g/cm ³ , g/mlcc, g/ml
°F	79.00	Lab Room Temperature	Density of Field Test Weights, ρ_{fwd}	7.85	g/cm ³ , g/mlcc, g/ml
%	55.0	Humidity	Base Temperature, T_b	60.0	°F
mm/Hg	28.8	Barometric Pressure	Base Pressure, P_b	0.0	psig

Prover Information

Prover Manufacturer: Meter Engineers, INC
 Prover Model Number: FMD 025
 Prover Serial Number: 987
 Internal Diameter (ID): 17.002 0 inches
 Wall Thickness (WT): 0.943 0 inches
 Detector Switches: 0.000 0 -
 Previous Base Prover Volume (BPV): 1,154.8800 in³ @ 60°F and 0 psig
 Coefficient of Linear Expansion, GLP: 0.000 009 60 per °F - 304 stainless steel
 Linear Expansion of External Rod, GLD: 0.000 009 60 per °F - 304 Stainless steel
 Modulus of Elasticity, Ep: 028 000 000 per psi - 304 stainless steel

Air Density Method - Elevation, Tair

Fixed Compressibility Method

Displacement Prover - Unidirectional Flow Design

Captive Displacer

Detectors Mounted on External Shaft

Calibration Summary

	WZeb"out"		WZeb"back"		CPV		K_{cal} μg/cc	Qv gpm
	in ³	mL	in ³	mL	in ³	mL		
Run 1	1,153.265 0	18,898.628			1,153.265 0	18,898.628	1.4	6.51
Run 2	1,153.221 0	18,897.906			1,153.221 0	18,897.906	1.4	4.05
Run 3	1,153.318 1	18,899.497			1,153.318 1	18,899.497	1.4	6.24
Run 4	1,153.294 6	18,899.113			1,153.294 6	18,899.113	1.4	3.25
Run 5	1,153.347 8	18,899.984			1,153.347 8	18,899.984	1.4	6.51
Average	1,153.289 3	18,899.025	NA	NA	1,153.289 3	18,899.025	1.4	5.31
R (%)	0.011 0	0.011 0	NA	NA	0.011 0	0.011 0	0.0	99.89

R (%) ≤ 0.020 ?	"Out" Criteria?	Pass	Previous BPV	1,154.880 0	in ³ @ 60°F and 0 psig
	"Back" Criteria?	NA	New BPV Larger / (Smaller)	(1,500.2)	in ³ @ 60°F and 0 psig
	CPV Criteria?	Pass	New BPV Larger / (Smaller)	(0.137 9)	%
K_{cal} range within 200, max value less than 1,000?	Pass	New BPV	1,153.289 3	in ³ @ 60°F and 0 psig	
ΔQ_{cal} at least 25% between successive runs?	Pass	New BPV	18,899.025	mL @ 60°F and 0 psig	

T_b of 60.0 °F, P_b of 0.0 psig			T_b of 15.0 °C, P_b of 0.0 kPag	
U.S. Gallons	Barrels	Cubic Feet	Liters	Cubic Meters
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	0.118 671	-	18,898.900	-
4.992 590	-	0.667 413	-	0.016 699

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Signature	Date	Company
	7-9-24	Meter Engineers Inc. Representative



Customer Information	Manufacturer Information
Name: FLOW MANAGEMENT DEVICES LLC PO: 036648	Sales Order: 6033643 Line: 1
Device Information	Calibration Information
Device Type: Pressure Transmitter Customer Ref/ID: 000-104178-SEN Serial No: 20SHPE0091825 Model No: 3051S2TG4A2E11A2EKDM8Q4 Module Serial No: Output: Linear Device ID: 5341608	Factory: Shakopee, MN, USA Station Name: SHAK_PRESSURE_CALIBRATION_07 Operator ID: 34934 Calibration Date: 08/06/2020 09:14:32 AM Internal Ref #: 40468303
Permanent Tag Information	Wire-On Tag Information

EqNumber:	EqName:	CalDueDate:
P3-55159	Pressure Controller	8/25/2020 7:20:00AM
E3-58713	Load Box	1/20/2021 10:32:00AM
E3-56230	Multimeter	4/20/2021 1:23:00PM

Calibration Data

Range: 0.000 TO 4,000.000 PSI

Reference of Calibration: Gauge
Damping: 0.40 seconds

% of Range	Applied Pressure	Requested Applied Pressure	Analog Output (mA)	% Span Error	Pass/Fail
100.000	4000.000 PSI	4000.0000 PSI	19.99946	-0.00337	PASS
80.000	3200.000 PSI	3200.0000 PSI	16.79980	-0.00125	PASS
60.000	2400.000 PSI	2400.0000 PSI	13.60006	0.00038	PASS
40.000	1600.000 PSI	1600.0000 PSI	10.40022	0.00138	PASS
20.000	800.000 PSI	800.0000 PSI	7.20026	0.00163	PASS
0.000	0.000 PSI	0.0000 PSI	4.00068	0.00425	PASS

This document certifies that the listed serialized instrument meets applicable Emerson specifications, has been calibrated per Emerson's calibration procedures and that the instrument conforms fully to all data and engineering requirements provided to Emerson and acknowledged by Emerson. The calibration of measuring and test equipment used in the manufacture and inspection of the listed product is traceable, through an unbroken chain of calibrations or comparisons, to standards maintained by internationally recognized National Metrology Institutes such as NIM, NIST, PTB, etc.



