Custom Stack Analysis, LLC.

1-800-824-4274

Renergy – Dovetail
1146 Herr Road
Fairborn, Ohio 45324

Report

Performed Velocity, Moisture, Temperature, Volumetric Flow Rate, Nitrogen Oxide, Non-Methane Organic Compounds, Oxygen and Carbon Monoxide Emissions Testing

Sampling performed on the B001 Engine Outlet

Fairborn, OH

Test Date: 6/7/18

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6/12/2018

X

Signed by: Custom Stack Analysis, LLC.

Brian E. Lemasters
Custom Stack Analysis, LLC.

REPORT CERTIFICATION

Custom Stack Analysis, LLC. has used its professional experience and best professional efforts in performing this compliance test. I have reviewed the results of these tests and to the best of my knowledge and belief they are true and correct.

6/12/2018

X

Signed by: Custom Stack Analysis, LLC.
Brian E. Lemasters

Custom Stack Analysis, LLC. P. O. Box 3750 14614 Cenfield St NE Alliance, Ohio 44601 Phone: 330-525-5119 Fax: 330-525-7908 E-mail: stacks@customstackanalysis.com

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EXECUTIVE SUMMARY

Custom Stack Analysis, LLC. conducted emissions sampling using USEPA Methods 1-4, 3A, 7E, 10 and 25A. Testing was conducted on the B001 Engine Outlet on June 7th, 2018. The testing was conducted at Renergy - Dovetail. on the B001 Engine Outlet to determine compliance status with Permit No. – P0124072 (see Table 1.2).

The Custom Stack Analysis, LLC. test crew consisted of Mr. Cody Davis and Mr. Brian Lemasters. The testing procedures were coordinated by Mr. Brian Arndts of Renergy – Dovetail. All testing procedures were witnessed by Ms. Lisa Jeter and Ms. Heather Kaweckiof the Regional Air Pollution Control Center Agency (see Table 1.1).

Table 1.1: Emissions Testing Program Contact Personnel

Name, Title	Company Address	Phone, Fax, email
Mr. Brian Arndts	Renergy – Dovetail 1146 Herr Road Fairborn, OH 45324	(937(768-8128 (Phone)
Ms. Lisa Jeter Ms. Heather Kawecki	Regional Air Pollution Control Agency 117 S. Main Street Dayton, OH 45422	(937) 224-3583 (Phone)
Mr. Brian Lemasters Project Manager Mr. Cody Davis Project Technician	Custom Stack Analysis,LLC. 14614 Cenfield St. N.E. Alliance, OH 44601	(330) 525-5119 (Phone) (330) 525-7908 (Fax)

Test results are located on page 3. A description of the testing protocol is included on pages 4-8. All testing calculations are located on pages 15-19. Appendix 1 includes field test data. Appendix 2 contains laboratory data from Custom Stack Analysis, LLC. Appendix 3 contains calibration data for the equipment used on test day. Appendix 4 contains monitoring data. Appendix 5 contains production data.

At the end of the testing a 999 ppm CO gas was introduced up the bias line and the analyzer read it as 1300 ppm, it was discovered later during the tear down process that a rubber glove had melted to the end of the CEMS probe, thus, causing no ventilation of excess gas and henceforth pressurizing the sample line.

Table 1.2 demonstrates how Renergy - Dovetail. in Fairborn, OH is operating in compliance with the applicable emission standards.

Table 1.2: Emission Limits and Test Results Summary

Pollutant	Emission Limitations	Test Result Average	Compliance Demonstrated
Carbon Monoxide	540 ppm @ 15% O^2	430.17 ppm @ 15% O^2	Yes
Nitrogen Oxide	160 ppm @ 15% O^2	88.99 ppm @ 15% O^2	Yes
Volatile Organic Compounds	86 ppm @ 15% O^2	74.65 ppm @ 15% O^2	Yes

Test Results

Renergy - Dovetail - B001 Engine Outlet
6/7/2018
Methods 1=4. 3A, 7E, 10 & 25A

		Run #1	Run #2	Run #3	Avg.	Limit
Moisture %		13.92%	11.79%	13.94%	13.21%	
Oxygen %		7.54%	8.07%	8.13%	7.91%	
CO	**(ppm)**	956.82	929.64	953.21	946.55	
CO	**(ppm @ 15%)**	422.56	427.61	440.34	430.17	540
Nox	**(ppm)**	203.69	198.31	185.74	195.91	
Nox	**(ppm @ 15%)**	89.96	91.22	85.80	88.99	160
VOC*	**(total ppm)**	654.14	634.50	648.92	645.85	
VOC*	**(methane ppm)**	456.15	491.50	495.80	481.15	
VOC**	**(ppm)**	197.99	143.00	153.12	164.70	
VOC**	**(ppm @ 15%)**	87.44	65.78	70.73	74.65	86
Operating Engine Horsepower		1177	1173	1174	1174	
Max Engine Horsepower		1300	1300	1300	1300	
Load %		90.50%	90.20%	90.30%	90.33%	
Megawatt		0.9050	0.9020	0.9030	0.9033	

* VOC concentration dry

** VOC concentration with the Methane removed and Dry.

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METHOD 1

Sample and velocity traverses for stationary sources.

To aid in the representative measurement of pollutant emissions and/ or total volumetric flow rate from a stationary source, a measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. A traverse point is then located within each of these equal areas.

METHOD 2

Determination of stack gas velocity and volumetric flow rate.

The average gas velocity in a stack is determined from the gas density and from measurement of the average velocity head with a Type S (Stausscheibe or reverse type) pitot tube.

METHOD 3

Gas analysis for the determination of dry molecular weight.

This method is applicable for determining carbon dioxide and oxygen concentrations and dry molecular weight of a sample from a gas stream of a fossil-fuel combustion process.

METHOD 4

Determination of moisture content in stack gases.

A gas sample is extracted at a constant rate from the source. It is determined either volumetrically or gravimetrically.

METHOD 3A TESTING DESCRIPTION

A gas sample is continuously extracted from the stack, and a portion of the sample is conveyed to an instrumental analyzer for determination of O2 gas concentration. The gases pass through a heated sampling probe and filter to prevent condensation. The gases then pass through a calibration valve to a heated sampling line. After the heated sampling line is a Universal Analyzers Model 530 air cooled single sample thermoelectric water condenser with a perostolic pump for moisture removal. The sample is then passed through to a California Analytical Instruments Model 100F for O2 concentrations. Before the testing procedures commence the analyzer is left to warm up for a 90 minute period. It is then calibrated according to Method 7E specifications. To the extent practicable, the measured emissions should be between 20 to 100 percent of the selected calibration span. Three calibration gases are selected. The High-Level gas concentrations shall be equivalent to 20 to 100 percent of the calibration span. Mid-Level concentrations shall be equivalent to 40 to 60 percent of the calibration span. The Low-Level Gas concentrations of less than 20 percent of the span. Before the first run an analyzer calibration error check is conducted. If the low-level, mid, or high cal gases expected concentrations differ by more than +-2% of the span then the procedure needs to be repeated until an acceptable 3 point calibration is obtained. After the analyzer calibration check the upscale and low level calibration gases are introduced to the sampling calibration valve and recorded. System bias calibration must be within 5.0% of the analyzer calibration span for low-scale and upscale calibration gases. At the conclusion of each of the test runs the low-level gas and an upscale gas closest to the concentrations are introduced to the calibration valve assembly. If either the low-level or upscale value exceeds +-3% of the span, then the run is considered invalid.

METHOD 7E TESTING DESCRIPTION

A gas sample is continuously extracted from the stack, and a portion of the sample is conveyed to an instrumental analyzer for determination of NOx gas concentration using a chemiluminescence analyzer. The gases pass through a heated sampling probe and filter to prevent condensation. The gases then pass through a calibration valve to a heated sampling line. After the heated sampling line is a condenser for moisture removal. The sample is then passed through to a Thermo Environmental Instruments Model 42 chemiluminescence analyzer where the gases are analyzed for NOx concentrations. Before the testing procedures commence the analyzer is left to warm up for a 90 minute period. It is then calibrated according to Method 7E specifications. To the extent practicable, the measured emissions should be between 20 to 100 percent of the selected calibration span. Three calibration gases are selected. The High-Level gas concentrations shall be equivalent to 20 to 100 percent of the calibration span. Mid-Level concentrations shall be equivalent to 40 to 60 percent of the calibration span. The Low-Level Gas concentrations of less than 20 percent of the span. Before the first run an analyzer calibration error check is conducted. If the low-level, mid, or high cal gases expected concentrations differ by more than +-2% of the span then the procedure needs to be repeated until an acceptable 3 point calibration is obtained. After the analyzer calibration check the upscale and low level calibration gases are introduced to the sampling calibration valve and recorded. System bias calibration must be within 5.0% of the analyzer calibration span for low-scale and upscale calibration gases. At the conclusion of each of the test runs the low-level gas and an upscale gas closest to the concentrations are introduced to the calibration valve assembly. If either the low-level or upscale value exceeds +-3% of the span, then the run is considered invalid.

METHOD 10 TESTING DESCRIPTION

A gas sample is continuously extracted from the stack, and a portion of the sample is conveyed to an instrumental analyzer for determination of CO gas concentration using a Luft-type nondispersive infrared analyzer. The gases pass through a heated sampling probe and filter to prevent condensation. The gases then pass through a calibration valve to a heated sampling line. After the heated sampling line is a Universal Analyzers Model 530 air cooled single sample thermoelectric water condenser with a perostolic pump for moisture removal. The sample is then passed through an ascarite tube to a Thermo Environmental Instruments Model 48 Luft-type analyzer where the gases are analyzed for CO concentrations. Before the testing procedures commence the analyzer is left to warm up for a 90 minute period. It is then calibrated according to Method 7E specifications. To the extent practicable, the measured emissions should be between 20 to 100 percent of the selected calibration span. Three calibration gases are selected. The High-Level gas concentrations shall be equivalent to 20 to 100 percent of the calibration span. Mid-Level concentrations shall be equivalent to 40 to 60 percent of the calibration span. The Low-Level Gas concentrations of less than 20 percent of the span. Before the first run an analyzer calibration error check is conducted. If the low-level, mid, or high cal gases expected concentrations differ by more than +-2% of the span then the procedure needs to be repeated until an acceptable 3 point calibration is obtained. After the analyzer calibration check the upscale and low level calibration gases are introduced to the sampling calibration valve and recorded. System bias calibration must be within 5.0% of the analyzer calibration span for low-scale and upscale calibration gases. At the conclusion of each of the test runs the low-level gas and an upscale gas closest to the concentrations are introduced to the calibration valve assembly. If either the low-level or upscale value exceeds +-3% of the span, then the run is considered invalid.

METHOD 25A TESTING DESCRIPTION

This method will be used to measure the total VOC concentration expressed in terms of ppm propane. A gas sample is extracted from the source through a stainless steel probe, through a heated sample line (teflon), to a flame ionization analyzer. The main components of Method 25A are the same as Method 204B with the exception of a non heated sample probe.

The sampling system is heated up to the proper operating temperature. Within two hours of the start of the test the FIA is calibrated. The calibration range or span is selected to be from 1.5 to 2.5 times the expected concentration. Three calibration ranges are then selected as follows: Low level 25-35% of the span, Mid level 45-55% of the span, and a High level 80-90% of the span. A zero and a high level calibration gas is then injected a the valve assembly and the FIA is adjusted to these levels. Then all four gases are introduced into the analyzer and recorded. If the responses are within 5% of the expected values then the analyzer is responding correctly. The sample probe is located in the center of the stack and sealed in place and the test is started. The test lasts for 60 minutes. At the end of the test run a drift check is ran. The zero gas and the mid level calibration gas is injected at the valve assembly. The analyzer responses are then recorded. The drift check is acceptable if the results are within 3% of the span value. These checks are performed before and after each test run.

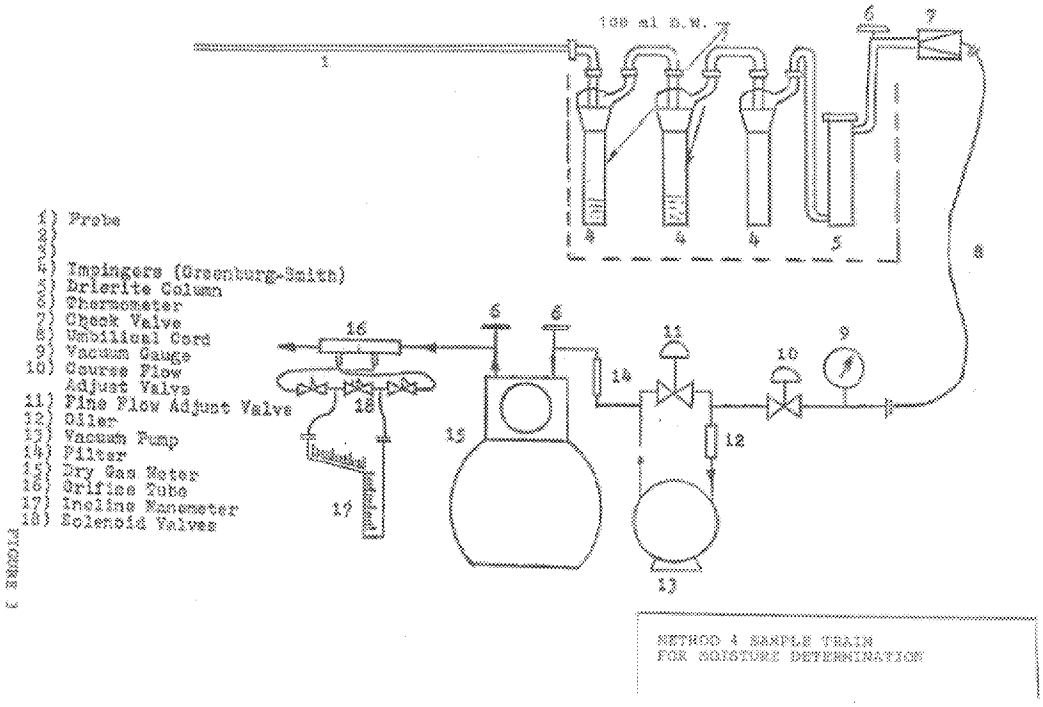
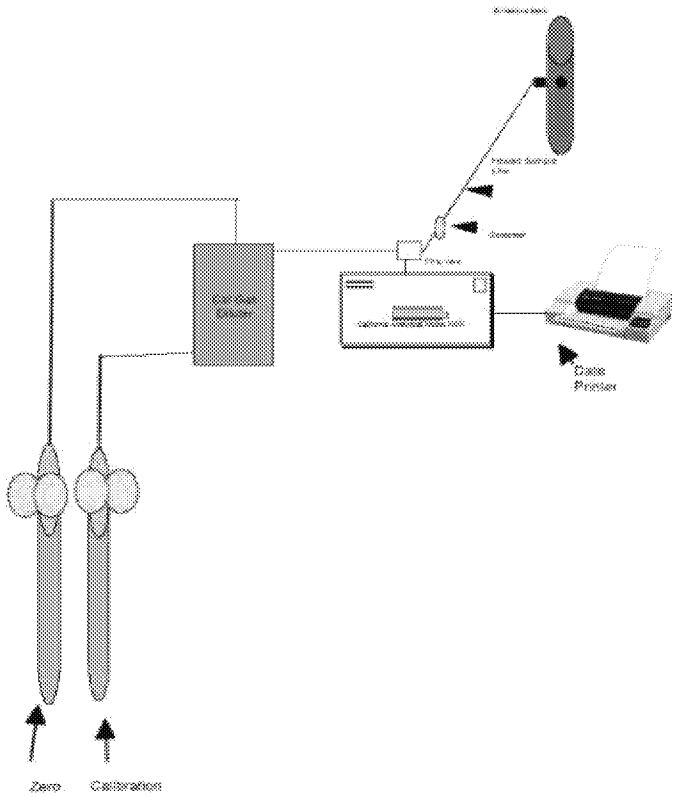
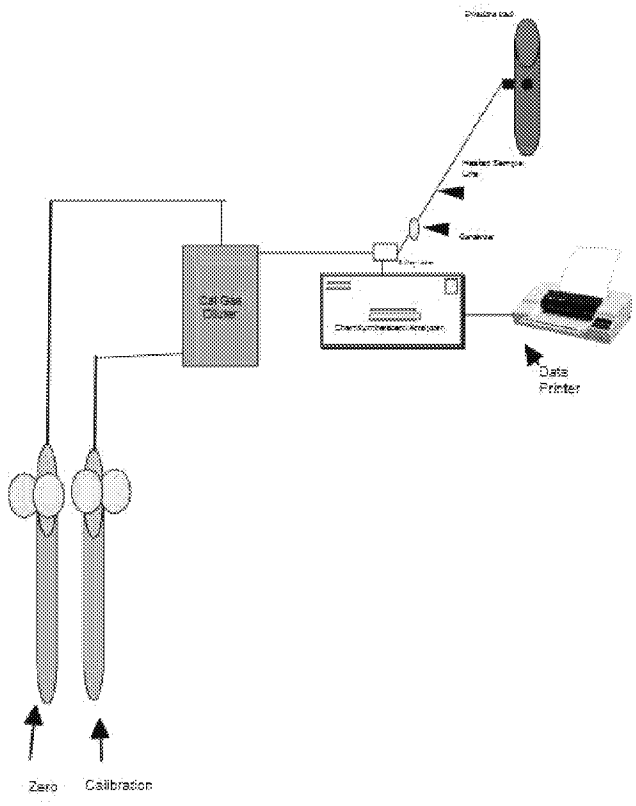

