09/10/2026

Jim Davies
Meggitt Aircraft Braking Systems Corp.
1204 Massillon Rd.
Akron, OH 44306

No	TOXIC REVIEW
No	SYNTHETIC MINOR TO AVOID MAJOR NSR
No	CEMS
No	MACT/GACT
No	NSPS
No	NESHAPS
No	NETTING
No	MODELING SUBMITTED
Yes	SYNTHETIC MINOR TO AVOID TITLE V
Yes	FEDERALLY ENFORCABLE PTIO (FEPTIO)
No	SYNTHETIC MINOR TO AVOID MAJOR GHG

RE: DRAFT AIR POLLUTION PERMIT-TO-INSTALL AND OPERATE

Facility ID: 1677010999
Permit Number: P0141227
Permit Type: Administrative Modification
County: Summit

Dear Permit Holder:

A draft of the Ohio Administrative Code (OAC) Chapter 3745-31 Air Pollution Permit-to-Install and Operate (PTIO) for the referenced facility has been issued for the emissions unit(s) listed in the Authorization section of the enclosed draft permit. This draft action is not an authorization to begin construction or modification of your emissions unit(s). The purpose of this draft is to solicit public comments on the permit. A public notice will appear in the Ohio Environmental Protection Agency Weekly Review and Public Notices website, ***Weekly Review and Public Notices***. A copy of the public notice and the draft permit are enclosed. This permit can be accessed electronically on the Ohio EPA document search webpage: ***eDocument Search | Ohio Environmental Protection Agency***. Comments will be accepted as a marked-up copy of the draft permit or in narrative format. Any comments must be sent to the following:

Andrea Moore
Permit Review/Development Section
Ohio EPA, DAPC
50 West Town Street Suite 700
PO Box 1049
Columbus, Ohio 43216-1049

and

Akron Regional Air Quality Management District
1867 West Market St.
Akron, OH 44313

Comments and/or a request for a public hearing will be accepted within 30 days of the date the notice appears on the Ohio EPA Weekly Review and Public Notices website, ***Weekly Review and Public Notices | Ohio Environmental Protection Agency***. You will be notified if a public hearing is scheduled. A decision on issuing a final permit-to-install will be made after consideration of comments received and oral testimony if a public hearing is conducted. Any permit fee that will be due upon issuance of a final Permit-to-Install is indicated in the Authorization section. Please do not submit any payment now. If you have any questions, please contact Akron Regional Air Quality Management District at (330)375-2480.

Sincerely,

Robert Hodanbosi
Chief, Division of Air Pollution Control

cc: U.S. EPA Region 5 Via E-Mail Notification
ARAQMD; Pennsylvania; West Virginia; Canada

PUBLIC NOTICE

The following matters are the subject of this public notice by the Ohio Environmental Protection Agency. The complete public notice, including any additional instructions for submitting comments, requesting information, a public hearing, or filing an appeal may be obtained at: ***Weekly Review and Public Notices | Ohio Environmental Protection Agency*** or Hearing Clerk, Ohio EPA, 50 W. Town St., Columbus, Ohio 43215. Ph: 614-644-3037 email: ***HClerk@epa.ohio.gov***

Draft Air Pollution Permit-to-Install and Operate Administrative Modification

Meggitt Aircraft Braking Systems Corp.
1204 Massillon Rd.
Akron, OH 44306

ID#:	P0141227
Date of Action:	09/10/2026
Permit Desc:	Facility-initiated administrative modification to incorporate RACT standards. Pursuant to Part D of Title I of the Clean Air Act (CAA), Ohio EPA is required to establish a State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. The above-mentioned permit is a part of Ohio's SIP for attainment and maintenance of the 2015 ozone NAAQS and will be submitted to United States Environmental Protection Agency (U.S. EPA) as a modification of the SIP.

The permit can be accessed electronically and comments may be submitted at: https://ohioepa.commentinput.com - Search by entering the permit # P0141227 in the "Search Projects" search box.

The public comment period will run until 10/12/2026 at 11:59 PM.

Permit Strategy Write-Up

1. Check all that apply:

   ☐ Synthetic Minor Determination **N/A**

   ☐ Netting Determination **N/A**

2. Source Description:

   Emissions units P036, P037, P038, P039, P041, P044, P048, and P049 – Aerospace brake component manufacturing. As required by the reclassification to serious nonattainment for ozone under the 2015 ozone National Ambient Air Quality Standards (NAAQS) promulgated by U.S. EPA, this facility has submitted a VOC Reasonably Available Control Technology (RACT) study on May 7, 2026 (subsequently revised on July 21, 2026) to address the feasibility of controlling VOC emissions from their aerospace manufacturing operations. This facility does not have any prior source-specific VOC RACT established under OAC rule 3745-21-09. This permit modification includes the implementation of the proposed RACT limits in the July 21, 2026 revision of the RACT study. Section B of this permit cites the RACT limits under OAC rule 3745-21-11(B). The RACT limits are implemented under an OAC rule 3745-31-05(D) synthetic minor restriction for the affected emissions units in section C of this permit.

   Pursuant to Part D of Title I of the Clean Air Act (CAA), Ohio EPA is required to establish a State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. This permit is part of Ohio's SIP for attainment and maintenance of the 2015 ozone NAAQS and will be submitted to United States Environmental Protection Agency (U.S. EPA) as a modification of the SIP.

3. Facility Emissions and Attainment Status:

   This is a Title V facility. Summit County was designated as "serious" nonattainment for the 2015 ozone NAAQS but is now a maintenance county. The county is currently designated attainment for all NAAQS (criteria) pollutants which include ozone, PM2.5, PM10, CO, NO2, lead and SO2.

4. Source Emissions:

   Emissions units P036, P037, P038, P039, P041, P044, P048, and P049 have VOC emissions that are subject to the VOC RACT requirements. The VOC RACT determination for these emissions unit is venting VOC emissions to a thermal oxidizer with an overall control efficiency of at least 98%, by weight, and includes associated monitoring, record keeping, reporting, and testing requirements.

5. Conclusion:

   This permit modification establishes VOC RACT limits as proposed by Meggitt Aircraft Braking Systems Corporation in their VOC RACT study as part of the requirements for the 2015 ozone NAAQs nonattainment and maintenance areas under the reclassification to serious nonattainment for the Cleveland area. The VOC RACT limit established in this permit will be implemented upon final issuance of this permit.

6. Please provide additional notes or comments as necessary:

   None

7. Total Permit Allowable Emissions Summary (for informational purposes only):

Pollutant	Tons Per Year
VOC	11.67
Combined HAPs	1.11

DRAFT

Division of Air Pollution Control
Permit-to-Install and Operate

for

Meggitt Aircraft Braking Systems Corp.

Facility ID:	1677010999
Permit Number:	P0141227
Permit Type:	Administrative Modification
Issued:	09/10/2026
Effective:	To be entered upon final issuance
Expiration:	To be entered upon final issuance

Division of Air Pollution Control

Permit-to-Install and Operate

for

Meggitt Aircraft Braking Systems Corp.

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Authorization

Facility ID:	1677010999
Application Number(s):	M0008873M0008873
Permit Number:	P0141227
Permit Description:	Facility-initiated administrative modification to incorporate RACT standards. Pursuant to Part D of Title I of the Clean Air Act (CAA), Ohio EPA is required to establish a State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. The above-mentioned permit is a part of Ohio's SIP for attainment and maintenance of the 2015 ozone NAAQS and will be submitted to United States Environmental Protection Agency (U.S. EPA) as a modification of the SIP.
Permit Type:	Administrative Modification
Permit Fee:	$0.00 *DO NOT send payment at this time, subject to change before final issuance*
Issue Date:	09/10/2026
Effective Date:	To be entered upon final issuance
Expiration Date:	To be entered upon final issuance
Permit Evaluation Report (PER) Annual Date:	To be entered upon final issuance

This document constitutes issuance of a Permit-to-Install and Operate for the emissions unit(s) identified on the following page to:

Meggitt Aircraft Braking Systems Corp.
1204 Massillon Rd.
Akron, OH 44306

Ohio Environmental Protection Agency (EPA) District Office or local air agency responsible for processing and administering your permit:

Akron Regional Air Quality Management District
1867 West Market St.
Akron, OH 44313
(330)375-2480

The above-named entity is hereby granted this Permit-to-Install and Operate for the air contaminant source(s) (emissions unit(s)) listed in this section pursuant to Chapter 3745-31 of the Ohio Administrative Code. Issuance of this permit does not constitute expressed or implied approval or agreement that, if constructed or modified in accordance with the plans included in the application, the described emissions unit(s) will operate in compliance with applicable State and Federal laws and regulations.

This permit is granted subject to the conditions attached hereto.

Ohio Environmental Protection Agency

John Logue
Director

Authorization (continued)

Permit Number: P0141227

Permit Description: Facility-initiated administrative modification to incorporate RACT standards. Pursuant to Part D of Title I of the Clean Air Act (CAA), Ohio EPA is required to establish a State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. The above-mentioned permit is a part of Ohio's SIP for attainment and maintenance of the 2015 ozone NAAQS and will be submitted to United States Environmental Protection Agency (U.S. EPA) as a modification of the SIP.

Permits for the following Emissions Unit(s) or groups of Emissions Units are in this document as indicated below:

Group Name: Carbon Furnaces

Emissions Unit ID:	**P036**
Company Equipment ID:	Carbon Processing Furnace P036-A
Superseded Permit Number:	P0129464
General Permit Category and Type:	Not Applicable P0129464
Emissions Unit ID:	**P037**
Company Equipment ID:	Carbon Processing Furnace P037-A
Superseded Permit Number:	P0129464
General Permit Category and Type:	Not Applicable P0129464
Emissions Unit ID:	**P038**
Company Equipment ID:	Carbon Processing Furnace
Superseded Permit Number:	P0129464
General Permit Category and Type:	Not Applicable P0129464
Emissions Unit ID:	**P039**
Company Equipment ID:	Accutherm Carbonization Furnace
Superseded Permit Number:	P0129464
General Permit Category and Type:	Not Applicable P0129464
Emissions Unit ID:	**P041**
Company Equipment ID:	Carbon Processing Furnace
Superseded Permit Number:	P0129464
General Permit Category and Type:	Not Applicable P0129464
Emissions Unit ID:	**P044**
Company Equipment ID:	Carbon Processing Furnace
Superseded Permit Number:	P0129464
General Permit Category and Type:	Not Applicable P0129464
Emissions Unit ID:	**P048**
Company Equipment ID:	Carbon Processing Furnace P036-B
Superseded Permit Number:	P0129464
General Permit Category and Type:	Not Applicable P0129464

Emissions Unit ID:	**P049**
Company Equipment ID:	Carbon Processing Furnace P037-B
Superseded Permit Number:	P0129464
General Permit Category and Type:	Not Applicable P0129464

List of Commonly Used Abbreviations

AP-42 = U.S. EPA's Compilation of Air Pollution Emissions Factors	HVLP = high volume, low pressure	PER = Permit Evaluation Report
ASTM = American Society for Testing and Materials	LAER = lowest achievable emission rate	PM = particulate matter
BACT = Best Available Control Technology	lb(s)/hr = pound(s) per hour	PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
BAT = Best Available Technology	LDAR = leak detection and repair	$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
CAA = Clean Air Act	LPG = liquefied petroleum gas/propane	ppb = parts per billion
CAM = compliance assurance monitoring	MACT = maximum achievable control technology	ppm = parts per million
CEMS = continuous emissions monitoring system	MAGLC = maximum acceptable ground level concentration	PSD = Prevention of Significant Deterioration
CFC = chlorofluorocarbon	mg/m3 = milligrams per cubic meter	psi = pounds per square inch
CFR = Code of Federal Regulations	MM = million	psia = pounds per square inch absolute
CH_4 = methane	MMBtu = million British Thermal Units	PTE = potential-to-emit
CI = compression ignition	MSDS = material safety data sheet	PTI = Permit-to-Install
CO = carbon monoxide	MSW = municipal solid waste	PTIO = Permit-to-Install and Operate
CO_2 = carbon dioxide	NAAQS = National Ambient Air Quality Standard	PTO = Permit-to-Operate
COM = continuous opacity monitor	NESHAP = National Emission Standard for Hazardous Air Pollutants	PWR = process weight rate
DAPC = Division of Air Pollution Control	NG = natural gas	RACM = reasonably available control measures
DO/LAA = District Office/Local Air Agency	ng/m3 = nanograms per cubic meter	RACT = reasonably available control technology
dscf = dry standard cubic foot	NH_3 = ammonia	RATA = relative accuracy test audit
EAC = emissions activity category	NMHC = non-methane hydrocarbons	RTO = regenerative thermal oxidizer
eDocs = electronic documents database	NMOC = non-methane organic compound	SB265 = Senate Bill 265
ERAC = Environmental Review Appeals Commission	NO = nitrogen oxide	scfm = standard cubic feet per minute
ESP = electrostatic precipitator	NO_2 = nitrogen dioxide	SI = spark ignition
EU = emissions unit	NO_x = nitrogen oxides	SIP = State Implementation Plan
FEPTIO = Federally Enforceable Permit-to-Install and Operate	NSPS = New Source Performance Standard	SO_2 = sulfur dioxide
FER = Fee Emissions Report	NSR = New Source Review	SSMP = startup, shutdown, and malfunction plan
FR = Federal Register	NTV = Non-Title V	TDS = total dissolved solids
GACT = generally achievable control technology	O&M = operation and maintenance	TLV = threshold limit value
GHG = greenhouse gases	OAC = Ohio Administrative Code	TO = thermal oxidizer
gr/dscf = grains per dry standard cubic foot	OC = organic compound	TPH = ton(s) per hour
H_2S = hydrogen sulfide	Ohio EPA = Ohio Environmental Protection Agency	TPY = ton(s) per year
H_2SO_4 = sulfuric acid	ORC = Ohio Revised Code	TSP = total suspended particulates
HAP = hazardous air pollutant	Pb = lead	VE = visible emissions
HCl = hydrogen chloride	PBR = Permit-By-Rule	VMT = vehicle miles traveled
HF = hydrogen fluoride	PCB = polychlorinated biphenyl	VOC = volatile organic compound
Hg = mercury	PE = particulate emissions	WPP = work practice plan
hp = horsepower	PEMS = predictive emissions monitoring system	µg/m3 = micrograms per cubic meter

A. Standard Terms and Conditions

1. What does this permit-to-install and operate (PTIO) allow me to do?

This permit allows you to install and operate the emissions unit(s) identified in this PTIO. You must install and operate the unit(s) in accordance with the application you submitted and all the terms and conditions contained in this PTIO, including emission limits and those terms that ensure compliance with the emission limits (for example, operating, recordkeeping and monitoring requirements).

2. Who is responsible for complying with this permit?

The person identified on the "Authorization" page, above, is responsible for complying with this permit until the permit is revoked, terminated, or transferred. "Person" means a person, firm, corporation, association, or partnership. The words "you," "your," or "permittee" refer to the "person" identified on the "Authorization" page above.

The permit applies only to the emissions unit(s) identified in the permit. If you install or modify any other equipment that requires an air permit, you must apply for an additional PTIO(s) for these sources.

3. What records must I keep under this permit?

You must keep all records required by this permit, including monitoring data, test results, strip-chart recordings, calibration data, maintenance records, and any other record required by this permit for five years from the date the record was created. You can keep these records electronically, provided they can be made available to Ohio EPA during an inspection at the facility. Failure to make requested records available to Ohio EPA upon request is a violation of this permit requirement.

4. What are my permit fees and when do I pay them?

There are two fees associated with permitted air contaminant sources in Ohio:

a) PTIO fee. This one-time fee is based on a fee schedule in accordance with Ohio Revised Code (ORC) section 3745.11 or based on a time and materials charge for permit application review and permit processing if required by the Director.

You will be sent an invoice for this fee after you receive this PTIO and payment is due within 30 days of the invoice date. You are required to pay the fee for this PTIO even if you do not install or modify your operations as authorized by this permit.

b) Annual emissions fee. Ohio EPA will assess a separate fee based on the total annual emissions from your facility. You self-report your emissions in accordance with Ohio Administrative Code (OAC) Chapter 3745-78. This fee assessed is based on a fee schedule in ORC section 3745.11 and funds Ohio EPA's permit compliance oversight activities. For facilities that are permitted as synthetic minor sources, the fee schedule is adjusted annually for inflation. Ohio EPA will notify you when it is time to report your emissions and to pay your annual emission fees.

5. When does my PTIO expire, and when do I need to submit my renewal application?

This permit expires on the date identified at the beginning of this permit document (see "Authorization" page above) and you must submit a renewal application to renew the permit. Ohio EPA will send a renewal notice to you approximately six months prior to the expiration date of this permit. However, it is very important that you submit a complete renewal permit application (either electronically through Ohio EPA’s eBusiness Center: Air

Services web service or postmarked prior to expiration of this permit) even if you do not receive the renewal notice.

If a complete renewal application is submitted before the expiration date, Ohio EPA considers this a timely application for purposes of ORC section 119.06, and you are authorized to continue operating the emissions unit(s) covered by this permit beyond the expiration date of this permit until final action is taken by Ohio EPA on the renewal application.

6. What happens to this permit if my project is delayed or I do not install or modify my source?

This PTIO expires 18 months after the issue date identified on the "Authorization" page above unless otherwise specified if you have not (1) started constructing the new or modified emission sources identified in this permit, or (2) entered into a binding contract to undertake such construction. This deadline can be extended once by 12 months, provided you apply to Ohio EPA for this extension within a reasonable time before the 18-month period has ended and you can show good cause for any such extension.

7. What reports must I submit under this permit?

An annual permit evaluation report (PER) is required in addition to any malfunction reporting required by OAC rule 3745-15-06 or other specific rule-based reporting requirement identified in this permit. Your PER due date is identified in the Authorization section of this permit.

8. If I am required to obtain a Title V operating permit in the future, what happens to the operating provisions and permit evaluation report (PER) obligations under this permit?

If you are required to obtain a Title V permit under OAC Chapter 3745-77 in the future, the permit-to-operate portion of this permit will be superseded by the issued Title V permit. From the effective date of the Title V permit forward, this PTIO will effectively become a PTI (permit-to-install) in accordance with OAC rule 3745-31-02(B). The following terms and conditions of this permit will no longer be applicable after issuance of the Title V permit: Section B, Term 1.b) and Section C, for each emissions unit, Term a)(2).

The PER requirements in this permit remain effective until the date the Title V permit is issued and is effective and cease to apply after the effective date of the Title V permit. The final PER obligation will cover operations up to the effective date of the Title V permit and must be submitted on or before the submission deadline identified in this permit on the last day prior to the effective date of the Title V permit.

9. What are my obligations when I perform scheduled maintenance on air pollution control equipment?

You must perform scheduled maintenance of air pollution control equipment in accordance with OAC rule 3745-15-06(A). If scheduled maintenance requires shutting down or bypassing any air pollution control equipment, you must also shut down the emissions unit(s) served by the air pollution control equipment during maintenance, unless the conditions of OAC rule 3745-15-06(A)(3) are met. Any emissions that exceed permitted amount(s) under this permit (unless specifically exempted by rule) must be reported as deviations in the annual permit evaluation report (PER), including nonexempt excess emissions that occur during approved scheduled maintenance.

10. Do I have to report malfunctions of emissions units or air pollution control equipment? If so, how must I report?

If you have a reportable malfunction of any emissions unit(s) or any associated air pollution control system, you must report this to the Akron Regional Air Quality Management District in accordance with OAC rule 3745-15-06(B). Malfunctions that must be reported are those that result in emissions that exceed permitted emission levels. It is your responsibility to evaluate control equipment breakdowns and operational upsets to determine if a reportable malfunction has occurred.

If you have a malfunction but determine that it is not a reportable malfunction under OAC rule 3745-15-06(B), it is recommended that you maintain records associated with control equipment breakdown or process upsets. Although it is not a requirement of this permit, Ohio EPA recommends that you maintain records for non-reportable malfunctions.

11. Can Ohio EPA or my local air agency inspect the facility where the emission unit(s) is/are located?

Yes. Under Ohio law, the Director or his/her authorized representative may inspect the facility, conduct tests, examine records or reports to determine compliance with air pollution laws and regulations and the terms and conditions of this permit. You must provide, within a reasonable time, any information Ohio EPA requests either verbally or in writing.

12. What happens if one or more emissions units operated under this permit is/are shut down permanently?

Ohio EPA can terminate the permit terms associated with any permanently shut down emissions unit. "Shut down" means the emissions unit has been physically removed from service or has been altered in such a way that it can no longer operate without a subsequent "modification" or "installation" as defined in OAC Chapter 3745-31.

You should notify Ohio EPA of any emissions unit that is permanently shut down by submitting a certification that identifies the date on which the emissions unit was permanently shut down. The certification must be submitted by an authorized official from the facility. You cannot continue to operate an emission unit once the certification has been submitted to Ohio EPA by the authorized official.

You must comply with all recordkeeping and reporting for any permanently shut down emissions unit in accordance with the provisions of the permit, regulations or laws that were enforceable during the period of operation, such as the requirement to submit a PER, air fee emission report, or malfunction report. You must also keep all records relating to any permanently shut down emissions unit, generated while the emissions unit was in operation, for at least five years from the date the record was generated.

Again, you cannot resume operation of any emissions unit certified by the authorized official as being permanently shut down without first applying for and obtaining a permit pursuant to OAC Chapter 3745-31.

13. Can I transfer this permit to a new owner or operator?

You can transfer this permit to a new owner or operator. If you transfer the permit, the new owner or operator must follow the procedures in OAC Chapter 3745-31-07, including notifying Ohio EPA or the local air agency of the change in ownership or operator within thirty days of the transfer date. Any transferee of this permit shall assume the responsibilities of the transferor permit holder.

14. Does compliance with this permit constitute compliance with OAC rule 3745-15-07, "air pollution nuisance"?

This permit and OAC rule 3745-15-07 prohibit operation of the air contaminant source(s) regulated under this permit in a manner that causes a nuisance. Ohio EPA can require additional controls or modification of the requirements of this permit through enforcement orders or judicial enforcement action if, upon investigation, Ohio EPA determines existing operations are causing a nuisance.

15. What happens if a portion of this permit is determined to be invalid?

If a portion of this permit is determined to be invalid, the remainder of the terms and conditions remain valid and enforceable. The exception is where the enforceability of terms and conditions are dependent on the term or condition that was declared invalid.

B. Facility-Wide Terms and Conditions

1. This permit document constitutes a permit-to-install issued in accordance with ORC 3704.03(F) and a permit-to-operate issued in accordance with ORC 3704.03(G).

   a) For the purpose of a permit-to-install document, the facility-wide terms and conditions identified below are federally enforceable with the exception of those listed below which are enforceable under state law only.

      (1) None.

2. OAC rule 3745-21-11(B) VOC RACT Requirements

   As required by the reclassification to serious nonattainment for ozone under the 2015 ozone National Ambient Air Quality Standards (NAAQS) promulgated by U.S. EPA, and pursuant to OAC rule 3745-21-11(B) and the VOC Reasonable Available Control Technology (RACT) Study submitted by MEGGIT AIRCRAFT BRAKING SYSTEMS CORP. on May 4, 2026 (subsequently revised on July 21, 2026):

   "MEGGIT AIRCRAFT BRAKING SYSTEMS CORP." (Facility ID: 1677010999) or any subsequent owner or operator of "MEGGIT AIRCRAFT BRAKING SYSTEMS CORP." facility located at 1204 Massillon Road, Akron, Ohio 44306 shall comply with the following requirements*:

   a) Emission Unit Group – Carbon Furnaces: P036, P037, P038, P039, P041, P044, P048, P049

      (1) The VOC emissions from emission units P036, P037, P038, P039, P041, P044, P048, and P049 shall be vented to a thermal oxidizer with an overall control efficiency of at least 99% by weight.

3. Monitoring and/or Recordkeeping Requirements

   a) In order to maintain compliance with the applicable emission limitation(s) contained in this permit, the acceptable average combustion temperature within the north thermal oxidizer, for any 3-hour block of time when one or more of the emissions units controlled by the north thermal oxidizer are in operation, shall not be more than 50°F below the average temperature measured during the most recent performance test that demonstrated the emissions units were in compliance.

   b) In order to maintain compliance with the applicable emission limitation(s) contained in this permit, the acceptable average combustion temperature within the south thermal oxidizer, for any 3-hour block of time when one or more of the emissions units controlled by the south thermal oxidizer are in operation, shall not be more than 50°F below the average temperature measured during the most recent performance test that demonstrated the emissions units were in compliance.

   c) The permittee shall properly install, operate, and maintain a continuous temperature monitor and recorder that measures and records the combustion temperature within the thermal oxidizers when any of the controlled emissions units are in operation, including periods of startup and shutdown. Units shall be in degrees Fahrenheit (°F). The accuracy for each thermocouple, monitor, and recorder shall be guaranteed by the manufacturer to be within ± 1% of the temperature being measured or ± 5°F, whichever is greater. The temperature monitor and recorder shall be installed, calibrated, operated, and maintained in accordance with the manufacturer's recommendations, instructions, and the operating manuals, with any modifications deemed necessary by the permittee. The permittee shall collect and record the following information each day any of the controlled emissions units are in operation:

(1) all 3-hour blocks of time, when any emissions unit was in operation and vented to the north thermal oxidizer, during which the average combustion temperature within the north thermal oxidizer was more than 50°F below the average temperature measured during the most recent performance test that demonstrated the emissions unit was in compliance;

(2) all 3-hour blocks of time, when any emissions unit was in operation and vented to the south thermal oxidizer, during which the average combustion temperature within the south thermal oxidizer was more than 50°F below the average temperature measured during the most recent performance test that demonstrated the emissions unit was in compliance; and

(3) a log (date and total time) of the downtime or bypass of the capture (collection) system and thermal oxidizer, and/or downtime of the monitoring equipment, when the associated emissions unit(s) was/were in operation.

