AGC-3 Specimen Load Calculations by Stack

David T Rohrbaugh

June 2019



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ENGINEERING CALCULATIONS AND ANALYSIS

INL/MIS-19-52628

Title:

AGC-3 Specimen Load Calculations by Stack

ECAR No.: 3932 Rev. No.: 0 Project No.: 32138 Date: 06/11/2019

SIGNATURES

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- 1. Confirmation of completeness, mathematical accuracy, and correctness of data and appropriateness of assumptions.
- 2. Concurrence of method or approach. See definition, LWP-10106.
- 3. Concurrence of procedure compliance. Concurrence with method/approach and conclusion.
- 4. Concurrence with the document's assumptions and input information. See definition of Acceptance, LWP-10200 [1].
- 5. Does the document contain CUI material please check either yes or no.

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REVISION LOG

Rev.	Date	Affected Pages	Revision Description
0	06/11/2019	All	New document.

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1.	Does this ECAR involve a Safety SSC?	NA	Professional Engineer's Stamp
2.	Safety SSC Determination Document ID	NA	See LWP-10010 for requirements.
3.	Engineering Job (EJ) No.		
4.	SSC ID		
5.	Building	NA	
6.	Site Area	NA	

7. Objective/Purpose:

This engineering calculations and analysis report documents the results of the threshold averaging on the load cell data taken during the third advanced graphite creep (AGC) test, AGC 3. Specimens were irradiated in the Advance Test Reactor (ATR) during Cycles 152B, 154B, 155A, and 155B (the AGC-3 capsule was not in ATR for Cycles 153A/B and 154A). During each cycle, the specimens located in the upper portions of the stacks were subjected to a compressive load to induce irradiation creep in the specimens. The applied load of each stack was monitored and load data were recorded in 1 minute intervals. Collecting data detailing the loads applied over the life of the experiment is necessary for use in future analyses. This load summary data will be used in specimen creep rate estimations and post irradiation examination of material properties.

8. If revision, please state the reason and list sections and/or pages being affected:

NA

9. Conclusions/Recommendations:

The load data from the AGC 3 experiment were analyzed. Quantification of the data was necessary to obtain a single load value for each stack of specimens. These values will be used in future analysis and characterization of material properties. The mean load values were calculated when ATR was near steady state. Steady state was defined as the load being above 50 lbf and the reactor power greater than 2 MW. After the averaging, the coefficient of variation was calculated for each stack. This provided an evaluation of the precision of the load cell data. Coefficients of variation ranged between 2.93% (Stack 6) and 4.98% (Stack 4).

A gas leak in the load control system was identified in the first few days of operation. The evaluation and solution to the gas leak was performed in the first few days of the initial cycle and resulted in lowering the applied load to channel pairs 1-4 to the values used for channel pair 2-5 (377 lbf) applied during the experiment. Analysis of the data shows the variation in average force for Stacks 1, 2, 4, and 5 during steady-state operation was less than 1%. No specimens were loaded at 470 lbf as originally planned.

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PROJECT ROLES AND RESPONSIBILITIES

Project Role	Name (Typed)	Organization	Pages covered (if applicable)
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INL/MIS-19-52628	John T. Major II	IVISTU	All
Manager ^d	Scott McBride	D520	All
Requestor ^e	William Windes	B120	All
Nuclear Safety ^e	NA		
Document Ownere	William Windes	B120	All

Responsibilities:

- a. Confirmation of completeness, mathematical accuracy, and correctness of data and appropriateness of assumptions.
- b. Concurrence of method or approach. See definition, LWP-10106.
- c. Concurrence with the document's markings in accordance with LWP-11202.
- d. Concurrence of procedure compliance. Concurrence with method/approach and conclusion.
- e. Concurrence with the document's assumptions and input information. See definition of Acceptance, LWP-10200 [Error! Bookmark not defined.]

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SCOPE AND BRIEF DESCRIPTION

This engineering calculations and analysis report documents the results of the threshold averaging on the load cell data taken during the third advanced graphite creep (AGC) test, AGC-3. Specimens were irradiated in the Advance Test Reactor (ATR) during Cycles 152B, 154B, 155A, and 155B (the AGC-3 capsule was not in ATR for Cycles 153A/B and 154A). During each cycle, the specimens located in the upper portions of the stacks were subjected to a compressive load. The applied load of each stack was monitored and load data were recorded in 1-minute intervals. This estimate of the mean load applied to each stack will be used to calculate creep rates and draw correlations in post-irradiation material property comparisons.

From the onset of the AGC-3 experiment, a gas leak rate of 5.6 L/min was detected in the compressive load control system. This leak rate was relatively high in comparison to previous AGC experiments with leak rates only on the order of 1 L/min. The significant increase was attributed primarily to the portion of the system providing the load on Stack 4. Therefore, a compressive load was not placed on Stack 4 until the source and future consequences of the leak were evaluated. In addition, a compressive load was not placed on Stack 1 (diametrically opposite and load pair companion to Stack 4) to prevent eccentrically loading the graphite specimen holder and possibly damaging the holder and capsule. The compressive loads on Stacks 2 and 5 were reduced from nominally 470 to 377 lbf on December 5, 2012, to maximize the range of specimen loading in the event that Stacks 1 and 4 were not able to have compressive loads applied for the remainder of the experiment.

Since the compressive loads have to remain constant throughout the irradiation, there were two major concerns: (1) the leak rate may increase to the point that the load could not be maintained; and (2) sufficient helium may not be obtainable to overcome the leak rate due to a national shortage of helium. Data from the inlet and outlet system flow meters indicated that the source of the leak was internal to the test train, most probably within the pneumatic ram for Stack 4. After discussions with the vendor and reviewing data taken during preassembly testing of the pneumatic rams, it was decided to test the system to determine the stability of the leak rate. The desired loads were imposed on Stacks 1 and 4 on Tuesday, December 11, 2012, and the leak rate was monitored until Monday, December 17, 2012. The leak rate was extremely stable with essentially no perceptible change over the 6-day period. This result indicated that the leak was most likely located in a metallic component (such as a fitting) and should remain very stable throughout the irradiation. Sufficient helium was located to support maintaining the load on the stacks for the duration of Cycle 152B. However, the compression gas was switched from helium to argon at the end of Cycle 152B. With the determination that the leak rate was stable, it was concluded that loads could successfully be applied to Stacks 1 and 4 for the duration of the AGC 3 experiment, albeit at a lower pressure to both conserve gas and to preclude any further damage to the compressive load system.