Heather Matthiesen
Quality Manager



Emerson Automation Solutions
6021 Innovation Blvd
Shakopee, MN 55379

Calibration Data Sheet Consistent with ISO 10474 3.1 or EN 10204 3.1

Customer Information Name: FLOW MANAGEMENT DEVICES LLC PO: 035876	Manufacturer Information Sales Order: 5970225 Line: 10
Device Information Device Type: Temperature Transmitter Customer Ref/ID: 000-112012-SEN Serial No: 20SHTC0060975 Model No: 3144PD1A1KAM5T1C4Q4 Output: Linear	Calibration Information Factory: SHAKOPEE, MN, USA Station Name: SHAK_TEMPERATURE_TRANSMITTER_CALIBRATI ON_04 Operator ID: 69390 Calibration Date: 08/04/2020 05:45:15 AM Internal Ref #: 40466701 
Permanent Tag Information	Wire-On Tag Information

Equipment Used

EqNumber:	EqName:	CalDueDate:
E3-60866	Multimeter	1/12/2021 12:12:00PM

Calibration Data

Sensor 1

Pt100 00385

4 Wire

-50.00 TO 150.00 DEG C

% of Range	Measured Input	Digital Output	Analog Output	% Span Error	Pass/Fail
100.098	150.196 DEG C	150.198 DEG C	20.0163 mA	0.0039	PASS
75.101	100.202 DEG C	100.211 DEG C	16.0168 mA	0.0040	PASS
50.092	50.184 DEG C	50.186 DEG C	12.0154 mA	0.0042	PASS
25.102	0.205 DEG C	0.213 DEG C	8.0164 mA	0.0000	PASS
0.090	-49.820 DEG C	-49.816 DEG C	4.0154 mA	0.0063	PASS

This is to certify that the listed product meets the applicable Emerson specifications. The calibration of measuring and test equipment used in the manufacture and inspection of the listed product is traceable, through an unbroken chain of calibrations or comparisons, to standards maintained by internationally recognized National Metrology Institutes such as NIM, NIST, PTB, etc.



Heather Matthiesen
Quality Manager



Emerson Automation Solutions
6021 Innovation Blvd
Shakopee, MN 55379

Calibration Data Sheet Consistent with ISO 10474 3.1 or EN 10204 3.1

Customer Information Name: FLOW MANAGEMENT DEVICES LLC PO: 035876	Manufacturer Information Sales Order: 5970225 Line: 10
Device Information Device Type: Temperature Transmitter Customer Ref/ID: 000-112012-SEN Serial No: 20SHTC0060974 Model No: 3144PD1A1KAM5T1C4Q4 Output: Linear	Calibration Information Factory: SHAKOPEE, MN, USA Station Name: SHAK_TEMPERATURE_TRANSMITTER_CALIBRATI ON_01 Operator ID: 69390 Calibration Date: 08/04/2020 05:59:03 AM Internal Ref #: 40466700 
Permanent Tag Information	Wire-On Tag Information

Equipment Used

EqNumber:	EqName:	CalDueDate:
E3-60868	Multimeter	11/12/2020 12:13:00PM

Calibration Data

Sensor 1

Pt100 00385

4 Wire

-50.00 TO 150.00 DEG C

% of Range	Measured Input	Digital Output	Analog Output	% Span Error	Pass/Fail
100.097	150.194 DEG C	150.187 DEG C	20.0146 mA	-0.0057	PASS
75.092	100.185 DEG C	100.184 DEG C	16.0154 mA	0.0038	PASS
50.089	50.177 DEG C	50.169 DEG C	12.0145 mA	0.0021	PASS
25.103	0.205 DEG C	0.204 DEG C	8.0166 mA	0.0013	PASS
0.081	-49.838 DEG C	-49.847 DEG C	4.0136 mA	0.0040	PASS

This is to certify that the listed product meets the applicable Emerson specifications. The calibration of measuring and test equipment used in the manufacture and inspection of the listed product is traceable, through an unbroken chain of calibrations or comparisons, to standards maintained by internationally recognized National Metrology Institutes such as NIM, NIST, PTB, etc.



Heather Matthiesen
Quality Manager

Report Number: 91197

Calibration Date: 07/27/2020

Submitted By: Flow Management Devices Phoenix, AZ 85040
PO Number: 035995

SO Number: 1347099

Platinum Resistance Thermometer
XP-RBF185L484-008(1/2)-FP-8PU493

Tolerance: IEC 60751:2008 Class B

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
1	E0FC87	-50	-50.04	-50.35	80.167	0.31	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.22	99.914	0.20	0.30	0.04	8.0	0.30	in
		100	100.00	99.70	138.394	0.30	0.80	0.04	20.0	0.80	in
		200	200.01	199.31	175.601	0.70	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.9205
Alpha = 0.00385036
Delta = 1.650048
Beta = 0.367027
A = 3.9139E-3
B = -6.35329E-7
C = -1.41319E-11

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
2	E0FC88	-50	-50.04	-50.40	80.151	0.36	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.28	99.892	0.26	0.30	0.04	8.0	0.30	in
		100	100.00	99.63	138.365	0.37	0.80	0.04	20.0	0.80	in
		200	200.01	199.23	175.572	0.78	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.8989
Alpha = 0.00385052
Delta = 1.642803
Beta = 0.365389
A = 3.91377E-3
B = -6.32564E-7
C = -1.40693E-11

Remarks:

The correction must be added algebraically to the UUT reading to obtain the correct value.

Equipment and Standards Used

ID Number	Manufacturer	Model	Description	Calibration Due
03-2021	Agilent	3458A	8 1/2 Digit Digital Multimeter	08/14/2020
03-2398	Hart Scientific	5626	SSPRT Working Standard	01/22/2021
03-3729	Hart Scientific	5626	SSPRT Working Standard	10/24/2020

Environmental Conditions at time of Calibration: Temperature: 23 °C [73 °F]

Relative Humidity: 39%

Procedure Used: WI-525-38 Rev 5 which is based, in part on ASTM E644-19

DUT Condition: New Calibration

Calibration performed by: *Lindi Bunn* Metrology Technician

The temperatures written in this report are those defined by the International Temperature Scale of 1990 (ITS-90).