These records shall be maintained at the facility for a period of five years.

d) Whenever the monitored average combustion temperature within either of the thermal oxidizers deviates from the range or limit established in accordance with this permit, the permittee shall promptly investigate the cause of the deviation. The permittee shall maintain records of the following information for each investigation:

(1) identification of the operating emissions unit(s) and oxidizer(s);

(2) the date and time the deviation began;

(3) the magnitude of the deviation at that time;

(4) the date the investigation was conducted;

(5) the name(s) of the personnel who conducted the investigation; and

(6) the findings and recommendations.

In response to each required investigation to determine the cause of a deviation, the permittee shall take prompt corrective action to bring the operation of the control equipment within the acceptable range/limit specified in this permit, unless the permittee determines that corrective action is not necessary and documents the reasons for that determination and the date and time the deviation ended. The permittee shall maintain records of the following information for each corrective action taken:

(7) a description of the corrective action;

(8) the date corrective action was completed;

(9) the date and time the deviation ended;

(10) the total period of time (in minutes) during which there was a deviation;

(11) the temperature readings immediately after the corrective action was implemented; and

(12) the name(s) of the personnel who performed the work.

Investigation and records required by this paragraph do not eliminate the need to comply with the requirements of OAC rule 3745-15-06 if it is determined that a malfunction has occurred.

4. Reporting Requirements

a) The permittee shall submit quarterly deviation (excursion) reports that identify:

(1) all deviations (excursions) of the following emission limitations, operational restrictions and/or control device operating parameter limitations that restrict the potential to emit (PTE) of any regulated air pollutant and have been detected by the monitoring, record keeping and/or testing requirements in this permit:

a. all 3-hour blocks of time when any emissions unit was in operation and vented to the north thermal oxidizer during which the average combustion temperature within the north thermal oxidizer was more than 50°F below the average temperature maintained during the most recent performance test that demonstrated the emissions unit was in compliance;

b. all 3-hour blocks of time when any emissions unit was in operation and vented to the south thermal oxidizer during which the average combustion temperature within the south thermal oxidizer was more than 50°F below the average temperature maintained during the most recent performance test that demonstrated the emissions unit was in compliance;

c. any records of downtime (date and length of time) for the capture (collection) system, the thermal oxidizer, and/or the monitoring equipment when the emissions unit(s) was/were in operation;

d. any period of time (start time and date, and end time and date) when the emissions unit(s) was/were in operation and the process emissions were not vented to the thermal oxidizer;

(2) the probable cause of each deviation (excursion);

(3) any corrective actions that were taken to remedy the deviations (excursions) or prevent future deviations (excursions); and

(4) the magnitude and duration of each deviation (excursion).

If no deviations (excursions) occurred during a calendar quarter, the permittee shall submit a report that states that no deviations (excursions) occurred during the quarter.

The quarterly reports shall be submitted each year by January 31 (covering October to December), April 30 (covering January to March), July 31 (covering April to June), and October 31 (covering July to September), unless an alternative schedule has been established and approved by the Director (the appropriate district office or local air agency).

b) All applications, notifications or reports required by terms and conditions in this permit to be submitted or "reported in writing" are to be submitted to Ohio EPA through the Ohio EPA's eBusiness Center: Air Services web service ("Air Services"). Ohio EPA will accept hard copy submittals on an as-needed basis if the permittee cannot submit the required documents through the Ohio EPA eBusiness Center. In the event of an alternative hard copy submission in lieu of the eBusiness Center, the post-marked date or the date the document is delivered in person will be recognized as the date submitted. Electronic submission of applications, notifications, or reports required to be submitted to Ohio EPA fulfills the requirement to submit the required information to the Director, the district office or local air agency, and/or any other individual or organization specifically identified as an additional recipient identified in this permit unless otherwise specified. Consistent with OAC rule 3745-15-03, the required application, notification or report is considered to be "submitted" on the date the submission is successful using a valid electronic signature. Signature by the signatory authority may be represented as provided through procedures established in Air Services.

5. Testing Requirements

a) The permittee shall conduct, or have conducted, emissions testing for emission units P036, P037, P038, P039, P041, P044, P048, and P049 per the following requirements:

(1) The emissions testing shall be conducted within six months of the permit expiration.

(2) The emissions testing shall be conducted to demonstrate compliance with the overall control efficiency limitation for VOC. No capture testing is required because the emissions units listed above are a closed system (emissions are hard piped to the control equipment) with 100% capture efficiency.

(3) The control efficiency (that is, the percent reduction in mass emissions between the inlet and outlet of the control system) shall be determined per the test methods and procedures specified in OAC rule 3745-21-10 or an alternative test protocol approved by Ohio EPA. The test methods and procedures selected shall be based on a consideration of the diversity of the organic species present and the total concentration, and on a consideration of the potential presence of interfering gases.

(4) During the emissions testing, the EUs shall be operated under operational conditions approved in advance by the appropriate Ohio DO/LAA. Operational conditions that may need to be approved include, but are not limited to, the production rate, the type of material processed, material make-up (solvent content, etc.) or control equipment operational limitations (burner temperature, precipitator voltage, etc.). In general, testing shall be done under worst-case conditions expected during the life of the permit. As part of the information provided in the Intent-to-Test (ITT) notification form described below, the permittee shall provide a description

of the EU operational conditions they will meet during the emissions testing and describe why they believe worst-case operating conditions will be met. Prior to conducting the test(s), the permittee shall confirm with the appropriate Ohio EPA DO/LAA that the proposed operating conditions constitute worst-case. Failure to test under the approved conditions may result in Ohio EPA not accepting the test results as a demonstration of compliance.

(5) Not later than 30 days prior to the proposed test date(s), the permittee shall submit an ITT notification to the appropriate Ohio EPA DO/LAA. The ITT notification shall describe in detail the proposed test methods and procedures, the EU operating parameters, the time(s) and date(s) of the test(s) and the person(s) who will be conducting the test(s). Failure to submit such notification for review and approval prior to the test(s) may result in the Ohio EPA DO/LAA's refusal to accept the results of the emission test(s).

(6) Personnel from the appropriate Ohio EPA DO/LAA shall be permitted to witness the test(s), examine the testing equipment and acquire data and information necessary to ensure that the operation of the EUs and the testing procedures provide a valid characterization of the emissions from the EUs and/or the performance of the control equipment.

(7) A comprehensive written report on the results of the emissions test(s) shall be signed by the person(s) responsible for the tests and submitted to the appropriate Ohio EPA DO/LAA within 30 days following completion of the test(s). The permittee may request additional time for the submittal of the written report, where warranted, with prior approval from the appropriate Ohio EPA DO/LAA.

C. Emissions Unit Terms and Conditions

1. Emissions Unit Group - Carbon Furnaces: P036, P037, P038, P039, P041, P044, P048, and P049.

EU ID	Operations, Property and/or Equipment Description
P036	11' carbon processing furnace - Carbon Processing Furnace P036-A
P037	11' carbon processing furnace - Carbon Processing Furnace P037-A
P038	11' carbon processing furnace
P039	Carbonization furnace (Plant F-Dept. 665) - Accutherm Carbonization Furnace
P041	One 11' Carbon Processing Furnace - Carbon Processing Furnace
P044	Carbon Processing Furnace (Plant F-Dept. 665) - Carbon Processing Furnace
P048	One 11' carbon processing furnace - Carbon Processing Furnace P036-B (Previously part of emissions unit P036 covered by Permit to Install 16-1531)
P049	One 11' carbon processing furnace - Carbon Processing Furnace P037-B (Previously part of emissions unit P037 covered by Permit to Install 16-1531)

a) This permit document constitutes a permit-to-install issued in accordance with ORC 3704.03(F) and a permit-to-operate issued in accordance with ORC 3704.03(G).

(1) For the purpose of a permit-to-install document, the emissions unit terms and conditions identified below are federally enforceable with the exception of those listed below which are enforceable under state law only.

a. None.

(2) For the purpose of a permit-to-operate document, the emissions unit terms and conditions identified below are enforceable under state law only with the exception of those listed below which are federally enforceable.

a. b)(1)b.

b) Applicable Emissions Limitations and/or Control Requirements

(1) The specific operation(s), property, and/or equipment that constitute each emissions unit along with the applicable rules and/or requirements and with the applicable emissions limitations and/or control measures are identified below. Emissions from each unit shall not exceed the listed limitations, and the listed control measures shall be specified in narrative form following the table.

	Applicable Rules/Requirements	Applicable Emissions Limitations/Control Measures
a.	OAC rule 3745-31-05(A)	The emissions of organic material (OM) from emissions units P036 and P048, combined, shall not exceed 2.5 pounds per hour and 10.95 tons per year. The emissions of OM from emissions units P037 and P049, combined, shall not exceed 2.5 pounds per hour and 10.95 tons per year. The emissions of OM from emissions unit P038 shall not exceed 2.5 pounds per hour and 10.95 tons per year. The emissions of OM from emissions unit P039 shall not exceed 2.5 pounds per hour and 10.95 tons per year. The emissions of OM from emissions unit P041 shall not exceed 2.5 pounds per hour and 10.95 tons per year. The volatile organic compound (VOC) emissions from emissions unit P044 shall not exceed 2.47 pounds per hour and 10.82 tons per year. See b)(2)a. and b)(2)b. below.
b.	OAC rule 3745-31-05(D) (Synthetic Minor to avoid Title V permitting and MACT applicability under 40 CFR Part 63, Subpart GG)	The use of a thermal oxidizer that restricts the annual emissions from emissions units P036, P037, P038, P039, P041, P044, P048 and P049, combined, to 11.67 tons of VOC per rolling, 12-month period and 1.11 tons of combined hazardous air pollutants (HAP) per rolling, 12-month period.
c.	OAC rule 3745-31-05(D) [Federally enforceable requirements to comply with OAC rule 3745-21-11(B)]	See Facility-Wide Terms and Conditions B.2. through B.5. above.
d.	OAC Rule 3745-21-07(N)(3)	The control measure specified by this rule is less stringent than the control measure established pursuant to OAC rule 3745-31-

		05(D) as specified under d)(1) and d)(2) below.

(2) Additional Terms and Conditions

a. See Facility-Wide Terms and Conditions B.2.a) above.

b. All of the VOC and organic HAPs emissions from the emissions units listed above and all of the OM emissions from emissions units P036, P037, P038, P039, P041, P048 and P049 shall be vented to a thermal oxidizer that shall meet the operational, monitoring, and record keeping requirements of this permit, when one or more of the emissions units are in operation.

c. The annual emission limitations are based on the “worst-case” scenario. However, if any proposed change(s), such as with production capacity, the types and/or quantities of materials used or processed, or anything else that increases the potential emissions of any air pollutant, then the permittee shall apply for and obtain either a final Chapter 31 or a final administrative modification to the federally enforceable permit-to-install and operate (FEPTIO) prior to the change(s).

c) Operational Restrictions

(1) None.

d) Monitoring and/or Recordkeeping Requirements

(1) See Facility-Wide Terms and Conditions B.3. above.

(2) In order to maintain compliance with the applicable emission limitation(s) contained in this permit, the acceptable average combustion temperature within the north thermal oxidizer, for any 3-hour block of time when one or more of the emissions units controlled by the north thermal oxidizer are in operation, shall not be more than 50°F below the average temperature measured during the most recent performance test that demonstrated the emissions units were in compliance.

(3) In order to maintain compliance with the applicable emission limitation(s) contained in this permit, the acceptable average combustion temperature within the south thermal oxidizer, for any 3-hour block of time when one or more of the emissions units controlled by the south thermal oxidizer are in operation, shall not be more than 50°F below the average temperature measured during the most recent performance test that demonstrated the emissions units were in compliance.

(4) The permittee shall properly install, operate, and maintain a continuous temperature monitor and recorder that measures and records the combustion temperature within the thermal oxidizers when any of the controlled emissions units are in operation, including periods of startup and shutdown. Units shall be in degrees Fahrenheit (°F). The accuracy for each thermocouple, monitor, and recorder shall be guaranteed by the manufacturer to be within ±

1% of the temperature being measured or ± 5°F, whichever is greater. The temperature monitor and recorder shall be installed, calibrated, operated, and maintained in accordance with the manufacturer's recommendations, instructions, and the operating manuals, with any modifications deemed necessary by the permittee. The permittee shall collect and record the following information each day any of the controlled emissions units are in operation:

a. all 3-hour blocks of time, when any emissions unit was in operation and vented to the north thermal oxidizer, during which the average combustion temperature within the north thermal oxidizer was more than 50°F below the average temperature measured during the most recent performance test that demonstrated the emissions unit was in compliance;

b. all 3-hour blocks of time, when any emissions unit was in operation and vented to the south thermal oxidizer, during which the average combustion temperature within the south thermal oxidizer was more than 50°F below the average temperature measured during the most recent performance test that demonstrated the emissions unit was in compliance; and

c. a log (date and total time) of the downtime or bypass of the capture (collection) system and thermal oxidizer, and/or downtime of the monitoring equipment, when the associated emissions unit(s) was/were in operation.

These records shall be maintained at the facility for a period of five years.

(5) Whenever the monitored average combustion temperature within either of the thermal oxidizers deviates from the range or limit established in accordance with this permit, the permittee shall promptly investigate the cause of the deviation. The permittee shall maintain records of the following information for each investigation:

a. identification of the operating emissions unit(s) and oxidizer(s);

b. the date and time the deviation began;

c. the magnitude of the deviation at that time;

d. the date the investigation was conducted;

e. the name(s) of the personnel who conducted the investigation; and

f. the findings and recommendations.

In response to each required investigation to determine the cause of a deviation, the permittee shall take prompt corrective action to bring the operation of the control equipment within the acceptable range/limit specified in this permit, unless the permittee determines that corrective action is not necessary and documents the reasons for that determination and the date and time the deviation ended. The permittee shall maintain records of the following information for each corrective action taken:

g. a description of the corrective action;

h. the date corrective action was completed;

i. the date and time the deviation ended;

j. the total period of time (in minutes) during which there was a deviation;

k. the temperature readings immediately after the corrective action was implemented; and

l. the name(s) of the personnel who performed the work.

Investigation and records required by this paragraph do not eliminate the need to comply with the requirements of OAC rule 3745-15-06 if it is determined that a malfunction has occurred.

(6) The temperature ranges/limits are effective for the duration of this permit, unless revisions are requested by the permittee and approved in writing by the appropriate Ohio EPA district office or local air agency. The permittee may request revisions to the permitted temperature ranges/limits based upon information obtained during future performance tests that demonstrate compliance with the allowable emission rate(s) for the controlled pollutant(s). In addition, approved revisions to the temperature ranges/limits will not constitute a relaxation of the monitoring requirements of this permit and may be incorporated into this permit by means of an administrative modification.

(7) The permittee shall maintain monthly records of the following information:

a. the rolling, 12-month summation of VOC emissions from emissions units P036, P037, P038, P039, P041, P044, P048 and P049, combined; and

b. the rolling, 12-month summation of total combined HAP emissions from emissions units P036, P037, P038, P039, P041, P044, P048 and P049, combined.

e) Reporting Requirements

(1) See Facility-Wide Terms and Conditions B.4. above.

(2) The permittee shall submit quarterly deviation (excursion) reports that identify:

a. all deviations (excursions) of the following emission limitations, operational restrictions and/or control device operating parameter limitations that restrict the potential to emit (PTE) of any regulated air pollutant and have been detected by the monitoring, record keeping and/or testing requirements in this permit:

i. all 3-hour blocks of time when any emissions unit was in operation and vented to the north thermal oxidizer during which the average combustion temperature within the north thermal oxidizer was more than 50°F below the average temperature maintained during the most recent performance test that demonstrated the emissions unit was in compliance;

ii. all 3-hour blocks of time when any emissions unit was in operation and vented to the south thermal oxidizer during which the average combustion temperature within the south thermal oxidizer was more than 50°F below the average temperature maintained during the most recent performance test that demonstrated the emissions unit was in compliance;

iii. any records of downtime (date and length of time) for the capture (collection) system, the thermal oxidizer, and/or the monitoring equipment when the emissions unit(s) was/were in operation;

iv. any period of time (start time and date, and end time and date) when the emissions unit(s) was/were in operation and the process emissions were not vented to the thermal oxidizer;

b. the probable cause of each deviation (excursion);

c. any corrective actions that were taken to remedy the deviations (excursions) or prevent future deviations (excursions); and

d. the magnitude and duration of each deviation (excursion).

If no deviations (excursions) occurred during a calendar quarter, the permittee shall submit a report that states that no deviations (excursions) occurred during the quarter.

The quarterly reports shall be submitted each year by January 31 (covering October to December), April 30 (covering January to March), July 31 (covering April to June), and October 31 (covering July to September), unless an alternative schedule has been established and approved by the Director (the appropriate district office or local air agency).

(3) The permittee shall submit an annual Permit Evaluation Report (PER) to the Ohio EPA. The PER must be submitted by the due date identified in the Authorization section of this permit. The PER shall cover a reporting period of no more than 12 months for each air contaminant source identified in this permit.

(4) All applications, notifications or reports required by terms and conditions in this permit to be submitted or "reported in writing" are to be submitted to Ohio EPA through the Ohio EPA's eBusiness Center: Air Services web service ("Air Services"). Ohio EPA will accept hard copy submittals on an as-needed basis if the permittee cannot submit the required documents through the Ohio EPA eBusiness Center. In the event of an alternative hard copy submission in lieu of the eBusiness Center, the post-marked date or the date the document is delivered in

person will be recognized as the date submitted. Electronic submission of applications, notifications, or reports required to be submitted to Ohio EPA fulfills the requirement to submit the required information to the Director, the district office or local air agency, and/or any other individual or organization specifically identified as an additional recipient identified in this permit unless otherwise specified. Consistent with OAC rule 3745-15-03, the required application, notification or report is considered to be "submitted" on the date the submission is successful using a valid electronic signature. Signature by the signatory authority may be represented as provided through procedures established in Air Services.

f) Testing Requirements

(1) See Facility-Wide Terms and Conditions B.5. above.

(2) Compliance with the Emissions Limitations and/or Control Requirements specified in section b) of these terms and conditions shall be determined in accordance with the following methods:

a. Emission Limitations:

The emissions of OM from emissions units P036 and P048, combined, shall not exceed 2.5 pounds per hour and 10.95 tons per year.

The emissions of OM from emissions units P037 and P049, combined, shall not exceed 2.5 pounds per hour and 10.95 tons per year.

The emissions of OM from emissions unit P038 shall not exceed 2.5 pounds per hour and 10.95 tons per year.

The emissions of OM from emissions unit P039 shall not exceed 2.5 pounds per hour and 10.95 tons per year.

The emissions of OM from emissions unit P041 shall not exceed 2.5 pounds per hour and 10.95 tons per year.

The VOC emissions from emissions unit P044 shall not exceed 2.47 pounds per hour and 10.82 tons per year.

Applicable Compliance Method:

Compliance with the hourly allowable OM and VOC emission limitations identified above shall be determined based upon the emission testing requirements in section f)(2).

The annual allowable OM and VOC emission limitations above were determined by multiplying the hourly allowable OM/VOC emission limitation by 8,760 hours per year, and dividing by 2,000 pounds per ton. Therefore, as long as compliance with the hourly allowable emission limitations is maintained, compliance with the annual allowable emission limitations will be demonstrated

b. Emission Limitation:

The use of a thermal oxidizer that restricts the annual emissions from emissions units P036, P037, P038, P039, P041, P044, P048 and P049, combined, to 11.67 tons of VOC per rolling, 12-month period and 1.11 tons of combined HAPs per rolling, 12-month period.

Applicable Compliance Method:

Compliance with the allowable annual VOC and combined HAPs emission limitations above shall be determined based upon the emission testing requirements in section f)(2).

(3) The permittee shall conduct, or have conducted, emission testing for the emissions units listed above in accordance with the following requirements:

a. The emission testing shall be conducted within 6 months prior to the permit expiration.

b. The emission testing shall be conducted to demonstrate compliance with the allowable mass emission rates for VOC, organic HAPs and OM.

c. The following test method(s) shall be employed to demonstrate compliance with the allowable mass emission rate(s):

i. Methods 1 through 4 and 18 of 40 CFR Part 60, Appendix A.

Alternative U.S. EPA-approved test methods may be used with prior approval from Ohio EPA.

d. During the emission testing, the emissions unit shall be operated under operational conditions approved in advance by the appropriate Ohio EPA district office or local air agency. Operational conditions that may need to be approved include, but are not limited to, the production rate, the type of material processed, material make-up (solvent content, etc.), or control equipment operational limitations (burner temperature, precipitator voltage, etc.). In general, testing shall be done under "worst case" conditions expected during the life of the permit. As part of the information provided in the "Intent to Test" notification form described below, the permittee shall provide a description of the emissions unit operational conditions they will meet during the emissions testing and describe why they believe "worst case" operating conditions will be met. Prior to conducting the test(s), the permittee shall confirm with the appropriate Ohio EPA district office or local air agency that the proposed operating conditions constitute "worst case". Failure to test under the approved conditions may result in Ohio EPA not accepting the test results as a demonstration of compliance.

e. Not later than 30 days prior to the proposed test date(s), the permittee shall submit an "Intent to Test" notification to the appropriate Ohio EPA district office or local air agency. The "Intent to Test" notification shall describe in detail the proposed test methods and procedures, the emissions unit operating parameters, the time(s) and date(s) of the test(s), and the person(s) who will be conducting the test(s). Failure to submit such notification for review and approval prior to the test(s) may result in the Ohio EPA district office's or local air agency's refusal to accept the results of the emission test(s).

f. Personnel from the appropriate Ohio EPA district office or local air agency shall be permitted to witness the test(s), examine the testing equipment, and acquire data and information necessary to ensure that the operation of the emissions unit and the testing procedures provide a valid characterization of the emissions from the emissions unit and/or the performance of the control equipment.

g. A comprehensive written report on the results of the emissions test(s) shall be signed by the person or persons responsible for the tests and submitted to the appropriate Ohio EPA district office or local air agency within 30 days following completion of the test(s). The permittee may request additional time for the submittal of the written report, where warranted, with prior approval from the appropriate Ohio EPA district office or local air agency.

g) Miscellaneous Requirements

(1) None.

VOC RACT STUDY
CARBON PROCESSING FURNACES

Meggitt Aircraft Braking Systems Corporation

Prepared By:

TRINITY CONSULTANTS
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Project 253601.0166

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1. BACKGROUND

On March 17, 2022, Ohio EPA promulgated revisions to the existing volatile organic compound (VOC) regulations under Chapter 3745-21 of the Ohio Administrative Code (OAC) due to the downgrade to moderate nonattainment status for the Cleveland area with respect to the 2015 8-hr Ozone National Ambient Air Quality Standard (NAAQS) as well as the change to marginal nonattainment status for the Cincinnati area.

Changes in the revised standards include but are not limited to:

- Extension of existing VOC Reasonably Available Control Technology (RACT) rules in OAC 3745-21 to the Cincinnati area; and
- Requirement for major VOC emitters (from non-control technique guidelines (CTG) sources) in the Cincinnati and Cleveland areas to conduct a detailed engineering study pursuant to OAC 3745-21-11.

Chapter 3745-21-11 requires facilities located in Butler, Clermont, Cuyahoga, Geauga, Hamilton, Lake, Lorain, Medina, Portage, Summit, or Warren County that have potential VOC emissions greater than 100 tons per year (tpy) from non-CTG sources to conduct a detailed engineering study to determine the technical and economic feasibility of reducing VOC emissions and define RACT for the affected sources. Additionally, it requires that any facility that has an existing site-specific definition of RACT in Chapter 3745-12-09 of the OAC submit an updated RACT study. In both cases the engineering study must be submitted to Ohio EPA within one (1) year of the effective date of the rule (i.e., by March 27, 2023).

On April 1, 2025, Ohio EPA promulgated revisions to the existing volatile organic compound (VOC) regulations under Chapter 3745-21 of the Ohio Administrative Code (OAC) following the classification of the Cleveland area to serious nonattainment status for the 2015 8-hr Ozone NAAQS in the Cleveland area.

Changes included in the revised standards include but are not limited to:

- ► Requirement for major VOC emitters (from non-CTG sources) in the Cleveland area to conduct a detailed engineering study pursuant to OAC 3745-21-11.

Chapter 3745-21-11 requires facilities located in Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, or Summit County that have potential VOC emissions greater than 50 tpy from non-CTG sources to conduct a detailed engineering study to determine the technical and economic feasibility of reducing VOC emissions and define RACT for the affected sources. Additionally, it requires that any facility that has an existing site-specific definition of RACT in Chapter 3745-12-09 of the OAC submit an updated RACT study. In both cases the engineering study must be submitted to Ohio EPA within one (1) year of the effective date of the rule (i.e., by April 1, 2026).

Meggitt Aircraft and Braking Systems Corporation’s manufacturing facility located in Akron, Ohio, is subject to a non-CTG RACT determination pursuant to OAC 3745-21-11. Accordingly, the facility is required to submit a VOC RACT study by April 1, 2026. The following sections comprise the required VOC RACT study for the Meggitt Aircraft Braking Systems Corporation Akron, Ohio Facility.