A nominal compressive load of 377 lbf was applied to Stacks 1 and 4 for the remainder of the experiment. Stacks 2 and 5 remained at nominally 377 lbf for the duration of the experiment so that the load applied to these stacks would be constant. Therefore, four stacks were nominally loaded to 377 lbf for the experiment and two stacks were loaded to 564 lbf (Stacks 3 and 6). It is also important to note that during reactor outages, as with previous AGC experiments, the load was removed until the beginning of the next reactor cycle.

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DESIGN OR TECHNICAL PARAMETER INPUT AND SOURCES

Load, power, and stack position data were obtained from the Next Generation Nuclear Plant (NGNP) Data Management and Analysis System (NDMAS) from ATR starting at Cycle 152B (November 28, 2012) and ending at Cycle 155B (April 12, 2014).

The accuracy of the load cells that are used is 0.3% of full scale. Full scale for this model is 1000 lb, thus the accuracy is ±3 lb. During assembly of the experiment, these load cells were Quality Assurance verified to be calibrated^[1]. Table 1, DWG 603535,^[2] and DWG 603520^[3] show additional information about the instruments used in the load control system.

Table 1. Load control system instrumentation.

Instrument	Manufacturer	Model/Part No.	Accuracy or Linearity	Repeatability
Precision miniature load cell	Honeywell Corp.	31/AL311CV	±0.3% of full scale (full scale = 1000 lbf) accuracy	±0.05% full scale
Position sensor (linear variable differential transformer [LVDT])	Macro Sensors	PRH 812-1000-080	≤ ±0.25% of full range linearity	<0.01% of full scale output

RESULTS OF LITERATURE SEARCHES AND OTHER BACKGROUND DATA

- 1. The requirements for this analysis were the following:
 - a. Describe the AGC capsule mechanical loading system, verify that the system operated as designed during irradiation, and describe any issues that occurred.
 - b. Calculate the steady-state compressive load imposed on the specimens for each outer stacks (1-6) in the AGC-3 capsule at steady state.
 - c. Describe the method used to quantify the loads for the specimen stacks.
 - d. Provide an estimate of the precision and accuracy of the calculated loads at steady state.

Requirements for the AGC-3 capsule irradiation data collection are presented in TFR-791,^[4] TFR-509,^[5] and TFR-510.^[6] A description of the approach to the load data qualification is included in INL/EXT-14-32425,^[7]

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ASSUMPTIONS

For this analysis, it was assumed that the specimens in each stack did not become lodged or stuck in a position that would alter the load of the remainder of the specimens in the stack. To help prevent this from happening, during reactor outages, the compressive loads are removed from the specimen stacks and each graphite stack is raised vertically by using lower pneumatic rams. Stack raising was performed at the end of Cycle 152B, between Cycles 154B and 155A, and at the end of Cycle 155B (which was the end of the capsule irradiation). No evidence of sticking was observed during any of those events.^[7] In addition, the position of each stack remained unaffected between cycles (see Figure 1).

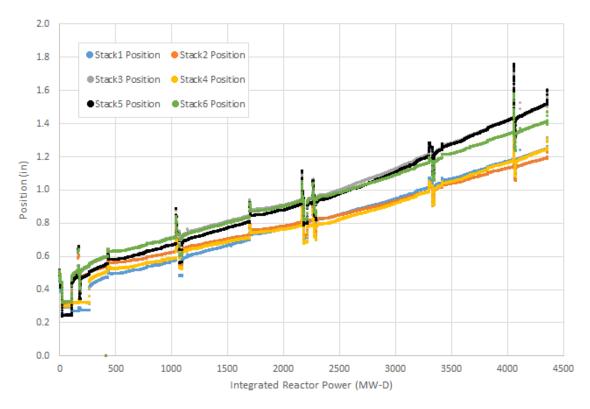


Figure 1. AGC-3 stack position data.

The condition of the load cells was checked during assembly of the compressive load control system by performing wire-to-wire resistance checks. Load cell resistance values were measured and recorded for both the excitation and signal lines. A similar process was used on the position sensors. [2] It was impossible to make similar checks on the load and monitoring system after completion of the experiment due to disassembly actions and high levels of radiation; however, the load and position data are consistent within itself indicating that the load cells and LVDTs operated properly for the entire experiment.

COMPUTER CODE VALIDATION

The "AGC3 10min Load Data ECAR-3932.xlsx" is the Excel spreadsheet used to make the load calculations. The spreadsheet contains load and reactor power data obtained from NDMAS. These data were first reduced from 1-minute increments to 10-minute increments by averaging the applied

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loads. The output of the spreadsheet is an average load value for each stack (1–6) of specimens along with an uncertainty estimation. This is shown in Table 3 below. The calculations performed in the spreadsheet are basic enough that they were easily validated by random hand-calculations performed by the checker.

DISCUSSION/ANALYSIS

Load cell data from each stack of specimens in the AGC-3 experiment were recorded in 1-minute intervals and saved to NDMAS. Data logging for AGC-3 began on November 27, 2012, with Cycle 152B and ended on April 12, 2014, with Cycle 155B.^[7] Figure 2 provides a history plot of the loads for each stack across all reactor cycles. The load data distributions were also plotted as histograms. These are shown in Figure 3 through Figure 5. The statistics shown are the steady-state statistics in that they only include data that is over 50 lbf when the power is greater than 2 MW.

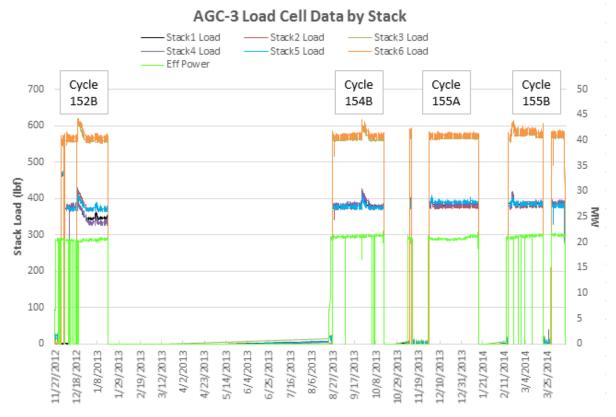


Figure 2. Time series data of load cell output from AGC-3 capsule.