100 ml D.W.
1) Probe
2)
3)
4) Impingers (Greenburg-Smith)
5) Drierite Column
6) Thermometer
7) Check Valve
8) Umbilical Cord
9) Vacuum Gauge
10) Course Flow Adjust Valve
11) Fine Flow Adjust Valve
12) Oiler
13) Vacuum Pump
14) Filter
15) Dry Gas Meter
16) Orifice Tube
17) Incline Manometer
18) Solenoid Valves
METHOD 4 SAMPLE TRAIN
FOR MOISTURE DETERMINATION

FIGURE 3

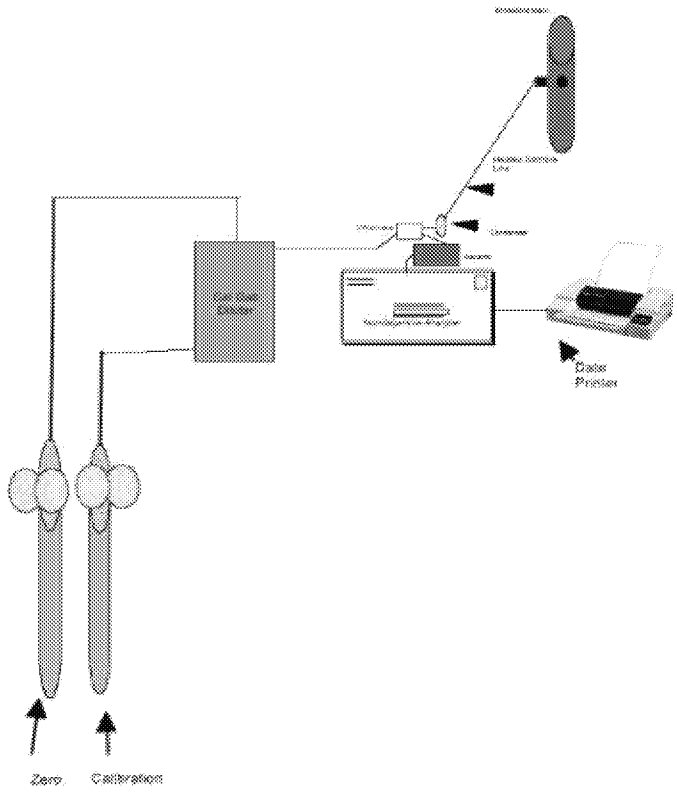
3A Sampling System



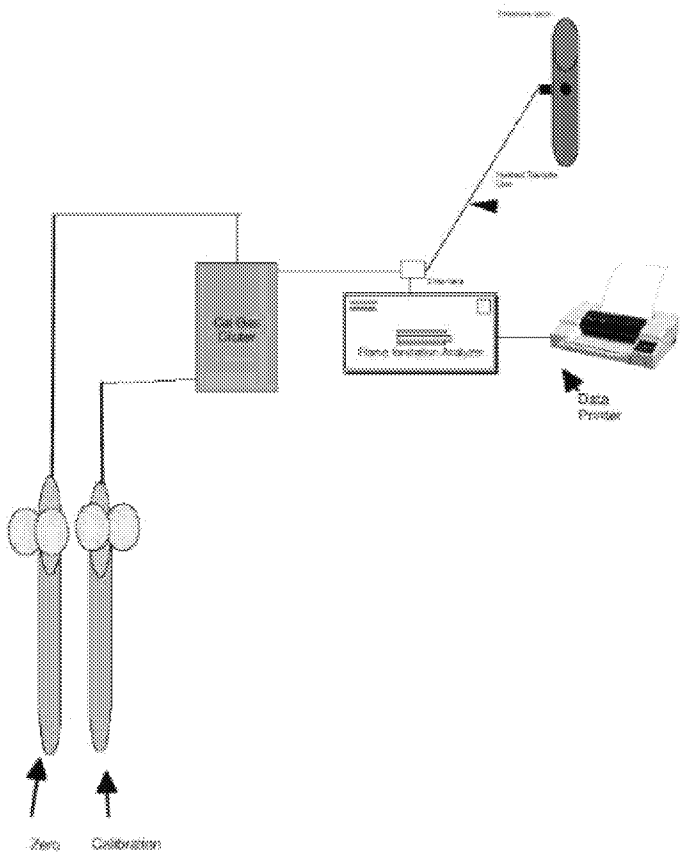
7E Sampling System



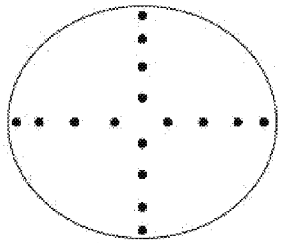
10 Sampling System

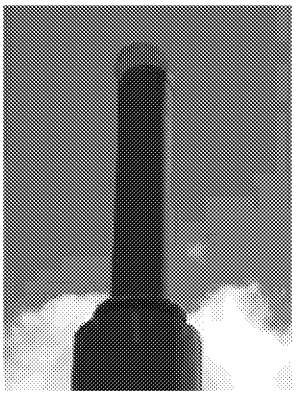


25A Sampling System



Location of Sampling Points





Location		Engine Outlet
Upstream		9 Inches
Downstream		68 Inches
Stack Diameter		12 Inches
Sample Point #		
	1	0.4 Inches
	2	1.3
	3	2.3
	4	3.9
	5	8.1
	6	9.7
	7	10.7
	8	11.6

CALCULATIONS

Outlet

		RUN #1	RUN #2	RUN #3		
1.	**Vm (std)**	41.89	41.68	41.69	=	$VM * 17.64 * \frac{PBAR + \frac{\wedge H}{13.6}}{Tm} * Y$

			RUN #1	RUN #2	RUN #3
Vm (std) = Volume of gas collected, corrected to standard conditions, cuft.		=	41.89	41.68	41.69
Vm	= Volume of gas sampled at meter box, cuft.	=	43.52	44.07	44.50
17.64	= Standard temperature, 528 Rankine / std pressure, 29.92.	=	17.64	17.64	17.64
Tm	= Average dry gas meter temperature, + 460 Rankine.	=	533.20833	542.625	547.91667
Pbar	= Barometric pressure, inches of mercury (Hg)	=	28.97	28.97	28.97
^H	= Average pressure differential across orifice.	=	2	2	2
13.6	= Specific gravity of mercury.	=	13.6	13.6	13.6
Y	= Calibration factor of meter box.	=	0.9993	0.9993	0.9993

		RUN #1	RUN #2	RUN #3		
2.	**Vw (std)**	6.77	5.57	6.75	=	$Vlc * \frac{P\ H20}{Mh20} * \frac{R\ Tstd}{Pstd} = K2 * Vlc$

			RUN #1	RUN #2	RUN #3
Vlc	= Volume of water and silica colected.	=	143.7	118.2	143.3
P H20	= Density of water, 0.002201 lb/ml.	=	0.002201	0.002201	0.002201
M H20	= Molecular weight of water, 18.01 lb/lb-mole.	=	18.01	18.01	18.01
R	= Ideal gas constant, 21.85 in. hg - ft3/R-lb-mole.	=	21.85	21.85	21.85
Tstd	= Standard absolute temperature, 528 R.	=	528	528	528
Pstd	= Standard absolute pressure, 29.92 in. Hg.	=	29.92	29.92	29.92
K2	= 0.0471 ft3 / ml.	=	0.0471	0.0471	0.0471

		RUN #1	RUN #2	RUN #3		
3.	**Bws**	0.13916	0.11788	0.13940	=	$\frac{Vw(std)}{Vm(std) + Vw(std)}$

			RUN #1	RUN #2	RUN #3
Bws	= Water vapor in the gas stream, proportion.	=	0.13916	0.11788	0.13940
Vw(std)	= Volume of water vapor in the gas sample, scf.	=	6.77	5.57	6.75
Vm(std)	= Volume of gas sampled at meter box, scf.	=	41.89	41.68	41.69

CALCULATIONS

VOC

		RUN #1	RUN #2	RUN #3		
1	**PPM @ 15% 02**	87.44	65.78	70.73	=	PPM * 5.9 / (20.9 - 02)

					RUN #1	RUN #2	RUN #3
02	=	Oxygen		=	7.54	8.07	8.13
PPM	=	PPM		=	197.98823	143.00197	153.11693

CALCULATIONS

NOX

		RUN #1	RUN #2	RUN #3		
1	**PPM Corr.**	203.69	198.31	185.74	=	$Cgas = (C - Co) \frac{Cma}{Cm - Co}$

				RUN #1	RUN #2	RUN #3
Co	=	Average of initial and final system calibration bias check responses for the zero gas, ppm.	=	1.58	3.54	3.54
C	=	Effluent gas concentration, dry basis, ppm.	=	207.25	203.37	187.19
Cm	=	Average of initial and final system calibration bias check responses for the upscale gas, ppm.	=	294.8	296.165	290.675
Cma	=	Actual concentration of the upscale calibration gas, ppm.	=	290.4	290.4	290.4

		RUN #1	RUN #2	RUN #3		
2	**PPM @ 15% 02**	89.96	91.22	85.80	=	PPM * 5.9 / (20.9 - 02)

				RUN #1	RUN #2	RUN #3
02	=	Oxygen	=	7.5402821	8.07	8.13
PPM	=	PPM	=	203.692	198.31057	185.73828

CALCULATIONS

CO

		RUN #1	RUN #2	RUN #3		
1	**PPM Corr.**	956.817	929.64	953.21	=	$Cgas = (C - Co) \frac{Cma}{Cm - Co}$

				RUN #1	RUN #2	RUN #3
Co	=	Average of initial and final system calibratio bias check responses for the zero gas, ppm	=	2.34	0.78	0
C	=	Effluent gas concentration, dry basis, ppm.	=	976.72	959.58	971.67
Cm	=	Average of initial and final system calibration bias check responses for the upscale gas, p	=	597.06	603.1	595.31
Cma	=	Actual concentration of the upscale calibration gas, ppm.	=	584	584	584

		RUN #1	RUN #2	RUN #3		
2	**PPM @ 15% 02**	431.35	441.39	448.87	=	PPM * 5.9 / (20.9 - 02)

				RUN #1	RUN #2	RUN #3
02	=	Oxygen	=	7.540282	8.07	8.13
PPM	=	PPM	=	956.82	929.64	953.21

CALCULATIONS

O2

		RUN #1	RUN #2	RUN #3		
1	**PPM Corr.**	7.54	8.07	8.13	=	$Cgas = (C - Co) \frac{Cma}{Cm - Co}$

				RUN #1	RUN #2	RUN #3
Co	=	Average of initial and final system cali bias check responses for the zero gas	=	-0.235	-0.5	-0.59
C	=	Effluent gas concentration, dry basis,	=	7.58	8.03	7.85
Cm	=	Average of initial and final system calibration bias check responses for the upscale	=	10.575	10.52	10.24
Cma	=	Actual concentration of the upscale calibration gas, ppm.	=	10.43	10.43	10.43

Appendix #1

Test Data

Custom Stack Analysis, LLC.
Pitot Traverse Data Sheet for Cyclonics

Plant Renergy - Dovetail - B0(Date 6/7/2018

Location B001 Engine Outlet By Cody D

Point #	Angle
1	8
2	6
3	5
4	5
5	3
6	7
7	4
8	4
B-1	6
2	7
3	6
4	2
5	5
6	6
7	4
8	5
Avg	5

TEST DATA

COMPANY NAME	Renergy - Dovetail - B001 Engine Outlet
ADDRESS	1145 Herr Road
CITY	Fairborn
STATE	OH
ZIP	45324
TEST METHODS	Methods 1=4. 3A, 7E, 10 & 25A
CREW MEMBERS	Brian L, Cody D
LOCATION	Outlet
SOURCE	B001 Engine
CONTROL	

	RUN #1	RUN #2	RUN #3
DATE	6/7/2018	6/7/2018	6/7/2018
RUN LENGTH (min)	60	60	60
VOLUME (cubic feet)	43.517	44.067	44.504
Y FACTOR	0.9993	0.9993	0.9993
BAROMETRIC	28.97	28.97	28.97
METER TEMP. (R)	533.21	542.63	547.92
AVERAGE ^H	2.00	2.00	2.00
IMPINGER VOLUME	143.70	118.20	143.30
STACK AREA	0.79	0.79	0.79
OXYGEN	7.54	8.07	8.13

TEST RESULTS

B001 Engine Outlet
6/7/2018

	RUN #1	RUN #2	RUN #3
VM (std)	41.889	41.683	41.689
VW (std)	6.772	5.570	6.753
BWS	0.139	0.118	0.139

Vm (std) = Volume of gas sampled at standard conditions.

Vw (std) = Volume of water vapor collected at standard conditions.

Bws = Stack moisture content.

TEST DATA

B001 Engine Outlet

6/7/2018

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (ppm)	197.99	143.00	153.12
NOX (ppm)	207.25	203.37	187.19
CO (ppm)	976.72	959.58	971.67
O2 (%)	7.58	8.03	7.85

NOX CAL. CORR.			
INITIAL ZERO	-0.38	3.54	3.54
INITIAL UPSCALE	290.30	299.3	293.03
FINAL ZERO	3.54	3.54	3.54
FINAL UPSCALE	299.30	293.03	288.32
ACTUAL UPSCALE	290.40	290.4	290.4
NOX (ppm corrected)	203.69	198.31	185.74

CO CAL. CORR.			
INITIAL ZERO	3.12	1.56	0
INITIAL UPSCALE	583.23	610.89	595.31
FINAL ZERO	1.56	0	0
FINAL UPSCALE	610.89	595.31	595.31
ACTUAL UPSCALE	584.00	584	584
CO (ppm corrected)	956.82	929.64	953.21

O2 CAL CORR.			
INITIAL ZERO	0.02	-0.49	-0.51
INITIAL UPSCALE	10.35	10.8	10.24
FINAL ZERO	-0.49	-0.51	-0.67
FINAL UPSCALE	10.80	10.24	10.24
ACTUAL UPSCALE	10.43	10.43	10.43
O2 (% corrected)	7.54	8.07	8.13

Custom Stack Analysis, L.L.C.

Method 4

Plant: Renrtgy - Dovetail Date : 6/7/2018

Engine P001

		Meter Box	
Barometer (Pg)	28.97	ID:	1
Ambient Temp	64	Y	0.9993
		ΔH	2.022
		ΔH Set Point :	2.0

	Time	Run Time
Start:	10:30	60
Stop:	11:30	

Run #1

Cold Box #					
6	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	753.234	70	69	68	4
5	756.947	70	69	46	4
10	760.371	71	68	46	4
15	764.282	73	69	48	4
20	767.646	75	69	50	4
25	771.311	76	70	53	4
30	774.951	77	70	53	4
35	778.479	78	71	53	4
40	782.173	79	72	53	4
45	785.752	80	72	53	4
50	789.427	81	73	53	4
55	793.074	82	73	54	4
60	796.751				
Vm	43.517				
	AVG:	73		52.5	4.0
Leak Rate @	9.0	" Hg =	0.007		

	Time	Run Time
Start:	12:15	60
Stop:	13:15	

Run #2

Cold Box #					
7	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	797.497	78	77	68	5
5	801.259	81	78	51	5
10	804.911	83	77	50	5
15	808.558	85	78	52	5
20	812.209	86	78	54	5
25	815.861	87	79	56	5
30	819.515	87	79	58	5
35	823.183	88	79	53	5
40	826.863	89	80	49	5
45	830.547	89	81	48	5
50	834.288	90	82	49	5
55	837.883	90	82	50	5
60	841.564				
Vm	44.067				
	AVG:	83		53.2	5.0
Leak Rate @	7.5	" Hg =	0.003		

	Time	Run Time
Start:	14:15	60
Stop:	15:15	

Run #3

Cold Box #					
1	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	842.298	85	83	66	4
5	846.101	87	83	56	4
10	849.716	89	83	52	4
15	853.579	90	84	53	4
20	857.235	91	84	54	4
25	860.949	92	85	54	4
30	864.691	92	85	51	4
35	868.341	93	85	51	4
40	871.993	93	86	52	4
45	875.751	93	86	50	4
50	879.437	94	86	49	4
55	883.124	94	87	51	4
60	886.802				
Vm	44.504				
	AVG:	88		53.3	4.0
Leak Rate @	7.0	" Hg =	0.007		

Appendix #2

Laboratory Data

Lab Data Sheet For: Renergy - Dovetail - B001 Engine Outlet By: Cody D

Moisture Weights Moisture

RUN # 1			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	6	702.1	609.3	473.6				926.2
	Tare		578.8	602.1	471.3				915.3
	Net		123.3	7.2	2.3	0.0	0.0	0.0	10.9
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

			grams		grams
Intial Imp mL =	200.0	Impinger Total =	132.8	Total =	143.7

RUN # 2			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	7	685.5	533.6	489.8				938.9
	Tare		571.7	542.1	487.0				928.8
	Net		113.8	-8.5	2.8	0.0	0.0	0.0	10.1
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

			grams		grams
Intial Imp mL =	200.0	Impinger Total =	108.1	Total =	118.2

RUN # 3			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	1	730.9	614.1	487.7				890.6
	Tare		609.8	603.5	486.0				880.7
	Net		121.1	10.6	1.7	0.0	0.0	0.0	9.9
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

			grams		grams
Intial Imp mL =	200.0	Impinger Total =	133.4	Total =	143.3

Scale Serial # 1203240794

Conditions:	Temp	RH	Date	Pb
Initial	67	32	6/6/2018	28.91
Post	68	49	6/8/2018	28.94

Appendix #3

Calibration Data

Calibration Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 1870-8235944

Traceable® Certificate of Calibration for Digital Barometer Module

Cust ID:Custom Stack Analysis, LLC, 14614 Cenfield Street NE, , Alliance, OH 44601 U.S.A. (RMA:1011256)

Instrument Identification:

Model: 23609-208 S/N: 41370014 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Barometer	D4540001	9/27/17	1000398691
Chilled Mirror Hygrometer	31874/H2048MCR	10/19/17	14489
Digital Thermometer	221197993	10/04/17	4000-8017448

Certificate Information:

Technician: 57 Procedure: CAL-31 Cal Date: 1/10/17 Due Date: 1/10/19

Test Conditions: 24.0°C 50.0 %RH 1019 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
mb/hPa		N.A.		803.58	801	Y	793	814	0.83	>4:1
mb/hPa		N.A.		908.60	906	Y	898	919	0.83	>4:1
mb/hPa		N.A.		1,016.42	1,015	Y	1,006	1,027	0.83	>4:1
°C		N.A.		25.17	24	Y	24	26	0.58	1.7:1
%RH		N.A.		46.11	32	N	36	56	1.3	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Barometer Module should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Barometer Modules change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2006-AQ-HOU-RvA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Traceable® is a registered trademark of Control Company © 2009 Control Company

TRANSCAT® CERTIFICATE OF CALIBRATION

Trust in every measure

Customer: CUSTOM STACK ANALYSIS
14614 CENFIELD STREET NE
ALLIANCE, OH 44601

PO Number: ___

ANAB ACCREDITED ISO/IEC 17025 ANSI/NCSL Z540-1
ANAB AC-2489.06

ilac-MRA

Certificate/SO Number: 15-B6K1Y-20-1 Revision 0

Manufacturer: Altek Industries Corp
Model Number: 22
Description: Thermocouple Calibrator
Serial Number: 148946
ID: NONE

As-Found: In Tolerance
As-Left: In Tolerance

Calibration Date: Mar 02, 2018
Due Date: Mar 02, 2019

Calibrated To: Manufacturer Specification
Calibration Procedure: 1-AC23545-0

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab's Scope of Accreditation are indicated by the presence of the Accrediting Body's Logo and Certificate Number. Any measurements on an accredited calibration not covered by that Lab's Scope of Accreditation are listed in the notes section of the certificate. SCC, NRC, CLAS or ANAB do not guarantee the accuracy of an individual calibration by accredited laboratories.

