



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	49	119.054	98	137.791				
1	100.423	50	119.439	99	138.171				
2	100.814	51	119.824	100	138.550				
3	101.205	52	120.209						
4	101.596	53	120.594						
5	101.986	54	120.979						
6	102.377	55	121.364						
7	102.767	56	121.748						
8	103.157	57	122.133						
9	103.547	58	122.517						
10	103.937	59	122.901						
11	104.327	60	123.285						
12	104.717	61	123.669						
13	105.106	62	124.053						
14	105.496	63	124.437						
15	105.885	64	124.820						
16	106.275	65	125.204						
17	106.664	66	125.587						
18	107.053	67	125.970						
19	107.442	68	126.353						
20	107.831	69	126.736						
21	108.219	70	127.119						
22	108.608	71	127.502						
23	108.996	72	127.885						
24	109.385	73	128.267						
25	109.773	74	128.650						
26	110.161	75	129.032						
27	110.549	76	129.414						
28	110.937	77	129.796						
29	111.324	78	130.178						
30	111.712	79	130.560						
31	112.099	80	130.941						
32	112.487	81	131.323						
33	112.874	82	131.704						
34	113.261	83	132.086						
35	113.648	84	132.467						
36	114.035	85	132.848						
37	114.422	86	133.229						
38	114.809	87	133.610						
39	115.195	88	133.991						
40	115.582	89	134.371						
41	115.968	90	134.752						
42	116.354	91	135.132						
43	116.740	92	135.512						
44	117.126	93	135.893						
45	117.512	94	136.273						
46	117.898	95	136.652						
47	118.283	96	137.032						
48	118.669	97	137.412						

ROSEMOUNT INC.

Report of Calibration

Industrial Platinum Resistance Thermometer (IPRT)

Calibration Schedule: VI

Sensor Model: 78N11C60N040V1Q4M7XA

Interpolation Method: Callendar-Van Dusen

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:	
Part Number:	78-4001-0115	Employee Number: 61286	
Serial Number:	1784695	<u>Anika Chea</u>	
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.