The combined standard uncertainty includes the standard uncertainty reported for the standard, and the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the JCGM100:2008 Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

The DUT Acceptance tolerance is based on the DUT specification, the measurement uncertainty, the resulting test uncertainty ratio (TUR), and the maximum allowable probability of false accept risk (PFA, assumed to be 2%). In cases where the TUR ≥ 4:1, the acceptance tolerance = the DUT tolerance (guard bands are not necessary to achieve a PFA of 2%). In cases where the TUR < 4:1, the acceptance limits are reduced by guard bands calculated using method 6 of NCSLI Z540.3. Refer to NCSLI Z540.3 or Pyromation SD-525-15 for additional information.

For purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded in accordance with the rounding method of ASTM Practice E29-19.

The standards of Pyromation Laboratory are traceable to the International System of Units (SI) through NIST or other National Metrology Institute, and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory. The laboratory report number identified above is the unique report number to be used in referencing measurement traceability for the items identified in this report only.

This calibration is compliant to ISO/IEC 17025:2017. This calibration report applies only to the items described. It must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government. This report shall not be reproduced except in full without written approval of Pyromation, Inc.

Report Of Calibration



5211 Industrial Road, Fort Wayne, IN 46825
www.pyromation.com 260.484.2580

Report Number: 91197

Calibration Date: 07/27/2020

Submitted By: Flow Management Devices Phoenix, AZ 85040
PO Number: 035995

SO Number: 1347099

Platinum Resistance Thermometer
XP-RBF185L484-008(1/2)-FP-8PU493

Tolerance: IEC 60751:2008 Class B

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
3	E0FC89	-50	-50.04	-50.39	80.151	0.35	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.31	99.882	0.29	0.30	0.04	8.0	0.30	in
		100	100.00	99.55	138.335	0.45	0.80	0.04	20.0	0.80	in
		200	200.01	199.09	175.522	0.92	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.8883
Alpha = 0.00384898
Delta = 1.64441
Beta = 0.345943
A = 3.91228E-3
B = -6.32931E-7
C = -1.33153E-11

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
4	E0FC8A	-50	-50.04	-50.35	80.167	0.31	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.23	99.910	0.21	0.30	0.04	8.0	0.30	in
		100	100.00	99.68	138.384	0.32	0.80	0.04	20.0	0.80	in
		200	200.01	199.26	175.586	0.75	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.9169
Alpha = 0.0038499
Delta = 1.649265
Beta = 0.353285
A = 3.9134E-3
B = -6.34951E-7
C = -1.36011E-11

Remarks:

The correction must be added algebraically to the UUT reading to obtain the correct value.

Equipment and Standards Used

ID Number	Manufacturer	Model	Description	Calibration Due
03-2021	Agilent	3458A	8 1/2 Digit Digital Multimeter	08/14/2020
03-2398	Hart Scientific	5626	SSPRT Working Standard	01/22/2021
03-3729	Hart Scientific	5626	SSPRT Working Standard	10/24/2020

Environmental Conditions at time of Calibration: Temperature: 23 °C [73 °F] Relative Humidity: 39%

Procedure Used: WI-525-38 Rev 5 which is based, in part on ASTM E644-19

DUT Condition: New Calibration

The temperatures written in this report are those defined by the International Temperature Scale of 1990 (ITS-90).

The combined standard uncertainty includes the standard uncertainty reported for the standard, and the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the JCGM100:2008 Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

The DUT Acceptance tolerance is based on the DUT specification, the measurement uncertainty, the resulting test uncertainty ratio (TUR), and the maximum allowable probability of false accept risk (PFA, assumed to be 2%). In cases where the TUR ≥ 4:1, the acceptance tolerance = the DUT tolerance (guard bands are not necessary to achieve a PFA of 2%). In cases where the TUR < 4:1, the acceptance limits are reduced by guard bands calculated using method 6 of NCSLI Z540.3. Refer to NCSLI Z540.3 or Pyromation SD-525-15 for additional information.

For purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded in accordance with the rounding method of ASTM Practice E29-19.

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Report Of Calibration



5211 Industrial Road, Fort Wayne, IN 46825
www.pyromation.com 260.484.2580

Report Number: 91197

Calibration Date: 07/27/2020

Submitted By: Flow Management Devices Phoenix, AZ 85040
PO Number: 035995

SO Number: 1347099

Platinum Resistance Thermometer
XP-RBF185L484-008(1/2)-FP-8PU493

Tolerance: IEC 60751:2008 Class B

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
5	E0FC8B	-50	-50.04	-50.38	80.155	0.34	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.31	99.880	0.29	0.30	0.04	8.0	0.30	in
		100	100.00	99.52	138.322	0.48	0.80	0.04	20.0	0.80	in
		200	200.01	199.02	175.496	0.99	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.8868
Alpha = 0.00384785
Delta = 1.644657
Beta = 0.351999
A = 3.91113E-3
B = -6.32839E-7
C = -1.35444E-11

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
6	E0FC8C	-50	-50.03	-50.34	80.169	0.31	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.23	99.910	0.21	0.30	0.04	8.0	0.30	in
		100	100.00	99.69	138.390	0.31	0.80	0.04	20.0	0.80	in
		200	200.00	199.29	175.593	0.71	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.9183
Alpha = 0.00385023
Delta = 1.644505
Beta = 0.37677
A = 3.91355E-3
B = -6.33173E-7
C = -1.45065E-11

Remarks:

The correction must be added algebraically to the UUT reading to obtain the correct value.

Equipment and Standards Used

ID Number	Manufacturer	Model	Description	Calibration Due
03-2021	Agilent	3458A	8 1/2 Digit Digital Multimeter	08/14/2020
03-2398	Hart Scientific	5626	SSPRT Working Standard	01/22/2021
03-3729	Hart Scientific	5626	SSPRT Working Standard	10/24/2020

Environmental Conditions at time of Calibration: Temperature: 23 °C [73 °F] Relative Humidity: 39%

Procedure Used: WI-525-38 Rev 5 which is based, in part on ASTM E644-19

DUT Condition: New Calibration

The temperatures written in this report are those defined by the International Temperature Scale of 1990 (ITS-90).