2. FACILITY OVERVIEW

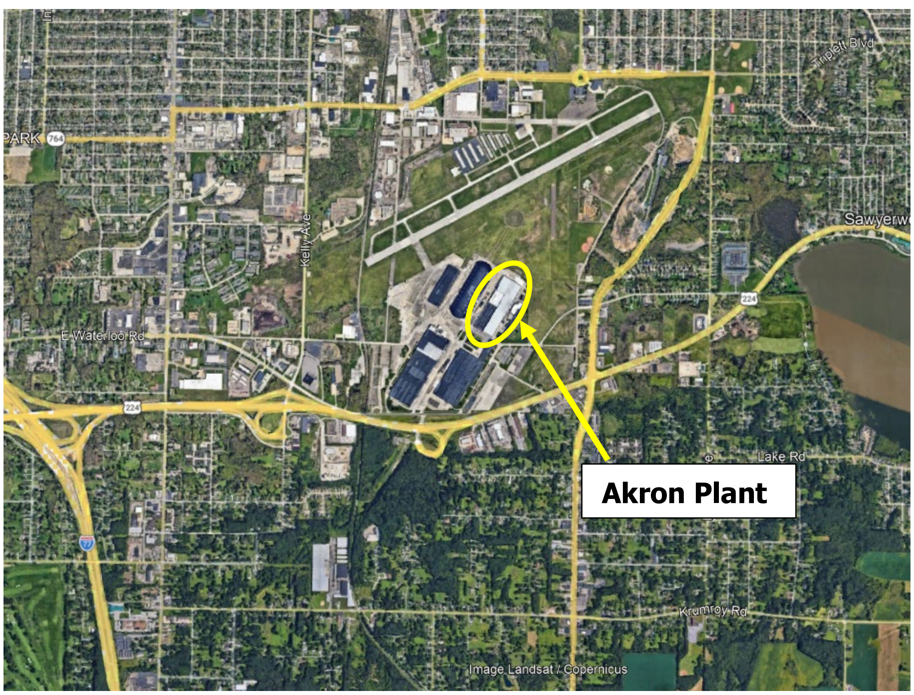
2.1 General Facility Information

Meggitt Aircraft Braking Systems Corporation (Meggitt) owns and operates an aircraft parts and auxiliary equipment manufacturing facility Summit County. The facility is located at 1204 Massillon Road, Akron, Ohio 44306. The Akron Facility manufactures advanced aircraft braking systems. These include:

- Wheels
- Carbon brakes
- Brake control systems
- Landing gear components.

Figure 2-1 is an area map that shows the site location relative to predominant geographical features such as highways and railroads.

Figure 2-1. Area Map for Meggitt



Facility information required by sections (1) through (4) of OAC 3745-21-11(B) is provided as follows:

a) The complete facility name, Ohio EPA air program facility identification number, and address:

Meggitt Aircraft Braking System Corporation
Facility ID 1677010999
1204 Massillon Road
Akron, OH 44306

b) The name, title, address and telephone number of the owner or operator's representative within the company who is the contact person for this facility regarding the engineering study and affected sources, and

Gary Scotton
EHS Manager
1204 Massillon Road
Akron, OH 44306
(330) 796-5933
Gary.Scotton@parker.com

c) The name, title, address, and telephone number of the official who is responsible for approval of the engineering study:

Patrick Sines
Senior Manager, Site Operations
1204 Massillon Road
Akron, OH 44306
(330) 208-3634
Patrick.Sines@parker.com

d) The standard industrial classification code and source classification code numbers which are applicable to the facility's operation:

SIC Code: *3728*
SCC: *3-09-900-03*

2.2 Permitted VOC Sources

Table 2-1 summarizes the PTIO permitted VOC sources at the Akron Facility. A detailed documentation of the approach for calculating potential to emit (PTE) is provided in Appendix A.

As shown in Table 2-1, Meggitt operates a touch up booth (i.e., K008), three portable parts washers (i.e., L007), a Grieve oven (i.e., P023), a foam packaging system (i.e., Z706), and a research and development furnace (TMP187138) that are de minimis sources of VOC emissions which are excluded from the RACT study.

The Akron Facility operates eight carbon processing electric induction coil furnaces (i.e., P036-P039, P041, P044, and P048-P049) that are subject to a non-CTG RACT determination at OAC 3745-21-11. The remainder of this study provides proposed VOC RACT determinations for these sources.

Table 2-1. PTIO Permitted VOC Sources at the Akron Facility[a]

Emission Unit ID	Emission Unit Description	Current VOC Control	VOC PTE (tpy)	Current VOC Emission Limit(s)	VOC RACT Applicability
P036, P037, P038, P041, P044, P048, and P049[b]	Carbon Processing Furnaces	Thermal Oxidizer	11.3	11.67	RACT Study
P039[b]	Accutherm Carbonization Furnace		0.4		

a. Excludes de-minimis and insignificant sources.
b. P036-P039, P041, P044, and P048-P049 are subject to a combined VOC emission limit of 11.67 tons per rolling, 12-month period.

3. RACT DETERMINATION

As discussed in Section 1 above, Meggitt is required to perform a RACT study for carbon processing furnaces (i.e, Ohio EPA Emission Unit IDs P036, P037, P038, P039, P041, P044, P048, and P049) pursuant to OAC 3745-21-11. Appendix B provides source specific information required by OAC 3745-21-11(B)(1) through (7). The following sections include a detailed description of the source followed by the top-down RACT analysis.

3.1 Source Overview

Meggitt operates carbon processing electric induction coil furnaces (i.e, Ohio EPA Emission Unit IDs P036, P037, P038, P039, P041, P044, P048, and P049), which are industrial thermal treatment units used to heat carbon-containing materials to high temperatures under controlled conditions. The furnaces perform processes such as carbonization, heat treatment, or stabilization to modify the physical and mechanical properties of the material, including strength, hardness, and thermal resistance.

Carbonization is a controlled thermal treatment process in which carbon-containing materials are heated in a high-temperature furnace operated under oxygen-limited or inert conditions. The purpose of the process is to thermally decompose organic constituents and remove volatile material while converting the processed material into a carbon-rich solid with improved structural and thermal properties.

The furnace is operated using controlled heating rates dependent on product requirements. The process environment prevents oxidation and open combustion; no direct flame contact occurs between the heating source and the material being processed.

VOC emissions associated with carbonization are generated as process emissions resulting from thermal decomposition of organic binders, resins, or other carbon-containing constituents within the material. As temperature increases, volatile organic compounds, moisture, and light hydrocarbons are driven off as off-gas.

The carbonization process itself is not a combustion process. Any fuel firing associated with the unit is limited to indirect heating of the furnace chamber and does not constitute a primary source of VOC emissions.

Off-gases from the carbonization furnace may contain, VOCs, Carbon Monoxide (CO), Methane and other hydrocarbons, and Carbon Dioxide (CO_2). Emission composition and quantity depend on material type, throughput, and operating temperature.

The carbonization process at Meggitt's Akron facility does not include coating operations, or cleanup solvents. Therefore, the requirements of OAC 3745-21(B)(7)(e) and (f), which are for coating operations and solvent cleaning activities, do not apply to Meggitt.

3.2 Control Overview

The carbon furnaces are equipped with thermal oxidizers, which are an air pollution control device used to control VOC emissions generated as process off-gases from the carbonization process. There are two thermal oxidizers associated with P036-P038, P041, P044, and P048-P049, and an additional thermal oxidizer associated with P039. Process exhaust gases from the carbonization furnaces are ducted directly to the thermal oxidizers, where VOCs and other combustibles are destroyed through high-temperature oxidation prior to atmospheric release.

The thermal oxidizers are regulated through Permit-to-Install and Operate (PTIO) P0129464, which contains enforceable operating parameters, including continuous monitoring and recordkeeping, to maintain minimum combustion temperatures. Additionally, the PTIO requires stack testing to demonstrate compliance with the allowable mass emission rates for VOC, organic hazardous air pollutants (HAPs), and organic material (OM). Appendix C provides a copy of the most recent stack test as required by OAC 3745-21-11(B)(7)(h).

A top-down RACT analysis was not performed for the carbon furnaces because the units are already equipped with thermal oxidizers that represent the highest level of reasonably available VOC control technology for this source category. Exhaust gases from the carbon furnaces are routed to thermal oxidizers designed and operated to achieve a VOC destruction efficiency of 99%.

Capture efficiency is estimated to exceed 99% because furnace exhaust is conveyed through a dedicated closed-duct system directly to a thermal oxidizer, and the furnaces are maintained under vacuum throughout the carbonization process. The integrity of the exhaust ductwork is critical because the introduction of oxygen into a furnace during carbonization could create a significant safety hazard, including the potential for fire or other upset conditions.

Thermal oxidation is widely recognized as the most effective and commonly implemented control technology for high-temperature, continuous industrial furnace exhaust streams containing VOCs. The installed thermal oxidizers provide near-complete oxidation of organic compounds and represents the upper bound of feasible VOC control performance for this type of process. Alternative control technology evaluated under a traditional top-down analysis (i.e., carbon adsorption, catalytic incinerator, condenser, scrubber, or alternative combustion-based controls) would not provide a materially higher level of control than the existing 99% destruction efficiency, nor would they be technically practicable for the furnace exhaust conditions.

Because the unit already achieves VOC emission reductions consistent with the most stringent level of control that is reasonably available, there are no technically feasible or economically reasonable control options that would result in a meaningful incremental reduction in VOC emissions beyond the existing configuration. Therefore, a top-down RACT analysis would not identify any additional RACT-level controls and would not materially inform the determination of RACT for this emission unit.

Accordingly, the existing carbon furnaces equipped with thermal oxidizers with a destruction efficiency of 99% are considered to meet RACT, and no further controls are evaluated.

3.3 Source Modification/Replacement

In accordance with OAC 3745-21-11(B)(11), this RACT evaluation includes consideration of process modifications or operational changes that could reduce or eliminate VOC emissions at the source.

The carbonization furnaces are integral to Meggitt's operations. These emission units are used to thermally process materials under controlled conditions to achieve required product characteristics and performance specifications. Continuous and reliable operation of the carbonization furnaces is necessary to meet production demands and maintain product quality and consistency.

Potential pollution prevention measures, including reductions in furnace operating frequency or limitations on operating hours, or elimination of carbonization activities, were evaluated. However, implementation of such measures would directly interfere with the Meggitt facility's ability to meet its manufacturing, quality assurance, and customer requirements and would not be consistent with the intended function of the source. The furnaces are operated in accordance with established production and operating practices designed to optimize thermal efficiency and minimize unnecessary material throughput, thereby limiting VOC generation to the extent practicable.

Based on this evaluation, elimination or substantial modification of the carbonization furnace operations is not technically feasible.

3.4 RACT Determination

The proposed RACT determination for VOC emissions from the carbon furnace is the continued operation of the existing thermal oxidizers in accordance with the operating requirements specified in PTIO P0129464. The thermal oxidizers are designed and operated to achieve a VOC capture and destruction efficiency of 99% and represent the most effective and commonly applied control technology for this type of emission source.

Continued operation of the thermal oxidizers ensures that VOC emissions from the carbon furnaces are controlled to a level consistent with the maximum degree of emission reduction that is reasonably available. No additional add-on controls or process modifications have been identified that would result in a meaningful incremental reduction in VOC emissions beyond the performance achieved by the existing control device. Therefore, continued operation and proper maintenance of the thermal oxidizer is proposed as RACT for the carbon furnace.

APPENDIX A. POTENTIAL-TO-EMIT DOCUMENTATION

REDACTED

REDACTED

MEGGITT AIRCRAFT BRAKING SYSTEMS CORPORATION
AKRON, OHIO

EMISSION CALCULATIONS

REDACTED

REDACTED

REDACTED

Appendix Table B-1. General Source Information

Emission Unit ID	Emission Unit Description	Installation Date (Month and Year)	Operating Schedule (hrs/day / days/week/ weeks/yr)	Control Equipment	Control Device Installation Date
P036	Carbon Processing Furnace	11/1996	24/7/52	Thermal Oxidizer	8/1/1996
P037	Carbon Processing Furnace	11/1996	24/7/52	Thermal Oxidizer	8/1/1996
P038	Carbon Processing Furnace	11/1996	24/7/52	Thermal Oxidizer	8/1/1996
P039	Accutherm Carbonization Furnace	6/1996	24/7/52	Thermal Oxidizer	3/1/1996
P041	Carbon Processing Furnace	12/1998	24/7/52	Thermal Oxidizer	8/1/1996
P044	Carbon Processing Furnace	7/1999	24/7/52	Thermal Oxidizer	8/1/1996
P048	Carbon Processing Furnace	11/1996	24/7/52	Thermal Oxidizer	8/1/1996
P049	Carbon Processing Furnace	11/1996	24/7/52	Thermal Oxidizer	8/1/1996

Appendix Table B-2. Annual Production Rates for 2022-2024

Emission Unit ID	Production Units	Average Daily Production Rates			Maximum Daily Production Rates			Annual Production Rates		
		2023	2024	2025	2023	2024	2025	2023	2024	2025
P036	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
P037, P038, P041, P044, P048, and P049	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
P039	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

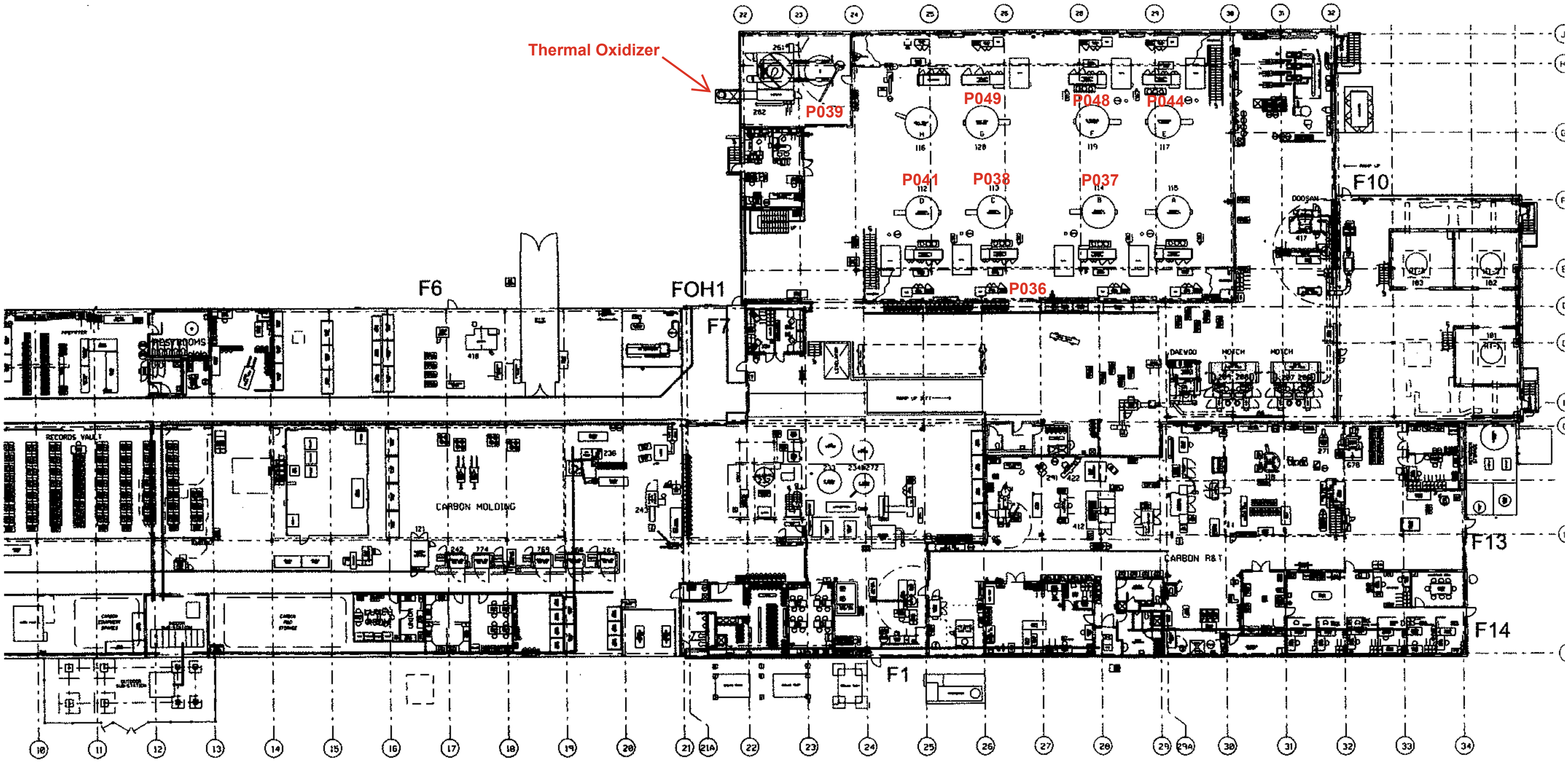
Appendix Table B-3. Average and Maximum Daily and Annual Actual VOC Emissions[a]

OEPA Emission Unit ID	Emission Unit Description	Average Daily VOC Emissions (lb/day)	Maximum Daily VOC Emissions (lb/day)	Maximum Annual VOC Emissions (tpy)
P036	Carbon Processing Furnaces		Did not operate	
P037, P038, P041, P044, P048, and P049	Carbon Processing Furnaces	0.61	0.78	0.11
P039	Accutherm Carbonization Furnace	0.68	0.35	0.05

[a] As specified by OAC 3745-21-11(B)(7) the average daily, maximum daily, and maximum annual VOC emissions are based upon the highest production rates for each of the three full calendar years preceding submission of the RACT study (i.e., 2023-2025).

Appendix Figure B-1. Facility Plot Plan


Meggitt Facility
Derby Downs Dr
Massillon Rd
Exeter Rd
Image Landsat / Copernicus



Thermal Oxidizer
P039
P049
P048
P044
P041
P038
P037
P036
F10
F6
FOH1
F7
RESTROOMS
RECORDS VAULT
CARBON MOLDING
CARBON R&T
F13
F14
F1
DAEWOO
DOOSAN

APPENDIX C. THERMAL OXIDIZER STACK TEST RESULTS

Meggitt Aircraft Braking Systems Corporation
1204 Massillon Road
Akron, Ohio 44306

Report

Performed Velocity, Moisture, Temperature, Volumetric Flow Rate and Volatile Organic Compounds Emissions Testing

Sampling performed on the North & South Afterburner Outlets

Akron, OH

Test Date: 12/7/20 & 12/8/20

Meggitt Aircraft Braking Systems Corporation
1204 Massillon Road
Akron, Ohio 44306

Report

Performed Velocity, Moisture, Temperature, Volumetric Flow Rate and Volatile Organic Compounds Emissions Testing

Sampling performed on the North & South Afterburner Outlets

Akron, OH

Test Date: 12/7/20 & 12/8/20

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.

Brian E.Lemasters

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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

EXECUTIVE SUMMARY

Custom Stack Analysis, LLC. conducted emissions sampling using USEPA Methods 1-4 and 25A at Facility ID# - 1677010999. Testing was conducted on the North & South Afterburner Outlets on December 7th & 8th, 2020 for compliance purposes - Permit # - P0121253 (see Table 1.2).

The Custom Stack Analysis, LLC. test crew consisted of Mr. James Gray, Mr. Brian Lemasters and Mr. Ethan Minor. The testing procedures were coordinated by Mr. Jim Davies and Mr. Jon Carver of Meggitt Aircraft Braking Systems Corporation (see Table 1.1).

Table 1.1: Emissions Testing Program Contact Personnel

Name, Title	Company Address	Phone, Fax, email
Mr. Jim Davies Mr.Jon Carver	Meggitt Aircraft Braking Corporation 1204 Massillon Road Akron, OH 44306	(330) 796-1743 (Phone)
Mr. James Gray Owner Mr. Brian Lemasters Project Manager Mr. Ethan Minor Project Technicians	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 pages 3-4. A description of the testing protocol is included on pages 5-6. All testing calculations are located on pages 11-18. 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.

Table 1.2 demonstrates how Meggitt Aircraft Baking Systems Corporation in Akron, 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
Volatile Organic Compounds	See below	**North Afterburner** 0.00415 lbs/hr 0.0182 tons/yr **South Afterburner** 0.00166 lbs/hr 0.00726 tons/yr	 Yes Yes Yes Yes

Individual unit VOC limitations:

- from emissions units P036 and P048, combined, 2.5 lb/hr and 10.95 ton/yr
- from emissions units P037 and P049, combined, 2.5 lb/hr and 10.95 ton/yr
- from emissions unit P038, 2.5 lb/hr and 10.95 ton/yr
- from emissions unit P041, 2.5 lb/hr and 10.95 ton/yr
- from emissions unit P044, 2.47 lb/hr and 10.82 ton/yr

The overall combined VOC emissions from emissions units P036, P037, P038, P041, P044, P048 and P049 are limited to 11.31 ton/yr.

Test Results

Meggitt Aircraft Braking Systems Corporation - North Afterburner Outlet
12/7/2020
Methods 1-4 & 25A

	Run #1	Run #2	Run #3	Avg.
Stack Gas Velocity (ft/sec)	37.31	38.22	38.31	37.95
Standard Cubic Feet an Hour	227,390	230,154	232,946	230,163
Actual Cubic Feet per Minute	15,822	16,212	16,246	16,093
Moisture %	8.18%	8.70%	8.48%	8.45%
Carbon Dioxide %	4.33%	4.17%	4.17%	4.22%
Oxygen %	12.17%	12.33%	12.17%	12.22%
Nitrogen %	83.50%	83.50%	83.66%	83.55%

Method 25A

		Run #1	Run #2	Run #3	Avg.
VOC	**(ppm)**	0.20	0.19	0.20	0.19
	(lbs/hr Carbon)	4.17E-03	4.01E-03	4.29E-03	4.15E-03
	(tons/yr)	1.83E-02	1.76E-02	1.88E-02	1.82E-02

Test Results

Meggitt Aircraft Braking Systems Corporation - South Afterburner Outet
12/8/2020
Methods 1-4 & 25A

	Run #1	Run #2	Run #3	Avg.
Stack Gas Velocity (ft/sec)	30.58	30.95	30.53	30.69
Standard Cubic Feet an Hour	197,116	195,080	190,059	194,085
Actual Cubic Feet per Minute	12,968	13,128	12,950	13,015
Moisture %	8.46%	8.80%	8.39%	8.55%
Carbon Dioxide %	4.83%	4.83%	4.83%	4.83%
Oxygen %	11.67%	11.67%	11.50%	11.61%
Nitrogen %	83.50%	83.50%	83.67%	83.56%

Method 25A

		Run #1	Run #2	Run #3	Avg.
VOC	**(ppm)**	0.11	0.09	0.08	0.09
	(lbs/hr Carbon)	2.01E-03	1.60E-03	1.36E-03	1.66E-03
	(tons/yr)	8.82E-03	7.01E-03	5.95E-03	7.26E-03

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

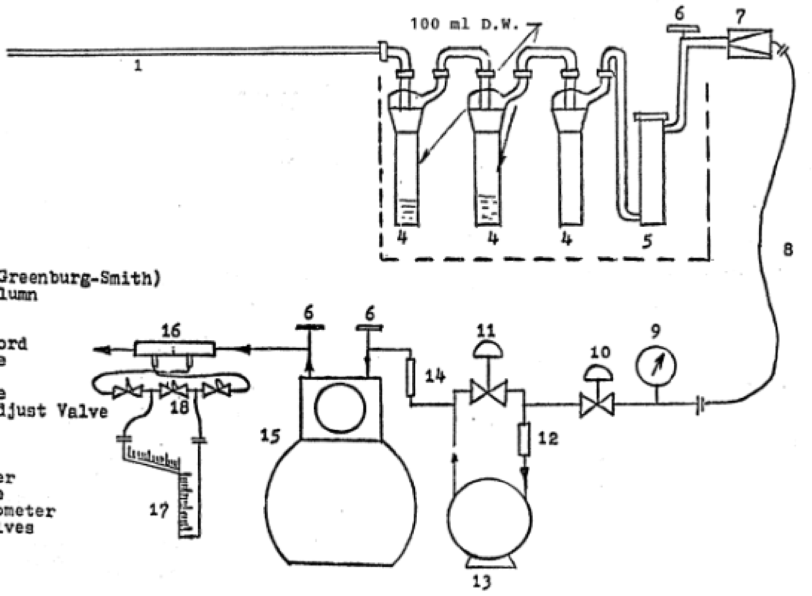
Determination of moisture content in stack gases.

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

METHOD 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.