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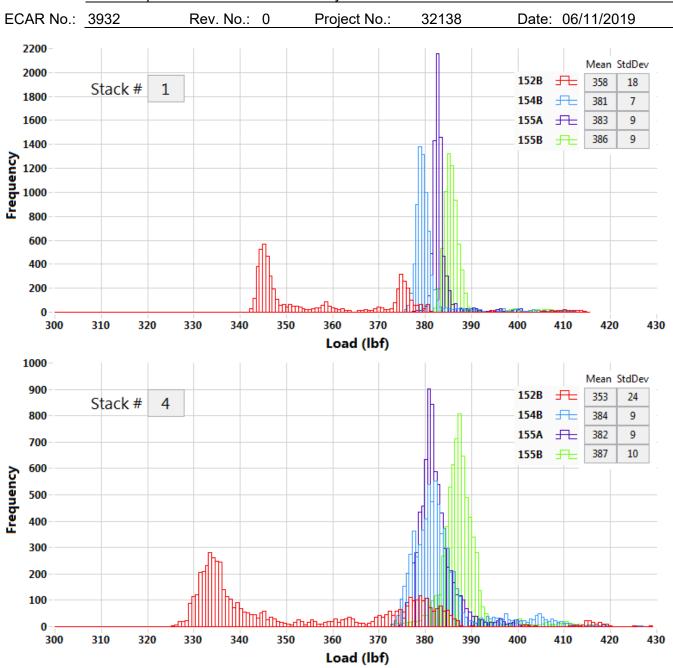


Figure 3. Histogram of loads for Stacks 1 and 4.

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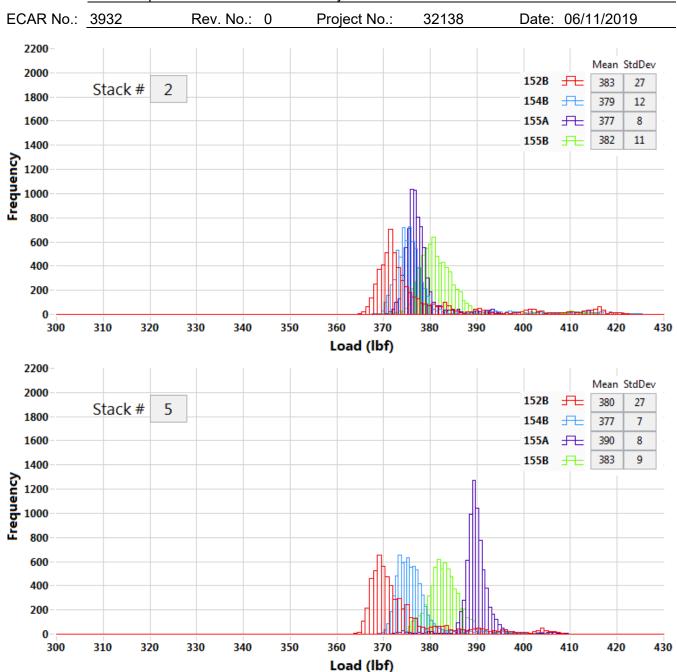


Figure 4. Histogram of loads for Stacks 2 and 5.

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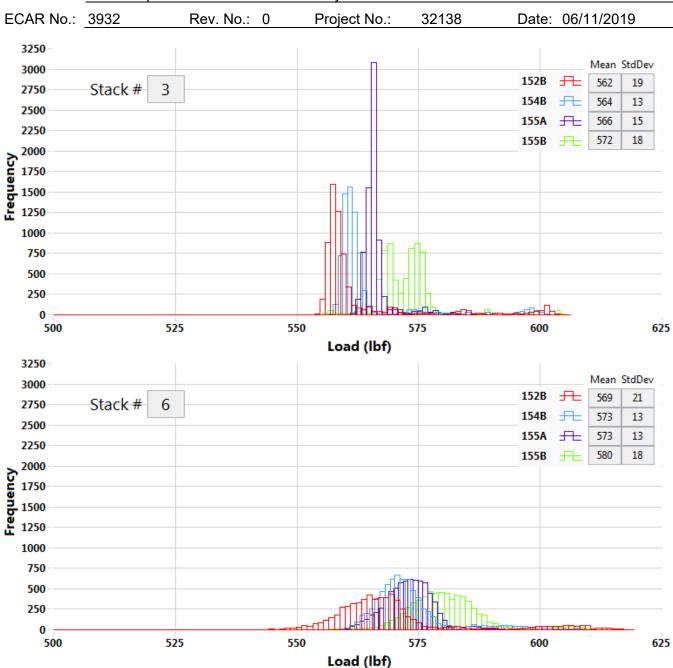


Figure 5. Histogram of loads for Stacks 3 and 6.

SUMMARY AND CONCLUSIONS

The load data from the AGC-3 capsule were analyzed. Quantification of the data was necessary to obtain a single load value for each stack of specimens. These values will be used in future analysis and characterization of material properties of the AGC-3 specimens. The mean load values were calculated when the reactor was near steady state. Steady state was defined as the load being above 50 lbf and the reactor power greater than 2 MW. Table 2 shows the results of this averaging. Table 3 shows the average loads by cycle.

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Table 2. Steady-state load statistics by specimen stack.

Steady-State Statistics	Stack 1	Stack 2	Stack 3	Stack 4	Stack 5	Stack 6
Average load (lbf)	378	380	566	378	382	574
2*Std Dev (lbf)	31	32	33	38	31	34
Coefficient of variation (%)	4.0	4.2	3.0	5.0	4.0	2.9

Table 3 Steady-state load averages for each specimen stack by cycle.

		V	•	Load Average of)		
Cycle	Stack 1	Stack 2	Stack 3	Stack 4	Stack 5	Stack 6
152B	358	383	562	353	380	569
154B	381	379	564	384	377	573
155A	383	377	566	382	390	573
155B	386	382	572	387	383	580

REFERENCES

[1] WO 159704-01, "Engineering Work Instructions for Assembling the AGC-3 Experiment."