The combined standard uncertainty includes the standard uncertainty reported for the standard, and the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the JCGM100:2008 Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

The DUT Acceptance tolerance is based on the DUT specification, the measurement uncertainty, the resulting test uncertainty ratio (TUR), and the maximum allowable probability of false accept risk (PFA, assumed to be 2%). In cases where the TUR ≥ 4:1, the acceptance tolerance = the DUT tolerance (guard bands are not necessary to achieve a PFA of 2%). In cases where the TUR < 4:1, the acceptance limits are reduced by guard bands calculated using method 6 of NCSLI Z540.3. Refer to NCSLI Z540.3 or Pyromation SD-525-15 for additional information.

For purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded in accordance with the rounding method of ASTM Practice E29-19.

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Report Of Calibration



5211 Industrial Road, Fort Wayne, IN 46825
www.pyromation.com 260.484.2580

Report Number: 91197

Calibration Date: 07/27/2020

Submitted By: Flow Management Devices Phoenix, AZ 85040
PO Number: 035995

SO Number: 1347099

Platinum Resistance Thermometer
XP-RBF185L484-008(1/2)-FP-8PU493

Tolerance: IEC 60751:2008 Class B

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
7	E0FC8D	-50	-50.03	-50.03	80.294	0.00	0.55	0.04	14.0	0.55	in
		0	-0.02	0.20	100.078	-0.22	0.30	0.04	8.0	0.30	in
		100	100.00	100.36	138.644	-0.36	0.80	0.04	20.0	0.80	in
		200	200.00	200.22	175.937	-0.22	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 100.0859
Alpha = 0.00385244
Delta = 1.637286
Beta = 0.384429
A = 3.91551E-3
B = -6.30754E-7
C = -1.48099E-11

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
8	E0FC8E	-50	-50.03	-50.36	80.164	0.33	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.27	99.896	0.25	0.30	0.04	8.0	0.30	in
		100	100.00	99.62	138.360	0.38	0.80	0.04	20.0	0.80	in
		200	200.00	199.17	175.551	0.83	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.9046
Alpha = 0.00384919
Delta = 1.641798
Beta = 0.387
A = 3.91238E-3
B = -6.31959E-7
C = -1.48964E-11

Remarks:

The correction must be added algebraically to the UUT reading to obtain the correct value.

Equipment and Standards Used

ID Number	Manufacturer	Model	Description	Calibration Due
03-2021	Agilent	3458A	8 1/2 Digit Digital Multimeter	08/14/2020
03-2398	Hart Scientific	5626	SSPRT Working Standard	01/22/2021
03-3729	Hart Scientific	5626	SSPRT Working Standard	10/24/2020

Environmental Conditions at time of Calibration: Temperature: 23 °C [73 °F] Relative Humidity: 39%

Procedure Used: WI-525-38 Rev 5 which is based, in part on ASTM E644-19

DUT Condition: New Calibration

The temperatures written in this report are those defined by the International Temperature Scale of 1990 (ITS-90).

The combined standard uncertainty includes the standard uncertainty reported for the standard, and the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the JCGM100:2008 Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

The DUT Acceptance tolerance is based on the DUT specification, the measurement uncertainty, the resulting test uncertainty ratio (TUR), and the maximum allowable probability of false accept risk (PFA, assumed to be 2%). In cases where the TUR ≥ 4:1, the acceptance tolerance = the DUT tolerance (guard bands are not necessary to achieve a PFA of 2%). In cases where the TUR < 4:1, the acceptance limits are reduced by guard bands calculated using method 6 of NCSLI Z540.3. Refer to NCSLI Z540.3 or Pyromation SD-525-15 for additional information.

For purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded in accordance with the rounding method of ASTM Practice E29-19

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Report Of Calibration

Report Number: 91197

Calibration Date: 07/27/2020

Submitted By: Flow Management Devices Phoenix, AZ 85040
PO Number: 035995

SO Number: 1347099

Platinum Resistance Thermometer
XP-RBF185L484-008(1/2)-FP-8PU493

Tolerance: IEC 60751:2008 Class B

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
9	E0FC8F	-50	-50.03	-50.41	80.142	0.38	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.30	99.883	0.28	0.30	0.04	8.0	0.30	in
		100	100.00	99.61	138.359	0.39	0.80	0.04	20.0	0.80	in
		200	200.00	199.18	175.554	0.82	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.8911
Alpha = 0.00385093
Delta = 1.651157
Beta = 0.37639
A = 3.91452E-3
B = -6.35849E-7
C = -1.44945E-11

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
10	E0FC90	-50	-50.03	-50.38	80.154	0.35	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.27	99.893	0.25	0.30	0.04	8.0	0.30	in
		100	100.00	99.63	138.367	0.37	0.80	0.04	20.0	0.80	in
		200	200.00	199.22	175.569	0.78	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.9013
Alpha = 0.00385032
Delta = 1.639291
Beta = 0.415921
A = 3.91343E-3
B = -6.31179E-7
C = -1.60143E-11

Remarks:

The correction must be added algebraically to the UUT reading to obtain the correct value.

Equipment and Standards Used

ID Number	Manufacturer	Model	Description	Calibration Due
03-2021	Agilent	3458A	8 1/2 Digit Digital Multimeter	08/14/2020
03-2398	Hart Scientific	5626	SSPRT Working Standard	01/22/2021
03-3729	Hart Scientific	5626	SSPRT Working Standard	10/24/2020

Environmental Conditions at time of Calibration: Temperature: 23 °C [73 °F] Relative Humidity: 39%

Procedure Used: WI-525-38 Rev 5 which is based, in part on ASTM E644-19

DUT Condition: New Calibration

The temperatures written in this report are those defined by the International Temperature Scale of 1990 (ITS-90).