Transcat calibrations, as applicable, are performed in compliance with the requirements of the Transcat Quality Manual QAC-P01-000 Revision 1.0, the customer's Purchase Order and/or Quality Agreement requirements, ISO 9001:2008, ANSI/NCSL Z540.1-1994 (R2002). Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are listed below.

Transcat documents the traceability of measurements to the SI units through the National Institute of Standards and Technology (NIST), or the National Research Council of Canada (NRC), or other national measurement institutes (NMI) that are signatories to the CIPM Mutual Recognition Arrangement, or accepted fundamental and/or natural physical constants, or by the use of specified methods, consensus standards or ratio type measurements. Documentation supporting traceability information is available for review upon written request at a Transcat facility. The measured quantity and the measurement uncertainty are required for further dissemination of traceability.

Uncertainties are reported with a coverage factor k=2, providing a level of confidence of approximately 95%. All calibrations have been performed using processes having a TUR of 4:1 or better (3:1 for mass calibrations), unless otherwise noted. The Test Uncertainty Ratio (TUR) is calculated in accordance with NCSL International RP-18. For mass calibrations: Conventional mass referenced to 8.0 g/cm³.

The results in this report relate only to the item calibrated or tested. Recorded calibration data is valid at the time of calibration within the stated uncertainties at the environmental conditions noted. The determination of compliance to the specification is specific to the model/serial no./ID no. referenced above based on the tolerances shown; these tolerances are either the original equipment manufacturers (OEM's) warranted specifications or the client's requested specifications. This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).

Columbus
7410 Worthington Galena Rd
Columbus, OH 43085
614-436-4933

Indianapolis
8164 Zionsville Rd
Indianapolis, IN 46268
317-735-2614

Tech: Sam Shults
Date: 12/21/2017

HFID M/NM

Asset#	Model	Serial#	Sample Pressure	Air/Fuel Pressure	Cutter Temp	Analog output
B20117B	CAI 600	Y01011	1.38 psi	6.9 / 9.4 psi	314 C	10v/4-20 mA

Gas HC	Cylinder #	Conc. (ppm)	Response (ppm)	Error (ppm)	Criteria (ppm)	Thru Cutter (ppm)
					within 2% of Span	ppm
Zero Air	B16957B	0.0	0.0	**0.0**		0.0
High Level	B21825B	1013.0	1014.0	**1.0**	**20.3**	0.0
Mid Level	B21928B	598.0	583.0	**-15.0**	**20.3**	0.0
Low Level	B20191B	208.0	207.0	**-1.0**	**20.3**	0.0

Cutter Efficiencys						
Methane	BAQ-150A-500-4	500.0	180.0	Conversion Factor:	2.8	178.0
Ethane	B16954B	100.0	67.0	Conversion Factor:	1.5	3.6

Cutter Coefficent: **0.950**
Cutter Zero Offset: 0

CH4 Cutter Efficiency%: **-1.11**

All of the test gases used are NIST traceable and have +/- 1 % accuracy.

APEX INSTRUMENTS
EPA Method 5
560 Series Meter Box Calibration
Pre-Test Orifice Method
Metric Meter Box Volume Units, English K' Factor

CONVERSION FACTORS

1 mm Hg =	0.13330	kPa
1 inch =	0.39370	cm
1 inch =	0.03937	mm
1 cu ft =	28.32	liters

Filename: \\JAMESGRAY-PC\Customer Project Files\APPENDIX\Cal Sheets\Meter Boxes\[Meter Box 1 42618.xls]A
Revised: 7/25/95 Version: 2.2

Model #: 1
Serial #:

Date: ----------> 4/26/2018
Barometric Pressure: ----------> 28.64 (in. Hg)
Theoretical Critical Vacuum:---> 13.51 (in. Hg)

!!!!!!!
IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units. (ft)^3*(deg R)^0.5/((in.Hg)*(min))
!!!!!!!

---------- DRY GAS METER READINGS ----------									-CRITICAL ORIFICE READINGS-						-- Average Temperatures --		
dH (in H2O)	Time (min)	Volume Initial (ft^3)	Volume Final (ft^3)	Volume Total (liters)	Initial Temps. Inlet (deg F)	Initial Temps. Outlet (deg F)	Final Temps. Inlet (deg F)	Final Temps. Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	-- Ambient Temperature -- Initial (deg F)	Final (deg F)	Average (deg F)	DGM Outlet (deg R)	DGM Overall (deg R)	Ambient Temp (deg R)
0.5	10	497.975	501.999	113.95968	58	57	60	58	12	0.31220801	15	60	61	60.5	517.5	518.25	520.5
0.93	10	501.999	507.239	148.3968	60	58	61	59	16	0.40651147	15	61	61	61	518.5	519.5	521
1.4	10	507.239	513.418	174.98928	61	59	62	59	19	0.47958868	15	61	61	61	519	520.25	521
2.2	5	513.418	517.294	109.76832	62	60	63	60	23	0.60233125	15	61	61	61	520	521.25	521
3.9	5	517.294	522.395	144.46032	63	60	63	60	31	0.79594598	15	61	61	61	520	521.5	521

********** RESULTS **********

--- DRY GAS METER ---		-------- ORIFICE --------			-- DRY GAS METER --		-------- ORIFICE --------		
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	CALIBRATION FACTOR Y Value (number)	CALIBRATION FACTOR Y Variation (number)	CALIBRATION FACTOR dH@ Value (in H2O)	Value (mm H2O)	Variation (in H2O)
3.9277822	111.23	3.9192835	110.99411	4.0379	0.99784	-0.00144	1.78816315	45.42	-0.23369
5.1080253	144.66	5.1006668	144.45088	5.26009	0.99856	-0.00072	1.95993263	49.78	-0.06192
6.0219326	170.54	6.0175967	170.41834	6.20568	0.99928	9.1E-07	2.11775338	53.79	0.0959
3.7779428	106.99	3.7788491	107.01701	3.89696	1.00024	0.00096	2.10572232	53.49	0.08387
4.9911366	141.35	4.993531	141.4168	5.1496	1.00048	0.0012	2.13769938	54.30	0.11585
		Average Y ------>			0.99928		2.02185417	51.36	<------- Average dH@

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.

SIGNED:_____ Cody Davis

Date:_____ 4/26/2018

ED_014244_00000020-00037

MATHESON
ask. . .The Gas Professionals™

Analysis Report

To:

Manufacturing Location
1650 ENTERPRISE PARKWAY
TWINSBURG, OH 44087

Product: FID Fuel Zero Grade 40% H2 / 60% He

Grade: CERTIFIED
MTG Part No: G0867147X

Cylinder Size: 2R
Valve: CGA 350 BR

Contents:
Net: 72 ft³; 2.05 m³

Pressure: 2000 psig @ 70°F; 13891 kPa @ 21°C

CYLINDER NUMBER(S)
SD012979

	Requested Concentration	Certified Concentration	Units	Blend Tolerance	Certified Accuracy
Hydrogen	40	40.02	%	±2% (abs)	±2
Helium	Balance	Balance			

Post Fill Impurity Analysis	Specification	Certified Concentration	Units	Analysis Method
THC as Methane	≤ 0.5	ND < 0	ppm	

TRACEABILITY

COMMENTS

Lot No: 1099638166
Fill Date: 02/10/2017
Expiration Date: 02/13/2020

Analysis Date: 02/13/2017

Unless otherwise indicated, Matheson Tri-Gas terms and conditions govern the product data contained herein. This document was issued electronically and data validated by electronic signature. For further information visit www.matheson-trigas.com.

Judith Zadravec — 02/13/2017
Judy Zadravec - Analyst — Date

Judith Zadravec — 02/13/2017
Judy Zadravec - QA Approval — Date

MATHESON

ask. . .The Gas Professionals™

Certificate of Batch Analysis

To: Matheson

Sales Order No:
Purchase Order:

Manufacturing Location
Matheson
1055 Garden Street
Greensburg, PA 15601

Product: Air

Grade: Ultra Zero
Part No: G2001312

Cylinder Size: 1L
Valve: CGA 590

Pressure: 2400 PSIG

CYLINDER NUMBER(S)

748203Y
30-872
W-450273
TWC-563435
279432Y
3041791Y
24598
BA-1429
NK00455
7899
O8572
784192
3897456Y
SG904256
935283
46-1392

Component	Specification	Certified Concentration	Units	Analytical Method
Oxygen	20 - 22	20.8	%	J
THC	<0.1	0.01	ppm	E
Water	<2	1.6	ppm	F
Carbon Dioxide	<1	ND	ppm	H
Carbon Monoxide	<1	ND	ppm	H

COMMENTS

Product Composition verified by instrumentation calibrated with at least one of the following: NIST traceable weights, gas mixtures traceable to NIST weights NIST gas standards such as NTRM's or SRM's manufacturer NIST calibrations.

Analytical Method Key

A Trace oxygen analyzer
B Gas chromatograph with thermal conductivity detector
C Gas chromatograph with flame ionization detector
D Trace nitrogen analyzer
E Total hydrocarbon analyzer
F Specific moisture analyzer
G Gas chromatograph with helium ionization detector
H Gas chromatograph with discharge ionization detector
I Specific carbon monoxide analyzer
J Paramagnetic oxygen analyzer
K Specific carbon dioxide analyzer
L Binary gas mixture analyzer

Lot No: 118K41520

Fill Date: 4/28/2015

IMPORTANT

The information contained herein has been prepared at your request by qualified experts within Matheson. While we believe that the information is accurate within the limits of the analytical methods employed and is complex to the extent of the specified analysis performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Matheson arising out of the use of the information contained herein exceed the fee established for providing such information.

The undersigned certifies that the product(s) listed above reflect gas phase by volume (unless otherwise indicated) and meet or exceed the minimum purity specification(s)

Analyst

12/20/16
Date

MATHESON

ask: "The Gas Professionals"

1650 Enterprise Parkway
Twinsburg, OH 44087
215-648-4000

Certificate of Analysis – EPA Protocol Mixtures

Customer: YOUNGSTOWN OXYGEN
Cylinder Number: SD-13278
Cylinder pressure: 2000 psig
Last Analysis date: 4/3/2017
Expiration Date: 4/3/2025

Protocol:	Reference #	Lot #
G1	15143972	109-96-38369

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

REPLICATE RESPONSES

		Date: 4/3/2017	Date:
Component:	Carbon Dioxide	20.04%	
Certified Conc:	20.04% ± 0.04%	20.04%	
		20.04%	

		Date: 4/3/2017	Date:
Component:	Oxygen	20.02%	
Certified Conc:	20.00% ± 0.03%	20.00%	
		19.98%	

BALANCE GAS: Nitrogen

REFERENCE STANDARDS

Component:	Carbon Dioxide	Oxygen
SRM #:	SRM-2745	SRM-2659a
Sample #:	9-D-41	71-E-31
Cylinder #:	FF-13582	FF-22194
Concentration:	16.080%	20.863%

CERTIFICATION INSTRUMENTS

Component:	Carbon Dioxide	Oxygen
Make/Model:	Varian 3800 GC	Horiba MPA-510
Serial Number:	LR-92489	9XUYXODW
Measurement Principle:	TCD, FID	Paramagnetic
Last Calibration:	3/13/2017	3/14/2017

Notes: G2695116X

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D42017, PGVP Participation Date: 01/01/17, PGVP Renewal Date: 01/01/18. The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%.

Analyst Philip D. Mat.

Date 4/4/2017

MATHESON

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1650 Enterprise Parkway
Twinsburg, OH 44087
215-648-4000

Certificate of Analysis – EPA Protocol Mixtures

Customer: Matheson Tri-Gas
Cylinder Number: SX- 53139
Cylinder Pressure: 1800 psig
Last Analysis Date: 1/4/2017
Expiration Date: 12/27/2024

Protocol:	Reference #:	Lot #:
G1	702700	109-96-37921

Part #: G 2695119X

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

		REPLICATE RESPONSES	
Component: Nitric Oxide		Date: 12/27/2016	Date: 1/4/2017
Certified Conc: 547.7 ppm +/- 1.2 ppm		546.9 ppm	547.4 ppm
		548.3 ppm	547.4 ppm
		548.5 ppm	547.4 ppm

Component: Carbon Monoxide		Date: 12/27/2016
Certified Conc: 548.7 ppm +/- 1.9 ppm		548.8 ppm
		548.6 ppm
		548.6 ppm

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Nitric Oxide	Carbon Monoxide
SRM #:	SRM-1685b	SRM-1681b
Sample #:	43-M-57	01-L-35
Cylinder #:	FF22139	FF20649
Concentration:	251.5 ppm	993.1 ppm

CERTIFICATION INSTRUMENTS

Component:	Nitric Oxide	Carbon Monoxide
Make/Model:	NOX CLA-510SS	CO Horiba VIA-510 HIGH
Serial Number:	XXFD0YW0	ML0E13T1
Measurement Principle:	Chemiluminescence	NDIR
Last Calibration:	12/19/2016	12/7/2016

Notes: Nox = 547.7 ppm REFERENCE VALUE ONLY

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D42017, PGVP Participation Date: 01/01/17, PGVP Renewal Date: 01/01/18. The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%.

Analyst: _____ Date 1/5/2017

MATHESON

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1650 Enterprise Parkway
Twinsburg, OH 44087
215-648-4000

Certificate of Analysis – EPA Protocol Mixtures

Customer: Youngstown Oxygen
Cylinder Number: SX- 52051
Cylinder Pressure: 1800 psig
Last Analysis Date: 2/28/2018
Expiration Date: 2/21/2026

Protocol:	Reference #:	Lot#:
G1	17054379-00	109-96-39758

Part #: G 2677175X

[redacted]

		REPLICATE RESPONSES	
Component: Nitric Oxide		Date: 2/21/2018	Date: 2/28/2018
		290.3 ppm	290.9 ppm
Certified Conc: 290.4 ppm +/- 1.5 ppm		289.8 ppm	291.0 ppm
		289.6 ppm	291.1 ppm

Component: Carbon Monoxide	Date: 2/21/2018
	297.8 ppm
Certified Conc: 297.8 ppm +/- 0.9 ppm	297.9 ppm
	297.9 ppm

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Nitric Oxide	Carbon Monoxide
SRM #:	SRM-1487	NTRM-080615
Sample #:	46-8-53	151103
Cylinder #:	FF20540	ND42984
Concentration:	1487 ppm	490.7 ppm

CERTIFICATION INSTRUMENTS

Component:	Nitric Oxide	Carbon Monoxide
Make/Model:	NOX CLA-510SS	CO Horiba VIA-510 HIGH
Serial Number:	XXFD0YW0	ML0E13T1
Measurement Principle:	Chemiluminescence	NDIR
Last Calibration:	2/28/2018	1/30/2018

Notes: Nox = 290.4 ppm REFERENCE VALUE ONLY

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D42018, PGVP Participation Date: 01/01/18, PGVP Renewal Date: 01/01/19. The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%.

Analyst: _____ Date 3/1/2018

MATHESON
...ask... The Gas Professionals™

1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: WHS 109
YTOWN OXYGEN

Part # G2695803

Protocol:	Reference #:	Lot#:
G1	T231804-01	9007417750

Cylinder Number: CC78213
Cylinder Pressure: 2000 psig
Last Analysis Date: 5/25/2017
Expiration Date: 5/25/2020

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

				REPLICATE RESPONSES	
				Date: 5/17/2017	Date: 5/25/2017
Component:	Nitrogen Dioxide			49.3	49.1
				49.4	49.1
Certified Conc:	49.2 ppm	+/- 0.5 ppm	ABS	49.3	49.2

BALANCE GAS: Air

REFERENCE STANDARDS:

Component: Oxides of Nitrogen
Reference Standard: GMIS
Cylinder #: EB0026419
Concentration: 50.5 +/- 0.5 ppm ABS
Exp Date: 8/1/2022

Reference Standard: SRM
Cylinder #: CAL017977
Concentration: 48.79 +/- 0.3 ppm ABS
Exp Date: 3/25/2019
SRM #: 1683b
NIST Sample #: 45-U-74

CERTIFICATION INSTRUMENTS

Component: Nitric Oxide
Make/Model: CAI / 600
Serial Number: Y09003
Measurement Principle: CHEMI
Last Calibration: 5/25/2017

Notes:

The certification was performed by Global Calibration Gases, LLC, Sarasota, FL and according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA PGVP Vendor ID Number: N22017.
The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%.