- [3] DWG 603520, "ATR Advanced Graphite Capsule (AGC-3) Test Train Facility Assembly," June 25, 2012.
- [4] TFR-791, "NGNP Advanced Graphite Capsule AGC-3 Experimental Test Train."
- [5] TFR-509, "Advanced Graphite Capsule Temperature Control System."
- [6] TFR-510, "Advanced Graphite Capsule Compressive Load Control Gas System."
- [7] INL/EXT-14-32425, AGC-3 Experiment Irradiation Monitoring Data Qualification Final Report, October 2014.

^[2] DWG 603535, "ATR Advanced Graphite Capsule (AGC) Upper Cylinder Assembly," June 12, 2012.

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Appendix A

INL Calibration Input Data

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Material Amount: 0 4 Clean 4 Out of Tolerance >3x <5x Charge Number: 100778251 5 Limited Calibration 5 Out of Tolerance >5x Cal Work Inst ID: 5748R 6 Functional Check 6 Out of Tolerance-Undetermined Outside Vendor: 7 Performance Check 7 Inoperative 8 Modify 8 Damaged 9 Repair-needs Charge Level 9 Not Used 10 Other 10 Not Determined 11 Excessed Calibrated By: Stan Zohner S#: 58146 Phone: 526-2350 12 Extension CALIBRATION STANDARDS USED STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DEBYED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNOLOGY. Physical STD (196C) (20.0 ± 0.3) °C (40 to 55) °KRH Electronic STD (196D) (23.0 ± 0.5) °C (20 to 45) °KRH Dimensional STD (196B) (20.0 ± 0.25) °C (30 to 45) °KRH Electronic CAL (Lab II2) (23.0 ± 0.5) °C (20 to 50) °KRH Phys/Dim CAL (Lab III) (20.0 ± 0.5) °C (20 to 50) °KRH Remaining S&CL calibration area: (23.0 ± 5.3) °C (20 to 50) °KRH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. COMMENTS COMMENTS LIBRATION STANDARD USE OCEPTICIENTS GENERATED: (COMMENTS)														
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CALIBRATION STANDARDS USED CALIBRATION STANDARDS USED STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES. LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20.0 ± 0.3) °C (40 to 55) %RH Electronic STD (106D) (23.0 ± 0.5) °C (30 to 45) %RH Dimensional STD (106B) (20.0 ± 0.25) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 ± 53) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. COMMENTS COMMENTS LIMITED: MUST USE COEFFICIENTS GENERATED: 8- 1.3536230138-1 84.4570331278+1 C= -2.9599572488-4,			10		Other			10		Not D	etermi	ned		
CALIBRATION STANDARDS USED 304399 350815 375257								11		Exces	sed			
STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES. LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20.0 ± 0.3) °C (40 to 55) %RH Electronic STD (106D) (23.0 ± 0.5) °C (30 to 45) %RH Dimensional STD (106B) (20.0 ± 0.25) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 +5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Function Tested Standard Reading UUT Reading UUT Tolerance COMMENTS LIMITED: MUST USE COEFFICIENTS GENERATED: \$\text{A} = 1,355623013E-1 B= -4.457032127E+1 C= -2.959957248E-4,}	Calibrated By:	Stan Zohner	S#: 58	146	Phone	526-2350		12		Extens	sion			
STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES. LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20.0 ± 0.3) °C (40 to 55) %RH Electronic STD (106D) (23.0 ± 0.5) °C (30 to 45) %RH Dimensional STD (106B) (20.0 ± 0.25) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 + 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Function Tested Standard Reading UUT Reading UUT Tolerance COMMENTS LIMITED: MUST USE COEFFICIENTS GENERATED: \$\text{A} = 1,355623013E-1 B= -4,457032127E+1 C= -2,959957248E-4,}														
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VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES. LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20.0 ± 0.3) °C (40 to 55) %RH Electronic STD (106D) (23.0 ± 0.5) °C (30 to 45) %RH Dimensional STD (106B) (20.0 ± 0.25) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 + 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Standard Reading UUT Reading UUT Tolerance COMMENTS LIMITED: MUST USE COEFFICIENTS GENERATED: 1.353623013E-1 B= -4.457032127E+1 C= -2.959957248E-4,									_					=
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Function Tested Standard Reading UUT Reading UUT Tolerance COMMENTS LIMITED: MUST USE COEFFICIENTS GENERATED: 1.353623013E-1 B= -4.457032127E+1 C= -2.959957248E-4,	VALU Phy Dir	rsical STD (106C)	(20.0 ± 0 06B) (20.0 ± 0	(CON (3) °C (3) 25) °C	LABORAT C (40 to 55 C (30 to 4	ORY TEMPE) %RH 5) %RH	ERATURE A Electronic S Electronic C	E RAT	UMII 06D) ab 11	OITY 2)	(23 (23	5.0 ± 0.5)	°C (30 to 45°°C (20 to 50°°C)	5) %RH
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Function Tested Standard Reading UUT Reading UUT Tolerance COMMENTS LIMITED: MUST USE COEFFICIENTS GENERATED: 1.353623013E-1 B= -4.457032127E+1 C= -2.959957248E-4,	Manufa	cturer's environi	nental specificat	ions a	are evaluat	d for conforn	nance when	alibra	tions	are perfo	rmed ou	itside the	e above state	d conditions.
Function Tested Standard Reading UUT Reading UUT Tolerance COMMENTS LIMITED: MUST USE COEFFICIENTS GENERATED: 1.353623013E-1 B= -4.457032127E+1 C= -2.959957248E-4,				-	-									
LIMITED: MUST USE COEFFICIENTS GENERATED: A= 1.353623013E-1 B= -4.457032127E+1 C= -2.959957248E-4,	Funct	ion Tested										_	UUT To	blerance
LIMITED: MUST USE COEFFICIENTS GENERATED: A= 1.353623013E-1 B= -4.457032127E+1 C= -2.959957248E-4,												_		
COMMENTS LIMITED: MUST USE COEFFICIENTS GENERATED: R= 1.353623013E-1 B= -4.457032127E+1 C= -2.959957248E-4, EXCITATION VOLTAGE 10 VDC, TENSION NOT CALIBRATED PER USER (SCOTT BARRIE)														
A= 1.353623013E-1 B= -4.457032127E+1 C= -2.959957248E-4,						COM	MENTS							
A= 1.353623013E-1 B= -4.457032127E+1 C= -2.959957248E-4,	LIMITED: MUST USE	COEFFICIENTS	GENERATED:											
	A= 1.353623013E-1	B = -4.457032	2127E+1 C= -				OTT BARRI	E)						