The combined standard uncertainty includes the standard uncertainty reported for the standard, and the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the JCGM100:2008 Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

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For purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded in accordance with the rounding method of ASTM Practice E29-19

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Report for Callendar-Van Dusen Coefficients

XP-RBF185L484-008(1/2)-FP-8PU493

91197 - 4

Date: July 28, 2020

Reference (°C)	UUT (Ohms)	Residual (°C)
-50.0370	80.1673	0.0000
-0.0170	99.9101	0.0000
100.0000	138.3839	0.0000
200.0110	175.5861	0.0000

Coefficients:

$R_0 = 99.9169$

$\alpha = 0.0038499$

$\Delta = 1.649265$

$\beta = 0.353285$

$A = 3.9134E-3$

$B = -6.34951E-7$

$C = -1.36011E-11$

XP-RBF185L484-008(1/2)-FP-8PU493 91197 - 4 Callendar-Van Dusen Temperature vs. Resistance Table

°C	Resistance	dR/dT	°C	Resistance	dR/dT	°C	Resistance	dR/dT
-50	80.182	0.399	-3	98.743	0.391	44	116.999	0.385
-49	80.581	0.399	-2	99.135	0.391	45	117.384	0.385
-48	80.980	0.399	-1	99.526	0.391	46	117.769	0.385
-47	81.378	0.398	0	99.917	0.391	47	118.154	0.385
-46	81.777	0.398	1	100.308	0.391	48	118.539	0.385
-45	82.175	0.398	2	100.699	0.391	49	118.924	0.385
-44	82.573	0.398	3	101.089	0.391	50	119.309	0.385
-43	82.970	0.398	4	101.480	0.391	51	119.694	0.385
-42	83.368	0.397	5	101.870	0.390	52	120.078	0.384
-41	83.765	0.397	6	102.261	0.390	53	120.462	0.384
-40	84.163	0.397	7	102.651	0.390	54	120.847	0.384
-39	84.560	0.397	8	103.041	0.390	55	121.231	0.384
-38	84.956	0.397	9	103.431	0.390	56	121.615	0.384
-37	85.353	0.397	10	103.821	0.390	57	121.999	0.384
-36	85.750	0.396	11	104.210	0.390	58	122.382	0.384
-35	86.146	0.396	12	104.600	0.389	59	122.766	0.384
-34	86.542	0.396	13	104.989	0.389	60	123.149	0.383
-33	86.938	0.396	14	105.379	0.389	61	123.533	0.383
-32	87.334	0.396	15	105.768	0.389	62	123.916	0.383
-31	87.729	0.396	16	106.157	0.389	63	124.299	0.383
-30	88.125	0.395	17	106.546	0.389	64	124.682	0.383
-29	88.520	0.395	18	106.935	0.389	65	125.065	0.383
-28	88.915	0.395	19	107.323	0.389	66	125.447	0.383
-27	89.310	0.395	20	107.712	0.388	67	125.830	0.383
-26	89.705	0.395	21	108.100	0.388	68	126.213	0.382
-25	90.099	0.395	22	108.488	0.388	69	126.595	0.382
-24	90.494	0.394	23	108.877	0.388	70	126.977	0.382
-23	90.888	0.394	24	109.265	0.388	71	127.359	0.382
-22	91.282	0.394	25	109.653	0.388	72	127.741	0.382
-21	91.676	0.394	26	110.040	0.388	73	128.123	0.382
-20	92.070	0.394	27	110.428	0.388	74	128.505	0.382
-19	92.464	0.394	28	110.816	0.387	75	128.886	0.381
-18	92.857	0.393	29	111.203	0.387	76	129.268	0.381
-17	93.251	0.393	30	111.590	0.387	77	129.649	0.381
-16	93.644	0.393	31	111.977	0.387	78	130.030	0.381
-15	94.037	0.393	32	112.364	0.387	79	130.411	0.381
-14	94.430	0.393	33	112.751	0.387	80	130.792	0.381
-13	94.823	0.393	34	113.138	0.387	81	131.173	0.381
-12	95.215	0.393	35	113.525	0.387	82	131.553	0.381
-11	95.608	0.392	36	113.911	0.386	83	131.934	0.380
-10	96.000	0.392	37	114.298	0.386	84	132.314	0.380
-9	96.392	0.392	38	114.684	0.386	85	132.695	0.380
-8	96.785	0.392	39	115.070	0.386	86	133.075	0.380
-7	97.177	0.392	40	115.456	0.386	87	133.455	0.380
-6	97.568	0.392	41	115.842	0.386	88	133.835	0.380
-5	97.960	0.392	42	116.228	0.386	89	134.215	0.380
-4	98.352	0.392	43	116.613	0.386	90	134.594	0.380

XP-RBF185L484-008(1/2)-FP-8PU493 91197 - 4 Callendar-Van Dusen Temperature vs. Resistance Table