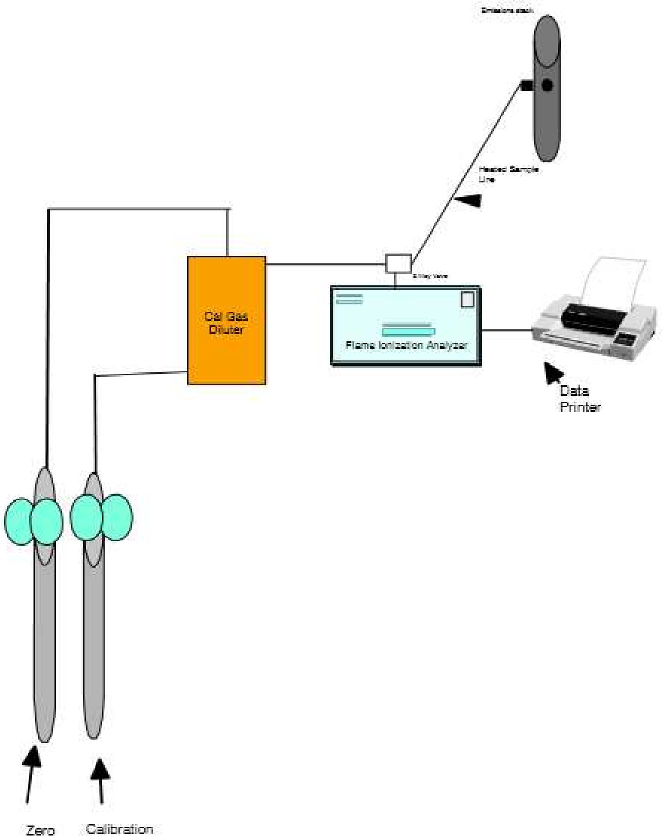
1) Probe
2)
3)
4) Impingers (Greenburg-Smith)
5) Drierite Column
6) Thermometer
7) Check Valve
8) Umbilical Cord
9) Vacuum Gauge
10) Course Flow
Adjust Valve
11) Fine Flow Adjust Valve
12) Oiler
13) Vacuum Pump
14) Filter
15) Dry Gas Meter
16) Orifice Tube
17) Incline Manometer
18) Solenoid Valves

FIGURE 3

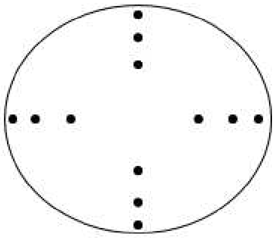
METHOD 4 SAMPLE TRAIN
FOR MOISTURE DETERMINATION

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

25A Sampling System

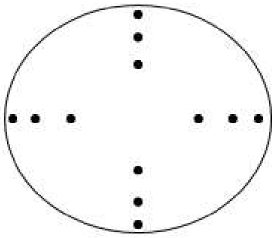


Location of Sampling Points



Location:		North Afterburner Outlet	
Upstream		3'	
Downstream		15'	
Stack Diameter		36	Inches
Sample Point #			
	1	1.6	Inches
	2	5.3	
	3	10.7	
	4	25.3	
	5	30.7	
	6	34.4	

Location of Sampling Points



Location:		South Afterburner Outlet	
Upstream		3'	
Downstream		15'	
Stack Diameter		36	Inches
Sample Point #			
	1	1.6	Inches
	2	5.3	
	3	10.7	
	4	25.3	
	5	30.7	
	6	34.4	

CALCULATIONS

North Afterburner Outlet

		RUN #1	RUN #2	RUN #3		
1.	**Vm (std)**	42.74	42.04	42.21	=	$VM * 17.64 * \frac{PBAR + \frac{\wedge H}{13.6}}{Tm} * Y$

		RUN #1	RUN #2	RUN #3
Vm (std) = Volume of gas collected, corrected to standard conditions, cuft.	=	42.74	42.04	42.21
Vm = Volume of gas sampled at meter box, cuft.	=	45.13	44.39	44.53
17.64 = Standard temperature, 528 Rankine / std pressure, 29.92.	=	17.64	17.64	17.64
Tm = Average dry gas meter temperature, + 460 Rankine.	=	538.58333	538.58333	538.16667
Pbar = Barometric pressure, inches of mercury (Hg)	=	28.76	28.76	28.76
^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.	=	1.0004	1.0004	1.0004

		RUN #1	RUN #2	RUN #3		
2.	**Vw (std)**	3.81	4.01	3.91	=	$Vlc * \frac{P\ H20}{Mh20} * \frac{R\ Tstd}{Pstd} = K2 * Vlc$

		RUN #1	RUN #2	RUN #3
Vlc = Volume of water and silica colected.	=	80.8	85	83
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**	0.08180	0.08698	0.08481	=	$\frac{Vw(std)}{Vm(std) + Vw(std)}$

		RUN #1	RUN #2	RUN #3
Bws = Water vapor in the gas stream, proportion.	=	0.08180	0.08698	0.08481
Vw(std) = Volume of water vapor in the gas sample, scf.	=	3.81	4.01	3.91
Vm(std) = Volume of gas sampled at meter box, scf.	=	42.74	42.04	42.21

		RUN #1	RUN #2	RUN #3		
4.	**Md**	29.1796	29.1604	29.154	=	$\boxed{0.44\ (\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2) + \%CO)}$

			RUN #1	RUN #2	RUN #3
Md	= Dry molecular weight, lb / lb-mole.	=	29.18	29.16	29.15
0.44	= Molecular weight of CO2 divided by 100.	=	0.44	0.44	0.44
0.32	= Molecular weight of O2 divided by 100.	=	0.32	0.32	0.32
0.28	= Molecular weight of N2 or CO divided by 100.	=	0.28	0.28	0.28

Co2, O2, N2, and CO are in percent by volume, dry basis.

		RUN #1	RUN #2	RUN #3		
5.	**Ms**	28.27	28.19	28.21	=	$\boxed{Md * (1-Bws) + M\ H20 * (Bws)}$

			RUN #1	RUN #2	RUN #3
Ms	= Molecular weight of gas , wet basis, lb /lb-mole.	=	28.27	28.19	28.21
M H20	= Molecular weight of water, 18 lb / lb-mole.	=	18	18	18

		RUN #1	RUN #2	RUN #3		
6.	**Vs**	37.31	38.22	38.31	=	$\boxed{85.49 * Cp * \sqrt{\hat{}p} * \sqrt{\frac{Ts + 460}{Ps * Ms}}}$

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	37.31	38.22	38.31
85.49	= Pitot tube constant, ft / sec.	=	85.49	85.49	85.49
Cp	= Pitot tube coefficient, dimensionless.	=	0.84	0.84	0.84
^P	= Velocity head of stack gas, avg. sq rt.	=	0.33580	0.34248	0.34462
Ts	= Temperature of stack gas, + 460 (Rankine).	=	1948.2083	1961	1946
Ps	= Absolute stack gas pressure, barometric + static.	=	28.80	28.80	28.80
Ms	= Molecular weight of stack gas, wet basis.	=	28.27	28.19	28.21

		RUN #1	RUN #2	RUN #3		
7.	**ACFM**	15821.95	16211.57	16246.01	=	$\boxed{Stack\ Area * 60 * Vs}$

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	37.31	38.22	38.31

		RUN #1	RUN #2	RUN #3		
8	**SCFH**	227390	230154	232946	=	$3600 * (1 - Bws) * Vs * A * \frac{Tstd}{Ts} * \frac{Ps}{Pstd}$

				RUN #1	RUN #2	RUN #3
3600	=	Seconds per hour.	=	3600	3600	3600
Bws	=	Water vapor in the gas stream, proportion.	=	0.0817974	0.0869803	0.084805
A	=	Area of stack in sq ft.	=	7.07	7.07	7.07
Tstd	=	Standard absolute temperature, 528 R.	=	528	528	528
Pstd	=	Standard absolute pressure, 29.92 in. Hg.	=	29.92	29.92	29.92
Ts	=	Temperature of stack gas, + 460 (Rankine).		1948.2083	1961	1946
Ps	=	Absolute stack gas pressure, barometric + static.		28.76	28.76	28.76
Vs	=	Average stack gas velocity, ft / sec.		37.31	38.22	38.31

CALCULATIONS

VOC

		RUN #1	RUN #2	RUN #3		
1.	**Lbs/Hr Propane**	0.00510	0.00490	0.00524	=	0.11443 * SCFH * PPM * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	227390	230154	232946
PPM	=	PPM	=	0.1960352	0.1861953	0.1966794

		RUN #1	RUN #2	RUN #3		
2.	**Lbs/Hr Carbon**	0.00417	0.00401	0.00429	=	0.031182 * SCFH * PPM * 3 * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	227390	230154	232946
PPM	=	PPM	=	0.1960352	0.1861953	0.1966794
3	=	Carbon equivalent correction factor for propane.	=	3	3	3

CALCULATIONS

South Afterburner Outlet

		RUN #1	RUN #2	RUN #3		
1.	**Vm (std)**	43.20	42.42	42.83	=	$VM * 17.64 * \frac{PBAR + \frac{\wedge H}{13.6}}{Tm} * Y$

			RUN #1	RUN #2	RUN #3
Vm (std)	= Volume of gas collected, corrected to standard conditions, cuft.	=	43.20	42.42	42.83
Vm	= Volume of gas sampled at meter box, cuft.	=	45.21	44.38	44.80
17.64	= Standard temperature, 528 Rankine / std pressure, 29.92.	=	17.64	17.64	17.64
Tm	= Average dry gas meter temperature, + 460 Rankine.	=	535.58333	535.33333	535.20833
Pbar	= Barometric pressure, inches of mercury (Hg)	=	28.85	28.85	28.85
^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.	=	1.0004	1.0004	1.0004

		RUN #1	RUN #2	RUN #3		
2.	**Vw (std)**	3.99	4.09	3.92	=	$Vlc * \frac{P\ H20}{Mh20} * \frac{R\ Tstd}{Pstd} = K2 * Vlc$

			RUN #1	RUN #2	RUN #3
Vlc	= Volume of water and silica colected.	=	84.7	86.9	83.2
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**	0.08458	0.08803	0.08385	=	$\frac{Vw(std)}{Vm(std) + Vw(std)}$

			RUN #1	RUN #2	RUN #3
Bws	= Water vapor in the gas stream, proportion.	=	0.08458	0.08803	0.08385
Vw(std)	= Volume of water vapor in the gas sample, scf.	=	3.99	4.09	3.92
Vm(std)	= Volume of gas sampled at meter box, scf.	=	43.20	42.42	42.83

		RUN #1	RUN #2	RUN #3		
4.	**Md**	29.2396	29.2396	29.2328	=	0.44 (%CO2) + 0.32 (%O2) + 0.28 (%N2) + %CO)

			RUN #1	RUN #2	RUN #3
Md	= Dry molecular weight, lb / lb-mole.	=	29.24	29.24	29.23
0.44	= Molecular weight of CO2 divided by 100.	=	0.44	0.44	0.44
0.32	= Molecular weight of O2 divided by 100.	=	0.32	0.32	0.32
0.28	= Molecular weight of N2 or CO divided by 100.	=	0.28	0.28	0.28

Co2, O2, N2, and CO are in percent by volume, dry basis.

		RUN #1	RUN #2	RUN #3		
5.	**Ms**	28.29	28.25	28.29	=	Md * (1-Bws) + M H20 * (Bws)

			RUN #1	RUN #2	RUN #3
Ms	= Molecular weight of gas , wet basis, lb /lb-mole.	=	28.29	28.25	28.29
M H20	= Molecular weight of water, 18 lb / lb-mole.	=	18	18	18

		RUN #1	RUN #2	RUN #3		
6.	**Vs**	30.58	30.95	30.53	=	$85.49 * Cp * \sqrt{\text{^p}} * \sqrt{\frac{Ts + 460}{Ps * Ms}}$

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	30.58	30.95	30.53
85.49	= Pitot tube constant, ft / sec.	=	85.49	85.49	85.49
Cp	= Pitot tube coefficient, dimensionless.	=	0.84	0.84	0.84
^P	= Velocity head of stack gas, avg. sq rt.	=	0.28360	0.28421	0.27818
Ts	= Temperature of stack gas, + 460 (Rankine).	=	1842.2083	1877	1909
Ps	= Absolute stack gas pressure, barometric + static.	=	28.89	28.89	28.89
Ms	= Molecular weight of stack gas, wet basis.	=	28.29	28.25	28.29

		RUN #1	RUN #2	RUN #3		
7.	**ACFM**	12967.65	13127.84	12949.88	=	Stack Area * 60 * Vs

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	30.58	30.95	30.53

		RUN #1	RUN #2	RUN #3		
8	**SCFH**	197116	195080	190059	=	$3600 * (1 - Bws) * Vs * A * \frac{Tstd}{Ts} * \frac{Ps}{Pstd}$

				RUN #1	RUN #2	RUN #3
3600	=	Seconds per hour.	=	3600	3600	3600
Bws	=	Water vapor in the gas stream, proportion.	=	0.0845824	0.0880319	0.0838546
A	=	Area of stack in sq ft.	=	7.07	7.07	7.07
Tstd	=	Standard absolute temperature, 528 R.	=	528	528	528
Pstd	=	Standard absolute pressure, 29.92 in. Hg.	=	29.92	29.92	29.92
Ts	=	Temperature of stack gas, + 460 (Rankine).		1842.2083	1877	1909
Ps	=	Absolute stack gas pressure, barometric + static.		28.85	28.85	28.85
Vs	=	Average stack gas velocity, ft / sec.		30.58	30.95	30.53

CALCULATIONS

VOC

		RUN #1	RUN #2	RUN #3		
1.	**Lbs/Hr Propane**	0.00246	0.00196	0.00166	=	0.11443 * SCFH * PPM * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	197116	195080	190059
PPM	=	PPM	=	0.1092398	0.0877224	0.0764071

		RUN #1	RUN #2	RUN #3		
2.	**Lbs/Hr Carbon**	0.00201	0.00160	0.00136	=	0.031182 * SCFH * PPM * 3 * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	197116	195080	190059
PPM	=	PPM	=	0.1092398	0.0877224	0.0764071
3	=	Carbon equivalent correction factor for propane.	=	3	3	3

Appendix #1

Test Data

Custom Stack Analysis, LLC.

Pitot Traverse Data Sheet

Plant ggitt Aircraft BrakingSystems Corporat Date 12/7/2020

Location North Afterburner By Ethan M

Run No.	Pre 1		Post 1		Post 2		Post 3	
Point #	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**
A-1	0.16	1658	0.06	1547	0.08	1651	0.07	1733
2	0.18	1689	0.05	1599	0.10	1692	0.08	1762
3	0.26	1602	0.15	1671	0.11	1669	0.11	1593
4	0.22	1548	0.10	1292	0.09	1545	0.11	1448
5	0.18	1355	0.07	1074	0.07	1295	0.09	1233
6	0.10	1157	0.06	1048	0.06	1198	0.08	1054
B-1	0.04	1680	0.15	1578	0.14	1660	0.11	1634
2	0.05	1720	0.17	1673	0.17	1697	0.22	1726
3	0.04	1612	0.22	1702	0.20	1633	0.22	1630
4	0.07	1413	0.19	1645	0.18	1524	0.16	1349
5	0.07	1235	0.16	1478	0.15	1475	0.14	1150
6	0.06	1118	0.11	1392	0.10	1289	0.11	1032

			Run #1			Run #2		Run #3
			0.34	1488.21		0.34	1501.13	0.34 1486.33
	0.328	1502	0.343	1475	0.342	1527	0.347	1445
Static:	0.53		0.54		0.55		0.53	

TEST DATA

COMPANY NAME	Meggitt Aircraft Braking Systems Corporation -
ADDRESS	1204 Massillon Road
CITY	Akron
STATE	OH
ZIP	44306
TEST METHODS	Methods 1-4 & 25A
CREW MEMBERS	Brian L. Ethan M
LOCATION	Outlet
SOURCE	North Afterburner
CONTROL	

	RUN #1	RUN #2	RUN #3
DATE	12/7/2020	12/7/2020	12/7/2020
RUN LENGTH (min)	60	60	60
VOLUME (cubic feet)	45.125	44.390	44.529
Y FACTOR	1.0004	1.0004	1.0004
BAROMETRIC	28.76	28.76	28.76
METER TEMP. (R)	538.58	538.58	538.17
STACK TEMP. (R)	1948.21	1961.13	1946.33
AVERAGE ^P	0.34	0.34	0.34
AVERAGE ^H	2.00	2.00	2.00
IMPINGER VOLUME	80.80	85.00	83.00
PITOT COEF.	0.84	0.84	0.84
STATIC PRESSURE	0.54	0.55	0.54
STACK AREA	7.07	7.07	7.07
CARBON DIOXIDE	4.33	4.17	4.17
OXYGEN	12.17	12.33	12.17
NITROGEN	**83.50**	**83.50**	**83.66**

TEST RESULTS

North Afterburner Outlet
12/7/2020

	RUN #1	RUN #2	RUN #3
VM (std)	42.741	42.044	42.209
VW (std)	3.808	4.005	3.911
BWS	0.082	0.087	0.085
MD	29.180	29.160	29.154
MS	28.265	28.190	28.208
VS (ft/sec)	37.306	38.224	38.306
SCFH	227389.53	230153.95	232946.44
ACFM	15821.95	16211.57	16246.01
DCFM	3789.83	3835.90	3882.44

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

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

Bws = Stack moisture content.

Md = Determination of dry molecular weight of stack gas.

Ms = Determination of stack gas molecular weight.
Vs = Average gas stack velocity. (ft/sec.)

ACFM = Actual cubic feet per minute of gas velocity.

DCFM = Dry standard cubic feet per minute of gas velocity.

TEST RESULTS

North Afterburner Outlet

12/7/2020

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (lbs/hr propane)	**0.005**	**0.005**	**0.005**
VOC (lbs/hr carbon)	**0.004**	**0.004**	**0.004**

TEST DATA

North Afterburner Outlet

12/7/2020

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (ppm)	**0.20**	**0.19**	**0.20**

Custom Stack Analysis, L.L.C.

Method 4

Plant: eggitt Aircraft Braking Systems Corporati   Date : 12/7/2020

North Afterburner Outlet

		Meter Box	
Barometer (Pg)	28.76	ID:	1
Ambient Temp		Y	1.0004
		ΔH	1.986
		ΔH Set Point :	2.0

	Time	Run Time
Start:	12:14	60
Stop:	13:14	

Run #1

Cold Box #					
9	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	478.000	77	75	41	3
5	481.764	78	76	41	3
10	485.534	79	76	40	3
15	489.282	80	76	40	3
20	493.042	82	77	41	3
25	496.631	81	77	42	3
30	500.430	81	77	43	3
35	504.175	81	78	43	3
40	508.275	81	79	45	3
45	511.755	81	77	44	3
50	515.450	81	77	44	3
55	519.230	81	78	45	3
60	523.125				
Vm	45.125				
	AVG:	79		42.4	3.0

Leak Rate @	5.5	" Hg =	0.000

	Time	Run Time
Start:	13:45	60
Stop:	14:45	

Run #2

Cold Box #					
6	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	526.364	79	77	42	4
5	530.111	79	77	40	4
10	533.812	79	77	39	4
15	537.549	79	77	40	4
20	541.278	80	77	41	4
25	544.972	80	77	42	4
30	548.684	80	77	43	4
35	552.372	80	77	43	4
40	556.058	80	78	45	4
45	559.751	80	78	44	4
50	563.435	80	78	44	4
55	566.535	81	79	46	4
60	570.754				
Vm	44.390				
	AVG:	79		42.4	4.0
Leak Rate @	8.0	" Hg =	0.000		

	Time	Run Time
Start:	15:13	60
Stop:	16:13	

Run #3

Cold Box #					
11	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	571.148	78	77	39	4
5	574.893	78	77	1	4
10	578.625	79	77	41	4
15	582.387	79	77	43	4
20	586.065	79	78	44	4
25	589.731	80	77	44	4
30	593.435	80	78	45	4
35	597.210	80	78	45	5
40	600.935	79	77	47	5
45	604.645	79	77	45	5
50	608.345	80	77	46	5
55	612.153	79	76	46	5
60	615.677				
Vm	44.529				
	AVG:	78		40.5	5.0
Leak Rate @	8.5	" Hg =	0.000		

Custom Stack Analysis, LLC.

Pitot Traverse Data Sheet

Plant ggitt Aircraft Braking Systems Corpor   Date 12/8/2020

Location South Afterburner   By Ethan M

Run No.	**Pre 1**		**Post 1**		**Post 2**		**Post 3**	
Point #	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**
A-1	0.06	1743	0.08	1231	0.07	1356	0.07	1595
2	0.10	1703	0.11	1449	0.09	1523	0.10	1633
3	0.08	1538	0.11	1435	0.07	1701	0.08	1523
4	0.07	1144	0.10	1395	0.11	1658	0.07	1176
5	0.10	1236	0.09	1121	0.08	1432	0.06	1062
6	0.08	1087	0.07	1046	0.06	1134	0.07	1087
B-1	0.06	1153	0.06	1467	0.05	1473	0.06	1543
2	0.07	1326	0.08	1692	0.08	1657	0.11	1687
3	0.06	1648	0.10	1581	0.07	1682	0.11	1654
4	0.08	1305	0.07	1411	0.10	1519	0.09	1521
5	0.10	1212	0.09	1275	0.09	1389	0.06	1362
6	0.06	1189	0.07	1168	0.06	1222	0.07	1198

			Run #1		Run #2		Run #3	
			0.28	1382.21	0.28	1417.38	0.28	1449.46
	0.276	1409	0.292	1356	0.277	1479	0.280	1420
Static:	0.53		0.57		0.55		0.53	

TEST DATA

COMPANY NAME	Meggitt Aircraft Braking Systems Corporation -
ADDRESS	1204 Massillon Road
CITY	Akron
STATE	OH
ZIP	44306
TEST METHODS	Methods 1-4 & 25A
CREW MEMBERS	Brian L. Ethan M
LOCATION	Outlet
SOURCE	South Afterburner
CONTROL	

	RUN #1	RUN #2	RUN #3
DATE	12/8/2020	12/8/2020	12/8/2020
RUN LENGTH (min)	60	60	60
VOLUME (cubic feet)	45.212	44.380	44.801
Y FACTOR	1.0004	1.0004	1.0004
BAROMETRIC	28.85	28.85	28.85
METER TEMP. (R)	535.58	535.33	535.21
STACK TEMP. (R)	1842.21	1877.38	1909.46
AVERAGE ^P	0.28	0.28	0.28
AVERAGE ^H	2.00	2.00	2.00
IMPINGER VOLUME	84.70	86.90	83.20
PITOT COEF.	0.84	0.84	0.84
STATIC PRESSURE	0.55	0.56	0.54
STACK AREA	7.07	7.07	7.07
CARBON DIOXIDE	4.83	4.83	4.83
OXYGEN	11.67	11.67	11.50
NITROGEN	**83.50**	**83.50**	**83.67**

TEST RESULTS

South Afterburner Outet
12/8/2020

	RUN #1	RUN #2	RUN #3
VM (std)	43.197	42.422	42.834
VW (std)	3.991	4.095	3.921
BWS	0.085	0.088	0.084
MD	29.240	29.240	29.233
MS	28.289	28.250	28.291
VS (ft/sec)	30.576	30.954	30.534
SCFH	197115.57	195079.74	190058.77
ACFM	12967.65	13127.84	12949.88
DCFM	3285.26	3251.33	3167.65

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

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

Bws = Stack moisture content.

Md = Determination of dry molecular weight of stack gas.

Ms = Determination of stack gas molecular weight.
Vs = Average gas stack velocity. (ft/sec.)

ACFM = Actual cubic feet per minute of gas velocity.

DCFM = Dry standard cubic feet per minute of gas velocity.

TEST RESULTS

South Afterburner Outet

12/8/2020

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (lbs/hr propane)	0.002	0.002	0.002
VOC (lbs/hr carbon)	0.002	0.002	0.001

TEST DATA

South Afterburner Outet

12/8/2020

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (ppm)	0.11	0.09	0.08

Custom Stack Analysis, L.L.C.

Method 4

Plant: ɘggitt Aircraft Braking Systems Corporati Date : 12/8/2020

South Afterburner Outet

		Meter Box	
Barometer (Pg)	28.85	ID:	1
Ambient Temp	30	Y	1.0004
		ΔH	1.986
		ΔH Set Point :	2.0

	Time	Run Time
Start:	8:40	60
Stop:	9:40	

Run #1

Cold Box #					
12	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	669.947	77	75	37	4
5	673.645	75	75	38	4
10	677.430	77	77	36	4
15	681.450	77	77	39	4
20	685.020	75	75	39	4
25	688.905	75	76	40	4
30	692.605	76	74	40	4
35	696.250	77	75	43	4
40	700.100	76	74	41	4
45	703.955	77	74	43	4
50	707.740	76	74	42	4
55	711.462	76	74	43	4
60	715.159				
Vm	45.212				
	AVG:	76		40.1	4.0

Leak Rate @	7.5	" Hg =	0.000

	Time	Run Time
Start:	10:40	60
Stop:	11:40	

Run #2

Cold Box #					
11	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	716.015	76	74	39	5
5	719.788	76	74	41	5
10	723.551	76	74	43	5
15	727.279	77	75	42	5
20	731.004	76	74	42	5
25	734.717	76	75	44	5
30	738.405	76	75	45	5
35	742.091	77	74	46	5
40	745.754	77	74	46	5
45	749.512	76	75	47	5
50	753.100	77	74	47	5
55	756.862	76	74	48	5
60	760.395				
Vm	44.380				
	AVG:	75		44.2	5.0

Leak Rate @	10.0	" Hg =	0.000

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

Run #3

Cold Box #					
9	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	761.450	75	74	42	5
5	765.015	76	74	43	5
10	768.815	77	74	43	5
15	772.445	76	74	44	5
20	776.295	77	74	46	5
25	780.225	76	75	46	5
30	783.825	77	74	47	5
35	787.550	76	74	47	5
40	791.281	77	74	46	5
45	795.039	76	75	46	5
50	798.793	76	74	48	5
55	802.514	76	74	46	5
60	806.251				
Vm	44.801				
	AVG:	75		45.3	5.0

Leak Rate @	9.5	" Hg =	0.000

Fyrite

Date: 12-7-20 Technician: Ethan

		1		2		3		Avg
Run #1	Time	12:15	Time	12:45	Time	13:07		
	CO^2	4.5	CO^2	4.0	CO^2	4.5	CO^2	4.33
	O^2	12.0	O^2	12.5	O^2	12.0	O^2	12.17

		1		2		3		Avg
Run #2	Time	13:50	Time	14:17	Time	14:42		
	CO^2	4.0	CO^2	4.0	CO^2	4.5	CO^2	4.17
	O^2	12.5	O^2	12.5	O^2	12.0	O^2	12.33

		1		2		3		Avg
Run #3	Time	15:16	Time	15:38	Time	16:00		
	CO^2	4.5	CO^2	4.0	CO^2	4.0	CO^2	4.17
	O^2	12.0	O^2	12.0	O^2	12.5	O^2	12.17

Fyrite

Date: 12-8-20 Technician: Ethan M

		1		2		3		Avg
Run #1	Time	8:41	Time	9:16	Time	9:40		
	CO^2	4.5	CO^2	5.0	CO^2	4.5	CO^2	4.83
	O^2	12.0	O^2	11.5	O^2	11.5	O^2	11.67

		1		2		3		Avg
Run #2	Time	10:44	Time	11:09	Time	11:35		
	CO^2	5.0	CO^2	5.0	CO^2	4.5	CO^2	4.83
	O^2	11.5	O^2	11.5	O^2	12.0	O^2	11.67

		1		2		3		Avg
Run #3	Time	12:17	Time	12:46	Time	13:13		
	CO^2	5.0	CO^2	4.5	CO^2	5.0	CO^2	4:83
	O^2	11.5	O^2	11.5	O^2	11.5	O^2	11.5

Appendix #2

Laboratory Data

Lab Data Sheet For: Meggitt Aircraft Braking Systems Corporation - North Afterburner Outlet   By: Ethan M