ENGINEERING CALCULATIONS AND ANALYSIS

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Title: AGC-3 Specimen Load Calculations by Stack

ECAR No.: 3932 Rev. No.: 0 Project No.: 32138 Date: 06/11/2019

		-	11	1/6/2017				
NAME: MATT WESEN	MAN	BADGE: 45985	PH: 526-2573	AREA: RE	C BLI	DG: NHL	RM:	
D Number: 727812 Next Cal Due Date:		HONEYWELL	Model: 3			e: LOAD CE		Serial #: 1295038
Calibration Date:	12/22/2011	I 🗌	Acceptance Test	1	In Tole	rance		
Charge Level:	12	2	Calibration - SCL	Specs 2	Out of	Tolerance >1	x <2x	
Repair/Adj/etc C.L:	0	3	Calibration - MFG	Specs 3	Out of	Tolerance >2	2x < 3x	
Material Amount:	0	4	Clean	4	Out of	Tolerance >3	5x < 5x	
Charge Number:	101817504	5	Limited Calibration	n 5	Out of	Tolerance >5	iχ	
Cal Work Inst ID:	5748R	6	Functional Check	6	Out of	Tolerance-U	ndetermine	d
Outside Vendor:		7	Performance Check	k 7	Inopera	ative		
		8	Modify	8	Damag	ed		
		9	Repair-needs Char	ge Level 9	☐ Not Us	ed		
		10	Other	10	Not De	etermined		
				11	l 🗌 Excess	ed		
Calibrated By:	Stan Zohner	S#: 58146	Phone: 526-2350	12	2 Extens	ion		
	204200	250015	CALIBRATION	STANDARDS	USED			٦
	304399	350815	75257					1
								=
			,				nump pp.or	
STANDAR VALU	DS USED ARE T ES FOR NATUR	RACEABLE TO T AL PHYSICAL CO	HE NATIONAL INSTIT NSTANTS, OR DERIVE	ED FROM THE RA	TIO TYPE OF	SELF CALIBR	ATION TECH	NIQUES.
			LABORATORY TEMP	PERATURE AND H	IUMIDITY			
Phy	sical STD (106C)		°C (40 to 55) %RH	Electronic STD (1			°C (30 to 45)	
	nensional STD (10		°C (30 to 45) %RH	Electronic CAL (I			°C (20 to 50)	
	s/Dim CAL (Lab		°C (20 to 50) %RH	Remaining S&CL			°C (20 to 50	
Manufa	cturer's environ	mental specifications	are evaluated for confor	mance when calibra	ations are perfo	rmed outside the	above stated	conditions.
Γ	i Tours		TOLERANCE CONDIT			TION	LILIT Tal	(
runci	ion Tested	Sta	ndard Reading	00	T Reading		UUT Tol	erance
				-				
,								
			COM	MMENTS				
LIMITED: MUST USE								
A = -2.242700453E (SCOTT BARRIE)	-1, B = -4.75	33217677E+1, C	= -2.440357825E-	3, EXCITATION	VOLTAGE 10 V	JDC, TENSION	NOT CALIE	BRATED PER USER

ENGINEERING CALCULATIONS AND ANALYSIS

Page A3 of A6

Title: AGC-3 Specimen Load Calculations by Stack

ECAR No.: 3932 Rev. No.: 0 Project No.: 32138 Date: 06/11/2019

		-	11/6/	2017				
NAME: MATT WESE	MAN	BADGE: 45985	PH: 526-2573	AREA: RE	EC BI	DG: NHL	RM:	
D Number: 72778 Next Cal Due Date		HONEYWEL	Model: 31-1 ACTION PERFOR			ne: LOAD CE FOUND CO		Serial #: 1295039
Calibration Date:	12/22/2011	1	Acceptance Test	1	In Tol	erance		
Charge Level:	12	2	Calibration - SCL Spe	ecs 2	Out of	Tolerance >	1x < 2x	
Repair/Adj/etc C.L	: 0	3	Calibration - MFG Sp	pecs 3	Out of	Tolerance >2	2x < 3x	
Material Amount:	0	4	Clean	4	Out of	Tolerance >3	3x < 5x	
Charge Number:		5	Limited Calibration	5	Out of	Tolerance >5	δx	
Cal Work Inst ID:	5748R	6	Functional Check	6	Out of	Tolerance-U	ndetermine	d
Outside Vendor:		7	Performance Check	7	Inoper	ative		
		8	Modify	8	Dama	ged		
		9	Repair-needs Charge	Level 9	☐ Not U	sed		
		10	Other	10	0 Not D	etermined		
				1	1 Exces	sed		
Calibrated By:	Stan Zohner	S#: 5814	6 Phone: 526-2350	12	2 Extens	sion		
			CALIDDATION ST	CANDADDC	LICED			
	304399	350815	375257	ANDARDS	USED	1		7
	00.000							╡
								j
STANDAR VALU	DS USED ARE T	RACEABLE TO AL PHYSICAL C	THE NATIONAL INSTITUT ONSTANTS, OR DERIVED I	E OF STANDAL	RDS AND TEC	HNOLOGY DEI SELF CALIBRA	RIVED FROM	I ACCEPTED NIQUES.
			LABORATORY TEMPER	ATURE AND H	IUMIDITY			
Phy	sical STD (106C)	$(20.0\pm0.3$		Electronic STD (1		(23.0 ± 0.5)	°C (30 to 45)	%RH
Dir	nensional STD (10	6B) (20.0 ± 0.2)	5) °C (30 to 45) %RH E	Electronic CAL (I	Lab 112)	(23.0 ± 1.0)	°C (20 to 50)	%RH
Phy	s/Dim CAL (Lab	(20.0 ± 0.5)	°C (20 to 50) %RH	temaining S&CL	calibration area	s: (23.0 +5, -3)	°C (20 to 50)) %RH
Manufa	cturer's environn	nental specification	as are evaluated for conforma	nce when calibra	ations are perfo	rmed outside the	above stated	conditions.
Funct	ion Tested		TOLERANCE CONDITION andard Reading		ING CALIBRATE	ATION	UUT Tole	erance
			-					
-								
-		_	COMM	IENTS				-
LIMITED: MUST USE	NEW COPPETCT	ENTS CENEDATE	D.					
A = 2.521207478E-1 (SCOTT BARRIE)	B = -4.651	409641E+1, C	= 4.704088638E-3, EX	CITATION VO	LTAGE 10 VD	C, TENSION N	OT CALIBRA	TED PER USER
(bcoll billing)								