°C	Resistance	dR/dT	°C	Resistance	dR/dT	°C	Resistance	dR/dT
91	134.974	0.379	138	152.669	0.374	185	170.083	0.368
92	135.353	0.379	139	153.042	0.373	186	170.451	0.367
93	135.733	0.379	140	153.415	0.373	187	170.818	0.367
94	136.112	0.379	141	153.789	0.373	188	171.185	0.367
95	136.491	0.379	142	154.162	0.373	189	171.552	0.367
96	136.870	0.379	143	154.535	0.373	190	171.919	0.367
97	137.248	0.379	144	154.907	0.373	191	172.286	0.367
98	137.627	0.379	145	155.280	0.373	192	172.653	0.367
99	138.006	0.378	146	155.653	0.372	193	173.020	0.367
100	138.384	0.378	147	156.025	0.372	194	173.386	0.366
101	138.762	0.378	148	156.397	0.372	195	173.752	0.366
102	139.140	0.378	149	156.770	0.372	196	174.119	0.366
103	139.518	0.378	150	157.142	0.372	197	174.485	0.366
104	139.896	0.378	151	157.514	0.372	198	174.851	0.366
105	140.274	0.378	152	157.885	0.372	199	175.216	0.366
106	140.652	0.378	153	158.257	0.372	200	175.582	0.366
107	141.029	0.377	154	158.629	0.371			
108	141.406	0.377	155	159.000	0.371			
109	141.784	0.377	156	159.371	0.371			
110	142.161	0.377	157	159.742	0.371			
111	142.538	0.377	158	160.113	0.371			
112	142.915	0.377	159	160.484	0.371			
113	143.291	0.377	160	160.855	0.371			
114	143.668	0.377	161	161.226	0.371			
115	144.045	0.376	162	161.596	0.370			
116	144.421	0.376	163	161.967	0.370			
117	144.797	0.376	164	162.337	0.370			
118	145.173	0.376	165	162.707	0.370			
119	145.549	0.376	166	163.077	0.370			
120	145.925	0.376	167	163.447	0.370			
121	146.301	0.376	168	163.817	0.370			
122	146.676	0.376	169	164.186	0.370			
123	147.052	0.375	170	164.556	0.369			
124	147.427	0.375	171	164.925	0.369			
125	147.802	0.375	172	165.294	0.369			
126	148.177	0.375	173	165.664	0.369			
127	148.552	0.375	174	166.033	0.369			
128	148.927	0.375	175	166.401	0.369			
129	149.302	0.375	176	166.770	0.369			
130	149.677	0.375	177	167.139	0.369			
131	150.051	0.374	178	167.507	0.368			
132	150.425	0.374	179	167.876	0.368			
133	150.800	0.374	180	168.244	0.368			
134	151.174	0.374	181	168.612	0.368			
135	151.548	0.374	182	168.980	0.368			
136	151.921	0.374	183	169.348	0.368			
137	152.295	0.374	184	169.716	0.368			

Report Number: 90564

Calibration Date: 07/02/2020

Submitted By: Flow Management Devices Phoenix, AZ 85040

SO Number: 1342959

PO Number: 035379

Platinum Resistance Thermometer

Tolerance: IEC 60751:2008 Class B

XP-RBF185L484-004-FP-8HN93

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
1	E0AB2D	-50	-50.04	-50.37	80.159	0.33	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.29	99.886	0.27	0.30	0.04	8.0	0.30	in
		100	99.95	99.51	138.317	0.44	0.80	0.04	20.0	0.80	in
		200	199.92	199.00	175.491	0.92	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

$R_0 = 99.895$
 $\alpha = 0.00384828$
 $\Delta = 1.640556$
 $\beta = 0.354138$
 $A = 3.91141E-3$
 $B = -6.31332E-7$
 $C = -1.36282E-11$

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
2	E0AB2E	-50	-50.04	-50.35	80.167	0.31	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.20	99.920	0.18	0.30	0.04	8.0	0.30	in
		100	99.95	99.73	138.402	0.22	0.80	0.04	20.0	0.80	in
		200	199.92	199.36	175.622	0.56	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

$R_0 = 99.9294$
 $\alpha = 0.00385196$
 $\Delta = 1.641689$
 $\beta = 0.367887$
 $A = 3.9152E-3$
 $B = -6.32372E-7$
 $C = -1.41709E-11$

Remarks: Calibrated Prior To Final Assembly.

The correction must be added algebraically to the UUT reading to obtain the correct value.

Equipment and Standards Used

ID Number	Manufacturer	Model	Description	Calibration Due
03-1268	Hewlett Packard	3458A	8 1/2 Digit Digital Multimeter	05/13/2021
03-2398	Hart Scientific	5626	SSPRT Working Standard	07/21/2020
03-3729	Hart Scientific	5626	SSPRT Working Standard	10/24/2020

Environmental Conditions at time of Calibration: Temperature: 23 °C [73 °F]

Relative Humidity: 38%

Procedure Used: WI-525-38 Rev 5 which is based, in part on ASTM E644-19

DUT Condition: New Calibration

Calibration performed by: Lindi Bunn, Metrology Technician

The temperatures written in this report are those defined by the International Temperature Scale of 1990 (ITS-90).

The combined standard uncertainty includes the standard uncertainty reported for the standard, and the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the JCGM100:2008 Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

The DUT Acceptance tolerance is based on the DUT specification, the measurement uncertainty, the resulting test uncertainty ratio (TUR), and the maximum allowable probability of false accept risk (PFA, assumed to be 2%). In cases where the TUR ≥ 4:1, the acceptance tolerance = the DUT tolerance (guard bands are not necessary to achieve a PFA of 2%). In cases where the TUR < 4:1, the acceptance limits are reduced by guard bands calculated using method 6 of NCSLI Z540.3. Refer to NCSLI Z540.3 or Pyromation SD-525-15 for additional information.

For purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded in accordance with the rounding method of ASTM Practice E29-19.

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Report Of Calibration



5211 Industrial Road, Fort Wayne, IN 46825
www.pyromation.com 260.484.2580

Report Number: 90564

Calibration Date: 07/02/2020

Submitted By: Flow Management Devices Phoenix, AZ 85040
PO Number: 035379

SO Number: 1342959

Platinum Resistance Thermometer
XP-RBF185L484-004-FP-8HN93

Tolerance: IEC 60751:2008 Class B

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
3	E0AB2F	-50	-50.04	-50.36	80.162	0.32	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.22	99.914	0.20	0.30	0.04	8.0	0.30	in
		100	99.95	99.71	138.395	0.24	0.80	0.04	20.0	0.80	in
		200	199.92	199.33	175.613	0.59	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.9234
Alpha = 0.00385209
Delta = 1.644071
Beta = 0.346116
A = 3.91542E-3
B = -6.33311E-7
C = -1.33327E-11

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
4	E0AB30	-50	-50.04	-50.34	80.173	0.30	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.18	99.928	0.16	0.30	0.04	8.0	0.30	in
		100	99.95	99.75	138.411	0.20	0.80	0.04	20.0	0.80	in
		200	199.92	199.37	175.626	0.55	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.9368
Alpha = 0.00385184
Delta = 1.650718
Beta = 0.341224
A = 3.91542E-3
B = -6.35829E-7
C = -1.31434E-11

Remarks: Calibrated Prior To Final Assembly.