Moisture Weights   Moisture

RUN # 1

		grams	grams	grams	grams	grams	grams	grams
	Box ID	1	2	3	4	5	6	Drierite
Gross	9	821.3	652.2	537.2				981.5
Tare		749.7	651.1	536.5				974.1
Net		71.6	1.1	0.7	0.0	0.0	0.0	7.4
	Reagent	H2O	H2O					
	mLs	100.0	100.0					

Intial Imp mL =	200.0	Impinger Total =	73.4 grams	Total =	80.8 grams

RUN # 2

		grams	grams	grams	grams	grams	grams	grams
	Box ID	1	2	3	4	5	6	Drierite
Gross	6	688.3	755.3	508.4				956.0
Tare		612.6	754.1	507.8				948.5
Net		75.7	1.2	0.6	0.0	0.0	0.0	7.5
	Reagent	H2O	H2O					
	mLs	100.0	100.0					

Intial Imp mL =	200.0	Impinger Total =	77.5 grams	Total =	85 grams

RUN # 3

		grams	grams	grams	grams	grams	grams	grams
	Box ID	1	2	3	4	5	6	Drierite
Gross	11	802.2	723.5	535.8				997.8
Tare		729.0	722.6	535.0				989.7
Net		73.2	0.9	0.8	0.0	0.0	0.0	8.1
	Reagent	H2O	H2O					
	mLs	100.0	100.0					

Intial Imp mL =	200.0	Impinger Total =	74.9 grams	Total =	83 grams

Lab Data Sheet For: Meggitt Aircraft Braking Systems Corporation - South Afterburner Outet By: Ethan M

Moisture Weights Moisture

			grams	grams	grams	grams	grams	grams	grams
RUN # 1		Box ID	1	2	3	4	5	6	Drierite
	Gross	12	697.9	546.8	625.2				993.1
	Tare		622.0	546.1	624.8				985.4
	Net		75.9	0.7	0.4	0.0	0.0	0.0	7.7
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

				grams		grams
Intial Imp mL =	200.0		Impinger Total =	77	Total =	84.7

			grams	grams	grams	grams	grams	grams	grams
RUN # 2		Box ID	1	2	3	4	5	6	Drierite
	Gross	11	806.6	723.2	535.6				970.4
	Tare		729.2	722.3	535.1				962.3
	Net		77.4	0.9	0.5	0.0	0.0	0.0	8.1
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

				grams		grams
Intial Imp mL =	200.0		Impinger Total =	78.8	Total =	86.9

			grams	grams	grams	grams	grams	grams	grams
RUN # 3		Box ID	1	2	3	4	5	6	Drierite
	Gross	9	824.8	652.0	536.9				979.0
	Tare		750.0	651.4	536.6				971.5
	Net		74.8	0.6	0.3	0.0	0.0	0.0	7.5
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

				grams		grams
Intial Imp mL =	200.0		Impinger Total =	75.7	Total =	83.2

Appendix #3

Calibration Data

B21856

Scott-Gross Co., Inc.
664 Magnolia Ave.
Lexington, KY 40505
(859)231-0225 (888)431-5882

SCOTT GROSS GASES & EQUIPMENT | INDUSTRIAL MEDICAL SPECIALTY

Certificate of Analysis

Certification Date:	12 January 2017
Certificate Number:	0097B-02T5-C01
Mixture Grade:	EPA Protocol Standard Gas Mixture
Lot Number:	0097B-02T5
Expiration Date:	12 January 2025
Cylinder Number:	EB0049442
Part Number:	T5L EPA2RATAP-14

Mixture Components	Requested Composition	Certified Composition	U (Expanded Uncertainty, k=2)
Propane	43 ppm	47.05 PPM	+/- 0.12 PPM (absolute)
Air	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 R12017
Procedure Used:	EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012
Analytical Method:	C3H8: FTIR
Multipoint Calibration Date:	Propane: 12/29/2016

Reference Standards								
Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CAL017809	83-J-12	8/17/2017	SRM	C3H8	Air	48.83 PPM	0.225	1667b

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

ACCREDITED
A2LA Certificate No. 1750.01 Calibration

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

Cert. No.: 3415-11278230

Traceable® Certificate of Calibration for Digital Calipers

Customer :Custom Stack Analysis, LLC ,14614 Cenfield Street NE ,Alliance ,OH-44601 ,U.S.A.

Instrument Identification:

Model: 3415, S/N: 101856179 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Set	99146223	17 Dec 2020	1000449283

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 12 May 2020 Cal Due Date: 12 May 2021

Test Conditions: 55.18%RH 22.45°C 1018mBar

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	0.101	0.0003	3.33:1
in	N.A.	N.A.		2.0000	2.0005	Y	1.998	2.002	0.00033	>4:1
in	N.A.	N.A.		4.0000	4.0005	Y	3.996	4.004	0.0004	>4:1
in	N.A.	N.A.		6.0000	6.0005	Y	5.994	6.006	0.0005	>4:1
in depth	N.A.	N.A.		2.0000	2.000	Y	1.998	2.002	0.00033	>4:1
in inside	N.A.	N.A.		1.0000	1.0005	Y	0.999	1.001	0.00031	3.23:1
in step	N.A.	N.A.		2.0000	1.9985	Y	1.998	2.002	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

Nicol Rodriguez, Quality Manager

Marisa Elms

Marisa Elms, Technical Manager

Note :

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.

Issue Date : 12 May 2020

B21925B

Scott-Gross Co., Inc.
664 Magnolia Ave.
Lexington, KY 40505
(859)231-0225 (888)433-3882

GASES & EQUIPMENT — INDUSTRIAL MEDICAL SPECIALTY

Cylinder Number:	CC444989	Certification Date:	28 April 2017
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	29 April 2025
Certificate Number:	1147B-02T5-C01	Lot Number:	1147B-02T5
Cylinder Pressure:	2015 PSIG	Customer Part Number:	T5L EPA2RATAP-19

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Propane	24.7 PPM	+/- 0.2 PPM (absolute)	4/28/2017
Air	Balance		

Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Propane	FTIR	Thermo	Antaris IGS	AWZ1200117	4/17/2017

Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CC459851	2186A-01T5	11/10/2024	GMIS	C3H8	N2	247.7 PPM	0.411	2644a

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

Analyst: Allison Hanover

Reviewer: Jeff Lynn

Production Laboratory:
Tier 5 Labs, LLC
5353 W. Southern Ave.
Indianapolis, IN 46241
PGVP Vendor ID R12017

B21925B

GASES & EQUIPMENT | INDUSTRIAL MEDICAL SPECIALTY
Scott-Gross Co., Inc.
664 Magnolia Ave.
Lexington, KY 40505
(859)231-0225 (888)433-5882

Cylinder Number:	CC444989	Certification Date:	28 April 2017
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	29 April 2025
Certificate Number:	1147B-02T5-C01	Lot Number:	1147B-02T5
Cylinder Pressure:	2015 PSIG	Customer Part Number:	T5L EPA2RATAP-19

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

Certified Concentrations

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Air	Balance		

Analytical Instrumentation

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Reference Standards

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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

Analyst: Allison Hanover

Reviewer: Jeff Lynn

Production Laboratory:
Tier 5 Labs, LLC
5353 W. Southern Ave.
Indianapolis, IN 46241
PGVP Vendor ID R12017

LIQUID TECHNOLOGY CORPORATION
"INDUSTRY LEADER IN SPECIALTY GASES"

Certificate of Analysis

- EPA PROTOCOL GAS -

B21477B

Customer	IE Monitoring Instruments (Worthington, OH)
Date	October 06, 2014
Delivery Receipt	DR-53322
Gas Standard	13.8 ppm Propane/Air - EPA PROTOCOL
Final Analysis Date	October 06, 2014
Expiration Date	October 07, 2022

Component	Propane
Balance Gas	Air

Analytical Data:
EPA Protocol, Section No. 2.2, Procedure G-1.

DO NOT USE BELOW 100 psig

Reported Concentrations

Propane: 13.7 ppm +/- 0.1 ppm
Air: Balance

Reference Standards:		GMIS Traceability
SRM/GMIS:	GMIS	SRM-1667b
Cylinder Number:	CC-165367	XF-003853B
Concentration:	20.21 ppm Propane (+/- 0.09 ppm)	49.54 ppm Propane (+/- 0.26 ppm)
Expiration Date:	12/02/18	07/12/15
NIST Sample Number:	NA	83-I-14

Certification Instrumentation

Component:	Propane
Make/Model:	Agilent 7890A
Serial Number:	CN10736166
Principal of Measurement:	GC-FID
Last Calibration:	September 28, 2014

Cylinder Data

Cylinder Serial Number:	EB-0051537	Cylinder Outlet:	CGA 590
Cylinder Volume:	138 Cubic Feet	Cylinder Pressure:	1950 psig, 70°F

Analytical Uncertainty and NIST Traceability are in compliance with EPA-600/R-12/531.

Certified by: Cole Dylewski

Cole Dylewski

PGVP Vendor ID: E12014

"UNMATCHED EXCELLENCE"

2048 APEX COURT, APOPKA, FLORIDA 32703 ~ PHONE (407)-292-2990 FAX (407)-292-3313
WWW.LIQUIDTECHCORP.COM
APOPKA, FL • HOUSTON, TX

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

ACCREDITED
A2LA Certificate No. 1750.01 Calibration

Cert. No.: 1870-11290275

Traceable® Certificate of Calibration for Digital Barometer Module

Customer :Custom Stack Analysis, LLC ,14614 Cenfield Street 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	10 Oct 2020	4000-10785768
Chilled Mirror Hygrometer	31874/1H2048MR	22 Jan 2021	18004
Digital Barometer	D4540001	01 Nov 2020	1000447551

Certificate Information:

Technician: 57 Procedure: CAL-31 Cal Date: 17 May 2020 Cal Due Date: 17 May 2021

Test Conditions: 57.18%RH 22.6°C 1012mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
%RH	N.A.	N.A.		48.33	32	N	43	53	0.74	>4:1
°C	N.A.	N.A.		24.29	24	Y	23.29	25.29	0.05	>4:1
mb/hPa	N.A.	N.A.		806.00	812	Y	795	817	0.62	>4:1
mb/hPa	N.A.	N.A.		909.98	914	Y	899	921	0.62	>4:1
mb/hPa	N.A.	N.A.		1018.72	1022	Y	1008	1030	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

Nicol Rodriguez, Quality Manager

Marisa Elms

Marisa Elms, Technical Manager

Note :

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.

Issue Date : 17 May 2020

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.traceable.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 9001:2015 Quality Certified by DNV GL, Certificate No. CERT-01805-2006-AQ-HOU-ANAB.
International Laboratory Accreditation Cooperation - Multilateral Recognition Arrangement (ILAC-MRA).

ilac-MRA ACCREDITED A2LA Certificate No. 1750.01 Calibration

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

Cert. No.: 3415-10347847

Traceable® Certificate of Calibration for Digital Calipers

Manufactured for and distributed by : Control Company 12554 Galveston Rd B230, Webster, TX 77598

Instrument Identification:

Model: 3415, S/N: 192125551 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Block Set	99146223	06 Dec 2019	1000434942

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 23 Apr 2019 Cal Due Date: 23 Apr 2021

Test Conditions: 57.01%RH 23.96°C 1018mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
in	N.A.	N.A.		0.1000	0.0995	Y	0.099	0.101	0.0003	3.33:1
in	N.A.	N.A.		2.0000	1.9985	Y	1.998	2.002	0.00033	>4:1
in	N.A.	N.A.		4.0000	3.998	Y	3.996	4.004	0.0004	>4:1
in	N.A.	N.A.		6.0000	5.997	Y	5.994	6.006	0.0005	>4:1
in depth	N.A.	N.A.		2.0000	1.998	Y	1.998	2.002	0.00033	>4:1
in inside	N.A.	N.A.		1.0000	0.9995	Y	0.999	1.001	0.00031	3.23:1
in step	N.A.	N.A.		2.0000	2.000	Y	1.998	2.002	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.

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Nicol Rodriguez

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Note:

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.

Certificate of Batch Analysis

MATHESON
ask. . .The Gas Professionals'

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-1423
NK00455
7899
O8572
784192
3597456Y
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	G	Gas chromatograph with helium ionization detector
B	Gas chromatograph with thermal conductivity detector	H	Gas chromatograph with discharge ionization detector
C	Gas chromatograph with flame ionization detector	I	Specific carbon monoxide analyzer
D	Trace nitrogen analyzer	J	Percent oxygen analyzer
E	Total hydrocarbon analyzer	K	Specific carbon dioxide analyzer
F	Specific moisture analyzer	L	Binary gas mixture analyzer

Lot No: 118K41520

Fill Date: 4/28/2015

IMPORTANT

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™

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)
ED012979

	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

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

Judith Zadravec

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

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

Filename: C:\Customer Project Files\APPENDIX\Cal Sheets\Meter Boxes\[Meter Box 1 5-7-20.xls]A
Revised: 7/25/95 Version: 2.2

CONVERSION FACTORS

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

Model #: 1
Serial #:

Date: ------------------------> 5/7/2020
Barometric Pressure: ----------> 28.44 (in. Hg)
Theoretical Critical Vacuum:---> 13.42 (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-

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)	Ambient Temperature Final (deg F)	Ambient Temperature Average (deg F)	Average Temperatures DGM Outlet (deg R)	DGM Overall (deg R)	Ambient Temp (deg R)
0.5	10	311.555	315.488	111.38256	62	61	65	62	12	0.30390681	15	64	64	64	521.5	522.5	524
0.93	10	315.488	320.81	150.71904	67	63	66	63	16	0.41080925	15	64	65	64.5	523	524.75	524.5
1.4	10	320.81	327.085	177.708	66	64	68	65	19	0.48449779	15	65	65	65	524.5	525.75	525
2.1	5	327.085	331.027	111.63744	68	65	69	66	23	0.60910402	15	66	66	66	525.5	527	526
3.8	5	331.027	336.224	147.17904	68	66	70	67	31	0.80595932	15	66	66	66	526.5	527.75	526

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

DRY GAS METER VOLUME CORRECTED Vm(std) (cu ft)	DRY GAS METER VOLUME CORRECTED Vm(std) (liters)	ORIFICE VOLUME CORRECTED Vcr(std) (cu ft)	ORIFICE VOLUME CORRECTED Vm(std) (liters)	ORIFICE VOLUME NOMINAL Vcr (cu ft)	DRY GAS METER CALIBRATION FACTOR Y Value (number)	DRY GAS METER Y Variation (number)	ORIFICE CALIBRATION FACTOR dH@ Value (in H2O)	ORIFICE dH@ Value (mm H2O)	ORIFICE dH@ Variation (in H2O)
3.7811759	107.08	3.77576	106.92952	3.94373	0.99857	-0.00186	1.89856015	48.22	-0.08712
5.1002748	144.44	5.1014902	144.4742	5.33353	1.00024	-0.00019	1.92887722	48.99	-0.0568
6.0094088	170.19	6.0136998	170.30798	6.29322	1.00071	0.00029	2.08361031	52.92	0.09793
3.7729909	106.85	3.7765756	106.95262	3.95964	1.00095	0.00052	1.97745971	50.23	-0.00822
4.9888287	141.28	4.9971208	141.51846	5.23935	1.00166	0.00124	2.03987228	51.81	0.0542
			Average Y ------->		1.00043		1.98567594	50.44	<------ 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: ______ Brian Lemasters Date:_____ 5/7/2020

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

595572

FOR Custom Stack 593P
14614 Cenfield St Alliance Ohio

P.O. ________ DATE 5/12/20

☐ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
☐ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
☐ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
☐ 490 S. Mapleton St. **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
☐ 1060 National Parkway **MANSFIELD**, OH 44906 419-529-3006
☐ 526 31st St. **PARKERSBURG**, WV 26101 304-428-1792
☐ 2351 Jaclyn Court **SOUTH BEND**, IN 46614
☐ 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. 2019-0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: MP.
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	Navigator	1119252404	Lab	2,100g	0.1g	HI 2000 / LO ϕ	6months	YES	YES ✓ / NO	11/2020

WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1 200	200.0	ϕ		NO	200.0	
2 500	500.0	ϕ		NO	500.0	
3 1000	1000.0	ϕ		NO	1000.0	
4						
5						
6						

PARTS USED

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

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584495

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!! DATE 5/12/20

❑ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
❑ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
❑ 1424 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
❑ 490 S. Mapleton St. 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
❑ 2351 Jaclyn Court SOUTH BEND, IN 46614
❑ 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. 2019. 0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: MC

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
-	OHAUS	ADVENTURER	1203240794	LAB	4100 g	.1 g	HI - g	6 Months	YES	YES ✓	11/2020
	-	-	-				LO - g			NO	

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10.0	0	+/-.2%	YES / NO	10.0	CALIBRATED
2	20g	20.0	0	+/-.2%	YES / NO	20.0	
3	50g	50.0	0	+/-.2%	YES / NO	50.0	
4	100g	100.0	0	+/-.2%	YES / NO	100.0	
5	1kg	999.7	-.3	+/-.2%	YES / NO	1000.0	
6	2kg	1999.4	-.6	+/- 2%	YES / NO	2000.0	

PARTS USED

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

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584497

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

☐ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
☐ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
☐ 1424 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
☐ 490 S. Mapleton St. 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
☐ 2351 Jaclyn Court SOUTH BEND, IN 46614
☐ 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. 2019-0187

WEIGHT S/N'S Colom kit #3

SCALE TECHNICIAN: M.P.

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 --	6 Months	YES	YES ✓	11/2020
	-	-	-				LO 500 --			NO	

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	500	500.0	Ø	+/-.2%	YES / NO	500.0	
2	1000	1000.0	Ø	+/-.2%	YES / NO	1000.0	
3	1500	1500.0	Ø	+/-.2%	YES / NO	1500.0	
4	2000	2000.0	Ø	+/-.2%	YES / NO	2000.0	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584496

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

❑ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
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❑ 490 S. Mapleton St. **COLUMBUS**, IN 47201 812-372-8374
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❑ 5525 Galaeo Court **INDIANAPOLIS**, IN 46241 317-548-7821
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❑ 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
❑ 2351 Jaclyn Court **SOUTH BEND**, IN 46614
❑ 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. 2019-0182

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: MP 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
-	SARTORIUS	A2005	39080133	LAB	100 GM g	0.1 g	HI - g	6 Months	YES	YES	✓	11/2020
	-	-	-				LO - g			NO		

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10000.9	+0.9	+/-.2%	YES / NO	10000.0	CALIBRATED
2	20g	20001.3	+1.3	+/-.2%	YES / NO	20000.0	
3	50g	50004.5	+4.5	+/-.2%	YES / NO	50000.0	
4	100g	100010.8	+10.8	+/-.2%	YES / NO	100000.0	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584489

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!!   DATE 5/12/20

☐ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
☐ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
☐ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
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☐ 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
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☐ 1080 National Parkway **MANSFIELD**, OH 44906 419-529-3006
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☐ 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. 2019-018t

WEIGHT S/N'S Colam kit #3

PARTS USED

SCALE TECHNICIAN: M.L.
SIGNATURE

ACCEPTED BY: [signature]
SIGNATURE

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	11/2020

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	9.9995	-.0005		YES / NO	10.0000	CALIBRATED
2	20g	19.9996	-.0004		YES / NO	20.0000	
3	50g	49.9997	-.0003		YES / NO	50.0000	
4	100g	99.9980	-.0020		YES / NO	100.0000	
5	200g	199.9970	-.0030		YES / NO	200.0000	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584490

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

☐ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
☐ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
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☐ 7550 Jacks Lane **CLAYTON**, OH 45315 937-832-2040
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☐ 5200 Grand Avenue **PITTSBURGH**, PA 15225 412-299-7960
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☐ 477 North Pike Rd. **SARVER**, PA 16055 724-224-7180
☐ 1060 National Parkway **MANSFIELD**, OH 44906 419-529-3006
☐ 526 31st St. **PARKERSBURG**, WV 26101 304-428-1792
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☐ 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. 2019-0187

WEIGHT S/N'S Gram kit #3

PARTS USED

SCALE TECHNICIAN: M.T.
SIGNATURE

ACCEPTED BY: [signature]
SIGNATURE

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	11/2020

	WGHT USED	AS FOUND	DEV.	TOL +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10.000	⌀		YES / NO	10.000	
2	20g	20.000	⌀		YES / NO	20.000	
3	50g	50.000	⌀		YES / NO	50.000	
4	100g	100.000	⌀		YES / NO	100.000	
5	200g	200.000	⌀		YES / NO	200.000	
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.

#

BRECHBUHLER SCALES, INC.

Jim Gray
330-821-[illegible]

SCALE INSPECTION REPORT

584488

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

P.O. COD!!!!!

DATE 5/12/20

❑ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
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❑ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
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❑ 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. 2019-0187

WEIGHT S/N'S Gram Kit #3

SCALE TECHNICIAN: MT
SIGNATURE

PARTS USED

ACCEPTED BY: [signature]
SIGNATURE

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	11/2020

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	200g	200.00	0		YES / NO	200.00	
2	500g	500.00	0		YES / NO	500.00	
3	1000g	1000.00	0		YES / NO	1000.00	
4	g				YES / NO		
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.

MONITORING INSTRUMENTS

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

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Temperature Calibration Certificate

Instrument: H-B Thermometer
Serial #: 4A6108

Date: 4/6/2020
Technician: Sam Shults

Lab Standard	Thermometer Mark
169.9	170.0
190.0	190.0
204.8	205.0
214.6	215.0

Accuracy = 1 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 9/6/2020
Hart 9103 Temp Dry Well

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

MONITORING INSTRUMENTS

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

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Temperature Calibration Certificate

Instrument: H-B Thermometer
Serial #: 4B5200

Date: 4/6/2020
Technician: Sam Shults

Lab Standard	Thermometer Mark
30.1	30.0
50.1	50.0
70.0	70.0
88.0	88.0

Accuracy = 1 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 9/6/2020
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 12/23/19 BY ANDREW CANNON Pb 28.76

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	32	212	212
O-2	32	32	212	212
O-3	32	31	212	211
O-4	32	31	212	211
O-5	32	32	212	212
O-6	32	31	212	211
O-7	32	31	212	211
O-8	32	32	212	212
O-9	32	32	212	212
O-10	32	32	212	212
O-11	32	31	212	211
O-12	32	31	212	211
STACK THERMOCOUPLES				
2S-1	32	31	212	211
2S-2	32	31	212	211
2S-3	32	32	212	212
3S-1	32	32	212	212
3S-2	32	31	212	211
3S-3	32	31	212	211
3S-4	32	31	212	211
3S-5	32	31	212	211
4S-1	32	32	212	212
4S-2	32	31	212	211
4S-3	32	31	212	211
4S-4	32	33	212	213
4S-5	32	31	212	211
4S-6	32	32	212	212
5S-1	32	32	212	212
5S-2	32	32	212	212
5S-3	32	33	212	213
6S-1	32	31	212	211
6S-2	32	31	212	211
6S-3	32	31	212	211
6S-4	32	32	212	212
8S-1	32	32	212	212
8S-2	32	32	212	212
10S-1	32	32	212	212
10S-2	32	31	212	211
12S-1	32	31	212	211

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 12/23/19 BY ANDREW CANNON Pb 28.76

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.

TC	ICE WATER PRECISION	ICE WATER TC	BOILING WATER PRECISION	BOILING WATER TC
CONDENSOR THERMOCOUPLES				
C-1	32	31	212	211
C-2	32	31	212	211
C-3	32	31	212	211
C-4	32	31	212	211
C-5	32	31	212	211
C-6	32	32	212	212
C-7	32	31	212	211
C-8	32	31	212	211
C-9	32	31	212	211
PROBE THERMOCOUPLES				
2P-1	32	31	212	211
2P-2	32	31	212	211
2P-3	32	31	212	211
3P-1	32	32	212	212
3P-2	32	31	212	211
3P-3	32	31	212	211
3P-4	32	32	212	212
3P-5	32	33	212	213
4P-1	32	32	212	212
4P-2	32	32	212	212
4P-3	32	32	212	212
40-4	32	32	212	212
4P-5	32	32	212	212
4P-6	32	32	212	212
5P-1	32	32	212	212
5P-2	32	31	212	211
5P-3	32	31	212	211
6P-1	32	31	212	211
6P-2	32	31	212	211
6P-3	32	31	212	211
6P-4	32	31	212	211
8P-1	32	32	212	212
8P-2	32	32	212	212
10P-1	32	33	212	213
10P-2	32	32	212	212
12P-1	32	32	212	212

Client: heggitt

Pitot Tube Inspection

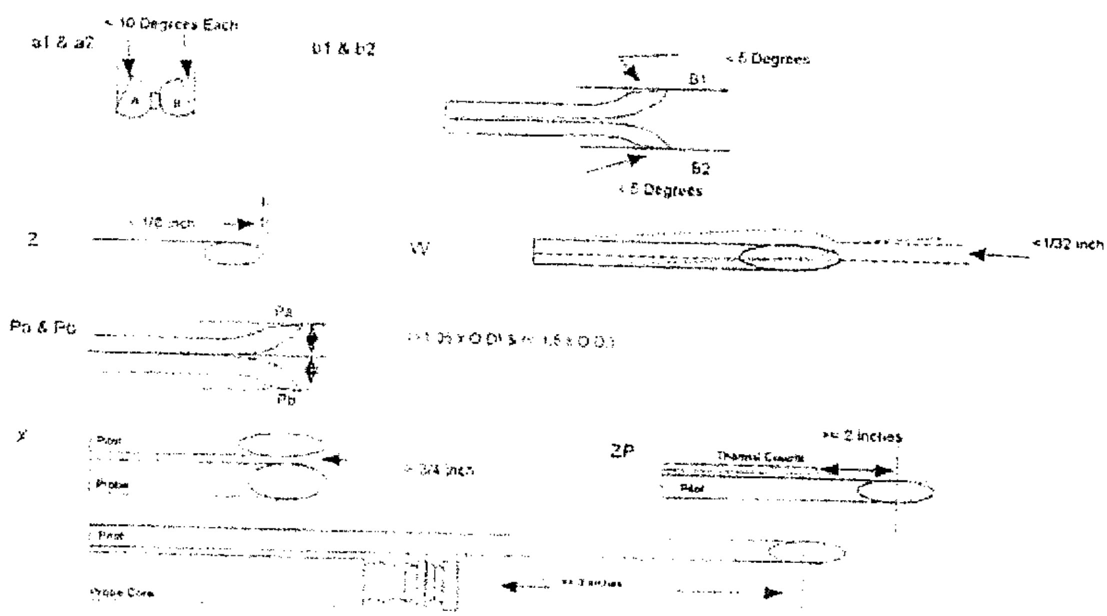
Date: 12-6-20

Probe/Pitot Number	3p-2	A (Pa + Pb)	.957
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)	.471
a_2 (-10° < a_2 < +10°)	0	P_b (1.05 D_t < P_b < 1.5 D_t)	.486
b_1 (-5° < b_1 < -5°)	0	Pa = Pb ± 0.063"	.015
b_2 (-5° < b_2 < +5°)	0		

Probe Minimum Interferences

Y (>= 3.0")		D_n	
X (> .75")		X /D_n (>= 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)



THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 12/23/19 BY ANDREW CANNON Pb 28.76

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.