ENGINEERING CALCULATIONS AND ANALYSIS

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Title: AGC-3 Specimen Load Calculations by Stack

ECAR No.: 3932 Rev. No.: 0 Project No.: 32138 Date: 06/11/2019

CALIBRATION STANDARDS USED 304399 350815 375257				CAL		I INPUT DA	TA				
Noun Name: LOAD CELL Serial #: 129509	NAME: MATT WESEM	A N	RADCE: 45085	PH-			FC	DI	DC: NUI	DM.	
Next Cal Due Date: 12/21/2012	NAME. MATT WESEME	<u> </u>	BADGE, 43303	111.	320-2373	AREA, RI		BL,	DG. NIL	KM.	
Calibration Date: 12/21/2011			HONEYWELL				N				Serial #: 129509
Charge Level: 12 2			1 🗆							INDITION	
Repair/Adj/etc C.L: 0 3 Calibration - MFG Specs 3 Out of Tolerance >2x <3x Material Amount: 0 4 Clean 4 Out of Tolerance >3x <5x Charge Number: 101817504 5			Load							>1x <2x	
Material Amount: 0											
Charge Number: 101817504 5 Limited Calibration 5 Out of Tolerance >5x Cal Work Inst ID: 5748R 6 Functional Check 6 Out of Tolerance-Undetermined Outside Vendor: 7 Performance Check 7 Inoperative 8 Modify 8 Damaged 9 Repair-needs Charge Level 9 Not Used 10 Other 10 Not Determined 11 Excessed Calibrated By: Stan Zohner S#: 58146 Phone: 526-2350 12 Extension CALIBRATION STANDARDS USED STANDARDS USED ABE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES. Laboratory Temperature And Humidity Physical STD (1066) (20 0 ± 0.25) °C (30 to 55) %RRI Electronic STD (1065) (23 0 ± 1.0) °C (20 to 50) %RI Physipim CAL (Lab 111) (20 0 ± 0.5) °C (30 to 55) %RRI Electronic CAL (Lab 112) (23 0 ± 1.0) °C (20 to 50) %RI Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. COMMENTS INITED: MOST USE BEN COEFFICIENTS GENERATED: ** 1.4374561438-1 B= -4.436245566E91 C= 1.0039841448-2, EKCITATION VOLTAGE 10 VDC,											
Call Work Inst ID: 5748R 6 Functional Check 6 Out of Tolerance-Undetermined Outside Vendor: 7 Performance Check 7 Inoperative 8 Modify 8 Damaged 9 Repair-needs Charge Level 9 Not Used 10 Other 10 Not Determined 11 Excessed Callibrated By: Stan Zohner S#: 58146 Phone: 526-2350 12 Extension CALIBRATION STANDARDS USED STANDARDS USED ASSESSED				Limited C	alibration	5					
Outside Vendor: 7 Performance Check		5748R	6	Functiona	l Check	6					i
9 Repair-needs Charge Level 9 Not Used 10 Other 10 Not Determined 11 Excessed Calibrated By: Stan Zohner S#: 58146 Phone: 526-2350 12 Extension CALIBRATION STANDARDS USED STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES. LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20 0 + 0.3) **C (30 to 55) **RH Electronic STD (106D) (23 0 ± 1.0) **C (20 to 50) **RH Dimensional STD (106B) (20 0 ± 0.5) **C (20 to 50) **RH Electronic CAL (Lab 112) (23.0 ± 1.0) **C (20 to 50) **RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) **C (20 to 50) **RH Remaining S&CL calibration areas: (23.0 ± 5, -3) **C (20 to 50) **RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Standard Reading UUT Reading UUT Tolerance COMMENTS IMITED: MOST USE NEW COEFFICIENTS GENERATED: = 1.4374551438-1 B* -4.4362455668+1 C* 1.0039841448-2, EXCITATION VOLTAGE 10 VDC,	Outside Vendor:		7	Performar	nce Check	7					
Calibrated By: Stan Zohner S#: 58146 Phone: 526-2350 12 Extension CALIBRATION STANDARDS USED			8	Modify		8		Damag	ed		
CALIBRATION STANDARDS USED CALIBRATION STANDARDS USED STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNOLOGY. LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20 0 ± 0.5) °C (40 to 55) %RH Electronic STD (106D) (23.0 ± 0.5) °C (30 to 45) %RH Dimensional STD (106B) (20.0 ± 0.25) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 ± 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Standard Reading			9	Repair-ne	eds Charge	Level 9		Not Us	ed		
CALIBRATION STANDARDS USED CALIBRATION STANDARDS USED			10	Other		10	0 [Not De	termined		
CALIBRATION STANDARDS USED 304399 350815 375257						1	1	Excess	ed		
STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES. LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20.0 ± 0.3) °C (40 to 55) %RH Electronic STD (106D) (23.0 ± 0.5) °C (30 to 45) %RH Dimensional STD (106B) (20.0 ± 0.25) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 ± 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Standard Reading UUT Reading UUT Tolerance COMMENTS COMMENTS LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20.0 ± 0.5) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 ± 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION UUT Reading UUT Tolerance COMMENTS COMMENTS LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20.0 ± 0.5) °C (30 to 45) %RH Electronic STD (106D) (23.0 ± 0.5) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 ± 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.	Calibrated By:	Stan Zohner	S#: 58146	Phone:	526-2350	12	2 [Extens	ion		
