

Certificate of Calibration Fluke Park Laboratory

Description:	Field Metrology Well with Process Readout	Certificate Number:	B9829035
Manufacturer:	Fluke	Date of Calibration:	29 Aug 2019
Model:	9142	Date Due:	
Serial Number:	B98922	Temperature:	20.0 to 26.0 °C
Status:	As-Found: New As-Left: In Tolerance	Relative Humidity:	15 to 70 %RH
Calibration:	Full	Pressure:	95 to 103 kPa
Procedure:	HCT301 - 1	Issue Date:	29 Aug 2019
Customer:	FLUKE DO BRASIL LTDA SAO PAULO, BR	RMA/SO Number:	31810820
PO Number:	11660		

This calibration is traceable to the SI through recognized national metrological institutes (NIST, PTB, NPL, NIM, NRC, etc.), radiometric techniques, or natural physical constants and is in compliance with ISO/IEC17025:2005 and ANSI/NCSL Z540.1. The calibration has been completed in accordance with the Fluke Corporate Quality System document QSD 111.0. Calibration certificates without identification of the authorizing person are not valid. This certificate applies to only the item identified and shall not be reproduced other than in full, without the specific written approval by Fluke Corporation.

This calibration certificate may contain data that is not covered by the Scope of Accreditation. The unaccredited test points, where applicable, are indicated by an asterisk (*), or confined to clearly marked sections. This certificate shall not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in the ISO Guide to the Expression of Uncertainty in Measurement. 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 %.

Comments:



APROVADO	
Responsável: <u>RENATO</u>	
Padrão: <u>H001 A03 BS</u>	
Data: <u>08/10/2019</u>	
Validade: <u>29/08/2021</u>	

Cert: B9829035
 Due: S/N: B98922

Approved Signatory

Ivars Ikstrums

Standards Used

Description	Serial Number	Due-Date
1560 Thermometer, "Black Stack" Base Unit	B34609	NCR
1560 Thermometer, "Black Stack" Base Unit	B4C815	NCR
2562-H Precision Digital Thermometer	8A244	10-Mar-2020
2562-H Precision Digital Thermometer	B08077	15-Nov-2019
5628 Platinum Resistance Thermometer	1535	15-Jan-2020
5628 Platinum Resistance Thermometer	1902	25-Mar-2020
1529-R Digital Thermometer	B08261	28-Sep-2019
3591 Standard Resistor Set	A45009	01-Sep-2019
5610 Thermistor Probe	A521109	07-Sep-2019
5610 Thermistor Probe	A692906	24-Oct-2019
5700A DC Reference Standard	1616602	13-Sep-2019
Field Metrology Well Test Station	13	NCR

Quality Manuals

This calibration has been completed in accordance with:

The Fluke Corporate Quality Manual, QSD 111.00, Revision 122, Dated June, 2018 and/or

The Fluke 17025 Quality Manual, QSD 111.41, Revision 005, Dated Sept. 2014

The instrument described herein consists of a heat source component and a built-in process readout component. This calibration pertains to both components.

The heat source component was calibrated by direct measurement of generated temperatures using the pertinent reference standards listed in the "Test Equipment" section of this report. The calibration was performed using test insert Model 914; INST as described in the user manual. This insert is similar to insert "C" but is designed to accommodate the test PRTs and aid in the performance of the axial gradient calibration. The calibration data, internal calibration constants, and uncertainties are shown on the following page(s) of this report. The temperature accuracy test is self-explanatory. The axial differential temperature test is more complex. Due to the nature of the axial differential temperature characteristic and the influence of the test equipment on the test result, this test utilizes tolerances which do not precisely match the instrument specifications. However, the unique tolerances used are intended to determine the axial differential temperature tolerance status based on the published specifications. The temperature observations were performed in both increasing and decreasing directions.

The process readout component was calibrated directly using laboratory transfer standards as listed in the "Test Equipment" section of this report. The calibration data, internal calibration constants, and uncertainties are shown on the following page(s) of this report.

The calibration uncertainties are shown at a coverage factor of 2 ($k=2$). All known significant sources of uncertainty have been considered. Any limitations or remarks pertaining to this instrument and/or calibration are shown below. Additionally, out of tolerance indications, if any, are identified along with the corresponding data on the data pages of this report. Calibration uncertainties have been taken into account in the determination of tolerance status using risk analysis algorithm. When using the instrument in a calibration process, it is recommended that the instrument specifications be used as the contribution of the instrument rather than the calibration uncertainties. The instrument tolerances are shown on the report at a confidence interval of 95%.