TC METER THERMOCOUPLES	ICE WATER PRECISION	ICE WATER TC	BOILING WATER PRECISION	BOILING WATER TC
1M-1	32	31	212	211
1M-2	32	31	212	211
2M-1	32	32	212	212
2M-2	32	32	212	212
3M-1	32	32	212	212
3M-2	32	32	212	212
4M-1	32	33	212	213
4M-2	32	33	212	213
5M-1	32	32	212	212
5M-2	32	32	212	212
6M-1	32	32	212	212
6M-2	32	31	212	211
7M-1	32	31	212	211
7M-2	32	31	212	211
8M-1	32	31	212	211
8M-2	32	31	212	211
9M-1	32	31	212	211
9M-2	32	31	212	211
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	33	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.

Appendix #4

Monitoring Data

Meggitt Aircraft Braking Systems Crporation
North Afterburner Outlet

VOC	Conc.
High	47.05
Mid	24.7
Low	13.7

VOC	Time Stamp	
47.21	12/7/2020 11:46:59 AM	High
47.27	12/7/2020 11:48:00 AM	
46.81	12/7/2020 11:49:00 AM	
47.04	12/7/2020 11:50:01 AM	
46.75	12/7/2020 11:51:02 AM	
1.44	12/7/2020 11:52:02 AM	
0.15	12/7/2020 11:53:03 AM	Zero
0.15	12/7/2020 11:54:03 AM	
0.15	12/7/2020 11:55:04 AM	
0.15	12/7/2020 11:56:05 AM	
0.15	12/7/2020 11:57:05 AM	
8.87	12/7/2020 11:58:06 AM	
13.38	12/7/2020 11:59:06 AM	
13.43	12/7/2020 12:00:07 PM	Low
13.55	12/7/2020 12:01:08 PM	
13.44	12/7/2020 12:02:08 PM	
13.62	12/7/2020 12:03:09 PM	
13.49	12/7/2020 12:04:09 PM	
19.58	12/7/2020 12:05:10 PM	
24.60	12/7/2020 12:06:11 PM	
24.76	12/7/2020 12:07:11 PM	Bias
24.77	12/7/2020 12:08:12 PM	
24.20	12/7/2020 12:09:12 PM	
23.85	12/7/2020 12:10:13 PM	
23.63	12/7/2020 12:11:14 PM	
1.57	12/7/2020 12:12:14 PM	
0.16	12/7/2020 12:13:15 PM	
0.15	12/7/2020 12:14:15 PM	Start Run 1
0.15	12/7/2020 12:15:16 PM	
0.18	12/7/2020 12:16:11PM	
0.15	12/7/2020 12:17:12 PM	
0.15	12/7/2020 12:18:12 PM	
0.15	12/7/2020 12:19:13 PM	
0.23	12/7/2020 12:20:13 PM	
0.19	12/7/2020 12:21:14 PM	
0.15	12/7/2020 12:22:14 PM	
0.15	12/7/2020 12:23:15 PM	
0.15	12/7/2020 12:24:16 PM	
0.40	12/7/2020 12:25:16 PM	
0.25	12/7/2020 12:26:17 PM	
0.17	12/7/2020 12:27:18 PM	
0.15	12/7/2020 12:28:18 PM	
0.15	12/7/2020 12:29:19 PM	
0.15	12/7/2020 12:30:19 PM	
0.15	12/7/2020 12:31:20 PM	
0.15	12/7/2020 12:32:20 PM	
0.15	12/7/2020 12:33:21 PM	
0.21	12/7/2020 12:34:22 PM	
0.15	12/7/2020 12:35:22 PM	
0.15	12/7/2020 12:36:23 PM	
0.15	12/7/2020 12:37:24 PM	
0.15	12/7/2020 12:38:24 PM	

0.24	12/7/2020 12:39:25 PM	
0.38	12/7/2020 12:40:25 PM	
0.16	12/7/2020 12:41:26 PM	
0.26	12/7/2020 12:42:26 PM	
0.15	12/7/2020 12:43:27 PM	
0.15	12/7/2020 12:44:28 PM	
0.18	12/7/2020 12:45:28 PM	
0.16	12/7/2020 12:46:29 PM	
0.15	12/7/2020 12:47:29 PM	
0.15	12/7/2020 12:48:30 PM	
0.15	12/7/2020 12:49:31 PM	
0.15	12/7/2020 12:50:31 PM	
0.24	12/7/2020 12:51:32 PM	
0.17	12/7/2020 12:52:32 PM	
0.35	12/7/2020 12:53:33 PM	
0.57	12/7/2020 12:54:34 PM	
0.15	12/7/2020 12:55:34 PM	
0.15	12/7/2020 12:56:35 PM	
0.15	12/7/2020 12:57:36 PM	
0.15	12/7/2020 12:58:36 PM	
0.15	12/7/2020 12:59:37 PM	
0.15	12/7/2020 1:00:37 PM	
0.15	12/7/2020 1:01:38 PM	
0.15	12/7/2020 1:02:38 PM	
0.15	12/7/2020 1:03:39 PM	
0.22	12/7/2020 1:04:40 PM	
0.15	12/7/2020 1:05:40 PM	
0.15	12/7/2020 1:06:41 PM	
0.16	12/7/2020 1:07:42 PM	
0.15	12/7/2020 1:08:42 PM	
0.15	12/7/2020 1:09:43 PM	
0.15	12/7/2020 1:10:43 PM	
0.15	12/7/2020 1:11:44 PM	
0.20	12/7/2020 1:12:45 PM	
0.15	12/7/2020 1:13:45 PM	
0.15	12/7/2020 1:14:46 PM	Stop Run 1
0.18		Avg
0.15	12/7/2020 1:15:46 PM	
0.15	12/7/2020 1:16:47 PM	
0.15	12/7/2020 1:17:48 PM	
0.15	12/7/2020 1:18:48 PM	
3.82	12/7/2020 1:19:49 PM	
25.08	12/7/2020 1:20:49 PM	
25.07	12/7/2020 1:21:50 PM	Bias
24.90	12/7/2020 1:22:51 PM	
25.10	12/7/2020 1:23:51 PM	
25.06	12/7/2020 1:24:52 PM	
25.05	12/7/2020 1:25:52 PM	
25.12	12/7/2020 1:26:53 PM	
22.29	12/7/2020 1:27:54 PM	
0.16	12/7/2020 1:28:54 PM	
0.15	12/7/2020 1:29:55 PM	Zero
0.15	12/7/2020 1:30:55 PM	
0.15	12/7/2020 1:31:56 PM	
0.15	12/7/2020 1:32:57 PM	
0.15	12/7/2020 1:33:57 PM	
0.19	12/7/2020 1:34:58 PM	
0.15	12/7/2020 1:35:58 PM	
0.15	12/7/2020 1:36:59 PM	
0.17	12/7/2020 1:38:00 PM	
0.15	12/7/2020 1:39:00 PM	
0.28	12/7/2020 1:40:01 PM	

0.28	12/7/2020 1:40:01 PM	
0.20	12/7/2020 1:41:02 PM	
0.15	12/7/2020 1:42:02 PM	
0.15	12/7/2020 1:43:03 PM	
0.15	12/7/2020 1:44:03 PM	
0.18	12/7/2020 1:45:04 PM	Start Run 2
0.23	12/7/2020 1:46:04 PM	
0.16	12/7/2020 1:47:05 PM	
0.15	12/7/2020 1:48:06 PM	
0.15	12/7/2020 1:49:06 PM	
0.15	12/7/2020 1:50:07 PM	
0.15	12/7/2020 1:51:08 PM	
0.15	12/7/2020 1:52:08 PM	
0.25	12/7/2020 1:53:09 PM	
0.18	12/7/2020 1:54:09 PM	
0.15	12/7/2020 1:55:10 PM	
0.15	12/7/2020 1:56:11 PM	
0.15	12/7/2020 1:57:11 PM	
0.15	12/7/2020 1:58:12 PM	
0.15	12/7/2020 1:59:12 PM	
0.15	12/7/2020 2:00:13 PM	
0.15	12/7/2020 2:01:14 PM	
0.15	12/7/2020 2:02:14 PM	
0.15	12/7/2020 2:03:15 PM	
0.15	12/7/2020 2:04:15 PM	
0.15	12/7/2020 2:05:16 PM	
0.17	12/7/2020 2:06:17 PM	
0.31	12/7/2020 2:07:17 PM	
0.18	12/7/2020 2:08:18 PM	
0.15	12/7/2020 2:09:18 PM	
0.15	12/7/2020 2:10:19 PM	
0.15	12/7/2020 2:11:20 PM	
0.15	12/7/2020 2:12:20 PM	
0.15	12/7/2020 2:13:21 PM	
0.15	12/7/2020 2:14:21 PM	
0.15	12/7/2020 2:15:22 PM	
0.15	12/7/2020 2:16:23 PM	
0.21	12/7/2020 2:17:23 PM	
0.17	12/7/2020 2:18:24 PM	
0.15	12/7/2020 2:19:25 PM	
0.15	12/7/2020 2:20:25 PM	
0.15	12/7/2020 2:21:26 PM	
0.15	12/7/2020 2:22:27 PM	
0.15	12/7/2020 2:23:27 PM	
0.15	12/7/2020 2:24:28 PM	
0.15	12/7/2020 2:25:29 PM	
0.27	12/7/2020 2:26:30 PM	
0.34	12/7/2020 2:27:31 PM	
0.16	12/7/2020 2:28:32 PM	
0.15	12/7/2020 2:29:36 PM	
0.15	12/7/2020 2:30:37 PM	
0.15	12/7/2020 2:31:38 PM	
0.15	12/7/2020 2:32:42 PM	
0.15	12/7/2020 2:33:43 PM	
0.18	12/7/2020 2:34:46 PM	
0.15	12/7/2020 2:35:47 PM	
0.15	12/7/2020 2:36:50 PM	
0.15	12/7/2020 2:37:51 PM	
0.15	12/7/2020 2:28:52 PM	
0.15	12/7/2020 2:39:53 PM	
0.24	12/7/2020 2:40:55 PM	
0.18	12/7/2020 2:41:56 PM	

0.15	12/7/2020 2:42:58 PM	
0.15	12/7/2020 2:43:59 PM	
0.15	12/7/2020 2:44:01 PM	
0.15	12/7/2020 2:45:02 PM	Stop Run 2
0.17		Avg
0.15	12/7/2020 2:46:03 PM	
0.15	12/7/2020 2:47:04 PM	
0.26	12/7/2020 2:48:05 PM	
0.23	12/7/2020 2:49:06 PM	
0.19	12/7/2020 2:50:07 PM	
0.15	12/7/2020 2:51:08 PM	
0.15	12/7/2020 2:52:08 PM	
0.15	12/7/2020 2:53:09 PM	
0.15	12/7/2020 2:54:10 PM	
0.40	12/7/2020 2:55:10 PM	
16.34	12/7/2020 2:56:11 PM	
23.90	12/7/2020 2:57:12 PM	
24.47	12/7/2020 2:58:12 PM	Bias
24.70	12/7/2020 2:59:13 PM	
24.62	12/7/2020 3:00:13 PM	
24.46	12/7/2020 3:01:14 PM	
24.44	12/7/2020 3:02:15 PM	
24.69	12/7/2020 3:03:15 PM	
21.88	12/7/2020 3:04:16 PM	
0.15	12/7/2020 3:05:16 PM	
0.15	12/7/2020 3:06:17 PM	Zero
0.15	12/7/2020 3:07:18 PM	
0.15	12/7/2020 3:08:18 PM	
0.15	12/7/2020 3:09:19 PM	
0.15	12/7/2020 3:10:19 PM	
0.22	12/7/2020 3:11:20 PM	
0.15	12/7/2020 3:12:21 PM	
0.15	12/7/2020 3:13:21 PM	Start Run 3
0.15	12/7/2020 3:14:22 PM	
0.25	12/7/2020 3:15:22 PM	
0.36	12/7/2020 3:16:23 PM	
0.24	12/7/2020 3:17:24 PM	
0.15	12/7/2020 3:18:24 PM	
0.15	12/7/2020 3:19:25 PM	
0.15	12/7/2020 3:20:26 PM	
0.15	12/7/2020 3:21:26 PM	
0.15	12/7/2020 3:22:27 PM	
0.15	12/7/2020 3:23:27 PM	
0.15	12/7/2020 3:24:28 PM	
0.15	12/7/2020 3:25:29 PM	
0.15	12/7/2020 3:26:29 PM	
0.15	12/7/2020 3:27:30 PM	
0.15	12/7/2020 3:28:30 PM	
0.15	12/7/2020 3:29:31 PM	
0.15	12/7/2020 3:30:31 PM	
0.15	12/7/2020 3:31:32 PM	
0.15	12/7/2020 3:32:33 PM	
0.20	12/7/2020 3:33:33 PM	
0.37	12/7/2020 3:34:34 PM	
0.21	12/7/2020 3:35:35 PM	
0.15	12/7/2020 3:36:35 PM	
0.15	12/7/2020 3:37:36 PM	
0.15	12/7/2020 3:38:36 PM	
0.15	12/7/2020 3:39:37 PM	
0.15	12/7/2020 3:40:38 PM	
0.15	12/7/2020 3:41:38 PM	

0.15	12/7/2020 3:41:38 PM	
0.15	12/7/2020 3:42:39 PM	
0.15	12/7/2020 3:43:39 PM	
0.15	12/7/2020 3:44:40 PM	
0.15	12/7/2020 3:45:41 PM	
0.15	12/7/2020 3:46:41 PM	
0.24	12/7/2020 3:47:42 PM	
0.46	12/7/2020 3:48:42 PM	
0.31	12/7/2020 3:49:43 PM	
0.18	12/7/2020 3:50:44 PM	
0.15	12/7/2020 3:51:44 PM	
0.15	12/7/2020 3:52:45 PM	
0.15	12/7/2020 3:53:45 PM	
0.15	12/7/2020 3:54:46 PM	
0.17	12/7/2020 3:55:47 PM	
0.15	12/7/2020 3:56:47 PM	
0.15	12/7/2020 3:57:48 PM	
0.15	12/7/2020 3:58:48 PM	
0.15	12/7/2020 3:59:49 PM	
0.15	12/7/2020 4:00:50 PM	
0.15	12/7/2020 4:01:50 PM	
0.15	12/7/2020 4:02:51 PM	
0.23	12/7/2020 4:03:51 PM	
0.29	12/7/2020 4:04:52 PM	
0.20	12/7/2020 4:05:53 PM	
0.15	12/7/2020 4:06:53 PM	
0.15	12/7/2020 4:07:54 PM	
0.15	12/7/2020 4:08:54 PM	
0.15	12/7/2020 4:09:55 PM	
0.16	12/7/2020 4:10:56 PM	
0.15	12/7/2020 4:11:56 PM	
0.15	12/7/2020 4:12:57 PM	
0.17	12/7/2020 4:13:57 PM	Stop Run 3
0.18		Avg
0.15	12/7/2020 4:14:58 PM	
0.15	12/7/2020 4:15:59 PM	
0.15	12/7/2020 4:16:59 PM	
0.27	12/7/2020 4:17:01 PM	
0.19	12/7/2020 4:18:02 PM	
0.15	12/7/2020 4:19:02 PM	
0.15	12/7/2020 4:20:03 PM	
0.15	12/7/2020 4:21:03 PM	
0.15	12/7/2020 4:22:04 PM	
1.05	12/7/2020 4:23:04 PM	
22.63	12/7/2020 4:24:05 PM	
24.79	12/7/2020 4:25:06 PM	
25.52	12/7/2020 4:26:06 PM	Bias
25.51	12/7/2020 4:27:07 PM	
25.05	12/7/2020 4:28:07 PM	
25.50	12/7/2020 4:29:08 PM	
25.64	12/7/2020 4:30:08 PM	
25.67	12/7/2020 4:31:09 PM	
10.69	12/7/2020 4:32:10 PM	
0.15	12/7/2020 4:33:10 PM	Zero
0.15	12/7/2020 4:34:11 PM	
0.15	12/7/2020 4:35:12 PM	

Meggitt Aircraft Braking Systems Corporation
South Afterburner Outlet

VOC	Conc.
High	47.05
Mid	24.7
Low	13.7

VOC	Time Stamp	
46.92	12/8/2020 7:59:44 AM	
47.22	12/8/2020 8:00:45 AM	High
47.23	12/8/2020 8:01:45 AM	
47.22	12/8/2020 8:02:46 AM	
47.41	12/8/2020 8:03:46 AM	
47.67	12/8/2020 8:04:47 AM	
47.86	12/8/2020 8:05:48 AM	
12.15	12/8/2020 8:06:48 AM	
0.02	12/8/2020 8:07:49 AM	
0.02	12/8/2020 8:08:50 AM	Zero
0.02	12/8/2020 8:09:50 AM	
0.02	12/8/2020 8:10:51 AM	
0.79	12/8/2020 8:11:51 AM	
0.02	12/8/2020 8:12:52 AM	
0.02	12/8/2020 8:13:52 AM	
1.08	12/8/2020 8:14:53 AM	
12.10	12/8/2020 8:15:54 AM	
13.10	12/8/2020 8:16:54 AM	
13.40	12/8/2020 8:17:55 AM	Low
13.43	12/8/2020 8:18:56 AM	
13.36	12/8/2020 8:19:56 AM	
12.95	12/8/2020 8:20:57 AM	
12.75	12/8/2020 8:21:57 AM	
12.80	12/8/2020 8:22:58 AM	
12.03	12/8/2020 8:23:59 AM	
19.00	12/8/2020 8:24:59 AM	
23.96	12/8/2020 8:26:00 AM	
24.87	12/8/2020 8:27:00 AM	Bias
24.84	12/8/2020 8:28:01 AM	
24.94	12/8/2020 8:29:02 AM	
24.50	12/8/2020 8:30:02 AM	
24.36	12/8/2020 8:31:03 AM	
24.37	12/8/2020 8:32:03 AM	
20.03	12/8/2020 8:33:04 AM	
0.03	12/8/2020 8:34:05 AM	
0.02	12/8/2020 8:35:05 AM	
0.02	12/8/2020 8:36:06 AM	
0.49	12/8/2020 8:37:06 AM	
0.21	12/8/2020 8:38:07 AM	
0.02	12/8/2020 8:39:08 AM	
0.02	12/8/2020 8:40:08 AM	Start Run 1
0.02	12/8/2020 8:41:09 AM	
0.02	12/8/2020 8:42:10 AM	
0.48	12/8/2020 8:43:10 AM	
0.15	12/8/2020 8:44:11 AM	
0.02	12/8/2020 8:45:11 AM	
0.02	12/8/2020 8:46:12 AM	
0.02	12/8/2020 8:47:12 AM	
0.02	12/8/2020 8:48:13 AM	
0.02	12/8/2020 8:49:14 AM	
0.34	12/8/2020 8:50:14 AM	

0.15	12/8/2020 8:51:15 AM	
0.02	12/8/2020 8:52:15 AM	
0.02	12/8/2020 8:53:16 AM	
0.02	12/8/2020 8:54:17 AM	
0.02	12/8/2020 8:55:17 AM	
0.02	12/8/2020 8:56:18 AM	
0.07	12/8/2020 8:57:18 AM	
0.02	12/8/2020 8:58:19 AM	
0.02	12/8/2020 8:59:20 AM	
0.02	12/8/2020 9:00:20 AM	
0.02	12/8/2020 9:01:21 AM	
0.47	12/8/2020 9:02:22 AM	
0.02	12/8/2020 9:03:22 AM	
0.02	12/8/2020 9:04:23 AM	
0.02	12/8/2020 9:05:23 AM	
0.25	12/8/2020 9:06:24 AM	
0.02	12/8/2020 9:07:25 AM	
0.02	12/8/2020 9:08:25 AM	
0.06	12/8/2020 9:09:26 AM	
0.02	12/8/2020 9:10:26 AM	
0.02	12/8/2020 9:11:27 AM	
0.18	12/8/2020 9:12:27 AM	
0.02	12/8/2020 9:13:28 AM	
0.02	12/8/2020 9:14:29 AM	
0.02	12/8/2020 9:15:29 AM	
0.61	12/8/2020 9:16:30 AM	
0.02	12/8/2020 9:17:31 AM	
0.02	12/8/2020 9:18:31 AM	
0.02	12/8/2020 9:19:32 AM	
0.26	12/8/2020 9:20:32 AM	
0.11	12/8/2020 9:21:33 AM	
0.02	12/8/2020 9:22:34 AM	
0.02	12/8/2020 9:23:34 AM	
0.02	12/8/2020 9:24:35 AM	
0.51	12/8/2020 9:25:35 AM	
0.02	12/8/2020 9:26:36 AM	
0.02	12/8/2020 9:27:37 AM	
0.07	12/8/2020 9:28:37 AM	
0.02	12/8/2020 9:29:38 AM	
0.09	12/8/2020 9:30:39 AM	
0.02	12/8/2020 9:31:39 AM	
0.02	12/8/2020 9:32:40 AM	
0.67	12/8/2020 9:33:40 AM	
0.41	12/8/2020 9:34:41 AM	
0.07	12/8/2020 9:35:42 AM	
0.02	12/8/2020 9:36:42 AM	
0.02	12/8/2020 9:37:43 AM	
0.02	12/8/2020 9:38:43 AM	
0.02	12/8/2020 9:39:44 AM	
0.13	12/8/2020 9:40:44 AM	Stop Run 1
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0.02	12/8/2020 9:42:46 AM	
0.37	12/8/2020 9:43:46 AM	
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0.02	12/8/2020 9:45:48 AM	
0.61	12/8/2020 9:46:48 AM	
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19.05	12/8/2020 9:48:49 AM	
24.41	12/8/2020 9:49:50 AM	
24.37	12/8/2020 9:50:51 AM	
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0.02	12/8/2020 10:19:07 AM	
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0.02	12/8/2020 10:24:11 AM	
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0.02	12/8/2020 10:26:12 AM	
0.02	12/8/2020 10:27:12 AM	
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0.02	12/8/2020 10:29:14 AM	
0.02	12/8/2020 10:30:14 AM	
0.02	12/8/2020 10:31:15 AM	
0.02	12/8/2020 10:32:15 AM	
0.02	12/8/2020 10:33:16 AM	
0.02	12/8/2020 10:34:17 AM	
0.11	12/8/2020 10:35:17 AM	
0.02	12/8/2020 10:36:18 AM	
0.02	12/8/2020 10:37:18 AM	
0.02	12/8/2020 10:38:19 AM	
0.02	12/8/2020 10:39:19 AM	
0.05	12/8/2020 10:40:20 AM	Start Run 2
0.02	12/8/2020 10:41:21 AM	
0.02	12/8/2020 10:42:21 AM	
0.02	12/8/2020 10:43:22 AM	
0.25	12/8/2020 10:44:23 AM	
0.02	12/8/2020 10:45:23 AM	
0.02	12/8/2020 10:46:24 AM	
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0.02	12/8/2020 10:48:25 AM	
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0.02	12/8/2020 11:04:35 AM	
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0.02	12/8/2020 11:23:46 AM	
0.02	12/8/2020 11:24:47 AM	
0.02	12/8/2020 11:25:47 AM	
0.14	12/8/2020 11:26:48 AM	
0.02	12/8/2020 11:27:48 AM	
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0.02	12/8/2020 11:30:50 AM	
0.02	12/8/2020 11:31:51 AM	
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0.23	12/8/2020 11:33:52 AM	
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0.02	12/8/2020 11:35:53 AM	
0.02	12/8/2020 11:36:54 AM	
0.07	12/8/2020 11:37:55 AM	
0.02	12/8/2020 11:38:55 AM	
0.02	12/8/2020 11:39:56 AM	
0.02	12/8/2020 11:40:57 AM	Stop Run 2
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0.06	12/8/2020 11:42:58 AM	
0.02	12/8/2020 11:43:58 AM	
0.02	12/8/2020 11:44:59 AM	
0.02	12/8/2020 11:46:00 AM	
0.09	12/8/2020 11:47:00 AM	
0.02	12/8/2020 11:48:01 AM	
0.05	12/8/2020 11:49:01 AM	
5.11	12/8/2020 11:50:02 AM	
24.40	12/8/2020 11:51:02 AM	
24.71	12/8/2020 11:52:03 AM	
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24.95	12/8/2020 11:54:04 AM	
25.02	12/8/2020 11:55:05 AM	
25.03	12/8/2020 11:56:05 AM	

25.04	12/8/2020 11:57:06 AM	
25.05	12/8/2020 11:58:07 AM	
7.72	12/8/2020 11:59:07 AM	
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0.02	12/8/2020 12:01:08 PM	
0.02	12/8/2020 12:02:09 PM	
0.02	12/8/2020 12:03:10 PM	Zero
0.02	12/8/2020 12:04:10 PM	
0.02	12/8/2020 12:05:11 PM	
0.02	12/8/2020 12:06:11 PM	
0.11	12/8/2020 12:07:12 PM	
0.02	12/8/2020 12:08:13 PM	
0.02	12/8/2020 12:09:13 PM	
0.02	12/8/2020 12:10:14 PM	
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0.02	12/8/2020 12:12:15 PM	
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0.02	12/8/2020 12:14:16 PM	
0.02	12/8/2020 12:15:17 PM	Start Run 3
0.07	12/8/2020 12:16:18 PM	
0.02	12/8/2020 12:17:18 PM	
0.02	12/8/2020 12:18:19 PM	
0.37	12/8/2020 12:19:19 PM	
0.02	12/8/2020 12:20:20 PM	
0.02	12/8/2020 12:21:21 PM	
0.08	12/8/2020 12:22:21 PM	
0.02	12/8/2020 12:23:22 PM	
0.05	12/8/2020 12:24:22 PM	
0.02	12/8/2020 12:25:23 PM	
0.02	12/8/2020 12:26:24 PM	
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0.02	12/8/2020 12:28:25 PM	
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0.29	12/8/2020 12:31:27 PM	
0.02	12/8/2020 12:32:27 PM	
0.02	12/8/2020 12:33:28 PM	
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0.02	12/8/2020 12:40:32 PM	
0.02	12/8/2020 12:41:33 PM	
0.02	12/8/2020 12:42:33 PM	
0.26	12/8/2020 12:43:34 PM	
0.02	12/8/2020 12:44:35 PM	
0.02	12/8/2020 12:45:35 PM	
0.02	12/8/2020 12:46:36 PM	
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0.02	12/8/2020 12:48:37 PM	
0.02	12/8/2020 12:49:38 PM	
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0.02	12/8/2020 12:51:39 PM	
0.02	12/8/2020 12:52:39 PM	
0.02	12/8/2020 12:53:40 PM	
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0.02	12/8/2020 12:59:44 PM	
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0.02	12/8/2020 1:01:45 PM	
0.31	12/8/2020 1:02:45 PM	
0.02	12/8/2020 1:03:46 PM	
0.02	12/8/2020 1:04:47 PM	
0.02	12/8/2020 1:05:47 PM	
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0.02	12/8/2020 1:17:55 PM	
0.10	12/8/2020 1:18:55 PM	
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18.19	12/8/2020 1:24:59 PM	
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25.89	12/8/2020 1:30:02 PM	Bias
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26.02	12/8/2020 1:34:04 PM	
25.82	12/8/2020 1:35:05 PM	
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0.02	12/8/2020 1:38:07 PM	
0.02	12/8/2020 1:39:07 PM	Zero
0.03	12/8/2020 1:40:08 PM	

Custom Stack Analysis, LLC.
1-800-824-4274

Meggitt Aircraft Braking Systems Corporation
1204 Massillon Road
Akron, Ohio 44306

Report

Performed Velocity, Moisture, Temperature, Volumetric Flow Rate, Oxygen, Carbon Dioxide, Nitrogen Oxide, Carbon Monoxide and Volatile Organic Compounds Emissions Testing

Sampling performed on the P039 Accutherm Thermal Oxidizer Outlet

Akron, OH

Test Date: 4/15/2021

Meggitt Aircraft Braking Systems Corporation
1204 Massillon Road
Akron, Ohio 44306

Report

Performed Velocity, Moisture, Temperature, Volumetric Flow Rate, Oxygen, Carbon Dioxide, Nitrogen Oxide, Carbon Monoxide and Volatile Organic Compounds Emissions Testing

Sampling performed on the P039 Accutherm Thermal Oxidizer Outlet

Akron, OH

Test Date: 4/15/2021

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.