STANDARDS USED ARE TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY DERIVED FROM ACCEPTED VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES. LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20.0 ± 0.3) °C (40 to 55) %RH Electronic STD (106D) (23.0 ± 0.5) °C (30 to 45) %RH Dimensional STD (106B) (20.0 ± 0.25) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 ± 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Standard Reading UUT Reading UUT Tolerance COMMENTS COMMENTS LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20.0 ± 0.5) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 ± 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION UUT Reading UUT Tolerance COMMENTS COMMENTS LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20.0 ± 0.5) °C (30 to 45) %RH Electronic STD (106D) (23.0 ± 0.5) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 ± 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.											
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VALUES FOR NATURAL PHYSICAL CONSTANTS, OR DERIVED FROM THE RATIO TYPE OF SELF CALIBRATION TECHNIQUES. LABORATORY TEMPERATURE AND HUMIDITY Physical STD (106C) (20.0 ± 0.3) °C (40 to 55) %RH Electronic STD (106D) (23.0 ± 0.5) °C (30 to 45) %RH Dimensional STD (106B) (20.0 ± 0.25) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 ± 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Standard Reading UUT Reading UUT Tolerance COMMENTS LIMITED: MUST USE NEW COEFFICIENTS GENERATED: = 1.4374561438-1 B= -4.436245566E+1 C= 1.003984144E-2, EXCITATION VOLTAGE 10 VDC,	ŀ										1
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Physical STD (106C) (20.0 ± 0.3) °C (40 to 55) %RH Electronic STD (106D) (23.0 ± 0.5) °C (30 to 45) %RH Dimensional STD (106B) (20.0 ± 0.25) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 + 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Standard Reading UUT Reading UUT Tolerance COMMENTS COMMENTS CIMITED: MUST USE NEW COEFFICIENTS GENERATED: 1.4374561438-1 B= -4.4362455668+1 C= 1.003984144E-2, EXCITATION VOLTAGE 10 VDC,	VALUES	S USED ARE 1 S FOR NATUR.	AL PHYSICAL CO	NSTANTS, O	R DERIVED	FROM THE RA	TIO	TYPE OF	INOLOGY DI SELF CALIBI	ERIVED FROM RATION TECH	ACCEPTED NIQUES.
Dimensional STD (106B) (20.0 ± 0.25) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 + 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Standard Reading UUT Reading UUT Tolerance UUT Tolerance UUT Tolerance COMMENTS UUT Tolerance UUT Toleran				LABORATO	RY TEMPER	ATURE AND H	HUMI	DITY			
Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 + 5, -3) °C (20 to 50) %RH Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Standard Reading UUT Reading UUT Tolerance COMMENTS JUITED: MUST USE NEW COEFFICIENTS GENERATED: 1.4374561438-1 B= -4.4362455668+1 C= 1.003984144E-2, EXCITATION VOLTAGE 10 VDC,											
Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions. OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Function Tested Standard Reading UUT Reading UUT Tolerance COMMENTS JUMITED: MUST USE NEW COEFFICIENTS GENERATED: 1.4374561438-1 B= -4.4362455668+1 C= 1.003984144E-2, EXCITATION VOLTAGE 10 VDC,											
Function Tested OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION Standard Reading UUT Reading UUT Tolerance COMMENTS JUMITED: MUST USE NEW COEFFICIENTS GENERATED: 1.4374561438-1 B= -4.436245566E+1 C= 1.003984144E-2, EXCITATION VOLTAGE 10 VDC,											
Function Tested Standard Reading UUT Reading UUT Tolerance COMMENTS SIMITED: MUST USE NEW COEFFICIENTS GENERATED: 1 1.4374561438-1 B= -4.4362455665+1 C= 1.003984144E-2, EXCITATION VOLTAGE 10 VDC,	Manufact	urer's environn								ie above stated c	onditions.
COMMENTS JIMITED: MUST USE NEW COEFFICIENTS GENERATED: = 1.437456143E-1 B= -4.436245566E+1 C= 1.003984144E-2, EXCITATION VOLTAGE 10 VDC,	Functio	n Tested							TION	LILIT Tole	ranca
				radia read	5		1 100	admg		001 1010	rance
	_										
	7										
LIMITED: MUST USE NEW COEFFICIENTS GENERATED:											
COMMENTS LIMITED: MUST USE NEW COEFFICIENTS GENERATED: 1- 1.437456143E-1 B= -4.436245566E+1 C= 1.003984144E-2, EXCITATION VOLTAGE 10 VDC, FENSION NOT CALIBRATED PER USER (SCOTT BARRIE)											
A= 1.437456143E-1 B= -4.436245566E+1 C= 1.003984144E-2, EXCITATION VOLTAGE 10 VDC,					COMIN	TENTS					
TENSION NOT CALIBRATED PER USER (SCOTT BARRIE)	A= 1.437456143E-1 B	-4.436245	566E+1 C= 1.00	3984144E-2	, EXCITATI	ON VOLTAGE	10 V	DC,			
	TENSION NOT CALIBRA	red per use	R (SCOTT BARRII	E)							

