




5 September, 2015

Emerson Process Management
Rosemount Inc.
8200 Market Blvd
Chanhassen, MN U.S. 55317-9786

Calibration Data Sheet Consistent with ISO 10474 3.1

Customer Information Name: ILLUMINATE CONTRACTING LLC PO: 150415	Manufacturer Information Sales Order: 4342794 Line: 2
Device Information Device Type: Temperature Sensor Serial No: 1784695 Model No: 0078N11C60N040V1Q4M7XA	Calibration Information Factory: CHANHASSEN, MN, USA Internal Ref # 11960100 

This is to certify the below listed serialized equipment meet applicable Rosemount Inc. Specifications. All calibration is performed to Rosemount procedure 90002029. Please see attached Report of Calibration points for each sensor.

Model Number	Equipment Name	Serial Number	Tag Number
Date Added to Certificate: 9/5/2015 5:59:21AM			
0078N11C60N040V1Q4M7XA	Temperature Sensor	1784695	




Kelly Klein
Vice President of Global Quality, Approvals & EHS



5 September, 2015

Emerson Process Management
Rosemount Inc.
8200 Market Blvd
Chanhassen, MN U.S. 55317-9786

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

Customer Information Name: ILLUMINATE CONTRACTING LLC PO: 150415	Manufacturer Information Sales Order: 4342794 Line: 1
Device Information Device Type: Temperature Transmitter Tag No: Serial No: 0868371 Model No: 3144PD1A1NAP8B5M5C2Q4XA Output: Linear	Calibration Information Factory: CHANHASSEN, MN, USA Station Name: FinalStn3 Operator ID: 58680 Calibration Date: 9/4/2015 3:15:43PM Internal Ref # 11960097 

Calibration Data

Sensor 1	Pt100 00385C2	4 Wire	0.00 TO 100.00 DEG C			
% of Range	Measured Input	Digital Output	Analog Output	% Span Error	Pass/Fail	
100.087	100.087 DEG C	100.078 DEG C	20.0113 mA	-0.0164	PASS	
50.084	50.084 DEG C	50.071 DEG C	12.0113 mA	-0.0134	PASS	
0.034	0.034 DEG C	0.032 DEG C	4.0046 mA	-0.0052	PASS	

This is to certify that the listed product meets the applicable Rosemount Specifications. Measuring and test equipment used in the manufacture and inspection of the listed product are traceable to the National Institute of Standards and Technology. The calibration system was designed to meet the intent of ANSI Z540-1-1994.



Kelly Klein
Vice President of Global Quality, Approvals & EHS

ROSEMOUNT INC.

REPORT OF CALIBRATION

Model Option Code Q4V1

Industrial Platinum Resistance Thermometer (IPRT)

Calibration Schedule V1

Sensor Serial Number: 1784695
Sales Order/Line Number: 4342794 2
Sensor Model: 78N11C60N040V1Q4M7XA

Rosemount Inc.

Customer Central
8200 Market Blvd.
Chanhassen, MN, USA 55317-9687
1-800-999-9307

ROSEMOUNT INC.
Report of Calibration
Industrial Platinum Resistance Thermometer (IPRT)

Callendar – Van Dusen Method Of Temperature Interpolation

$$R_t = R_0 \left\{ 1 + \alpha \left[t - \delta \left(\frac{t}{100} \right) \left(\frac{t}{100} - 1 \right) - \beta \left(\frac{t}{100} - 1 \right) \left(\frac{t}{100} \right)^3 \right] \right\}$$

Where :

- R_t = Resistance at temperature t , Ω
- R_0 = Resistance at temperature 0°C
- t = Temperature, $^\circ\text{C}$
- α , β , and δ = Calibration Constants
- $\beta = 0$ for $t > 0^\circ\text{C}$

Alternate Form Of The Callendar – Van Dusen Interpolation Equation

$$R_t = R_0 [1 + At + Bt^2 + Ct^3(t - 100)]$$

Where :

- R_t = Resistance at temperature t , Ω
- R_0 = Resistance at temperature 0°C
- t = Temperature, $^\circ\text{C}$
- A, B, and C = Calibration Constants
- $C = 0$ for $t > 0^\circ\text{C}$

The Callendar – VanDusen method of temperature interpolation is the method utilized by the Rosemount Inc. 644, 648 and 3144 Temperature Transmitters.

ROSEMOUNT INC.