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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APPENDIX

EXECUTIVE SUMMARY

Custom Stack Analysis, LLC. conducted emissions sampling using USEPA Methods 1-4, 3A, 7E, 10 and 25A. Testing was conducted on the P039 Accutherm Outlet on April 15th, 2021. The testing was conducted at Meggitt Aircraft Braking Systems Corporation (Facility ID – 16-77-01-0999) on P039 Accutherm Outlet to determine compliance status with Permit No. – P0121253 (see Table 1.2).

The Custom Stack Analysis, LLC. test crew consisted of Mr. James Gray, Mr. Dylan Gray and Mr. Brian Lemasters. The testing procedures were coordinated by Mr. Jim Davies of Meggitt Aircraft Braking Systems Corporation. All testing procedures were witnessed by Mr. Connor Moroney of the Akron Regional Air Quality Management District (see Table 1.1).

Table 1.1: Emissions Testing Program Contact Personnel

Name, Title	Company Address	Phone, Fax, email
Mr. Jim Davies	Meggitt Aircraft Braking Systems Corporation 1204 Massillon Road Akron, OH 44306	(330) 796-1743 (Phone)
Mr. Connor Moroney	Akron Regional Air Quality Management District 1867 W. Market St, Akron, OH 44313	(330) 812-3904 (Phone)
Mr. James Gray Owner Mr. Brian Lemasters Project Manager Mr. Dylan Gray 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 15-22. 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 process data.

Table 1.2 demonstrates how Meggitt Aircraft Braking Systems Corporation in Akron, 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
Nitrogen Oxide		0.637 tons/yr	
Volatile Organic Compounds	0.36 tons/yr	0.0199 tons/yr	Yes
Carbon Monoxide		0.0023 tons/yr	

Test Results

Meggitt Aircraft Braking Systems Corporation - P039 Accutherm Outlet
4/15/2021
Methods 1-4, 3A, 7E, 10 and 25A

		Run #1	Run #2	Run #3	Avg.
Stack Gas	Velocity (ft/sec)	12.70	13.02	13.18	12.97
Standard Cubic Feet an Hour		50,567	50,007	49,802	50,125
Actual Cubic Feet per Minute		2,394	2,454	2,484	2,444
Moisture %		5.33%	6.49%	6.14%	5.99%
Carbon Dioxide %		3.24%	2.92%	3.32%	3.16%
Oxygen %		14.21%	14.76%	14.27%	14.41%
Nitrogen %		82.55%	82.33%	82.41%	82.43%
CO	(ppm)	0.07	0.17	0.20	0.14
CO	(lbs/hr)	0.0002	0.0006	0.0007	0.0005
CO	(tons/yr)	0.0011	0.0026	0.0032	0.0023
Nox	(ppm)	24.77	24.02	24.11	24.30
Nox	(lbs/hr)	0.1496	0.1434	0.1433	0.1454
Nox	(tons/yr)	0.6551	0.6282	0.6278	0.6370
VOC	(ppm)	0.86	1.28	0.77	0.97
VOC	(lbs/hr Carbon)	0.0040	0.0060	0.0036	0.0045
VOC	(tons/yr)	0.0177	0.0263	0.0157	0.0199

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.

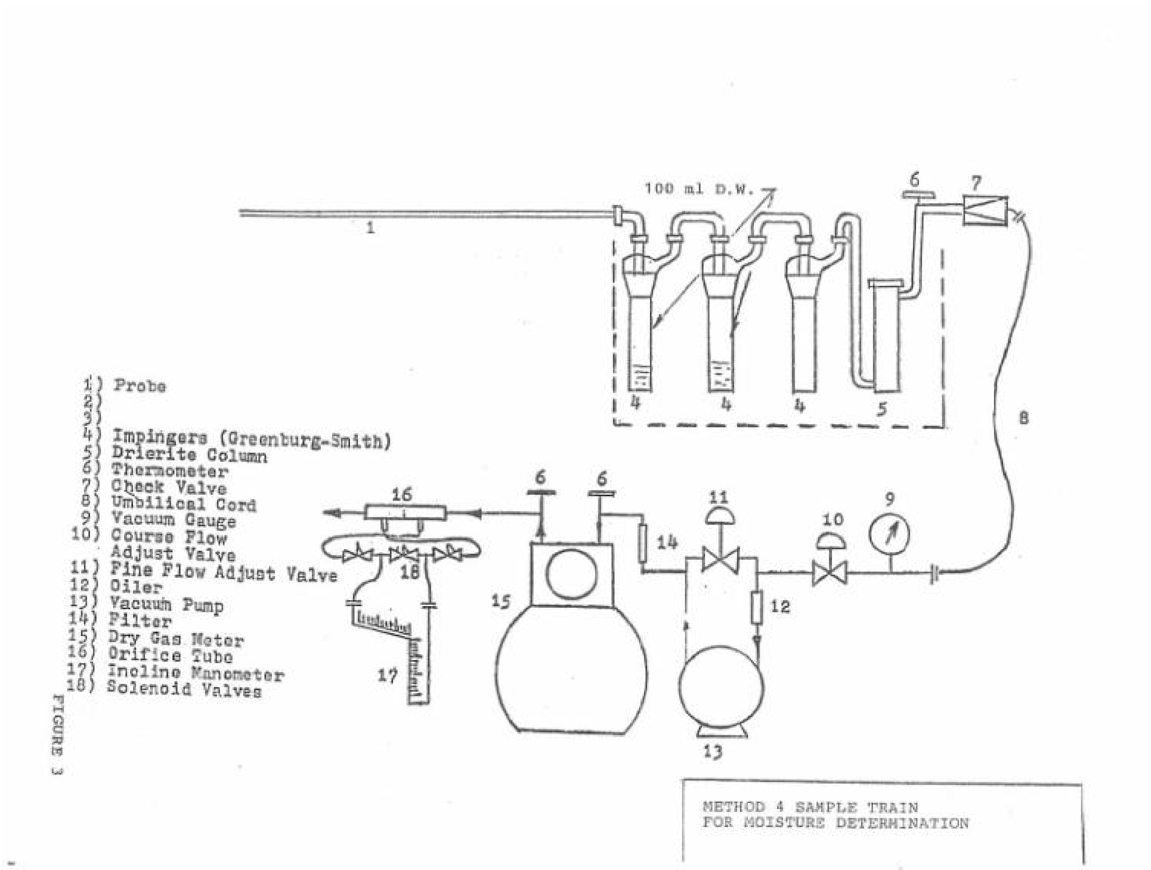
METHOD 10 TESTING DESCRIPTION

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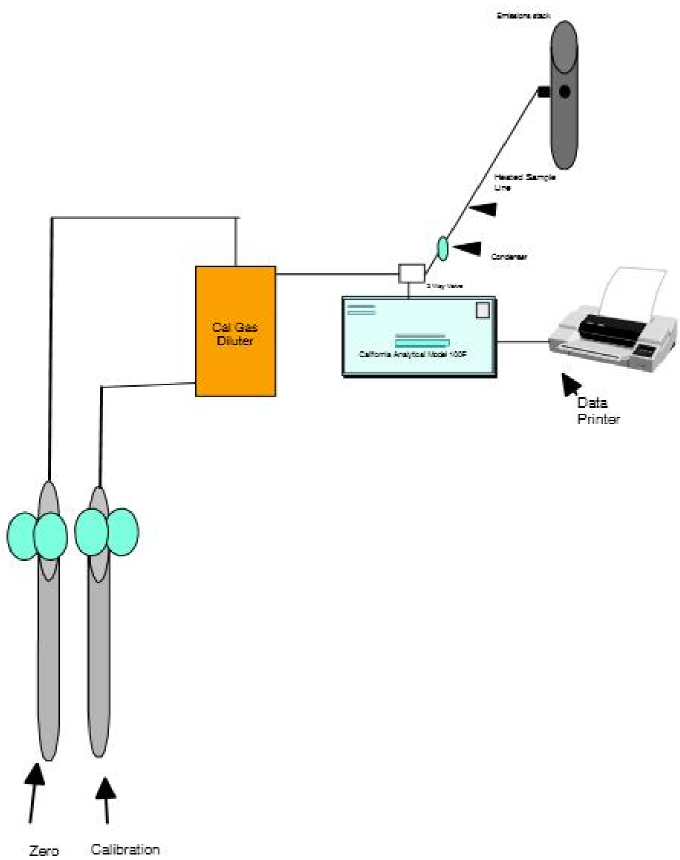
2)
3)
4) Impingers (Greenburg-Smith)
5) Drierite Column
6) Thermometer
7) Check Valve
8) Umbilical Cord
9) Vacuum Gauge
10) Course Flow Adjust Valve
11) Fine Flow Adjust Valve
12) Oiler
13) Vacuum Pump
14) Filter
15) Dry Gas Meter
16) Orifice Tube
17) Incline Manometer
18) Solenoid Valves
FIGURE 3
METHOD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

3A Sampling System



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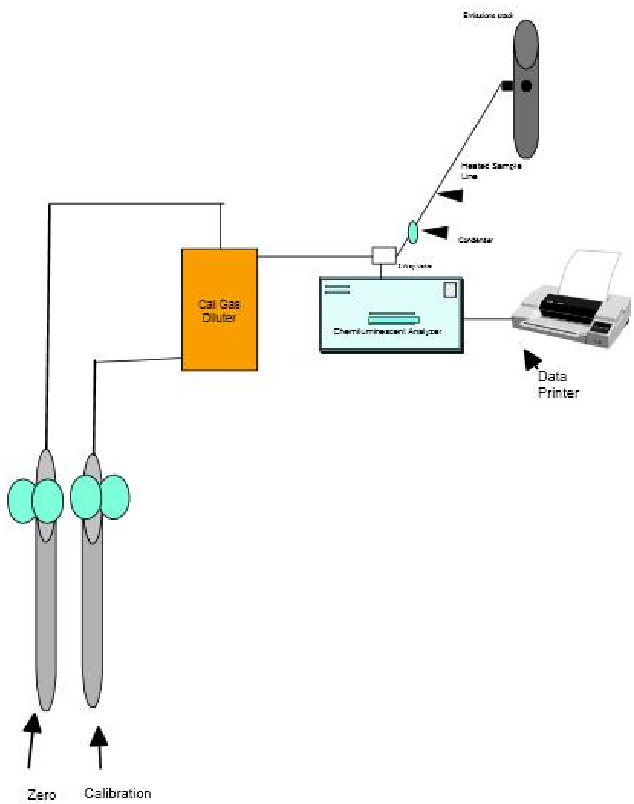
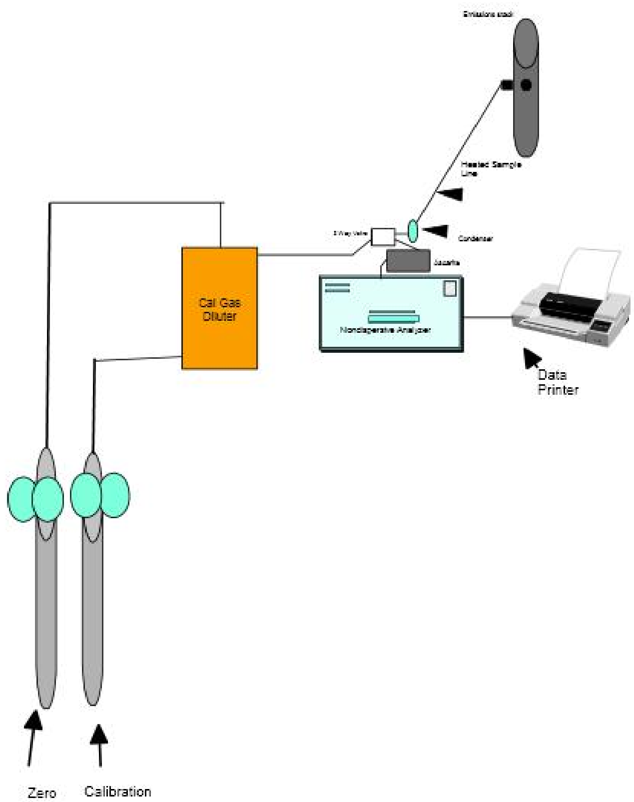
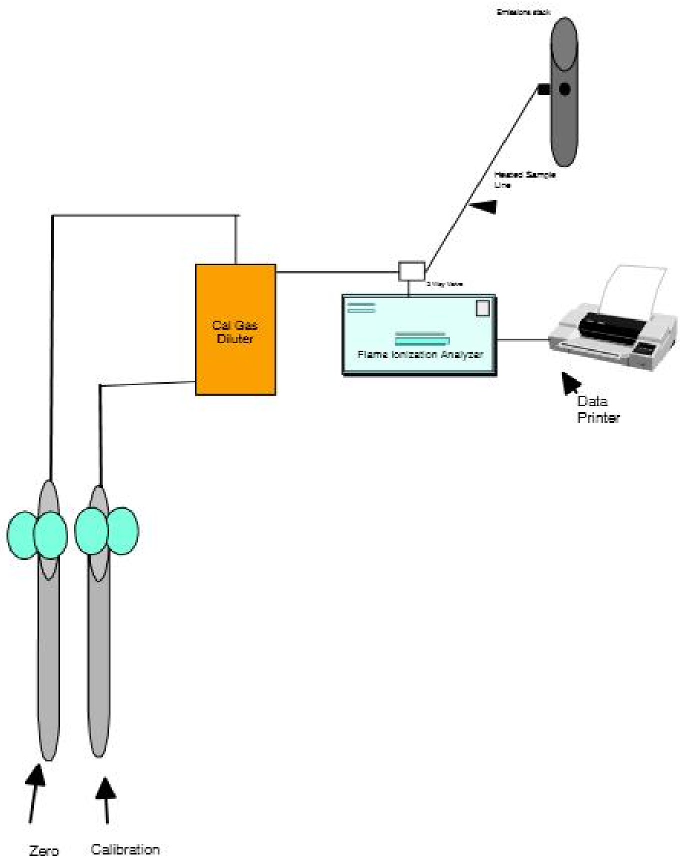


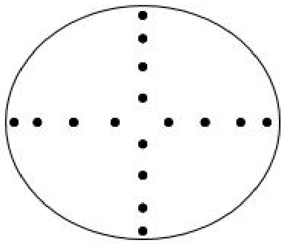
10 Sampling System



25A Sampling System



Location of Sampling Points



Location	Accutherm Outlet	
Upstream	180.0	Inches
Downstream	240	Inches
Stack Diameter	24	Inches
Sample Point #		
1	0.8	Inches
2	2.5	
3	4.7	
4	7.8	
5	16.2	
6	19.3	
7	21.5	
8	23.2	

CALCULATIONS

Outlet

		RUN #1	RUN #2	RUN #3		
1.	**Vm (std)**	43.07	42.45	42.75	=	$VM * 17.64 * \frac{PBAR + \frac{\wedge H}{13.6}}{Tm} * Y$

		RUN #1	RUN #2	RUN #3
Vm (std) = Volume of gas collected, corrected to standard conditions, cuft.	=	43.07	42.45	42.75
Vm = Volume of gas sampled at meter box, cuft.	=	45.02	44.61	45.09
17.64 = Standard temperature, 528 Rankine / std pressure, 29.92.	=	17.64	17.64	17.64
Tm = Average dry gas meter temperature, + 460 Rankine.	=	531.04167	533.75	535.79167
Pbar = Barometric pressure, inches of mercury (Hg)	=	28.64	28.64	28.64
^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.	=	1.0004	1.0004	1.0004

		RUN #1	RUN #2	RUN #3		
2.	**Vw (std)**	2.43	2.95	2.80	=	$Vlc * \frac{P\ H20}{Mh20} * \frac{R\ Tstd}{Pstd} = K2 * Vlc$

		RUN #1	RUN #2	RUN #3
Vlc = Volume of water and silica colected.	=	51.5	62.5	59.4
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**	0.05334	0.06487	0.06145	=	$\frac{Vw(std)}{Vm(std) + Vw(std)}$

		RUN #1	RUN #2	RUN #3
Bws = Water vapor in the gas stream, proportion.	=	0.05334	0.06487	0.06145
Vw(std) = Volume of water vapor in the gas sample, scf.	=	2.43	2.95	2.80
Vm(std) = Volume of gas sampled at meter box, scf.	=	43.07	42.45	42.75

		RUN #1	RUN #2	RUN #3		
4.	**Md**	29.086694	29.056811	29.102617	=	0.44 (%CO2) + 0.32 (%O2) + 0.28 (%N2) + %CO)

			RUN #1	RUN #2	RUN #3
Md	= Dry molecular weight, lb / lb-mole.	=	29.09	29.06	29.10
0.44	= Molecular weight of CO2 divided by 100.	=	0.44	0.44	0.44
0.32	= Molecular weight of O2 divided by 100.	=	0.32	0.32	0.32
0.28	= Molecular weight of N2 or CO divided by 100.	=	0.28	0.28	0.28

Co2, O2, N2, and CO are in percent by volume, dry basis.

		RUN #1	RUN #2	RUN #3		
5.	**Ms**	28.50	28.34	28.42	=	Md * (1-Bws) + M H20 * (Bws)

			RUN #1	RUN #2	RUN #3
Ms	= Molecular weight of gas , wet basis, lb /lb-mole.	=	28.50	28.34	28.42
M H20	= Molecular weight of water, 18 lb / lb-mole.	=	18	18	18

		RUN #1	RUN #2	RUN #3		
6.	**Vs**	12.70	13.02	13.18	=	$85.49 * Cp * \sqrt{\text{^p}} * \sqrt{\frac{Ts + 460}{Ps * Ms}}$

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	12.70	13.02	13.18
85.49	= Pitot tube constant, ft / sec.	=	85.49	85.49	85.49
Cp	= Pitot tube coefficient, dimensionless.	=	0.84	0.84	0.84
^P	= Velocity head of stack gas, avg. sq rt.	=	0.13704	0.13847	0.13895
Ts	= Temperature of stack gas, + 460 (Rankine).	=	1359.625	1393	1420
Ps	= Absolute stack gas pressure, barometric + static.	=	28.65	28.65	28.65
Ms	= Molecular weight of stack gas, wet basis.	=	28.50	28.34	28.42

		RUN #1	RUN #2	RUN #3		
7.	**ACFM**	2393.78	2454.40	2483.86	=	Stack Area * 60 * Vs

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	12.70	13.02	13.18

		RUN #1	RUN #2	RUN #3		
8	**SCFH**	50567	50007	49802	=	$3600 * (1 - Bws) * Vs * A * \frac{Tstd}{Ts} * \frac{Ps}{Pstd}$

				RUN #1	RUN #2	RUN #3
3600	=	Seconds per hour.	=	3600	3600	3600
Bws	=	Water vapor in the gas stream, proportion.	=	0.0533415	0.0648732	0.0614459
A	=	Area of stack in sq ft.	=	3.14	3.14	3.14
Tstd	=	Standard absolute temperature, 528 R.	=	528	528	528
Pstd	=	Standard absolute pressure, 29.92 in. Hg.	=	29.92	29.92	29.92
Ts	=	Temperature of stack gas, + 460 (Rankine).		1359.625	1393	1420
Ps	=	Absolute stack gas pressure, barometric + static.		28.64	28.64	28.64
Vs	=	Average stack gas velocity, ft / sec.		12.70	13.02	13.18

CALCULATIONS

VOC

		RUN #1	RUN #2	RUN #3		
1.	**Lbs/Hr Propane**	0.00495	0.00734	0.00437	=	0.11443 * SCFH * PPM * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	50567	50007	49802
PPM	=	PPM	=	0.8556412	1.2832484	0.7671375

		RUN #1	RUN #2	RUN #3		
2.	**Lbs/Hr Carbon**	0.00405	0.00600	0.00357	=	0.031182 * SCFH * PPM * 3 * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	50567	50007	49802
PPM	=	PPM	=	0.8556412	1.2832484	0.7671375
3	=	Carbon equivalent correction factor for propane.	=	3	3	3

CALCULATIONS

NOX

		RUN #1	RUN #2	RUN #3		
1.	**Lbs/Hr**	0.14956	0.14341	0.14333	=	$\boxed{1.194 * SCFH * PPM * 10^{-7}}$

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	50567	50007	49802
PPM	=	PPM corrected	=	24.77	24.02	24.10

		RUN #1	RUN #2	RUN #3		
2	**PPM Corr.**	24.77	24.02	24.10	=	$Cgas = (C - Co) \dfrac{Cma}{Cm - Co}$

				RUN #1	RUN #2	RUN #3
Co	=	Average of initial and final system calibration bias check responses for the zero gas, ppm.	=	0.11	0.16	0.135
C	=	Effluent gas concentration, dry basis, ppm.	=	24.73	24.35	24.2
Cm	=	Average of initial and final system calibration bias check responses for the upscale gas, ppm.	=	25.255	25.64	25.395
Cma	=	Actual concentration of the upscale calibration gas, ppm.	=	25.3	25.3	25.3

CALCULATIONS

CO

		RUN #1	RUN #2	RUN #3		
1	**Lbs/Hr**	0.00	0.00	0.00	=	.726 * SCFH * PPM * 10^- 7

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	50566.76	50007	49802
PPM	=	PPM	=	0.07	0.17	0.20

		RUN #1	RUN #2	RUN #3		
2	**PPM Corr.**	0.0665	0.1662	0.2	=	$Cgas = (C - Co) \dfrac{Cma}{Cm - Co}$

				RUN #1	RUN #2	RUN #3
Co	=	Average of initial and final system calibratio bias check responses for the zero gas, ppm	=	-0.055	-0.075	-0.01
C	=	Effluent gas concentration, dry basis, ppm.	=	0.01	0.09	0.19
Cm	=	Average of initial and final system calibration bias check responses for the upscale gas, p	=	14.04	14.24	14.41
Cma	=	Actual concentration of the upscale calibration gas, ppm.	=	14.42	14.42	14.42

CALCULATIONS

O_2

		RUN #1	RUN #2	RUN #3		
1	**% Corr.**	14.21	14.76	14.27	=	$Cgas = (C - Co) \dfrac{Cma}{Cm - Co}$

				RUN #1	RUN #2	RUN #3
Co	=	Average of initial and final system cali bias check responses for the zero gas	=	0.14	0.27	0.26
C	=	Effluent gas concentration, dry basis,	=	14.29	14.65	14.15
Cm	=	Average of initial and final system calibration bias check responses for the upscale	=	10.095	10.015	9.995
Cma	=	Actual concentration of the upscale calibration gas, ppm.	=	10.00	10.00	10.00

CALCULATIONS

CO2

		RUN #1	RUN #2	RUN #3		
1	**% Corr.**	3.24	2.92	3.32	=	$C_{gas} = (C - C_o) \dfrac{C_{ma}}{C_m - C_o}$

				RUN #1	RUN #2	RUN #3
Co	=	Average of initial and final system cali bias check responses for the zero gas	=	-0.005	0.02	0.025
C	=	Effluent gas concentration, dry basis,	=	3.26	2.93	3.31
Cm	=	Average of initial and final system calibration bias check responses for the upscale	=	9.795	9.72	9.63
Cma	=	Actual concentration of the upscale calibration gas, ppm.	=	9.72	9.72	9.72

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

Appendix #1

Test Data

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

Plant Meggitt Aircraft Braking | Date 4/15/2021

Location P039 Accutherm Outlet | By Jim G, Brian L, Dylan G

Point #	Angle
1	3
2	3
3	1
4	0
5	2
6	0
7	1
8	1
B-1	2
2	1
3	3
4	4
5	2
6	2
7	1
8	0
Avg	2

Custom Stack Analysis, LLC.