MATHESON

1950 Enterprise Parkway
Twinsburg, OH 44087
216-642-2000

Customer: YOUNGSTOWN OXYGEN
Cylinder Number: SX-59692
Cylinder pressure: 2000 psig
Last Analysis date: 4/4/2017
Expiration Date: 4/4/2025

Protocol.	Reference #	Lot #
G1	706121	109-96-38257

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

REPLICATE RESPONSES

Component:	Propane	Date:	4/4/2017	Date:
Certified Conc:	992 PPM ± 7 PPM		992 PPM 992 PPM 992 PPM	
Component:	Carbon Monoxide	Date:	4/4/2017	Date:
Certified Conc:	999 PPM ± 3 PPM		999 PPM 999 PPM 999 PPM	

BALANCE GAS: Nitrogen

REFERENCE STANDARDS

Component:	Propane	Carbon Monoxide
SRM #:	SRM-2646a	SRM-1681b
Sample #:	103-C-17	1-L-07
Cylinder #:	XF-001040B	FF-20643
Concentration:	979.1 ppm	993.1 ppm

CERTIFICATION INSTRUMENTS

Component:	Propane	Carbon Monoxide
Make/Model:	Varian 3800 GC	Horiba VIA-510
Serial Number:	LR-92489	XS2E66TB
Measurement Principle:	TCD, FID	NDIR
Last Calibration:	3/6/2017	3/16/2017

Notes:

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012. using procedure G1 and/or G2. U.S EPA Vendor ID Number: D42017, PGVP Participation Date: 01/01/17, PGVP Renewal Date: 01/01/18. The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%.

Analyst Philip D. Mat. Date 4/5/2017

GASES & EQUIPMENT | INDUSTRIAL MEDICAL SPECIALTY

3218263

Certificate of Analysis

Certification Date:	18 November 2016
Mixture Grade:	EPA Protocol Standard Gas Mixture
Lot Number:	3216B-05T5
Expiration Date:	18 November 2024
Cylinder Number:	CC459861
Part Number:	T5L EPA2RATAP-13

Mixture Components	Requested Composition	Certified Composition	U (Expanded Uncertainty, k=2)
Propane	364 PPM	389.9 PPM	+/- 2.4 PPM (absolute)
Nitrogen	Balance	Balance	

Cylinder Pressure:	1900 psi – Do not use below 100 psi (0.7 megapascals)
Production Lab:	Tier 5 Labs, LLC, Indianapolis, IN, PGVP Vendor ID R12016
Procedure Used:	EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012
Analytical Method:	Propane: FTIR
Multipoint Calibration Date:	Propane: 11/9/2016

Reference Standards:	Propane
NIST SRM Number	2647a
NIST Sample Number	104-C-09
Cylinder Identification Number	XF002997B
Certified Concentration	2467 µmol/mol
Expanded Uncertainty	+/- 13 µmol/mol
Certification Expiration	6-May-17

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025-2005.

Jeff Lynn

GASES & EQUIPMENT | INDUSTRIAL MEDICAL SPECIALTY
Scott-Gross Co., Inc
664 Magnolia Ave.
Lexington, KY 40505
(859)231-0225 (888)431-5882

MATHESON

ask. . .The Gas Professionals™

1650 Enterprise Parkway
Twinsburg, OH 44087
215-648-4000

Certificate of Analysis – EPA Protocol Mixtures

Customer: YOUNGSTOWN OXYGEN
Cylinder Number: SX-55258
Cylinder pressure: 2000 psig
Last Analysis date: 2/12/2018
Expiration Date: 2/12/2026

Protocol:	Reference #	Lot #
G1	724699	109-86-15767

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

REPLICATE RESPONSES

Component :	Carbon Dioxide	Date:	2/12/2018	Date:
Certified Conc:	9.87% ± 0.03%		9.87%	
			9.87%	
			9.87%	
Component:	Oxygen	Date:	2/12/2018	Date:
Certified Conc:	10.43% ± 0.03%		10.44%	
			10.44%	
			10.43%	

BALANCE GAS: Nitrogen

REFERENCE STANDARDS

Component:	Carbon Dioxide	Oxygen
SRM #:	SRM-1674b	SRM-2658a
Sample #:	7-H-31	72-D-58
Cylinder #:	FF-10542	CAL-016982
Concentration:	6.944 %	9.918%

CERTIFICATION INSTRUMENTS

Component:	Carbon Dioxide	Oxygen
Make/Model:	Varian 3800 GC	Horiba MPA-510
Serial Number:	LR-92489	9XUYXODW
Measurement Principle:	TCD, FID	Paramagnetic
Last Calibration:	2/5/2018	1/18/2018

Notes: G2687453

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D42018, PGVP Participation Date: 01/01/18, PGVP Renewal Date: 01/01/19. The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%.

Analyst Philip D. Mat. Date 2/13/2018

MATHESON

ask. . .The Gas Professionals™

1650 Enterprise Parkway
Twinsburg, OH 44087
215-648-4000

Certificate of Analysis – EPA Protocol Mixtures

Customer: YOUNGSTOWN OXYGEN
Cylinder Number: SX-26639
Cylinder pressure: 2000 psig
Last Analysis date: 5/7/2018
Expiration Date: 5/7/2026

Protocol:	Reference #	Lot #
G1	730002	109-96-40166

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

REPLICATE RESPONSES

		Date: 5/7/2018	Date:
Component:	Propane	586 PPM	
Certified Conc:	587 PPM ± 3 PPM	587 PPM	
		587 PPM	

		Date: 5/7/2018	Date:
Component:	Carbon Monoxide	584 PPM	
Certified Conc:	584 PPM ± 3 PPM	584 PPM	
		584 PPM	

BALANCE GAS: Nitrogen

REFERENCE STANDARDS

Component:	Propane	Carbon Monoxide
SRM #:	SRM-1669b	NTRM-080615
Sample #:	81-J-12	151103
Cylinder #:	FF-55638	ND-42984
Concentration:	496.7 ppm	490.7 ppm

CERTIFICATION INSTRUMENTS

Component:	Propane	Carbon Monoxide
Make/Model:	Varian 3800 GC	Horiba VIA-510
Serial Number:	LR-92489	XS2E66TB
Measurement Principle:	TCD, FID	NDIR
Last Calibration:	4/23/2018	4/12/2018

Notes: G2698019

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D42018, PGVP Participation Date: 01/01/18, PGVP Renewal Date: 01/01/19. The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%.

Analyst Philip D. Mat. Date 5/7/2018

AIR LIQUIDE Air Liquide America Specialty Gases LLC Scott

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory - PGVP Vendor ID: A22012

AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: 59661-70-65000
Document # : 45935248-028

Customer
CLEAN AIR INSTRUMENT RENTAL

JACK BIONDA
110 TECHNOLOGY DRIVE
RID PARK, FINLAY TOWNSHIP
CORAOPOLIS PA 15108
US

ANALYTICAL INFORMATION Gas Type : CH4,BALN

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: CC73789 **Certification Date:** 30May2012 **Exp. Date:** 31May2020
Cylinder Pressure*:** 2015 PSIG **Batch No:** TRO0059189

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ACCURACY**	TRACEABILITY
METHANE	446	PPM	+/- 1%	Direct NIST and VSL
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1000 10	18Jul2017	K005406	1001. PPM	METHANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/3400/7506	25May2012	TCD/FID

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis **Second Triad Analysis** **Calibration Curve**

METHANE

Date: 30May2012 Response Unit: AREA
Z1 = 0.00000 R1 = 908336.0 T1 = 404597.0
R2 = 908159.0 Z2 = 0.00000 T2 = 404506.0
Z3 = 0.00000 T3 = 404481.0 R3 = 908241.0
Avg. Concentration: 445.6 PPM

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999989
Constants: A = -0.508639
B = 0.001101 C = 0.000000
D = 0.000000 E = 0.000000

Special Notes: The expiration date has been extended without re-assay per EPA 600/R23-23/542.

APPROVED BY: ROBERT MCCRANDALL

AIR LIQUIDE Scott

RATA CLASS

Guaranteed +/- 1% Accuracy

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory - PGVP Vendor ID: A22014
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: 61002-71-65000
Document # : 53445512-025

Customer
CLEAN AIR ENGINEERING
500 WEST WOOD STREET
PALATINE IL 60067
US

ANALYTICAL INFORMATION **Gas Type : CH4,BALN**

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1, EPA/600/R-12/531; May 2012. Do not use this standard if pressure is less than 100 psig.

Cylinder Number: CC78768 **Certification Date:** 14Jan2014 **Exp. Date:** 15Jan2022
Cylinder Pressure: 2000 PSIG **Batch No:** TR00100977

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ACCURACY (ABSOLUTE / RELATIVE)			
METHANE	248	PPM	2.	PPM	/ 0.8	%
NITROGEN		BALANCE				

TRACEABILITY

REFERENCE STANDARD

COMPONENT	CONCENTRATION		UNCERTAINTY		CYLINDER	TYPE/SRM SAMPLE	EXP. DATE
METHANE	1001.0000	PPM	7.0000	PPM	K017937	NTRM 1000	18Jul2017

ANALYTICAL METHOD

1st Analysis: 14Jan2014

COMPONENT	INSTRUMENT	ANALYTICAL/PRINCIPLE	CALIBRATED	CONCENTRATION
METHANE	VARIAN 3400 7508	TCD/FID	08Jan2014	248.0 PPM

APPROVED BY: ROBERT LEGNIAK

PRAXAIR

Praxair
5700 South Alameda Street
Los Angeles, CA 90058
Tel: (323) 585-2154 Fax:(714) 542-6689
PGVPID, F22017

DocNumber: 000113555

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PRAXAIR PKG HILLSIDE IL HS
12000 ROOSEVELT RD
HILLSIDE IL 60162

Praxair Order Number: 70333991
Customer P. O. Number:
Customer Reference Number:

Fill Date: 8/7/2017
Part Number: NI ME850E-AS
Lot Number: 70086721906
Cylinder Style & Outlet: AS CGA 350
Cylinder Pressure & Volume: 2000 psig 140 cu ft

Certified Concentration:

Expiration Date:	8/11/2025		NIST Traceable
Cylinder Number:	DT0018702		Analytical Uncertainty:
873 ppm	METHANE		± 0.5 %
Balance	NITROGEN		

Certification Information: *Certification Date:* 8/11/2017 *Term:* 96 Months *Expiration Date:* 8/11/2025

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: METHANE

Requested Concentration: 850 ppm
Certified Concentration: 873 ppm
Instrument Used: HORIBA, FIA-510, 851135122
Analytical Method: Flame Ionization Detector
Last Multipoint Calibration 7/6/2017

Reference Standard Type GMIS
Ref Std Cylinder # DT0010035
Ref Std Conc 990 ppm
Ref Std Traceable to SRM # RGM#DT00
SRM Sample # N/A
SRM Cylinder # DT0007710

First Analysis Date: Date: 8/11/2017

Z:	0	R:	1035	C:	916	Conc:	870.01
R:	1048	Z:	0	C:	922	Conc:	875.71
Z:	0	C:	918	R:	1044	Conc:	871.91

UOM: ppm Mean Test Assay: 872.54 ppm

Second Analysis Date: Date:

Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0

UOM: ppm Mean Test Assay: 0 ppm

Analyzed by: Pupongmontre Pete

Certified by: Ying Yu

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.

Calibration Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 1870-8886025

Traceable® Certificate of Calibration for Digital Barometer Module

Cust ID:Custom Stack Analysis, LLC,14614 Cenfield Street NE.,Alliance OH 44601 U.S.A. Attn:Lemasters, Brian (RMA:1017860)

Instrument Identification:

Model: 23609-208 S/N: 61542879 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Barometer	D4540001	10/09/18	1000415948
Chilled Mirror Hygrometer	31874/H2048MCR	10/19/17	14489
Digital Thermometer	221197993	10/05/18	4000-8859710

Certificate Information:

Technician: 57 Procedure: CAL-31 Cal Date: 10/10/17 Due Date: 10/10/18

Test Conditions: 24.4°C 66.0 %RH 1016 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
mb/hPa		N.A.		806.25	803	Y	796	817	0.83	>4:1
mb/hPa		N.A.		907.30	906	Y	897	918	0.83	>4:1
mb/hPa		N.A.		1,017.34	1,016	Y	1,007	1,028	0.83	>4:1
°C		N.A.		24.43	24	Y	23	25	0.58	1.7:1
%RH		N.A.		44.90	41	Y	35	55	1.3	>4:1

This instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2 Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Barometer Module should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Barometer Modules change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2006-AQ-HOU-RvA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

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Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

ilac-MRA ACCREDITED A2LA Certificate No. 1750.01 Calibration

Cert. No.: 3415-9285559

Traceable® Certificate of Calibration for Digital Calipers

Customer :Custom Stack Analysis, LLC Attn: James Gray ,14614 Cenfield St NE ,Alliance ,OH-44601 ,U.S.A.

Instrument Identification:

Model: 3415, S/N: 12272684 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Block Set	99146223	28 Nov 2018	1000418160

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 05 Mar 2018 Cal Due Date: 05 Mar 2019

Test Conditions: 51.6%RH 23.41°C 1011mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
in	N.A.	N.A.		0.1000	0.1005	Y	0.099	0.1011	0.0003	3.33:1
in	N.A.	N.A.		2.0000	1.999	Y	1.998	2.0021	0.00033	>4:1
in	N.A.	N.A.		4.0000	3.999	Y	3.996	4.0041	0.00041	>4:1
in	N.A.	N.A.		6.0000	5.999	Y	5.994	6.0061	0.00051	>4:1
in depth	N.A.	N.A.		2.0000	1.998	Y	1.998	2.0021	0.00033	>4:1
in inside	N.A.	N.A.		1.0000	0.999	Y	0.999	1.0011	0.00031	3.23:1
in step	N.A.	N.A.		2.0000	1.998	Y	1.998	2.0021	0.00033	>4:1

This certificate indicates Traceability to standards provided by (NIST) National Institute of Standards and Technology and/or a National Standards Laboratory.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ± U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min=As Left Nominal(Rounded) – Tolerance; Max= As Left Nominal(Rounded) + Tolerance;

Nicol Rodriguez, Quality Manager

Aaron Justice Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Calipers should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Calipers change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.control3.com

Control Company is an ISO/IEC 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by DNV GL, Certificate No. CERT-01805-2006-AQ-HOU-RvA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Traceable® is a registered trademark of Control Company

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Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

ilac-MRA ACCREDITED A2LA Certificate No. 1750.01 Calibration

Cert. No.: 1870-9290360

Traceable® Certificate of Calibration for Digital Barometer Module

Customer :Custom Stack Analysis, LLC Attn: James Gray ,14614 Cenfield St NE ,Alliance ,OH-44601 ,U.S.A.

Instrument Identification:

Model: 1870, S/N: 90724105 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Thermometer	221197993	05 Oct 2018	4000-8859710
Chilled Mirror Hygrometer	31874/1H2048MR	15 Dec 2018	15660
Digital Barometer	D4540001	09 Oct 2018	1000415948

Certificate Information:

Technician: 57 Procedure: CAL-31 Cal Date: 06 Mar 2018 Cal Due Date: 06 Mar 2019

Test Conditions: 39.8%RH 23.09°C 1016mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
%RH	N.A.	N.A.		42.04	30	N	38	48	0.74	>4:1
°C	N.A.	N.A.		24.27	24	Y	23.27	25.27	0.051	>4:1
mb/hPa	N.A.	N.A.		1008.72	1012	Y	998	1020	0.62	>4:1
mb/hPa	N.A.	N.A.		806.70	813	Y	796	818	0.62	>4:1
mb/hPa	N.A.	N.A.		909.25	914	Y	899	921	0.62	>4:1

This certificate indicates Traceability to standards provided by (NIST) National Institute of Standards and Technology and/or a National Standards Laboratory.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement : (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

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Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Barometer Module should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Barometer Module change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.control3.com

Control Company is an ISO/IEC 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by DNV GL, Certificate No. CERT-01805-2006-AQ-HOU-RvA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

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Mitutoyo *Certificate of Calibration*

ilac-MRA ACCREDITED

Certificate No. 0750.01

NAME & ADDRESS: Amazon.com
Kenosha, WI

CONTROL NO.: 928342

CALIBRATED BY: Byron Gaddis
Calibration Technician I

CALIBRATION DATE: January 24, 2018

DATE PUT INTO SERVICE: _____

DESCRIPTION: Caliper, 0-6 inches
CODE NUMBER: 500-196-30
SERIAL NUMBER: A17299458

OUTSIDE	TOLERANCE	ERROR AS-FOUND	ERROR AS-LEFT
1	± 0.0010	NEW	0.0000
2	± 0.0010	NEW	0.0000
4	± 0.0010	NEW	0.0000
6	± 0.0010	NEW	0.0000
8	-----	--------	--------
12	-----	--------	--------
18	-----	--------	--------

OUTSIDE		TOLERANCE	ERROR AS-FOUND	ERROR AS-LEFT
24		-----	--------	--------
32		-----	--------	--------
40		-----	--------	--------
INSIDE	0.2	± 0.0010	NEW	0.0000
	1	± 0.0010	NEW	0.0000
STEP	1.00	± 0.0010	NEW	0.0000
DEPTH	1.00	± 0.0010	NEW	0.0000

Conformance to manufacturer specifications: As-Found Condition = NEW, As-Left Condition = PASS

All values in inches

Statements of conformance are based on the test values and the original manufacturer tolerances shown above and when accounting for the measurement uncertainty using a simple acceptance decision rule. The measurement uncertainty = ±(100+2L) µin, with L in inches, which achieves better than a 4:1 test uncertainty ratio. The uncertainty represents an expanded uncertainty expressed at approximately a 95% confidence level using a coverage factor of k=2. The errors shown above are test values for verification purposes only. These test values are traceable to the National Institute of Standards and Technology through the listed Mitutoyo reference standards. NIST Number 683/285541-14. Procedure: CLTM-7 REV. E, Environment: 20°C ± 0.50°C, RH 40% to 50%. This is an endorsed accredited calibration certificate (A2LA 0750.01) in accordance to ISO/IEC 17025:2005 and ANSI/NCSL Z540-1-1994. There is no calibration due date issued with this certificate as that must be determined by the end user in accordance to their quality system requirements. The manufacturer of this caliper recommends considering an initial calibration interval not to exceed 6 to 12 months after the date put into service. This certificate shall not be reproduced except in full without the written permission of Mitutoyo America Corporation.