ENGINEERING CALCULATIONS AND ANALYSIS

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Rev. 08

Title: AGC-3 Specimen Load Calculations by Stack

ECAR No.: 3932 Rev. No.: 0 Project No.: 32138 Date: 06/11/2019

INL CALIBRATION INPUT DATA 2/4/2019												
NAME: MATT WESE	BADGI	E: 45985	PH: 526-	PH: 526-2573 A		С	BLDG: NH	L RM:				
ID Number: 727880 Mfr: Next Cal Due Date: 1/11/2013		HONEYWELL		Model: 31-1000 ACTION PERFORMED				un Name: LOA	AD CELL D CONDITION		#: 1295093	
Calibration Date:	1/11/2012	1		Acceptance T	est	1	0	In Tolerance				
Charge Level:	12	2		Calibration -	SCL Specs	2	\odot	Out of Tolera	nce >1x <2x			
Repair/Adj/etc C.L	: 0	3		Calibration -	3	\circ	Out of Tolerance >2x <3x					
Material Amount:	0	4		Clean	4	\circ	Out of Tolerance >3x <5x					
Charge Number:	100911C56	5	✓	Limited Calib	5	0	Out of Tolerance >5x					
Cal Work Inst ID:	5748R	6		Functional Cl	6	0	Out of Tolerance-Undetermined					
Outside Vendor:		7 Perfor			Check	7		Inoperative				
				Modify		8		Damaged				
		9		Repair-needs	Charge Level	9		Not Used				
		10		Other		10		Not Determin	ed			
11 \(\subseteq \text{Excessed} \)												
Calibrated By: Stan Zohner S#: 58146 Phone: 526-235					-2350	12		Extension				
					CALI	BRATIC	ON S	STANDARDS	USED			
		L	304399	350815	375257	<u> </u>						
		L				<u> </u>						
		L]						
	ST										ERIVED FROM ACCEPTED RATION TECHNIQUES.	
					LABORA	TORY TE	МРЕ	RATURE AND H	UMIDITY			
Physical STD (106C) (20.0 ± 0.3) °C (40 to 55) %RH Electronic STD (106D) (23.0 ± 0.5) °C (30 to 45) %RH) °C (30 to 45) %RH	
Dimensional STD (100				(106B) (20.0 s	106B) (20.0 ± 0.25) °C (30 to 45) %RH			Electronic CAL (Lab 112)			(23.0 ± 1.0) °C (20 to 50) %RH	
Phys/Dim CAL (Lab 111) (20.0 ± 0.5) °C (20 to 50) %RH Remaining S&CL calibration areas: (23.0 +5, -3) °C (20 to 50)								3) °C (20 to 50) %RH				
Manufacturer's environmental specifications are evaluated for conformance when calibrations are performed outside the above stated conditions.												
OUT OF TOLERANCE CONDITIONS FOUND DURING CALIBRATION												
Fu			ı Tested		Standard Reading				Γ Reading		UUT Tolerance	
		b <u>f</u> bf		796.85 lbf				800 lbf 900 lbf		+/- 2.9 lbf +/- 2.9 lbf		
		<u>ы</u> bf		896.56 lbf 996.28 lbf				.000 lbf		+/- 2.9 lbf		
				330.20								

COMMENTS

Unit was out of tolerance.
LIMITED: MUST USE NEW COEFFICIENTS GENERATED:
A = 9.614428469E-2, B = -4.731088222E+1, C = 1.096843486E-3,
EXCITATION VOLTAGE 10 VDC, TENSION NOT CALIBRATED PER USER (SCOTT BARRIE)

ENGINEERING CALCULATIONS AND ANALYSIS

Page A6 of A6

Rev. 08

Title:

AGC-3 Specimen Load Calculations by Stack

ECAR No.: 3932 Rev. No.: 0 Project No.: 32138 Date: 06/11/2019

CALIBRATION INPUT L 2/4/2019						4 <i>TA</i>					
NAME: MATT WESEN	IAN	BADGE: 459	85	PH: 526-2573	AREA: REC	C	BLDG: NHL	RM:			
ID Number: 728183 Next Cal Due Date:		HONEYWE		Model: 31-10		Noun	Name: LOAD C		Serial #: 1315999		
Calibration Date:	12/21/2011	1] Acc	eptance Test	1	○ I ₁	n Tolerance				
Charge Level:	12	2] Cali	bration - SCL Spe	cs 2	● C	Out of Tolerance	>1x <2x			
Repair/Adj/etc C.L:	0	3	Cali	bration - MFG Spe	ecs 3	\circ	Out of Tolerance	>2x <3x			
Material Amount:	0	4	Clea	an	4	\bigcirc 0	out of Tolerance	>3x <5x			
Charge Number:	100911C56	5	Lim	ited Calibration	5	\circ	Out of Tolerance	>5 x			
Cal Work Inst ID:	5748R	6] Fun	ctional Check	6	0 0	Out of Tolerance-Undetermined				
Outside Vendor:		7	Perf	formance Check	7	□ In	noperative				
		8	Mod	dify	8		Damaged				
		9	Rep	air-needs Charge I	evel 9	□ N	lot Used				
		10	Oth	er	10	_ N	Not Determined				
			-		11	ПЕ	xcessed				
Calibrated By:	Stan Zohner	S#- 58	146 Pi	none: 526-2350	12	ПЕ	xtension				
			C	ALIBRATION S'	FANDARDS	USE	D				
	304399 350815 375		3752	257							
STANDAI	RDS USED ARE 1	TRACEABLE 1	TO THE N	ATIONAL INSTITUT	E OF STANDA	RDS AN	ND TECHNOLOGY	DERIVED FRO	OM ACCEPTED		
VALU	JES FOR NATUR	AL PHYSICA	L CONST	ANTS, OR DERIVED	FROM THE RA	TIO TY	PE OF SELF CALI	BRATION TEC	CHNIQUES.		
_				BORATORY TEMPER							
	ysical STD (106C)	-			Electronic STD (1			0.5) °C (30 to 4			
Dimensional STD (106B) (20.0 ± 0.25) °C (30 to 45) %RH Electronic CAL (Lab 112) (23.0 ± 1.0) °C (20 to 50) %RH											
Ph	ys/Dim CAL (Lab	111) (20.0 ±	0.5) °C (20 to 50) %RH I	Remaining S&CL	. calibrat	tion areas: (23.0 +5	, -3) °C (20 to	50) %RH		
Manuf	acturer's environ	mental specifica	ations are	evaluated for conforma	nce when calibr	ations a	re performed outside	the above state	ed conditions.		
		OUT		ERANCE CONDITION							
				rd Reading 7.07 lbf		T Read	_		olerance		
						700 1b 800 1b		+/-2.9 lbf +/-2.9 lbf			
									2.9 lbf		
	lbf			5.97 lbf	'	900 lbf 1000 lbf			+/-2.9 lbf		

COMMENTS

Unit was out of tolerance. Zero balance was 0.35838mV (it should be less than 0.22mV (1%fs)). zero balance can not be fixed. New coefficients were generated to bring within manufactures spec of +/- 0.29% F.S.
LIMITED: MUST USE NEW COEFFICIENTS GENERATED: A= -7.771009165E-2
B= -4.683035475E+1 C= -2.740229045E-3, EXCITATION VOLTAGE 10 VDC, TENSION NOT CALIBRATED PER USER (SCOTT BARRIE) 9/22/2010