Report of Calibration

Industrial Platinum Resistance Thermometer (IPRT)

Calibration Schedule: V1 Sensor Part Number: 78-4001-0115
Interpolation Method: Callendar-Van Dusen Sensor Serial Number: 1784695

Calibration Test Points

Temperature (°C)	Resistance (ohms)
0.000	100.032
100.000	138.550

Calibration Constants

Ro= 100.0320	
Alpha= 0.00385058	A= 0.00390985
Beta= 0.1110	B= -5.92715E-07
Delta= 1.5393	C= -4.27415E-12

ROSEMOUNT INC.

Report of Calibration

Industrial Platinum Resistance Thermometer (IPRT)

Calibration Schedule: V1 Capsule Part Number: 78-4001-0115
Interpolation Method: Callendar-Van Dusen Sensor Serial Number: 1784695

Temp. (°C)	Resistance (Ohms)
0	100.032
1	100.423
2	100.814
3	101.205
4	101.596
5	101.986
6	102.377
7	102.767
8	103.157
9	103.547
10	103.937
11	104.327
12	104.717
13	105.106
14	105.496
15	105.885
16	106.275
17	106.664
18	107.053
19	107.442
20	107.831
21	108.219
22	108.608
23	108.996
24	109.385
25	109.773
26	110.161
27	110.549
28	110.937
29	111.324
30	111.712
31	112.099
32	112.487
33	112.874
34	113.261
35	113.648
36	114.035
37	114.422
38	114.809
39	115.195
40	115.582
41	115.968
42	116.354
43	116.740
44	117.126
45	117.512
46	117.898
47	118.283
48	118.669

Temp. (°C)	Resistance (Ohms)
49	119.054
50	119.439
51	119.824
52	120.209
53	120.594
54	120.979
55	121.364
56	121.748
57	122.133
58	122.517
59	122.901
60	123.285
61	123.669
62	124.053
63	124.437
64	124.820
65	125.204
66	125.587
67	125.970
68	126.353
69	126.736
70	127.119
71	127.502
72	127.885
73	128.267
74	128.650
75	129.032
76	129.414
77	129.796
78	130.178
79	130.560
80	130.941
81	131.323
82	131.704
83	132.086
84	132.467
85	132.848
86	133.229
87	133.610
88	133.991
89	134.371
90	134.752
91	135.132
92	135.512
93	135.893
94	136.273
95	136.652
96	137.032
97	137.412

Temp. (°C)	Resistance (Ohms)
98	137.791
99	138.171
100	138.550

Temp. (°C)	Resistance (Ohms)
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Temp. (°C)	Resistance (Ohms)
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ROSEMOUNT INC.
Report of Calibration
Industrial Platinum Resistance Thermometer (IPRT)

Calibration Schedule: VI
Interpolation Method: Callendar-Van Dusen
Sensor Model: 78N11C60N040V1Q4M7XA
Sensor Serial Number: 1784695

TRACEABILITY

Sensor:	Calibration Bath:			
	0°C Bath	100°C Bath		
<u>Primary Standard</u>				
Manufacturer:	Fluke Corporation	Rosemount Aerospace		
Model Number:	5699	162CE		
Serial Number:	0444	5044		
Where Calibrated:	NIST	NIST		
<u>Secondary Standard</u>				
Manufacturer:	Fluke Corporation	Rosemount Aerospace		
Model Number:	5699	162CE		
Serial Number:	3150	5118		
Calibration Date:	9/15/2014	11/28/2006		
Where Calibrated:	Fluke Corporation	Rosemount Aerospace		
<u>Industrial PRT</u>				
Manufacturer:	Rosemount Inc.	IPRT Calibrated By: Employee Number: 61286 <u>Anika Chea</u>		
Part Number:	78-4001-0115			
Serial Number:	1784695			
Sales Order Number:	4342794 2			
Calibration Date:	9/4/2015			
Where Calibrated:	Rosemount Inc., Chanhassen, MN			

ITS-90 Temperature Scale values are utilized in this calibration process and report.

Definitions:

ITS-90 - International Temperature Scale, 1990 revision.

Primary Standard - Standard PRT (SPRT), Calibration traceable to NIST.

Secondary Standard - Rosemount Inc.'s Standard PRT (Secondary SPRT), calibrated against the primary standard.

Industrial PRT (IPRT) - The Rosemount model sensor that is the topic of this report, calibrated against the secondary standard(s) utilizing comparison methodology.