Reference Standards		
ID	Cal Date	Due Date
MM111	11/1/17	11/2018
MS024	10/1/17	10/2018
RG-106	10/10/17	10/2018

This calibration was performed at the world-class Mitutoyo Calibration Laboratory. Customer visits and tours are welcome.

Mitutoyo
Control No: 928342 By
Serial No. A17299458 BG
Cal Date 1/24-18

Mitutoyo America Corporation
965 Corporate Boulevard, Aurora, Illinois 60502
Phone: 888-648-8869 Fax: 630-978-6477
email: calibration@mitutoyo.com

ED_014244_00000020-00054

Industrial Environmental Monitoring Instruments, Inc.

7410 Worthington-Galena Road
Worthington, Ohio 43085
Phone: (614) 436-4933
Fax: (614) 436-9144

Website: www.ierents.com

Dwyer Digital Manometer Certificate of Calibration

Instrument: Dwyer Mark III Digital Manometer
Serial#: E46Z

Date: 7/20/2017
Technician: Sam Shults

Custom Stack Analysis

Positive Port

Calibrated Source	Dwyer Mark III	% Accuracy
0.500	0.497	+/- 0.2" H2O
2.000	1.995	-0.3
3.000	2.995	-0.2
4.000	3.993	-0.2

Negative Port

Calibrated Source	Dwyer Mark III	% Accuracy
0.500	0.499	+/- 0.2" H2O
2.000	2.007	0.4
3.000	3.007	0.2
4.000	4.008	0.2

Allowable Tolerance +\- 1.0% "H2O FS

Reference Standards
Druck 740 DPI sn.74001125, Cal Due: 6/15/2018

Instrument must be calibrated and operated according to manufacturers specifications
The calibration standards used are NIST traceable

BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

577470

Jim Grey
330-821-2094 cp

FOR CUSTOM STACK 593P - COD!!!!!!
14614 CENFIELD ST ALLIANCE, OH 44601

P.O. _____ DATE 5-10-2018

- 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
- 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
- ☑ 1414 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
- 980 South Marr Rd. **COLUMBUS**, IN 47201 812-372-8374
- 7550 Jacks Lane **CLAYTON**, OH 45315 937-832-2040
- 3306 Cavalier Dr. **FORT WAYNE**, IN 46808 260-496-8469
- 520 Brookpark Rd. **CLEVELAND**, OH 44109-5898 216-661-2660
- 5525 Galaeo Court **INDIANAPOLIS**, IN 46241 317-548-7821
- 4070 Perimeter Dr. **COLUMBUS**, OH 43228 614-274-9009
- 5200 Grand Avenue **PITTSBURGH**, PA 15225 412-299-7960
- 1001 Findlay Rd. **LIMA**, OH 45801 419-228-5021
- 477 North Pike Rd. **SARVER**, PA 16055 724-224-7180
- 1080 National Parkway **MANSFIELD**, OH 44906 419-529-3006
- 526 31st St. **PARKERSBURG**, WV 26101 304-428-1792
- 9930 Crescent Park Drive **WEST CHESTER**, OH 45069 513-777-5800
- 100 McJunkin Road **NITRO**, WV 25143 304-755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF Ohio TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2018-0010

WEIGHT S/N'S 70458KIT

SCALE TECHNICIAN: Bob B. BS1338 (SIGNATURE)

ACCEPTED BY: Jim Grey (SIGNATURE)

PARTS USED

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK	NEXT CAL
-	A&D	GF1200	14632225	LAB	1210 g	0.01 g	HI 1000 g LO 200 g	6 Months	Yes	YES ✓ NO	11-2018

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	200g	200.00	0	.2%	YES / NO	200.00	Balance tested in tolerance
2	500g	500.01	+0.01	.2%	YES / NO	500.01	
3	1000g	1000.03	+0.02	.2%	YES / NO	1000.03	COD Paid
4	g				YES / NO		$216.02
5	g				YES / NO		check # 12740
6	g				YES / NO		

PARTS USED

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

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BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

577472

FOR CUSTOM STACK 593P - COD!!!!!!
14614 CENFIELD ST ALLIANCE, OH 44601

P.O. _____ DATE 5-10-2018

- ❑ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
- ❑ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
- ✓ 1414 Scale St. S.W. **CANTON**, OH 44706-3095 330-453-2424
- ❑ 980 South Marr Rd. **COLUMBUS**, IN 47201 812-372-8374
- ❑ 7550 Jacks Lane **CLAYTON**, OH 45315 937-832-2040
- ❑ 3306 Cavalier Dr. **FORT WAYNE**, IN 46808 260-496-8469
- ❑ 520 Brookpark Rd. **CLEVELAND**, OH 44109-5898 216-661-2660
- ❑ 5525 Galaeo Court **INDIANAPOLIS**, IN 46241 317-548-7821
- ❑ 4070 Perimeter Dr. **COLUMBUS**, OH 43228 614-274-9009
- ❑ 5200 Grand Avenue **PITTSBURGH**, PA 15225 412-299-7960
- ❑ 1001 Findlay Rd. **LIMA**, OH 45801 419-228-5021
- ❑ 477 North Pike Rd. **SARVER**, PA 16055 724-224-7180
- ❑ 1080 National Parkway **MANSFIELD**, OH 44906 419-529-3006
- ❑ 526 31st St. **PARKERSBURG**, WV 26101 304-428-1792
- ❑ 9930 Crescent Park Drive **WEST CHESTER**, OH 45069 513-777-5800
- ❑ 100 McJunkin Road **NITRO**, WV 25143 304-755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF OHIO TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2017-0305

WEIGHT S/N'S LAB 2

SCALE TECHNICIAN: Bob B. BSI 328 (SIGNATURE)

ACCEPTED BY: (SIGNATURE)

PARTS USED

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK	NEXT CAL
-	US SOLID	NONE	NONE	TRAVELLER	500 g	0.001 g	HI 200 g LO 10 g	6 Months	Yes	YES ✓ NO	11-2018

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10.003	+0.003	.2%	YES / (NO)	10.003	Balance tested - in tolerance
2	20g	20.006	+0.006	.2%	YES / (NO)	20.006	
3	50g	50.015	+0.015	.2%	YES / (NO)	50.015	
4	100g	100.032	+0.032	.2%	YES / (NO)	100.032	
5	200g	200.040	+0.040	.2%	YES / (NO)	200.040	
6	g				YES / NO		

PARTS USED

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

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BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

577475

FOR CUSTOM STACK 593P - COD!!!!!!
14614 CENFIELD ST ALLIANCE, OH 44601

P.O. _____ DATE 5-10-2018

- ☐ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
- ☑ 1414 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
- ☐ 7550 Jacks Lane **CLAYTON**, OH 45315 937-832-2040
- ☐ 520 Brookpark Rd. **CLEVELAND**, OH 44109-5898 216-661-2660
- ☐ 4070 Perimeter Dr. **COLUMBUS**, OH 43228 614-274-9009
- ☐ 1001 Finclay Rd. **LIMA**, OH 45801 419-228-5021
- ☐ 1080 National Parkway **MANSFIELD**, OH 44906 419-529-3006
- ☐ 9930 Crescent Park Drive **WEST CHESTER**, OH 45069 513-777-5800
- ☐ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
- ☐ 980 South Marr Rd. **COLUMBUS**, IN 47201 812-372-8374
- ☐ 3306 Cavalier Dr. **FORT WAYNE**, IN 46808 260-496-8469
- ☐ 5525 Galaeo Court **INDIANAPOLIS**, IN 46241 317-548-7821
- ☐ 5200 Grand Avenue **PITTSBURGH**, PA 15225 412-299-7960
- ☐ 477 North Pike Rd. **SARVER**, PA 16055 724-224-7180
- ☐ 526 31st St. **PARKERSBURG**, WV 26101 304-428-1792
- ☐ 100 McJunkin Road **NITRO**, WV 25143 304-755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF Ohio TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2018-0010

WEIGHT S/N'S 70458 Kit

SCALE TECHNICIAN: Bob B. BSI 328 SIGNATURE

ACCEPTED BY: [signature] SIGNATURE

PARTS USED

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK		NEXT CAL
-	OHAUS	SCOUT PRO	7124111434	LAB	2000 --	.1 --	HI 2000 -- / LO 500 --	6 Months	Yes	YES	✓	11-2018
	-	-								NO		

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	500	500.0	Ø	+/-.2%	YES / NO	500.0	Balance tested in-tolerance
2	1000	1000.0	Ø	+/-.2%	YES / NO	1000.0	
3	1500	1500.0	Ø	+/-.2%	YES / NO	1500.0	
4	2000	1999.9	-0.1	+/-.2%	YES / NO	1999.9	
5					YES / NO		
6					YES / NO		

PARTS USED

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

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BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

577473

FOR CUSTOM STACK 593P - COD!!!!!

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. _____ DATE 5-10-2018

- ❑ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
- ☑ 1414 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
- ❑ 7550 Jacks Lane **CLAYTON**, OH 45315 937-832-2040
- ❑ 520 Brookpark Rd. **CLEVELAND**, OH 44109-5898 216-661-2660
- ❑ 4070 Perimeter Dr. **COLUMBUS**, OH 43228 614-274-9009
- ❑ 1001 Findlay Rd. **LIMA**, OH 45801 419-228-5021
- ❑ 1080 National Parkway **MANSFIELD**, OH 44906 419-529-3006
- ❑ 9930 Crescent Park Drive **WEST CHESTER**, OH 45069 513-777-5800
- ❑ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
- ❑ 980 South Marr Rd. **COLUMBUS**, IN 47201 812-372-8374
- ❑ 3306 Cavalier Dr. **FORT WAYNE**, IN 46808 260-496-8469
- ❑ 5525 Galaeo Court **INDIANAPOLIS**, IN 46241 317-548-7821
- ❑ 5200 Grand Avenue **PITTSBURGH**, PA 15225 412-299-7960
- ❑ 477 North Pike Rd. **SARVER**, PA 16055 724-224-7180
- ❑ 526 31st St. **PARKERSBURG**, WV 26101 304-428-1792
- ❑ 100 McJunkin Road **NITRO**, WV 25143 304-755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF OHIO TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2018-0010

WEIGHT S/N'S 70458 KIT

SCALE TECHNICIAN: Bob B. BSI 378 (SIGNATURE)

ACCEPTED BY: [signature] (SIGNATURE)

PARTS USED

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK	NEXT CAL
-	OHAUS	ADVENTURER	1203240794	LAB	4100 g	.1 g	HI 2Kg	6 Months	Yes	YES ✓	11-2018
	-	-	-				LO 0g			NO	

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10.0	Ø	+/-.2%	YES / (NO)	10.0	Balance tested in-tolerance
2	20g	20.0	Ø	+/-.2%	YES / (NO)	20.0	
3	50g	50.0	Ø	+/- 2%	YES / (NO)	50.0	
4	100g	100.0	Ø	+/-.2%	YES / (NO)	100.0	
5	1kg	1000.0	Ø	+/- 2%	YES (NO)	1000.0	
6	2kg	1999.9	-0.1	+/- 2%	YES (NO)	1999.9	

PARTS USED

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

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BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

577471

FOR CUSTOM STACK 583P - COD!!!!!!

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. _____ DATE 5-10-2018

- ❑ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
- ❑ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
- ☑ 1414 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
- ❑ 980 South Marr Rd. **COLUMBUS**, IN 47201 812-372-8374
- ❑ 7550 Jacks Lane **CLAYTON**, OH 45315 937-832-2040
- ❑ 3306 Cavalier Dr. **FORT WAYNE**, IN 46808 260-496-8469
- ❑ 520 Brookpark Rd. **CLEVELAND**, OH 44109-5898 216-661-2660
- ❑ 5525 Galeeo Court **INDIANAPOLIS**, IN 46241 317-548-7821
- ❑ 4070 Perimeter Dr. **COLUMBUS**, OH 43228 614-274-9009
- ❑ 5200 Grand Avenue **PITTSBURGH**, PA 15225 412-299-7960
- ❑ 1001 Findlay Rd. **LIMA**, OH 45801 419-228-5021
- ❑ 477 North Pike Rd. **SARVER**, PA 16055 724-224-7180
- ❑ 1080 National Parkway **MANSFIELD**, OH 44906 419-529-3006
- ❑ 526 31st St. **PARKERSBURG**, WV 26101 304-428-1792
- ❑ 9930 Crescent Park Drive **WEST CHESTER**, OH 45069 513-777-5800
- ❑ 100 McJunkin Road **NITRO**, WV 25143 304-755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF OHIO TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2017-0305

WEIGHT S/N'S LAB 2

SCALE TECHNICIAN: Bob B, BSI 388

ACCEPTED BY: Jerome Gray (SIGNATURE)

PARTS USED

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK	NEXT CAL
-	A&D	HR-200	12323498	LAB	210 g	0.0001 g	HI 200 g LO 10 g	6 Months	Yes	YES ✓ NO	11-2018

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	9.9992	-0.0008	.2%	YES / (NO)	9.9992	Balance tested in-tolerance
2	20g	19.9987	-0.0013	.2%	YES / (NO)	19.9987	
3	50g	49.9970	-0.030	.2%	YES / (NO)	49.9970	
4	100g	99.9945	-0.0055	.2%	YES / (NO)	99.9945	
5	200g	199.9888	-0.0112	.2%	YES / (NO)	199.9888	
6	g				YES / NO		

PARTS USED

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

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BRECHBUHLER SCALES, INC. An ISO Company

SCALE INSPECTION REPORT

577474

FOR CUSTOM STACK 593P - CODIIIIII
14614 CENFIELD ST ALLIANCE, OH 44601

P.O. _____ DATE 5-10-2018

- ☐ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
- ☐ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
- ☑ 1414 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
- ☐ 980 South Marr Rd. **COLUMBUS**, IN 47201 812-372-8374
- ☐ 7550 Jacks Lane **CLAYTON**, OH 45315 937-832-2040
- ☐ 3306 Cavalier Dr. **FORT WAYNE**, IN 46808 260-496-8469
- ☐ 520 Brookpark Rd. **CLEVELAND**, OH 44109-5898 216-661-2660
- ☐ 5525 Galaeo Court **INDIANAPOLIS**, IN 46241 317-548-7821
- ☐ 4070 Perimeter Dr. **COLUMBUS**, OH 43228 614-274-9009
- ☐ 5200 Grand Avenue **PITTSBURGH**, PA 15225 412-299-7960
- ☐ 1001 Findlay Rd. **LIMA**, OH 45801 419-228-5021
- ☐ 477 North Pike Rd. **SARVER**, PA 16055 724-224-7180
- ☐ 1080 National Parkway **MANSFIELD**, OH 44906 419-529-3006
- ☐ 526 31st St. **PARKERSBURG**, WV 26101 304-428-1792
- ☐ 9930 Crescent Park Drive **WEST CHESTER**, OH 45069 513-777-5800
- ☐ 100 McJunkin Road **NITRO**, WV 25143 304 755-0686

TEST WEIGHTS USED ARE CERTIFIED TO COMPLY WITH STANDARD MASSES, AND ARE NIST TRACEABLE.

STATE OF OHIO TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2017-0305

WEIGHT S/N'S LAB 2

SCALE TECHNICIAN: B. BS1378 SIGNATURE

ACCEPTED BY: SIGNATURE

PARTS USED

TAG NO.	MFG	MOD NO.	S/N	LOC.	CAP.	GRAD. SIZE	NORM RNG	CAL FRQ	CLEAN TEST	CAL STICK	NEXT CAL
-	SARTORIUS	A2005	39080133	LAB	100 GM g	0.1 g	HI - g 100g LO - g 0g	6 Months	Yes	YES ✓ NO	11-2018

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	9.9989	-0.0011	+/-.2%	YES / NO	9.9989	Balance tested in-tolerance
2	20g	19.9980	-0.0020	+/-.2%	YES / NO	19.9980	
3	50g	49.9942	-0.0058	+/-.2%	YES / NO	49.9942	
4	100g	99.9880	-0.012	+/-.2%	YES / NO	99.9880	
5	g				YES / NO		
6	g				YES / NO		

PARTS USED

The above indicated equipment has been tested/calibrated by Brechbuhler Scales, Inc. in conformance to ISO 9001 and ANSI/NCSL Z540.

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL FROM BRECHBUHLER SCALES, INC.

ED_014244_00000020-00061

MONITORING INSTRUMENTS

Industrial Environmental Monitoring Instruments, Inc.

7410 Worthington-Galena Road
Worthington, Ohio 43085
Phone: (614) 436-4933
Fax: (614) 436-9144

Website: www.ierents.com

Temperature Calibration Certificate

Instrument: H-B Thermometer
Serial #: 4B5200

Date: 3/6/2018
Technician: Sam Shults

Lab Standard	Thermometer Mark
30.0	30.0
50.0	50.0
70.0	70.0
88.1	88.0

Accuracy = 1 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 8/8/2018
Hart 9103 Temp Dry Well

Instrument must be calibrated and operated according to manufacturers specifications
The calibration standards used are NIST traceable

MONITORING INSTRUMENTS

Industrial Environmental Monitoring Instruments, Inc.