The correction must be added algebraically to the UUT reading to obtain the correct value.

Equipment and Standards Used

ID Number	Manufacturer	Model	Description	Calibration Due
03-1268	Hewlett Packard	3458A	8 1/2 Digit Digital Multimeter	05/13/2021
03-2398	Hart Scientific	5626	SSPRT Working Standard	07/21/2020
03-3729	Hart Scientific	5626	SSPRT Working Standard	10/24/2020

Environmental Conditions at time of Calibration: Temperature: 23 °C [73 °F] Relative Humidity: 38%

Procedure Used: WI-525-38 Rev 5 which is based, in part on ASTM E644-19

DUT Condition: New Calibration

The temperatures written in this report are those defined by the International Temperature Scale of 1990 (ITS-90).

The combined standard uncertainty includes the standard uncertainty reported for the standard, and the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the JCGM100:2008 Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

The DUT Acceptance tolerance is based on the DUT specification, the measurement uncertainty, the resulting test uncertainty ratio (TUR), and the maximum allowable probability of false accept risk (PFA, assumed to be 2%). In cases where the TUR ≥ 4:1, the acceptance tolerance = the DUT tolerance (guard bands are not necessary to achieve a PFA of 2%). In cases where the TUR < 4:1, the acceptance limits are reduced by guard bands calculated using method 6 of NCSLI Z540.3. Refer to NCSLI Z540.3 or Pyromation SD-525-15 for additional information.

For purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded in accordance with the rounding method of ASTM Practice E29-19

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Report Of Calibration



5211 Industrial Road, Fort Wayne, IN 46825
www.pyromation.com 260.484.2580

Report Number: 90564

Calibration Date: 07/02/2020

Submitted By: Flow Management Devices Phoenix, AZ 85040

SO Number: 1342959

PO Number: 035379

Platinum Resistance Thermometer
XP-RBF185L484-004-FP-8HN93

Tolerance: IEC 60751:2008 Class B

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
5 ✓	E0AB31	-50	-50.04	-50.38	80.154	0.34	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.27	99.895	0.25	0.30	0.04	8.0	0.30	in
		100	99.95	99.60	138.353	0.35	0.80	0.04	20.0	0.80	in
		200	199.92	199.17	175.551	0.75	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

$R_0 = 99.9041$
 $\alpha = 0.00385061$
 $\Delta = 1.642413$
 $\beta = 0.36104$
 $A = 3.91386E-3$
 $B = -6.3243E-7$
 $C = -1.39023E-11$

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
6 ✓	E0AB32	-50	-50.04	-50.32	80.178	0.28	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.16	99.937	0.14	0.30	0.04	8.0	0.30	in
		100	99.95	99.79	138.425	0.16	0.80	0.04	20.0	0.80	in
		200	199.93	199.45	175.652	0.48	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

$R_0 = 99.9465$
 $\alpha = 0.00385187$
 $\Delta = 1.642334$
 $\beta = 0.381973$
 $A = 3.91513E-3$
 $B = -6.32605E-7$
 $C = -1.47131E-11$

Remarks: Calibrated Prior To Final Assembly.

The correction must be added algebraically to the UUT reading to obtain the correct value.

Equipment and Standards Used

ID Number	Manufacturer	Model	Description	Calibration Due
03-1268	Hewlett Packard	3458A	8 1/2 Digit Digital Multimeter	05/13/2021
03-2398	Hart Scientific	5626	SSPRT Working Standard	07/21/2020
03-3729	Hart Scientific	5626	SSPRT Working Standard	10/24/2020

Environmental Conditions at time of Calibration: Temperature: 23 °C [73 °F] Relative Humidity: 38%

Procedure Used: WI-525-38 Rev 5 which is based, in part on ASTM E644-19

DUT Condition: New Calibration

The temperatures written in this report are those defined by the International Temperature Scale of 1990 (ITS-90).

The combined standard uncertainty includes the standard uncertainty reported for the standard, and the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the JCGM100:2008 Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

The DUT Acceptance tolerance is based on the DUT specification, the measurement uncertainty, the resulting test uncertainty ratio (TUR), and the maximum allowable probability of false accept risk (PFA, assumed to be 2%). In cases where the $TUR \geq 4.1$, the acceptance tolerance = the DUT tolerance (guard bands are not necessary to achieve a PFA of 2%). In cases where the $TUR < 4.1$, the acceptance limits are reduced by guard bands calculated using method 6 of NCSLI Z540.3. Refer to NCSLI Z540.3 or Pyromation SD-525-15 for additional information.

For purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded in accordance with the rounding method of ASTM Practice E29-19.

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Report Of Calibration



5211 Industrial Road, Fort Wayne, IN 46825
www.pyromation.com 260.484.2580

Report Number: 90564

Calibration Date: 07/02/2020

Submitted By: Flow Management Devices Phoenix, AZ 85040

SO Number: 1342959

PO Number: 035379

Platinum Resistance Thermometer
XP-RBF185L484-004-FP-8HN93

Tolerance: IEC 60751:2008 Class B

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
7	E0AB33	-50	-50.04	-50.36	80.164	0.32	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.21	99.917	0.19	0.30	0.04	8.0	0.30	in
		100	99.95	99.70	138.393	0.25	0.80	0.04	20.0	0.80	in
		200	199.93	199.32	175.607	0.61	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.9262
Alpha = 0.00385148
Delta = 1.64478
Beta = 0.370936
A = 3.91483E-3
B = -6.33483E-7
C = -1.42865E-11

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
8	E0AB34	-50	-50.04	-50.42	80.137	0.38	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.32	99.876	0.30	0.30	0.04	8.0	0.30	in
		100	99.95	99.53	138.325	0.42	0.80	0.04	20.0	0.80	in
		200	199.93	199.07	175.514	0.86	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.8847
Alpha = 0.00385039
Delta = 1.643319
Beta = 0.361042
A = 3.91367E-3
B = -6.32743E-7
C = -1.39015E-11

Remarks: Calibrated Prior To Final Assembly.