The sections labeled Temperature Stability, Axial Differential Temperature and/or Maximum Hysteresis contain data that are not covered by the NVLAP Scope of Accreditation.

APROVADO
Responsável: <u>RENATO</u>
Padrão: <u>1001403BS</u>
Data: <u>08/10/2019</u>
Validade: <u>29/08/2021</u>

Certificate of Calibration

Model: 9142

Serial No.: B98922

Certificate No: B9829035

As Found Data

No As Found Data Required

APROVADO
Responsável: <u>RENATO</u>
Padrão: <u>H001 A03 B5</u>
Data: <u>08/10/2019</u>
Validade: <u>29/08/2021</u>

As Left Data

Data ID: B9240140126589

Calibration Constants		Temperature Accuracy					
		Set-point °C	Actual °C	Error °C	Tolerance °C	Uncertainty	Pass/Fail
TEMP 1	0.060	-25.000	-24.995	0.005	±0.200	±0.025	P
TEMP 2	-0.035	0.000	-0.008	-0.008	±0.200	±0.025	P
TEMP 3	-0.111	50.000	49.999	-0.001	±0.200	±0.025	P
GRAD 1	0.003	100.000	100.007	0.007	±0.200	±0.030	P
GRAD 2	-0.018	150.000	149.999	-0.001	±0.200	±0.030	P
GRAD 3	0.003						

Control Constants		Temperature Stability				
		Set-point °C	Observed °C (2 Sigma)	Tolerance °C	Uncertainty	Pass/Fail
TEMP PB	2.0	-25.000	0.002	±0.010	±0.0040	P
TEMP INT	30.0	150.000	0.002	±0.010	±0.0055	P
TEMP DER	1.0					

Axial Differential Temperature						
Set-point °C	Target °C	Actual °C	Error °C	Tolerance °C	Uncertainty	Pass/Fail
-25.000	0.000	0.004	0.004	±0.040	±0.020	P
50.000	0.000	0.006	0.006	±0.040	±0.020	P
100.000	0.010	0.003	-0.007	±0.040	±0.025	P
150.000	0.010	0.015	0.005	±0.040	±0.030	P

Certificate of Calibration

Model: 9142
Serial No.: B98922
Certificate No: B9829035

As Found Data

No As Found Data Required

APROVADO
Responsável: <u>Renato</u>
Padrão: <u>H001A03BS</u>
Data: <u>08/10/2019</u>
Validade: <u>29/08/2021</u>

As Left Data

Data ID: B9240140126589	Nominal	Actual	Measured	Error	Tolerance	Uncertainty	Pass/Fail
PRT Test Data (Ω)							
PRT Calibration Constants	0	0.00000	-0.00011	-0.00011	± 0.00250	± 0.00030	P
REF1C0 -0.0002	25	24.99749	24.99733	-0.00016	± 0.00250	± 0.00030	P
REF1C100 0.0016	100	100.0067	100.0067	0.0000	± 0.0060	± 0.0010	P
	200	200.0013	200.0005	-0.0008	± 0.0120	± 0.0015	P
	400	400.0059	400.0053	-0.0006	± 0.0240	± 0.0025	P
4-Wire Test Data (Ω)							
	100	100.0067	100.0085	0.0018	± 0.0080	± 0.0010	P
3-Wire Test Data (Ω)							
	100	100.007	100.074	0.067	± 0.120	± 0.050	P
TC Test Data (mV)							
TC Calibration Constants	-10	-10.00000	-10.00021	-0.00021	± 0.01250	± 0.0020	P
TCC0 -0.0434	0	0.00000	-0.00015	-0.00015	± 0.01000	± 0.0020	P
TCC100 -0.0500	50	50.00000	49.99999	-0.00001	± 0.02250	± 0.0030	P
TCCRJ 10.2030	100	100.00000	99.99959	-0.00041	± 0.03500	± 0.0055	P
TCRJ Test Data ($^{\circ}\text{C}$)							
	25	25.000	24.999	-0.001	± 0.350	± 0.080	P
4-20 mA Test Data (mA)							
mA Calibration Constants	0	0.00000	0.00010	0.00010	± 0.00200	± 0.00060	P
mAC4 -0.0087	4	4.00000	3.99998	-0.00002	± 0.00280	± 0.00060	P
mAC22 -0.0092	12	12.00000	11.99981	-0.00019	± 0.00440	± 0.00090	P
	20	20.00000	19.99984	-0.00016	± 0.00600	± 0.0012	P
	22	22.00000	22.00046	0.00046	± 0.00640	± 0.0013	P