7410 Worthington-Galena Road
Worthington, Ohio 43085
Phone: (614) 436-4933
Fax: (614) 436-9144

Website: www.ierents.com

Temperature Calibration Certificate

Instrument: H-B Thermometer
Serial #: 4A6108

Date: 3/6/2018
Technician: Sam Shults

Lab Standard	Thermometer Mark
170.0	170.0
190.1	190.0
205.2	205.0
215.6	215.0

Accuracy = 1 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 8/8/2018
Hart 9103 Temp Dry Well

Instrument must be calibrated and operated according to manufacturers specifications
The calibration standards used are NIST traceable

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 5-29-18 BY Cody Davis Pb 28.73

CALIBRATIONS IN ICE WATER AND BOILING WATER USING A H-B PRECISION GLASS THERMOMETER No. 4B5200, ASTM NO. 63F FOR ICE WATER AND H-B NO. 4A6108, ASTM NO. 66F FOR BOILING WATER.

	ICE WATER		BOILING WATER	
TC	PRECISION	TC	PRECISION	TC
OVEN THERMOCOUPLES				
O-1	32	33	212	212
O-2	32	32	212	212
O-3	32	32	212	212
O-4	32	32	212	212
O-5	32	32	212	212
O-6	32	32	212	212
O-7	32	32	212	212
O-8	32	32	212	212
O-9	32	32	212	211
O-10	32	32	212	212
O-11	32	32	212	212
O-12	32	32	212	212
STACK THERMOCOUPLES				
2S-1	32	32	212	212
2S-2	32	32	212	212
2S-3	32	32	212	212
3S-1	32	32	212	212
3S-2	32	33	212	212
3S-3	32	32	212	212
3S-4	32	32	212	212
3S-5	32	32	212	212
4S-1	32	32	212	212
4S-2	32	32	212	212
4S-3	32	31	212	212
4S-4	32	32	212	211
4S-5	32	32	212	212
4S-6	32	32	212	212
5S-1	32	32	212	212
5S-2	32	32	212	212
5S-3	32	32	212	212
6S-1	32	32	212	212
6S-2	32	32	212	212
6S-3	32	32	212	212
6S-4	32	32	212	212
8S-1	32	32	212	212
8S-2	32	32	212	212
10S-1	32	31	212	212
10S-2	32	32	212	212
12S-1	32		212	

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 5-29-18 BY Cody Davis Pb 28.73

CALIBRATIONS IN ICE WATER AND BOILING WATER USING A H-B PRECISION GLASS THERMOMETER No. 4B5200, ASTM NO. 63F FOR ICE WATER AND H-B NO. 4A6108, ASTM NO. 66F FOR BOILING WATER.

	ICE WATER		BOILING WATER	
TC METER THERMOCOUPLES	PRECISION	TC	PRECISION	TC
1M-1	32	32	212	212
1M-2	32	32	212	212
2M-1	32	33	212	212
2M-2	32	32	212	212
3M-1	32	32	212	213
3M-2	32	32	212	212
4M-1	32	32	212	212
4M-2	32	32	212	212
5M-1	32	32	212	212
5M-2	32	32	212	212
6M-1	32	32	212	212
6M-2	32	32	212	212
7M-1	32	32	212	212
7M-2	32	32	212	212
8M-1	32	32	212	212
8M-2	32	32	212	212
9M-1	32	32	212	212
9M-2	32	33	212	212
10M-1	32	32	212	212
10M-2	32	32	212	212
15M-1	32	32	212	212
15M-2	32	32	212	212
17M-1	32	32	212	212
17M-2	32	32	212	213
18M-1	32	32	212	212
18M-2	32	32	212	212

THERMOCOUPLE TEMPERATURES ARE READ ON THE DTI DURING TEST.

DTI CALIBRATED BY ALTEK 22 TC SOURCE S# 148946 OR S# 243783 PRIOR TO TC CAL.

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 5-29-18 BY Cody Davis Pb 28.73

CALIBRATIONS IN ICE WATER AND BOILING WATER USING A H-B PRECISION GLASS THERMOMETER No. 4B5200, ASTM NO. 63F FOR ICE WATER AND H-B NO. 4A6108, ASTM NO. 66F FOR BOILING WATER.

	ICE WATER		BOILING WATER	
TC	PRECISION	TC	PRECISION	TC
CONDENSOR THERMOCOUPLES				
C-1	32	32	212	212
C-2	32	32	212	212
C-3	32	32	212	213
C-4	32	32	212	212
C-5	32	32	212	212
C-6	32	32	212	212
C-7	32	32	212	212
C-8	32	33	212	212
C-9	32	32	212	212
PROBE THERMOCOUPLES				
2P-1	32	32	212	212
2P-2	32	32	212	212
2P-3	32	32	212	212
3P-1	32	32	212	212
3P-2	32	32	212	212
3P-3	32	32	212	212
3P-4	32	32	212	212
3P-5	32	32	212	212
4P-1	32	32	212	212
4P-2	32	32	212	211
4P-3	32	32	212	212
40-4	32	32	212	212
4P-5	32	32	212	212
4P-6	32	33	212	212
5P-1	32	32	212	212
5P-2	32	32	212	212
5P-3	32	32	212	212
6P-1	32	32	212	212
6P-2	32	32	212	212
6P-3	32	32	212	212
6P-4	32	32	212	212
8P-1	32	32	212	212
8P-2	32	32	212	212
10P-1	32	32	212	212
10P-2	32	32	212	212
12P-1	32	32	212	212

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 5-29-18 BY Cody Davis Pb 28.73

CALIBRATIONS IN ICE WATER AND BOILING WATER USING A H-B PRECISION GLASS THERMOMETER No. 4B5200, ASTM NO. 63F FOR ICE WATER AND H-B NO. 4A6108, ASTM NO. 66F FOR BOILING WATER.

	ICE WATER		BOILING WATER	
TC	PRECISION	TC	PRECISION	TC
BACK HALF THERMOCOUPLES				
BH-1	32	32	212	212
BH-2	32	32	212	212
BH-3	32	32	212	212
BH-4	32	32	212	212
BH-5	32	32	212	212
BH-6	32	32	212	212
BH-7	32	32	212	213
BH-8	32	32	212	212
BH-9	32	32	212	212
SPLIT BOX OVEN THERMOCOUPLES				
SB-1	32	32	212	212
SB-2	32	32	212	212
SB-3	32	32	212	212

Pitot Tube Inspection

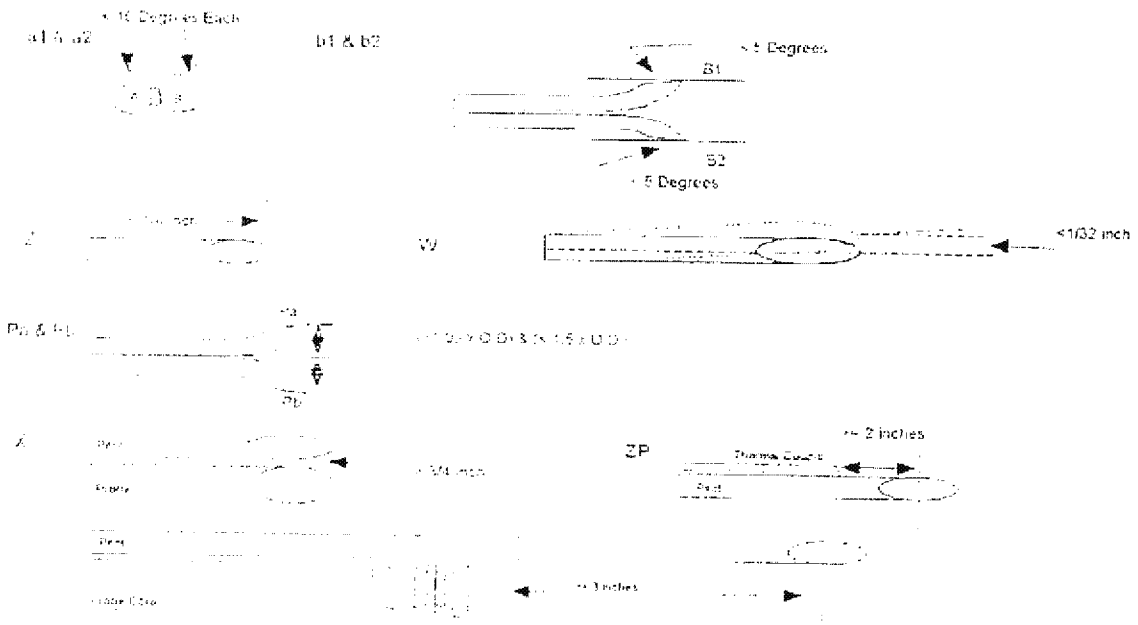
Client: _____ Date: 6-07-18

Probe/Pitot Number	3P5	A (Pa + Pb)	.857
Level and Perpendicular	yes	Zs= A tan Y (< 0.125")	0
Obstruction?	no	Ws= A tan 0 (< 0.03125")	0
Damaged?	no	D_t (0.1875" < D_t < 0.375")	.375
a_1 (-10° < a_1 < +10°)	0	P_a (1.05 D_t < P_a < 1.5 D_t)	.428
a_2 (-10° < a_2 < +10°)	0	P_b (1.05 D_t < P_b < 1.5 D_t)	.482
b_1 (-5° < b_1 < +5°)	0	Pa = Pb ± 0.063"	.007
b_2 (-5° < b_2 < +5°)	0		

Probe Minimum Interferences

Y (>= 3.0")		D_t	
X (> .75")		X /D_t (>= 1.5")	
Zp (>= .75")			

Pa	Distance between where pitots adjoin to tip of pitot (Must be between 1.05 & 1.50 times O.D. of tubing)
Pb	Distance between where pitots adjoin to tip of pitot (Must be between 1.05 & 1.50 times O.D. of tubing)
Dt	Diameter of pitot tube (0.375 inches on all pitots)
Zs	Distance between the tip of the impact and static line along the length of the pitot (Must be <1/8 inch(0.1250))
Ws	Spacing between Pitot tubes where welded together (Must be <1/32 inch (0.0313))
a1	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <10 Deg)
a2	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <10 Deg)
b1	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <5 Deg)
b2	Angle across opening of Pitot tube from side to side or perpendicular to length of probe (Must be <5 Deg)
X	Distance between side of nozzle and side of pitot tube (Must be >3/4 inch)
Zp	Distance from center of pitot opening back to tip of thermal couple (Must be >=3/4 inch (0.75))
Y	Distance from center of pitot opening back to probe (Must be >=3 inches)



Appendix #4

Monitoring Data

Renergy - Dovetail
B001 Engine Outlet

NOx	Gas	Cal
High	547.7	548
Mid	290.4	291
Zero	0	0.4

O2	Gas	Cal
High	20	20
Mid	10.43	10.4
Zero	0	0

CO	Gas	Cal
High	999	1001
Mid	584	585
Zero	0	0.3

CO	NOx	O2	VOC	Time Stamp		
3.12	-0.38	10.35	-1.64	6/7/2018 7:29:08 AM	O2 Bias Nox CO Zero	
3.12	-0.38	12.08	0.00	6/7/2018 7:30:08 AM		
48.31	-1.17	9.61	-1.64	6/7/2018 7:31:08 AM		
263.37	80.42	0.35	-3.28	6/7/2018 7:32:08 AM		
286.75	290.30	0.02	-1.64	6/7/2018 7:33:08 AM	Nox Bias VOC O2 Zero	
297.66	292.24	0.06	45.90	6/7/2018 7:34:08 AM		
779.20	286.75	1.10	778.62	6/7/2018 7:35:09 AM		
991.26	78.07	0.06	934.35	6/7/2018 7:36:09 AM		
1000.23	-0.38	0.12	999.42	6/7/2018 7:37:11 AM	VOC High	
994.26	-1.95	0.14	1029.42	6/7/2018 7:38:09 AM		
952.19	-1.95	4.13	727.81	6/7/2018 7:39:09 AM		
738.68	41.20	3.31	590.11	6/7/2018 7:40:09 AM		
120.00	156.52	-0.04	377.02	6/7/2018 7:41:09 AM		
59.22	165.15	3.74	380.30	6/7/2018 7:42:10 AM	VOC Low	
3.12	74.15	0.12	427.83	6/7/2018 7:43:10 AM		
67.52	9.81	5.97	573.72	6/7/2018 7:44:10 AM		
537.65	111.80	0.10	581.92	6/7/2018 7:45:10 AM		
583.23	36.49	0.08	593.39	6/7/2018 7:46:10 AM	CO VOC Bias	
582.84	6.68	0.12	596.67	6/7/2018 7:47:10 AM		
690.37	2.75	5.26	604.87	6/7/2018 7:48:11 AM		
969.33	53.08	7.89	588.47	6/7/2018 7:49:11 AM	NOx Converter	
964.65	53.06	8.00	596.67	6/7/2018 7:50:11 AM		
908.55	24.18	8.08	591.75	6/7/2018 7:51:11 AM		
908.55	105.55	8.14	588.47	6/7/2018 7:52:11 AM		
885.17	192.61	8.26	570.44	6/7/2018 7:53:11 AM		
899.20	192.61	8.30	562.25	6/7/2018 7:54:11 AM		
868.03	205.95	8.44	572.08	6/7/2018 7:55:12 AM		
852.45	194.18	8.49	570.44	6/7/2018 7:56:12 AM		
838.42	192.61	8.61	565.53	6/7/2018 7:57:12 AM		
839.98	190.26	8.69	555.69	6/7/2018 7:58:12 AM		
841.54	192.61	8.77	554.05	6/7/2018 7:59:12 AM		
811.93	193.39	8.89	554.05	6/7/2018 8:00:12 AM		
779.20	183.19	7.08	414.72	6/7/2018 8:01:13 AM		
121.56	165.94	-0.29	297.19	6/7/2018 8:02:13 AM		
3.12	43.55	-0.38	288.83	6/7/2018 8:03:13 AM		
1.56	17.66	-0.37	270.47	6/7/2018 8:04:13 AM		
1.56	9.81	-0.38	270.30	6/7/2018 8:05:13 AM		
1.56	7.46	-0.38	269.50	6/7/2018 8:06:13 AM	Methane High	289
1.56	4.32	1.82	211.46	6/7/2018 8:07:13 AM		
3.12	2.75	9.41	-1.64	6/7/2018 8:08:16 AM		
1.56	2.75	10.41	-3.28	6/7/2018 8:09:14 AM	Methane Zero	
1.56	2.75	13.93	4.92	6/7/2018 8:10:14 AM		
1.56	1.97	18.57	0.00	6/7/2018 8:11:14 AM		
1.56	1.18	20.24	0.00	6/7/2018 8:12:14 AM		
1.56	1.18	20.53	-1.64	6/7/2018 8:13:14 AM		
1.56	1.18	20.63	-1.64	6/7/2018 8:14:14 AM		
1.56	0.40	20.65	-1.64	6/7/2018 8:15:15 AM		
1.56	0.40	20.67	-3.28	6/7/2018 8:16:15 AM		

1.56	1.18	20.67	-1.64	6/7/2018 8:17:15 AM
1.56	0.40	20.69	-1.64	6/7/2018 8:18:15 AM
3.12	0.40	20.69	0.00	6/7/2018 8:19:15 AM
3.12	1.18	20.69	-3.28	6/7/2018 8:20:15 AM
1.56	-0.38	20.69	-1.64	6/7/2018 8:21:16 AM
1.56	-0.38	20.71	-1.64	6/7/2018 8:22:16 AM
1.56	-0.38	20.73	-1.64	6/7/2018 8:23:16 AM
1.56	0.40	20.71	-1.64	6/7/2018 8:24:16 AM
1.56	0.40	20.71	-3.28	6/7/2018 8:25:16 AM
1.56	-0.38	20.71	-1.64	6/7/2018 8:26:16 AM
1.56	-1.17	20.71	-1.64	6/7/2018 8:27:17 AM
1.56	-0.38	20.71	-3.28	6/7/2018 8:28:17 AM
49.87	-0.38	9.24	3.28	6/7/2018 8:29:17 AM
232.20	69.44	6.46	-3.28	6/7/2018 8:30:17 AM
35.84	243.60	19.47	-1.64	6/7/2018 8:31:17 AM
1.56	27.07	20.63	-1.64	6/7/2018 8:32:17 AM
1.56	0.40	20.67	-1.64	6/7/2018 8:33:17 AM
1.56	0.40	20.69	-1.64	6/7/2018 8:34:17 AM
3.12	0.40	20.71	-1.64	6/7/2018 8:35:18 AM
1.56	-0.38	20.71	-1.64	6/7/2018 8:36:18 AM
17.14	0.40	12.02	-3.28	6/7/2018 8:37:18 AM
0.00	12.17	10.61	-1.64	6/7/2018 8:38:18 AM
144.93	0.40	2.97	-3.28	6/7/2018 8:39:18 AM
144.93	183.98	13.95	-1.64	6/7/2018 8:40:18 AM
3.12	133.77	20.24	-1.64	6/7/2018 8:41:19 AM
1.56	1.97	18.34	-1.64	6/7/2018 8:42:19 AM
1.56	0.40	18.36	0.00	6/7/2018 8:43:19 AM
1.56	-0.38	18.38	-1.64	6/7/2018 8:44:19 AM
1.56	-0.38	18.36	-1.64	6/7/2018 8:45:19 AM
1.56	0.40	18.34	-1.64	6/7/2018 8:46:19 AM
1.56	-0.38	18.34	-1.64	6/7/2018 8:47:19 AM
1.56	-0.38	18.32	-1.64	6/7/2018 8:48:20 AM
1.56	-0.38	18.30	-3.28	6/7/2018 8:49:20 AM
1.56	-0.38	18.28	-3.28	6/7/2018 8:50:20 AM
1.56	-0.38	18.26	-1.64	6/7/2018 8:51:20 AM
1.56	0.40	18.24	-1.64	6/7/2018 8:52:20 AM
1.56	0.40	18.26	-1.64	6/7/2018 8:53:20 AM
1.56	-0.38	18.24	-1.64	6/7/2018 8:54:21 AM
1.56	-0.38	18.22	-3.28	6/7/2018 8:55:21 AM
1.56	-0.38	18.24	-1.64	6/7/2018 8:56:21 AM
0.00	-1.17	18.24	-1.64	6/7/2018 8:57:21 AM
1.56	-0.38	18.24	-1.64	6/7/2018 8:58:21 AM
1.56	-0.38	18.26	0.00	6/7/2018 8:59:21 AM
1.56	0.40	18.24	-3.28	6/7/2018 9:00:22 AM
1.56	-0.38	18.26	-1.64	6/7/2018 9:01:22 AM
1.56	0.40	18.26	-3.28	6/7/2018 9:02:22 AM
1.56	-0.38	18.26	-1.64	6/7/2018 9:03:22 AM
1.56	0.40	18.26	0.00	6/7/2018 9:04:22 AM
1.56	0.40	18.28	-1.64	6/7/2018 9:05:22 AM
1.56	-0.38	18.26	0.00	6/7/2018 9:06:22 AM
1.56	0.40	18.26	-3.28	6/7/2018 9:07:23 AM
1.56	0.40	18.63	0.00	6/7/2018 9:08:23 AM
1.56	-0.38	20.80	-1.64	6/7/2018 9:09:23 AM
1.56	-0.38	20.94	-3.28	6/7/2018 9:10:23 AM
1.56	0.40	20.00	-3.28	6/7/2018 9:11:23 AM
1.56	-1.17	8.75	-1.64	6/7/2018 9:12:23 AM
3.12	1.18	0.06	-1.64	6/7/2018 9:13:24 AM
3.12	0.40	12.37	-3.28	6/7/2018 9:14:24 AM
3.12	1.18	10.47	-3.28	6/7/2018 9:15:24 AM
3.12	1.18	8.65	0.00	6/7/2018 9:16:24 AM
3.12	0.40	4.03	-1.64	6/7/2018 9:17:24 AM
3.12	1.18	20.88	-3.28	6/7/2018 9:18:24 AM
1.56	1.18	20.98	-1.64	6/7/2018 9:19:24 AM