The correction must be added algebraically to the UUT reading to obtain the correct value.

Equipment and Standards Used

ID Number	Manufacturer	Model	Description	Calibration Due
03-1268	Hewlett Packard	3458A	8 1/2 Digit Digital Multimeter	05/13/2021
03-2398	Hart Scientific	5626	SSPRT Working Standard	07/21/2020
03-3729	Hart Scientific	5626	SSPRT Working Standard	10/24/2020

Environmental Conditions at time of Calibration: Temperature: 23 °C [73 °F]

Relative Humidity: 38%

Procedure Used: WI-525-38 Rev 5 which is based, in part on ASTM E644-19

DUT Condition: New Calibration

The temperatures written in this report are those defined by the International Temperature Scale of 1990 (ITS-90).

The combined standard uncertainty includes the standard uncertainty reported for the standard, and the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the JCGM100:2008 Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

The DUT Acceptance tolerance is based on the DUT specification, the measurement uncertainty, the resulting test uncertainty ratio (TUR), and the maximum allowable probability of false accept risk (PFA, assumed to be 2%). In cases where the TUR ≥ 4:1, the acceptance tolerance = the DUT tolerance (guard bands are not necessary to achieve a PFA of 2%). In cases where the TUR < 4:1, the acceptance limits are reduced by guard bands calculated using method 6 of NCSLI Z540.3. Refer to NCSLI Z540.3 or Pyromation SD-525-15 for additional information.

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Report Of Calibration



5211 Industrial Road, Fort Wayne, IN 46825
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Report Number: 90564

Calibration Date: 07/02/2020

Submitted By: Flow Management Devices Phoenix, AZ 85040

SO Number: 1342959

PO Number: 035379

Platinum Resistance Thermometer
XP-RBF185L484-004-FP-8HN93

Tolerance: IEC 60751:2008 Class B

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
9	E0AB35	-50	-50.04	-50.34	80.171	0.30	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.22	99.914	0.20	0.30	0.04	8.0	0.30	in
		100	99.95	99.66	138.374	0.29	0.80	0.04	20.0	0.80	in
		200	199.93	199.24	175.575	0.69	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.9233
Alpha = 0.00385001
Delta = 1.641939
Beta = 0.359011
A = 3.91322E-3
B = -6.32148E-7
C = -1.3822E-11

Item	Serial / Reference	Target (°C)	Actual (°C)	Reading (°C)	Reading (Ω)	Correction (°C)	Tolerance (± °C)	U _c (k = 2) (± °C)	TUR N:1	Acceptance (± °C)	Status (in/out)
10	E0AB36	-50	-50.04	-50.39	80.148	0.35	0.55	0.04	14.0	0.55	in
		0	-0.02	-0.25	99.900	0.23	0.30	0.04	8.0	0.30	in
		100	99.95	99.65	138.371	0.30	0.80	0.04	20.0	0.80	in
		200	199.93	199.24	175.578	0.69	1.30	0.04	32.0	1.30	in

Supplemental Information: Wire Color Red White. UUT data was fitted to the Callendar equation (below). Results are as follows:

Ro = 99.9089
Alpha = 0.00385164
Delta = 1.647594
Beta = 0.37444
A = 3.9151E-3
B = -6.34595E-7
C = -1.44221E-11

Remarks: Calibrated Prior To Final Assembly.

The correction must be added algebraically to the UUT reading to obtain the correct value.

Equipment and Standards Used

ID Number	Manufacturer	Model	Description	Calibration Due
03-1268	Hewlett Packard	3458A	8 1/2 Digit Digital Multimeter	05/13/2021
03-2398	Hart Scientific	5626	SSPRT Working Standard	07/21/2020
03-3729	Hart Scientific	5626	SSPRT Working Standard	10/24/2020

Environmental Conditions at time of Calibration: Temperature: 23 °C [73 °F]

Relative Humidity: 38%

Procedure Used: WI-525-38 Rev 5 which is based, in part on ASTM E644-19

DUT Condition: New Calibration

The temperatures written in this report are those defined by the International Temperature Scale of 1990 (ITS-90).

The combined standard uncertainty includes the standard uncertainty reported for the standard, and the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the JCGM100:2008 Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

The DUT Acceptance tolerance is based on the DUT specification, the measurement uncertainty, the resulting test uncertainty ratio (TUR), and the maximum allowable probability of false accept risk (PFA, assumed to be 2%). In cases where the TUR ≥ 4:1, the acceptance tolerance = the DUT tolerance (guard bands are not necessary to achieve a PFA of 2%). In cases where the TUR < 4:1, the acceptance limits are reduced by guard bands calculated using method 6 of NCSLI Z540.3. Refer to NCSLI Z540.3 or Pyromation SD-525-15 for additional information.

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Report for Callendar-Van Dusen Coefficients

XP-RBF185L484-004-FP-8HN93

90564 - 5

Date: July 2, 2020

Reference (°C)	UUT (Ohms)	Residual (°C)
-50.0400	80.1536	0.0000
-0.0230	99.8949	0.0000
99.9470	138.3532	0.0000
199.9240	175.5510	0.0000

Coefficients:

$R_0 = 99.9041$

$\text{ALPHA} = 0.00385061$

$\text{DELTA} = 1.642413$

$\text{BETA} = 0.36104$

$A = 3.91386\text{E-}3$

$B = -6.3243\text{E-}7$

$C = -1.39023\text{E-}11$