6.23	1.18	21.08	-1.64	6/7/2018 9:20:24 AM		
3.12	1.97	21.08	-1.64	6/7/2018 9:21:25 AM		
95.06	1.18	9.49	-3.28	6/7/2018 9:22:25 AM		
266.49	117.29	4.42	-1.64	6/7/2018 9:23:25 AM		
252.46	266.35	4.19	-3.28	6/7/2018 9:24:25 AM		
288.30	281.26	2.07	-3.28	6/7/2018 9:25:25 AM		
364.67	318.92	0.37	-1.64	6/7/2018 9:26:25 AM		
263.37	358.14	8.81	-1.64	6/7/2018 9:27:25 AM		
225.97	234.19	3.42	-3.28	6/7/2018 9:28:26 AM		
101.30	259.29	19.55	-3.28	6/7/2018 9:29:26 AM		
3.12	85.91	20.57	0.00	6/7/2018 9:30:26 AM		
1.56	1.18	20.67	0.00	6/7/2018 9:31:26 AM		
1.56	0.40	20.71	-1.64	6/7/2018 9:32:26 AM		
1.56	-0.38	20.75	-1.64	6/7/2018 9:33:26 AM		
4.68	-1.17	19.20	0.00	6/7/2018 9:34:27 AM		
174.54	5.89	14.17	0.00	6/7/2018 9:35:27 AM		
74.80	12.17	12.80	-3.28	6/7/2018 9:36:27 AM		
238.44	44.33	8.42	-3.28	6/7/2018 9:37:27 AM		
32.73	242.03	20.57	-1.64	6/7/2018 9:38:27 AM		
1.56	20.80	20.71	-1.64	6/7/2018 9:39:27 AM		
3.12	0.40	20.75	-3.28	6/7/2018 9:40:28 AM		
3.12	-0.38	20.75	-1.64	6/7/2018 9:41:28 AM		
1.56	-0.38	20.77	-1.64	6/7/2018 9:42:28 AM		
1.56	0.40	20.77	-1.64	6/7/2018 9:43:28 AM		
1.56	-0.38	20.69	-1.64	6/7/2018 9:44:28 AM		
4.68	-0.38	20.57	-1.64	6/7/2018 9:45:28 AM		
230.64	1.97	7.14	-3.28	6/7/2018 9:46:29 AM		
532.97	5.89	5.58	-4.92	6/7/2018 9:47:29 AM		
255.58	-0.38	4.50	104.91	6/7/2018 9:48:29 AM		
559.47	-0.38	0.45	567.16	6/7/2018 9:49:29 AM		
582.84	-0.38	0.02	603.23	6/7/2018 9:50:29 AM		
579.73	0.40	0.10	603.23	6/7/2018 9:51:29 AM		
539.21	0.40	0.72	278.66	6/7/2018 9:52:29 AM		
286.75	34.13	0.20	-1.64	6/7/2018 9:53:30 AM		
263.37	265.57	0.14	-1.64	6/7/2018 9:54:30 AM		
263.37	293.03	0.16	-1.64	6/7/2018 9:55:30 AM		
261.81	292.24	0.18	0.00	6/7/2018 9:56:30 AM		
160.52	292.24	6.89	-1.64	6/7/2018 9:57:30 AM		
4.68	165.15	9.22	0.00	6/7/2018 9:58:30 AM		
1.56	3.54	10.43	-3.28	6/7/2018 9:59:30 AM		
1.56	0.40	10.51	-3.28	6/7/2018 10:00:31 AM		
15.58	0.40	9.06	219.65	6/7/2018 10:01:31 AM		
458.17	9.81	0.23	603.23	6/7/2018 10:02:31 AM		
652.97	8.25	4.93	626.18	6/7/2018 10:03:31 AM		
652.97	67.08	2.97	195.07	6/7/2018 10:04:31 AM		
14.03	117.29	0.18	68.85	6/7/2018 10:05:31 AM		
4.68	7.46	0.02	68.85	6/7/2018 10:06:32 AM	Methane Low	88
1.56	1.97	0.65	208.18	6/7/2018 10:07:32 AM		
601.54	1.18	8.04	619.62	6/7/2018 10:08:32 AM		
771.41	139.26	4.40	304.89	6/7/2018 10:09:32 AM		
35.84	149.46	0.02	134.41	6/7/2018 10:10:32 AM		
4.68	16.09	-0.14	137.69	6/7/2018 10:11:33 AM	Mthane Mid	157
3.12	4.32	-0.33	140.97	6/7/2018 10:12:32 AM		
243.11	1.97	4.91	519.63	6/7/2018 10:13:34 AM		
977.12	74.15	7.89	593.39	6/7/2018 10:14:33 AM		
981.79	194.96	7.99	586.84	6/7/2018 10:15:33 AM		
974.00	202.02	8.02	599.95	6/7/2018 10:16:33 AM		
964.65	202.02	8.14	588.47	6/7/2018 10:17:33 AM		
947.51	209.08	8.16	586.84	6/7/2018 10:18:33 AM		
947.51	202.81	8.18	581.92	6/7/2018 10:19:34 AM		
935.04	205.16	8.26	572.08	6/7/2018 10:20:34 AM		
941.28	202.81	8.24	555.69	6/7/2018 10:21:34 AM		
950.63	202.81	8.22	562.25	6/7/2018 10:22:34 AM		

959.98	206.73	8.18	558.97	6/7/2018 10:23:34 AM	
966.21	208.30	8.08	560.61	6/7/2018 10:24:34 AM	
961.54	209.87	8.08	567.16	6/7/2018 10:25:34 AM	
966.21	205.16	8.00	550.77	6/7/2018 10:26:34 AM	
966.21	205.95	8.00	555.69	6/7/2018 10:27:35 AM	
977.12	205.95	7.97	557.33	6/7/2018 10:28:35 AM	
980.24	205.95	8.02	552.41	6/7/2018 10:29:35 AM	
969.33	209.08	8.06	552.41	6/7/2018 10:30:35 AM	Start Run 1
964.65	204.38	7.99	557.33	6/7/2018 10:31:35 AM	
974.00	202.81	7.85	554.05	6/7/2018 10:32:35 AM	
995.82	202.81	7.85	552.41	6/7/2018 10:33:36 AM	
984.91	210.65	7.85	567.16	6/7/2018 10:34:36 AM	
995.82	206.73	7.81	557.33	6/7/2018 10:35:36 AM	
986.47	210.65	7.79	572.08	6/7/2018 10:36:36 AM	
983.35	209.08	7.79	558.97	6/7/2018 10:37:36 AM	
985.50	207.52	7.75	560.61	6/7/2018 10:38:36 AM	
995.82	212.22	7.71	555.69	6/7/2018 10:39:36 AM	
982.05	210.65	7.69	567.16	6/7/2018 10:40:37 AM	
980.50	212.22	7.71	558.97	6/7/2018 10:41:37 AM	
979.85	212.22	7.71	560.61	6/7/2018 10:42:37 AM	
991.15	213.79	7.71	555.69	6/7/2018 10:43:37 AM	
974.00	211.44	7.71	560.61	6/7/2018 10:44:37 AM	
947.51	212.22	7.71	568.80	6/7/2018 10:45:37 AM	
905.43	207.52	7.67	562.25	6/7/2018 10:46:38 AM	
922.58	207.52	7.71	562.25	6/7/2018 10:47:38 AM	
972.44	213.79	7.67	560.61	6/7/2018 10:48:38 AM	
976.34	208.30	7.65	568.80	6/7/2018 10:49:38 AM	
968.29	208.30	7.59	562.25	6/7/2018 10:50:38 AM	
960.50	210.65	7.71	563.89	6/7/2018 10:51:38 AM	
959.98	213.01	7.71	568.80	6/7/2018 10:52:39 AM	
958.42	201.24	7.69	570.44	6/7/2018 10:53:39 AM	
980.24	202.81	7.65	554.05	6/7/2018 10:54:39 AM	
972.44	209.08	7.65	549.13	6/7/2018 10:55:39 AM	
972.44	204.38	7.59	560.61	6/7/2018 10:56:39 AM	
984.91	204.38	7.55	563.89	6/7/2018 10:57:39 AM	
977.12	205.95	7.55	573.72	6/7/2018 10:58:39 AM	
977.12	202.02	7.50	572.08	6/7/2018 10:59:39 AM	
991.15	200.45	7.50	570.44	6/7/2018 11:00:40 AM	
994.26	205.16	7.50	567.16	6/7/2018 11:01:40 AM	
998.29	206.73	7.44	557.33	6/7/2018 11:02:40 AM	
993.61	210.65	7.44	567.16	6/7/2018 11:03:40 AM	
995.17	209.87	7.44	563.89	6/7/2018 11:04:40 AM	
992.70	209.87	7.44	570.44	6/7/2018 11:05:40 AM	
988.29	207.52	7.36	567.16	6/7/2018 11:06:41 AM	
984.52	213.01	7.38	580.28	6/7/2018 11:07:41 AM	
974.00	211.44	7.36	577.00	6/7/2018 11:08:41 AM	
978.68	203.59	7.40	575.36	6/7/2018 11:09:41 AM	
963.09	210.65	7.46	573.72	6/7/2018 11:10:41 AM	
967.77	206.73	7.42	558.97	6/7/2018 11:11:41 AM	
963.09	210.65	7.57	554.05	6/7/2018 11:12:41 AM	
945.95	209.87	7.55	557.33	6/7/2018 11:13:42 AM	
949.07	201.24	7.53	557.33	6/7/2018 11:14:42 AM	
956.86	202.02	7.53	557.33	6/7/2018 11:15:42 AM	
953.74	205.16	7.52	563.89	6/7/2018 11:16:42 AM	
978.68	203.59	7.48	570.44	6/7/2018 11:17:42 AM	
984.91	204.38	7.48	554.05	6/7/2018 11:18:42 AM	
998.94	205.16	7.46	555.69	6/7/2018 11:19:42 AM	
992.70	209.08	7.46	567.16	6/7/2018 11:20:43 AM	
984.91	204.38	7.44	560.61	6/7/2018 11:21:43 AM	
998.94	204.38	7.42	557.33	6/7/2018 11:22:43 AM	
997.38	206.73	7.42	562.25	6/7/2018 11:23:43 AM	
981.79	208.30	7.46	563.89	6/7/2018 11:24:43 AM	

983.35	202.02	7.40	568.80	6/7/2018 11:25:43 AM		
977.12	202.02	7.38	568.80	6/7/2018 11:26:44 AM		
992.70	201.24	7.36	557.33	6/7/2018 11:27:44 AM		
983.35	206.73	7.36	563.89	6/7/2018 11:28:44 AM		
974.00	208.30	7.34	565.53	6/7/2018 11:29:44 AM		
981.79	203.59	7.34	562.25	6/7/2018 11:30:44 AM	Stop Run 1	
976.72	207.25	7.58	563.11		Avg	
986.47	208.30	7.32	560.61	6/7/2018 11:31:44 AM		
978.68	211.44	7.32	567.16	6/7/2018 11:32:44 AM		
889.85	205.95	4.50	275.39	6/7/2018 11:33:45 AM		
299.21	214.58	-0.96	0.00	6/7/2018 11:34:45 AM		
263.37	304.01	-0.39	-1.64	6/7/2018 11:35:45 AM		
269.60	304.80	-0.36	0.00	6/7/2018 11:36:45 AM		
272.72	300.87	-0.38	-3.28	6/7/2018 11:37:45 AM		
274.28	299.30	-0.43	-1.64	6/7/2018 11:38:46 AM	Nox Bias VOC Zero	
282.07	299.30	0.04	152.45	6/7/2018 11:39:46 AM		
520.51	297.74	-0.35	591.75	6/7/2018 11:40:46 AM		
607.78	67.08	-0.45	593.39	6/7/2018 11:41:46 AM		
610.89	6.68	-0.49	595.03	6/7/2018 11:42:46 AM	CO VOC Bias O2 Zero	
612.45	5.11	0.47	598.31	6/7/2018 11:43:46 AM		
652.97	5.89	9.08	162.28	6/7/2018 11:44:46 AM		
18.70	109.45	10.71	-3.28	6/7/2018 11:45:46 AM		
1.56	7.46	10.74	-1.64	6/7/2018 11:46:47 AM		
1.56	4.32	10.78	-1.64	6/7/2018 11:47:47 AM		
1.56	3.54	10.80	-1.64	6/7/2018 11:48:47 AM	O2 Bias NOx CO Zero	
185.45	2.75	9.41	431.11	6/7/2018 11:49:47 AM		
624.92	67.08	2.49	286.86	6/7/2018 11:50:47 AM		
7.79	122.00	-0.39	293.42	6/7/2018 11:51:47 AM	Metane 873	303
1.56	7.46	-0.48	293.42	6/7/2018 11:52:47 AM		
9.35	4.32	0.96	404.88	6/7/2018 11:53:48 AM		
811.93	9.81	8.18	588.47	6/7/2018 11:54:48 AM		
1097.12	195.75	8.32	580.28	6/7/2018 11:55:48 AM		
1084.65	229.48	8.44	565.53	6/7/2018 11:56:48 AM		
766.74	230.27	0.86	529.46	6/7/2018 11:57:48 AM		
603.10	107.88	-0.43	314.73	6/7/2018 11:58:48 AM		
607.78	12.95	-0.33	573.72	6/7/2018 11:59:49 AM		
556.35	7.46	-0.31	596.67	6/7/2018 12:00:49 PM		
561.03	4.32	-0.35	596.67	6/7/2018 12:01:49 PM		
584.40	2.75	-0.33	596.67	6/7/2018 12:02:49 PM		
578.17	1.97	2.62	365.54	6/7/2018 12:03:49 PM		
101.30	12.95	10.82	-3.28	6/7/2018 12:04:49 PM		
0.00	5.11	10.41	-3.28	6/7/2018 12:05:49 PM		
31.17	0.40	7.53	39.34	6/7/2018 12:06:50 PM		
255.58	31.00	0.29	122.94	6/7/2018 12:07:50 PM		
730.89	278.91	7.87	590.11	6/7/2018 12:08:50 PM		
1019.20	238.11	8.06	580.28	6/7/2018 12:09:50 PM		
1020.75	220.07	8.16	580.28	6/7/2018 12:10:50 PM		
988.03	227.13	8.30	581.92	6/7/2018 12:11:50 PM		
998.94	225.56	8.30	573.72	6/7/2018 12:12:51 PM		
988.03	225.56	8.34	575.36	6/7/2018 12:13:51 PM		
944.39	217.71	8.42	572.08	6/7/2018 12:14:51 PM		
956.86	205.95	8.36	562.25	6/7/2018 12:15:51 PM	Start Run 2	
980.24	211.44	8.28	568.80	6/7/2018 12:16:51 PM		
935.04	213.79	8.40	573.72	6/7/2018 12:17:51 PM		
950.63	208.30	8.32	560.61	6/7/2018 12:18:52 PM		
963.09	214.58	8.30	565.53	6/7/2018 12:19:52 PM		
961.54	215.36	8.28	570.44	6/7/2018 12:20:52 PM		
947.51	215.36	8.32	568.80	6/7/2018 12:21:52 PM		
950.63	213.79	8.30	554.05	6/7/2018 12:22:52 PM		
944.39	214.58	8.28	554.05	6/7/2018 12:23:52 PM		
947.51	211.44	8.26	547.49	6/7/2018 12:24:52 PM		

950.63	213.01	8.26	552.41	6/7/2018 12:25:53 PM	
956.86	216.14	8.24	550.77	6/7/2018 12:26:53 PM	
947.51	216.14	8.26	560.61	6/7/2018 12:27:53 PM	
942.83	213.01	8.26	555.69	6/7/2018 12:28:53 PM	
942.83	213.01	8.24	558.97	6/7/2018 12:29:53 PM	
949.07	213.01	8.18	552.41	6/7/2018 12:30:53 PM	
961.54	211.44	8.14	558.97	6/7/2018 12:31:54 PM	
945.95	213.79	8.14	557.33	6/7/2018 12:32:54 PM	
966.21	208.30	8.12	547.49	6/7/2018 12:33:54 PM	
964.65	216.93	8.12	558.97	6/7/2018 12:34:54 PM	
952.19	213.01	8.10	568.80	6/7/2018 12:35:54 PM	
958.42	207.52	8.06	563.89	6/7/2018 12:36:54 PM	
969.33	207.52	8.04	558.97	6/7/2018 12:37:54 PM	
975.56	209.87	8.04	567.16	6/7/2018 12:38:54 PM	
969.33	213.79	8.06	563.89	6/7/2018 12:39:55 PM	
949.07	209.87	8.10	567.16	6/7/2018 12:40:55 PM	
949.07	204.38	8.10	562.25	6/7/2018 12:41:55 PM	
963.09	203.59	8.06	557.33	6/7/2018 12:42:55 PM	
964.65	209.87	8.06	555.69	6/7/2018 12:43:55 PM	
955.30	212.22	8.04	572.08	6/7/2018 12:44:55 PM	
947.51	206.73	8.06	570.44	6/7/2018 12:45:55 PM	
952.19	199.67	8.08	567.16	6/7/2018 12:46:56 PM	
963.09	198.89	8.12	558.97	6/7/2018 12:47:56 PM	
978.68	205.16	8.08	557.33	6/7/2018 12:48:56 PM	
978.68	209.08	8.06	557.33	6/7/2018 12:49:56 PM	
977.12	206.73	8.02	562.25	6/7/2018 12:50:56 PM	
969.33	205.16	8.00	568.80	6/7/2018 12:51:56 PM	
981.79	200.45	7.97	558.97	6/7/2018 12:52:57 PM	
984.91	205.16	7.95	563.89	6/7/2018 12:53:57 PM	
983.35	205.16	7.91	558.97	6/7/2018 12:54:57 PM	
991.15	202.81	7.87	563.89	6/7/2018 12:55:57 PM	
988.03	199.67	7.77	572.08	6/7/2018 1:00:58 PM	
981.79	202.02	7.75	570.44	6/7/2018 1:01:58 PM	
969.33	198.89	7.77	572.08	6/7/2018 1:02:58 PM	
969.33	194.18	7.77	555.69	6/7/2018 1:03:58 PM	
972.44	194.18	7.75	560.61	6/7/2018 1:04:58 PM	
964.65	194.96	7.71	562.25	6/7/2018 1:05:59 PM	
961.54	193.39	7.71	563.89	6/7/2018 1:06:59 PM	
970.89	189.47	7.71	570.44	6/7/2018 1:07:59 PM	
949.07	191.82	7.75	565.53	6/7/2018 1:08:59 PM	
963.09	185.55	7.77	562.25	6/7/2018 1:09:59 PM	
953.74	191.04	7.81	568.80	6/7/2018 1:10:59 PM	
956.86	185.55	7.81	565.53	6/7/2018 1:12:00 PM	
955.30	187.90	7.81	560.61	6/7/2018 1:13:00 PM	
947.51	187.90	7.83	573.72	6/7/2018 1:14:00 PM	
935.04	183.19	7.85	573.72	6/7/2018 1:15:00 PM	
950.63	177.70	7.81	562.25	6/7/2018 1:16:00 PM	
950.63	184.76	7.83	572.08	6/7/2018 1:17:00 PM	
939.72	183.98	7.87	560.61	6/7/2018 1:18:00 PM	
939.72	180.06	7.91	562.25	6/7/2018 1:19:01 PM	Stop Run 2
959.98	203.37	8.03	559.71		Avg
945.95	179.27	7.89	558.97	6/7/2018 1:20:01 PM	
953.74	183.98	7.05	377.02	6/7/2018 1:21:01 PM	
412.98	187.90	-0.02	-1.64	6/7/2018 1:22:01 PM	
268.05	288.32	-0.23	-1.64	6/7/2018 1:23:01 PM	
269.60	299.30	-0.33	-1.64	6/7/2018 1:24:01 PM	
269.60	293.03	-0.39	-3.28	6/7/2018 1:25:28 PM	Nox Bias VOC Zero
271.16	289.89	-0.39	26.23	6/7/2018 1:26:06 PM	
425.44	288.32	0.04	554.05	6/7/2018 1:27:02 PM	
592.19	138.48	-0.51	593.39	6/7/2018 1:28:02 PM	
595.31	8.25	-0.51	593.39	6/7/2018 1:29:02 PM	CO VOC Bias O2 Zero
598.43	5.11	1.19	427.83	6/7/2018 1:30:02 PM	

160.52	10.60	10.02	-1.64	6/7/2018 1:31:02 PM		
0.00	9.03	10.20	-1.64	6/7/2018 1:32:02 PM		
0.00	3.54	10.24	-3.28	6/7/2018 1:33:03 PM	O2 Bias Nox CO Zero	
23.38	2.75	9.57	273.75	6/7/2018 1:34:03 PM		
833.75	12.95	7.79	519.63	6/7/2018 1:35:03 PM		
397.39	141.61	0.59	136.05	6/7/2018 1:36:03 PM		
3.12	73.36	-0.49	140.97	6/7/2018 1:37:03 PM		
3.12	13.74	-0.57	139.33	6/7/2018 1:38:04 PM	Methane 446	149.00
3.12	5.89	-0.55	140.97	6/7/2018 1:39:04 PM		
325.71	4.32	5.52	550.77	6/7/2018 1:40:07 PM		
506.48	81.21	0.92	278.66	6/7/2018 1:41:04 PM		
3.12	83.56	-0.47	291.78	6/7/2018 1:42:04 PM		
1.56	11.38	-0.51	293.42	6/7/2018 1:43:04 PM	Methane 873	303
1.56	5.11	-0.53	299.97	6/7/2018 1:44:04 PM		
433.24	3.54	6.34	590.11	6/7/2018 1:45:04 PM		
1022.31	98.47	7.57	586.84	6/7/2018 1:46:05 PM		
1020.75	169.86	7.71	580.28	6/7/2018 1:47:05 PM		
1016.08	181.63	7.79	575.36	6/7/2018 1:48:05 PM		
989.59	186.33	7.91	585.20	6/7/2018 1:49:05 PM		
969.33	183.98	8.00	575.36	6/7/2018 1:50:05 PM		
959.98	185.55	8.06	575.36	6/7/2018 1:51:09 PM		
953.74	181.63	8.06	575.36	6/7/2018 1:52:06 PM		
958.42	180.84	8.08	567.16	6/7/2018 1:53:06 PM		
961.54	183.98	8.06	568.80	6/7/2018 1:54:06 PM		
969.33	186.33	8.06	565.53	6/7/2018 1:55:06 PM		
966.21	187.90	8.04	568.80	6/7/2018 1:56:06 PM		
966.21	186.33	8.02	557.33	6/7/2018 1:57:06 PM		
975.56	186.33	8.00	555.69	6/7/2018 1:58:07 PM		
969.33	189.47	8.06	562.25	6/7/2018 1:59:07 PM		
967.77	188.69	8.06	563.89	6/7/2018 2:00:07 PM		
959.98	188.69	8.06	572.08	6/7/2018 2:01:07 PM		
949.07	182.41	8.08	562.25	6/7/2018 2:02:07 PM		
964.65	182.41	8.08	557.33	6/7/2018 2:03:07 PM		
961.54	187.12	8.10	550.77	6/7/2018 2:04:07 PM		
967.77	185.55	8.10	557.33	6/7/2018 2:05:08 PM		
950.63	188.69	8.12	549.13	6/7/2018 2:06:08 PM		
959.98	183.19	8.06	550.77	6/7/2018 2:07:08 PM		
966.21	184.76	8.06	560.61	6/7/2018 2:08:08 PM		
955.30	184.76	8.04	560.61	6/7/2018 2:09:08 PM		
972.44	182.41	8.02	552.41	6/7/2018 2:10:08 PM		
969.33	187.90	8.00	554.05	6/7/2018 2:11:08 PM		
975.56	188.69	8.02	568.80	6/7/2018 2:12:08 PM		
964.65	191.04	8.00	560.61	6/7/2018 2:13:09 PM		
974.00	185.55	8.02	560.61	6/7/2018 2:14:09 PM		
961.54	185.55	8.02	567.16	6/7/2018 2:15:09 PM	Start Run 3	
956.86	183.98	8.02	555.69	6/7/2018 2:16:14 PM		
969.33	182.41	8.00	552.41	6/7/2018 2:17:09 PM		
972.44	185.55	7.99	562.25	6/7/2018 2:18:10 PM		
981.79	185.55	7.95	557.33	6/7/2018 2:19:10 PM		
992.70	188.69	7.93	554.05	6/7/2018 2:20:10 PM		
983.35	191.82	7.95	567.16	6/7/2018 2:21:10 PM		
961.54	188.69	7.95	554.05	6/7/2018 2:22:10 PM		
963.09	187.90	7.95	560.61	6/7/2018 2:23:10 PM		
941.28	189.47	7.99	567.16	6/7/2018 2:24:10 PM		
941.28	182.41	7.93	563.89	6/7/2018 2:25:10 PM		
959.98	181.63	7.91	558.97	6/7/2018 2:26:11 PM		
955.30	185.55	7.91	563.89	6/7/2018 2:27:11 PM		
956.86	185.55	7.91	557.33	6/7/2018 2:28:11 PM		
966.21	186.33	7.91	558.97	6/7/2018 2:29:11 PM		
956.86	187.12	7.91	568.80	6/7/2018 2:30:11 PM		
952.19	181.63	7.89	562.25	6/7/2018 2:31:11 PM		
972.44	184.76	7.85	552.41	6/7/2018 2:32:12 PM		

967.77	189.47	7.85	567.16	6/7/2018 2:33:12 PM	
959.98	185.55	7.87	555.69	6/7/2018 2:34:12 PM	
975.56	183.98	7.87	555.69	6/7/2018 2:35:12 PM	
963.09	190.26	7.89	558.97	6/7/2018 2:36:12 PM	
958.42	183.98	7.89	554.05	6/7/2018 2:37:12 PM	
977.12	183.98	7.87	563.89	6/7/2018 2:38:12 PM	
966.21	189.47	7.87	555.69	6/7/2018 2:39:13 PM	
967.77	187.12	7.85	558.97	6/7/2018 2:40:13 PM	
970.89	186.33	7.85	557.33	6/7/2018 2:41:13 PM	
966.21	188.69	7.87	550.77	6/7/2018 2:42:13 PM	
978.68	187.90	7.83	550.77	6/7/2018 2:43:13 PM	
970.89	190.26	7.87	572.08	6/7/2018 2:44:13 PM	
966.21	184.76	7.85	565.53	6/7/2018 2:45:14 PM	
974.00	184.76	7.81	562.25	6/7/2018 2:46:14 PM	
983.35	186.33	7.79	560.61	6/7/2018 2:47:14 PM	
974.00	188.69	7.83	562.25	6/7/2018 2:48:14 PM	
981.79	185.55	7.83	557.33	6/7/2018 2:49:14 PM	
980.24	190.26	7.87	555.69	6/7/2018 2:50:14 PM	
967.77	190.26	7.83	563.89	6/7/2018 2:51:15 PM	
972.44	183.98	7.83	563.89	6/7/2018 2:52:15 PM	
981.79	185.55	7.81	549.13	6/7/2018 2:53:15 PM	
983.35	189.47	7.81	555.69	6/7/2018 2:54:15 PM	
983.35	189.47	7.81	558.97	6/7/2018 2:55:15 PM	
998.94	188.69	7.77	560.61	6/7/2018 2:56:15 PM	
995.82	191.82	7.85	552.41	6/7/2018 2:57:15 PM	
983.35	191.82	7.83	554.05	6/7/2018 2:58:16 PM	
992.70	189.47	7.83	552.41	6/7/2018 2:59:16 PM	
978.68	191.82	7.87	568.80	6/7/2018 3:00:16 PM	
974.00	182.41	7.87	560.61	6/7/2018 3:01:16 PM	
972.44	182.41	7.85	565.53	6/7/2018 3:02:16 PM	
986.47	179.27	7.81	563.89	6/7/2018 3:03:16 PM	
994.26	183.98	7.79	558.97	6/7/2018 3:04:16 PM	
990.50	186.33	7.77	554.05	6/7/2018 3:05:17 PM	
998.29	185.55	7.77	555.69	6/7/2018 3:06:17 PM	
998.94	189.47	7.77	560.61	6/7/2018 3:07:17 PM	
998.29	185.55	7.77	558.97	6/7/2018 3:08:17 PM	
994.13	183.19	7.71	537.66	6/7/2018 3:09:17 PM	
958.42	200.45	7.73	549.13	6/7/2018 3:10:17 PM	
903.87	202.02	7.75	550.77	6/7/2018 3:11:17 PM	
945.95	191.82	7.75	550.77	6/7/2018 3:12:18 PM	
952.19	188.69	7.75	558.97	6/7/2018 3:13:18 PM	
972.44	185.55	7.77	555.69	6/7/2018 3:14:18 PM	
966.21	187.90	7.77	555.69	6/7/2018 3:15:18 PM	Stop Run 3
971.67	187.19	7.85	558.46		Avg
964.65	185.55	7.79	555.69	6/7/2018 3:16:18 PM	
970.89	183.98	7.77	560.61	6/7/2018 3:17:19 PM	
958.42	181.63	7.75	562.25	6/7/2018 3:18:19 PM	
975.56	177.70	7.32	408.16	6/7/2018 3:19:19 PM	
423.89	186.33	-0.25	-1.64	6/7/2018 3:20:19 PM	
266.49	264.79	-0.59	-1.64	6/7/2018 3:21:19 PM	
269.60	288.32	-0.68	-3.28	6/7/2018 3:22:24 PM	Nox Bias VOC Zero
272.72	282.83	-0.06	136.05	6/7/2018 3:23:19 PM	
504.92	277.34	-0.72	586.84	6/7/2018 3:24:19 PM	
592.19	76.50	-0.86	590.11	6/7/2018 3:25:20 PM	
593.75	8.25	-0.67	591.75	6/7/2018 3:26:20 PM	
595.31	5.89	-0.67	591.75	6/7/2018 3:27:20 PM	CO VOC Bias O2 Zero
451.94	5.11	7.05	111.47	6/7/2018 3:28:20 PM	
9.35	23.15	10.16	-3.28	6/7/2018 3:29:20 PM	
0.00	5.11	10.22	-3.28	6/7/2018 3:30:20 PM	
0.00	3.54	10.24	-1.64	6/7/2018 3:31:20 PM	O2 Bias Nox CO Zero
31.17	3.54	9.36	309.81	6/7/2018 3:32:21 PM	
911.67	11.38	-0.39	1017.95	6/7/2018 3:33:21 PM	

methane Cal

873	291 as propane
	291 cal
446	149 as propane
	149 cal
248	83 as propane
	81 cal
0	0 cal

Run 3 Methane		Run 2	Run 1
495	= 495.5		
496		490	456
		491	456
		491	457
496		491	456
496	496		
496		492	456
		492	456
		491	456
497		492	456
496			
496		492	456
496		492	456
		491	456
		491	457
496			
496		492	456
497		491	457
496		491	456
		491	456
496			
496		491	456
496		491	456
496		491	456
		492	456

Stack Temp
859°F

Appendix #5

Production Data

Run #1	Run #2	Run #3
905 kw	902 kw	903 kw

The following data was collected by Renergy employees during the 6/7/18 engine stack testing performed by Custom Stack Analyis. H2S measurements were taken initially by Draeger Tube and then a handheld biogas analyzer that was calibrated prior to testing. % Methane and H2S measurements were taken on the uncombusted supply gas to the engine. The Nox and O2 reading came from permanently installed meters in the engine exhaust. Total gas flow through the engine is estimated based on blower speed compared to the blower flow curve.

Run 1

Time	Power (kw)	%Methane	H2S (ppm)	Nox (ppm)	O2 (ppm)	Blower Freq (HZ)	Blower Speed (RPM)	Estimated SCFM
1030	910	60	500	195	6.2	70	2065	380
1045	910	61	474	190	6.2	69	2035.5	380
1100	900	63	447	196	6.3	68	2006	380
1115	900	63	436	187	6.3	69	2035.5	380
1130	905	63	426	190	6.3	68	2006	380

Run 2

Time	Power (kw)	%Methane	H2S (ppm)	Nox (ppm)	O2 (ppm)	Blower Freq (HZ)	Blower Speed (RPM)	Estimated SCFM
1215	910	63	413	203	6.3	69	2035.5	380
1230	900	64	418	188	6.3	68	2006	380
1245	900	65	422	190	6.3	68	2006	380
1300	900	67	450	170	6.3	69	2035.5	380
1315	900	63	511	172	6.2	72	2124	380

Run 3

Time	Power (kw)	%Methane	H2S (ppm)	Nox (ppm)	O2 (ppm)	Blower Freq (HZ)	Blower Speed (RPM)	Estimated SCFM
1415	900	6+1	450	170	6.2	71	2094.5	380
1430	898	63	448	173	6.2	70	2065	380
1445	910	64	458	181	6.2	71	2094.5	380
1500	907	63	445	177	6.2	71	2094.5	380
1515	900	65	500	178	6.2	71	2094.5	380