Pitot Traverse Data Sheet

Plant Meggitt Aircraft Braking Systems Corporation Date 4/15/2021

Location P039 Accutherm Outlet By Brian L

Run No.	Pre 1		Post 1		Post 2		Post 3	
Point #	Pitot Δ P	°F	Pitot Δ P	°F	Pitot Δ P	°F	Pitot Δ P	°F
A-1	0.022	878	0.023	892	0.019	921	0.022	942
2	0.024	881	0.023	895	0.021	926	0.025	948
3	0.019	882	0.020	908	0.022	935	0.021	953
4	0.025	883	0.023	915	0.022	940	0.024	958
5	0.018	884	0.019	921	0.020	947	0.020	969
6	0.016	882	0.018	926	0.018	951	0.017	974
7	0.015	880	0.017	931	0.016	958	0.016	979
8	0.012	881	0.015	933	0.014	966	0.014	985
B-1	0.018	865	0.018	902	0.021	932	0.019	960
2	0.020	867	0.019	907	0.024	937	0.020	967
3	0.022	872	0.020	913	0.020	943	0.022	973
4	0.021	874	0.022	918	0.024	950	0.022	981
5	0.018	880	0.019	924	0.021	954	0.019	989
6	0.017	882	0.019	930	0.018	961	0.020	994
7	0.016	883	0.018	934	0.016	965	0.017	998
8	0.014	884	0.015	937	0.013	968	0.015	1002

			Run #1		Run #2		Run #3	
		0.14	899.63	0.14	932.50	0.14	960.19	
	0.136	881	0.138	918	0.138	947	0.139	973
Static:	0.186		0.189		0.189		0.192	

TEST DATA

COMPANY NAME	Meggitt Aircraft Braking Systems Corporation -
ADDRESS	1204 Massillon Road
CITY	Akron
STATE	OH
ZIP	44306
TEST METHODS	Methods 1-4, 3A, 7E, 10 and 25A
CREW MEMBERS	Jim G, Brian L, Dylan G
LOCATION	Outlet
SOURCE	P039 Accutherm
CONTROL	

	RUN #1	RUN #2	RUN #3
DATE	4/15/2021	4/15/2021	4/15/2021
RUN LENGTH (min)	60	60	60
VOLUME (cubic feet)	45.022	44.605	45.093
Y FACTOR	1.0004	1.0004	1.0004
BAROMETRIC	28.64	28.64	28.64
METER TEMP. (R)	531.04	533.75	535.79
STACK TEMP. (R)	1359.63	1392.50	1420.19
AVERAGE ^P	0.137	0.138	0.139
AVERAGE ^H	2.00	2.00	2.00
IMPINGER VOLUME	51.50	62.50	59.40
PITOT COEF.	0.84	0.84	0.84
STATIC PRESSURE	0.188	0.189	0.191
STACK AREA	3.14	3.14	3.14
CARBON DIOXIDE	3.24	2.92	3.32
OXYGEN	14.21	14.76	14.27
NITROGEN	**82.55**	**82.33**	**82.41**

TEST RESULTS

P039 Accutherm Outlet
4/15/2021

	RUN #1	RUN #2	RUN #3
VM (std)	43.069	42.454	42.755
VW (std)	2.427	2.945	2.799
BWS	0.053	0.065	0.061
MD	29.087	29.057	29.103
MS	28.495	28.340	28.420
VS (ft/sec)	12.699	13.021	13.177
SCFH	50566.76	50006.76	49802.36
ACFM	2393.78	2454.40	2483.86
DCFM	842.78	833.45	830.04

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

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

Bws = Stack moisture content.

Md = Determination of dry molecular weight of stack gas.

Ms = Determination of stack gas molecular weight.
Vs = Average gas stack velocity. (ft/sec.)

ACFM = Actual cubic feet per minute of gas velocity.

DCFM = Dry standard cubic feet per minute of gas velocity.

TEST RESULTS

P039 Accutherm Outlet

4/15/2021

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (lbs/hr propane)	0.005	0.007	0.004
VOC (lbs/hr carbon)	0.004	0.006	0.004
NOX (lbs/hr)	0.150	0.143	0.143
CO (lbs/hr)	0.000	0.001	0.001
O2 %	14.214	14.756	14.268
CO2 %	3.238	2.916	3.324

TEST DATA

P039 Accutherm Outlet

4/15/2021

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (ppm)	0.86	1.28	0.77
NOX (ppm)	24.73	24.35	24.20
CO (ppm)	0.01	0.09	0.19
O2 (%)	14.29	14.65	14.15
CO2 (%)	3.26	2.93	3.31

NOX CAL. CORR.			
INITIAL ZERO	0.04	0.18	0.14
INITIAL UPSCALE	25.15	25.36	25.92
FINAL ZERO	0.18	0.14	0.13
FINAL UPSCALE	25.36	25.92	24.87
ACTUAL UPSCALE	25.30	25.3	25.3
NOX (ppm corrected)	24.77	24.02	24.10

CO CAL. CORR.			
INITIAL ZERO	0.02	-0.13	-0.02
INITIAL UPSCALE	14.02	14.06	14.42
FINAL ZERO	-0.13	-0.02	0
FINAL UPSCALE	14.06	14.42	14.4
ACTUAL UPSCALE	14.42	14.42	14.42
CO (ppm corrected)	0.07	0.17	0.20

O2 CAL CORR.			
INITIAL ZERO	0.02	0.26	0.28
INITIAL UPSCALE	10.07	10.12	9.91
FINAL ZERO	0.26	0.28	0.24
FINAL UPSCALE	10.12	9.91	10.08
ACTUAL UPSCALE	10.00	10	10
O2 (% corrected)	14.21	14.76	14.27

CO2 CAL CORR.			
INITIAL ZERO	-0.04	0.03	0.01
INITIAL UPSCALE	9.79	9.8	9.64
FINAL ZERO	0.03	0.01	0.04
FINAL UPSCALE	9.80	9.64	9.62
ACTUAL UPSCALE	9.72	9.72	9.72
CO2 (% corrected)	3.24	2.92	3.32

Custom Stack Analysis, L.L.C.

Method 4

Plant: eggitt Aircraft Braking Systems Corporati   Date : 4/15/2021

		Meter Box	
Barometer (Pg)	28.64	ID:	1
Ambient Temp	50	Y	1.0004
		ΔH	1.986
		ΔH Set Point :	2.0

	Time	Run Time
Start:	13:45	60
Stop:	14:45	

Run #1

Cold Box #					
11	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	170.240	68	64.0	63	5
5	174.012	71	66.0	56	5
10	177.793	72	66.0	54	5
15	181.546	74	67.0	53	5
20	185.323	74	68.0	57	5
25	189.058	75	68.0	57	5
30	192.762	75	69.0	58	5
35	196.477	75	69.0	60	5
40	200.211	75	70.0	61	5
45	203.991	76	70.0	62	5
50	207.748	76	70.0	62	5
55	211.510	76	71.0	63	5
60	215.262				
Vm	45.022				
	AVG:	71		58.8	5.0

Leak Rate @	9.0	" Hg =	0.000

	Time	Run Time
Start:	15:27	60
Stop:	16:27	

Run #2

Cold Box #					
4	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	215.689	73	70	59	6
5	219.412	74	71	52	6
10	223.171	75	72	52	6
15	226.841	75	71	52	6
20	230.576	77	71	53	6
25	234.243	76	71	55	6
30	237.930	76	72	57	6
35	241.628	77	70	56	6
40	245.371	77	72	58	6
45	249.025	77	72	57	6
50	252.831	77	72	57	6
55	256.558	77	75	58	6
60	260.294				
Vm	44.605				
	AVG:	74		55.5	6.0

Leak Rate @	10.5	" Hg =	0.004

	Time	Run Time
Start:	17:04	60
Stop:	18:04	

Run #3

Cold Box #					
6	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	264.046	74	72	58	5
5	267.823	76	73	53	5
10	271.548	77	73	53	5
15	275.332	78	73	54	5
20	279.127	78	73	58	5
25	282.879	78	74	58	5
30	286.626	78	74	57	5
35	290.390	79	74	57	5
40	294.139	79	74	58	5
45	297.893	79	74	56	5
50	301.663	79	75	53	5
55	305.358	80	75	54	5
60	309.139				
Vm	45.093				
	AVG:	76		55.8	5.0

Leak Rate @	10.0	" Hg =	0.000

Appendix #2

Laboratory Data

Lab Data Sheet For: Meggitt Aircraft Braking Systems Corporation - P039 Accutherm Outlet By: Brian L

Moisture Weights

Moisture

RUN # 1			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	11	812.6	563.0	537.8				968.5
	Tare		726.3	610.3	536.6				957.2
	Net		86.3	-47.3	1.2	0.0	0.0	0.0	11.3
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

Intial Imp mL = 200.0

Impinger Total = 40.2 grams Total = 51.5 grams

RUN # 2			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	4	677.5	755.0	626.3				1030.3
	Tare		628.1	752.7	625.2				1020.6
	Net		49.4	2.3	1.1	0.0	0.0	0.0	9.7
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

Intial Imp mL = 200.0

Impinger Total = 52.8 grams Total = 62.5 grams

RUN # 3			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	6	792.8	655.7	488.4				969.2
	Tare		750.5	650.4	487.0				958.8
	Net		42.3	5.3	1.4	0.0	0.0	0.0	10.4
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

Intial Imp mL = 200.0

Impinger Total = 49.0 grams Total = 59.4 grams

Scale Serial # 1203240794

Appendix #3

Calibration Data

ilac-MRA ACCREDITED A2LA Certificate No. 1750.01 Calibration

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

Cert. No.: 3415-10347847

Traceable® Certificate of Calibration for Digital Calipers

Manufactured for and distributed by : Control Company 12554 Galveston Rd B230, Webster, TX 77598

Instrument Identification:

Model: 3415, S/N: 192125551 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Block Set	99146223	06 Dec 2019	1000434942

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 23 Apr 2019 Cal Due Date: 23 Apr 2021

Test Conditions: 57.01%RH 23.96°C 1018mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
in	N.A.	N.A.		0.1000	0.0995	Y	0.099	0.101	0.0003	3.33:1
in	N.A.	N.A.		2.0000	1.9985	Y	1.998	2.002	0.00033	>4:1
in	N.A.	N.A.		4.0000	3.998	Y	3.996	4.004	0.0004	>4:1
in	N.A.	N.A.		6.0000	5.997	Y	5.994	6.006	0.0005	>4:1
in depth	N.A.	N.A.		2.0000	1.998	Y	1.998	2.002	0.00033	>4:1
in inside	N.A.	N.A.		1.0000	0.9995	Y	0.999	1.001	0.00031	3.23:1
in step	N.A.	N.A.		2.0000	2.000	Y	1.998	2.002	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

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Note :

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).

B22438B

AMERICAN WELDING & GAS PurityPlus

AMERICAN WELDING AND GAS
1210 GLENDALE-MILFORD
CINCINNATI, OH 45215
513-772-8786

Cylinder Number:	EB0052956	Certification Date:	07 April 2019
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	08 April 2027
Certificate Number:	0869C-01T5-C01	Lot Number:	0869C-01T5
Cylinder Fill Pressure:	2015 PSIG	Customer Part Number:	T5E 4800001-A1-2

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Oxygen	10.0%	+/- 0.10% (absolute)	4/7/2019
Carbon Dioxide	9.72%	+/- 0.04% (absolute)	4/7/2019
Nitrogen	Balance		

Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Oxygen	GC-TCD	Shimadzu	GC-8A	C10495021497SA	3/25/2019
Carbon Dioxide	GC-TCD	Shimadzu	GC-8A	C10495021497SA	3/27/2019

Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
D685109	VSL	9/14/2023	PRM	O2	N2	21.00%	0.100	VSL
FF13624	9-D-37	3/8/2021	SRM	CO2	N2	16.08%	0.124	2745

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. Mixture stability is certified according to maximum certification periods set forth by Table 2-3 of EPA 600/R-12/531 May 2012. The listed expiration date may be extended by special request. The nitrogen used as a component or balance gas as well as the oxygen used in air mixtures meets the requirements set forth in EPA 1065.750. 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

Preparer: Allison Hanover

Reviewer: Abby Helman

Production Laboratory:
Tier 5 Labs, LLC
5353 W. Southern Ave.
Indianapolis, IN 46241
PGVP Vendor ID R12019

B21856

Scott-Gross Co., Inc.
664 Magnolia Ave.
Lexington, KY 40505
(859)231-0225 (888)431-5882

Certificate of Analysis

Certification Date:	12 January 2017
Certificate Number:	0097B-02T5-C01
Mixture Grade:	EPA Protocol Standard Gas Mixture
Lot Number:	0097B-02T5
Expiration Date:	12 January 2025
Cylinder Number:	EB0049442
Part Number:	T5L EPA2RATAP-14

Mixture Components	Requested Composition	Certified Composition	U (Expanded Uncertainty, k=2)
Propane	43 ppm	47.05 PPM	+/- 0.12 PPM (absolute)
Air	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 R12017
Procedure Used:	EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012
Analytical Method:	C3H8: FTIR
Multipoint Calibration Date:	Propane: 12/29/2016

Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CAL017809	83-J-12	8/17/2017	SRM	C3H8	Air	48.83 PPM	0.225	1667b

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

LIQUID TECHNOLOGY CORPORATION
"INDUSTRY LEADER IN SPECIALTY GASES"

Certificate of Analysis

- EPA PROTOCOL GAS -

B21477B

Customer	IE Monitoring Instruments (Worthington, OH)
Date	October 06, 2014
Delivery Receipt	DR-53322
Gas Standard	13.8 ppm Propane/Air - EPA PROTOCOL
Final Analysis Date	October 06, 2014
Expiration Date	October 07, 2022

Component	Propane
Balance Gas	Air

Analytical Data:
EPA Protocol, Section No. 2.2, Procedure G-1.

DO NOT USE BELOW 100 psig

Reported Concentrations

Propane: 13.7 ppm +/- 0.1 ppm
Air: Balance

Reference Standards:		GMIS Traceability
SRM/GMIS:	GMIS	SRM-1667b
Cylinder Number:	CC-165367	XF-003853B
Concentration:	20.21 ppm Propane (+/- 0.09 ppm)	49.54 ppm Propane (+/- 0.26 ppm)
Expiration Date:	12/02/18	07/12/15
NIST Sample Number:	NA	83-I-14

Certification Instrumentation

Component:	Propane
Make/Model:	Agilent 7890A
Serial Number:	CN10736166
Principal of Measurement:	GC-FID
Last Calibration:	September 28, 2014

Cylinder Data

Cylinder Serial Number:	EB-0051537	Cylinder Outlet:	CGA 590
Cylinder Volume:	138 Cubic Feet	Cylinder Pressure:	1950 psig, 70°F

Analytical Uncertainty and NIST Traceability are in compliance with EPA-600/R-12/531.

Certified by: Cole Dylewski

Cole Dylewski

PGVP Vendor ID: E12014

"UNMATCHED EXCELLENCE"

2048 APEX COURT, APOPKA, FLORIDA 32703 ~ PHONE (407)-292-2990 FAX (407)-292-3313
WWW.LIQUIDTECHCORP.COM
APOPKA, FL • HOUSTON, TX

B219 25 B

Scott-Gross Co., Inc.
664 Magnolia Ave.
Lexington, KY 40505
(859)231-0225 (888)431-5882

GASES & EQUIPMENT — INDUSTRIAL MEDICAL SPECIALTY

Cylinder Number:	CC444989	Certification Date:	28 April 2017
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	29 April 2025
Certificate Number:	1147B-02T5-C01	Lot Number:	1147B-02T5
Cylinder Pressure:	2015 PSIG	Customer Part Number:	T5L EPA2RATAP-19

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Propane	24.7 PPM	+/- 0.2 PPM (absolute)	4/28/2017
Air	Balance		

Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Propane	FTIR	Thermo	Antaris IGS	AWZ1200117	4/17/2017

Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CC459851	2186A-01T5	11/10/2024	GMIS	C3H8	N2	247.7 PPM	0.411	2644a

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

Analyst: Allison Hanover

Reviewer: Jeff Lynn

Production Laboratory.
Tier 5 Labs, LLC
5353 W. Southern Ave.
Indianapolis, IN 46241
PGVP Vendor ID R12017

b22573b

TIER 5 LABS
5353 W. SOUTHERN AVE.
INDIANAPOLIS, IN 46241
317-638-5690

Cylinder Number:	CC514251	Certification Date:	15 July 2020
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	15 July 2023
Certificate Number:	1690A-07T5-C01	Lot Number:	1690A-07T5
Cylinder Fill Pressure:	2015 PSIG	Customer Part Number:	T5E AM0001-A1-15

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Sulfur Dioxide	26.7 PPM	+/- 0.2 PPM (absolute)	7/6/2020, 7/15/2020
Nitric Oxide	25.3 PPM	+/- 0.11 PPM (absolute)	6/23/2020, 6/30/2020
Nitrogen	Balance		

Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Sulfur Dioxide	NDIR	Horiba	VA-3111	PC062W1E	6/25/2020
Nitric Oxide	Chemiluminescence	Thermo	42iQ	1200906802	6/25/2020

Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CC473760	3108A-02T5	1/23/2027	GMIS	SO2	N2	102.13 PPM	0.798	1694a
CC480411	1847A-02T5	10/4/2025	GMIS	NO	N2	300.03 PPM	0.437	2735

Notes

NOx = 25.6 ppm REFERENCE VALUE ONLY

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. The nitrogen used as a component or balance gas as well as the oxygen used in air mixtures meets the requirements set forth in EPA 1065.750. 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

Christopher Haas
Preparer: Christopher Haas

Reviewer: Allison Martinez

Production Laboratory:
Tier 5 Labs, LLC
5353 W. Southern Ave.
Indianapolis, IN 46241
PGVP Vendor ID R12020

Airgas.
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
12722 S. Wentworth Ave.
Chicago, IL 60628
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0163	Reference Number:	54-401724343-1
Cylinder Number:	CC265467	Cylinder Volume:	144.3 Cubic Feet
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12020	Valve Outlet:	660
Gas Code:	NO,NOX,BALN	Certification Date:	Feb 18, 2020

Expiration Date: Feb 18, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	46.93 PPM	G1	+/- 1.1% NIST Traceable	02/10/2020, 02/18/2020
NITRIC OXIDE	45.00 PPM	46.93 PPM	G1	+/- 1.1% NIST Traceable	02/10/2020, 02/18/2020
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16060650	CC442691	50.42 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jun 27, 2020
PRM	12386	D685025	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 20, 2020
GMIS	7302017104	CC506604	4.426 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1%	Jul 03, 2022

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900100	FTIR	Feb 03, 2020
Nicolet 6700 AMP0900100	FTIR	Feb 03, 2020

Triad Data Available Upon Request

Approved for Release

Airgas.
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
12722 S. Wentworth Ave.
Chicago, IL 60628
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A1129	Reference Number:	54-401830766-1
Cylinder Number:	CC267139	Cylinder Volume:	144.3 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12020	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Jun 11, 2020

Expiration Date: Jun 11, 2028

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	15.00 PPM	14.42 PPM	G1	+/- 0.4% NIST Traceable	06/11/2020
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	150102	KAL004704	24.35 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Sep 04, 2021

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
(CO-4) Thermo 48i-TLE 1406960657	NDIR	Jun 01, 2020

Triad Data Available Upon Request

Allan Camp

Approved for Release

Airgas.
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
12722 S. Wentworth Ave.
Chicago, IL 60628
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0497	Reference Number:	54-401871452-1
Cylinder Number:	XC026367B	Cylinder Volume:	144.3 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12020	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Aug 03, 2020

Expiration Date: Aug 03, 2028

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	30.00 PPM	29.76 PPM	G1	+/- 0.6% NIST Traceable	08/03/2020
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	09010228	KAL004841	98.48 PPM CARBON MONOXIDE/NITROGEN	+/- 0.5%	Oct 16, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO-1 SIEMENS ULTRAMAT 6E N1J5700	NDIR	Jul 15, 2020

Triad Data Available Upon Request

Approved for Release

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

Filename: C:\Customer Project Files\APPENDIX\Cal Sheets\Meter Boxes\[Meter Box 1 5-7-20.xls]A
Revised: 7/25/95 Version: 2.2

CONVERSION FACTORS

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

Model #: 1
Serial #:

Date ------------------------> 5/7/2020
Barometric Pressure: ----------> 28.44 (in. Hg)
Theoretical Critical Vacuum:---> 13.42 (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-

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)	Ambient Temperature Final (deg F)	Ambient Temperature Average (deg F)	Average Temperatures DGM Outlet (deg R)	Average Temperatures DGM Overall (deg R)	Average Temperatures Ambient Temp (deg R)
0.5	10	311.555	315.488	111.38256	62	61	65	62	12	0.30390681	15	64	64	64	521.5	522.5	524
0.93	10	315.488	320.81	150.71904	67	63	66	63	16	0.41080925	15	64	65	64.5	523	524.75	524.5
1.4	10	320.81	327.085	177.708	66	64	68	65	19	0.46449779	15	65	65	65	524.5	525.75	525
2.1	5	327.085	331.027	111.63744	68	65	69	66	23	0.60910402	15	66	66	66	525.5	527	526
3.8	5	331.027	336.224	147.17904	66	66	70	67	31	0.80595932	15	66	66	66	526.5	527.75	526

** RESULTS **

DRY GAS METER VOLUME CORRECTED Vm(std) (cu ft)	DRY GAS METER VOLUME CORRECTED Vm(std) (liters)	ORIFICE VOLUME CORRECTED Vcr(std) (cu ft)	ORIFICE VOLUME CORRECTED Vm(std) (liters)	ORIFICE VOLUME NOMINAL Vcr (cu ft)	DRY GAS METER CALIBRATION FACTOR Y Value (number)	DRY GAS METER CALIBRATION FACTOR Y Variation (number)	ORIFICE CALIBRATION FACTOR dH@ Value (in H2O)	ORIFICE CALIBRATION FACTOR dH@ Value (mm H2O)	ORIFICE CALIBRATION FACTOR dH@ Variation (in H2O)
3.7811759	107.08	3.77576	106.92952	3.94373	0.99857	-0.00186	1.89856015	48.22	-0.08712
5.1002748	144.44	5.1014902	144.4742	5.33353	1.00024	-0.00019	1.92887722	48.99	-0.0568
6.0094088	170.19	6.0136998	170.30798	6.29322	1.00071	0.00029	2.08361031	52.92	0.09793
3.7729909	106.85	3.7765756	106.95262	3.95964	1.00095	0.00052	1.97745971	50.23	-0.00822
4.9888287	141.28	4.9971208	141.51846	5.23935	1.00166	0.00124	2.03987228	51.81	0.0542
			Average Y ------->		1.00043		1.98567594	50.44 <------ 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:_______ Brian Lemasters Date:____ 5/7/2020

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

Cert. No.: 3415-11278230

A2LA Certificate No. 1750.01 Calibration

Traceable® Certificate of Calibration for Digital Calipers

Customer :Custom Stack Analysis, LLC ,14614 Cenfield Street NE ,Alliance ,OH-44601 ,U.S.A.

Instrument Identification:

Model: 3415, S/N: 101856179 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Set	99146223	17 Dec 2020	1000449283

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 12 May 2020 Cal Due Date: 12 May 2021

Test Conditions: 55.18%RH 22.45°C 1018mBar

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	0.101	0.0003	3.33:1
in	N.A.	N.A.		2.0000	2.0005	Y	1.998	2.002	0.00033	>4:1
in	N.A.	N.A.		4.0000	4.0005	Y	3.996	4.004	0.0004	>4:1
in	N.A.	N.A.		6.0000	6.0005	Y	5.994	6.006	0.0005	>4:1
in depth	N.A.	N.A.		2.0000	2.000	Y	1.998	2.002	0.00033	>4:1
in inside	N.A.	N.A.		1.0000	1.0005	Y	0.999	1.001	0.00031	3.23:1
in step	N.A.	N.A.		2.0000	1.9985	Y	1.998	2.002	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

Nicol Rodriguez, Quality Manager

Marisa Elms

Marisa Elms, Technical Manager

Note :

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.

Issue Date : 12 May 2020

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.traceable.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 9001:2015 Quality Certified by DNV GL, Certificate No. CERT-01805-2006-AQ-HOU-ANAB.
International Laboratory Accreditation Cooperation - Multilateral Recognition Arrangement (ILAC-MRA).

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

ACCREDITED
A2LA Certificate No. 1750.01 Calibration

Cert. No.: 1870-11290275

Traceable® Certificate of Calibration for Digital Barometer Module

Customer :Custom Stack Analysis, LLC ,14614 Cenfield Street 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	10 Oct 2020	4000-10785768
Chilled Mirror Hygrometer	31874/1H2048MR	22 Jan 2021	18004
Digital Barometer	D4540001	01 Nov 2020	1000447551

Certificate Information:

Technician: 57 Procedure: CAL-31 Cal Date: 17 May 2020 Cal Due Date: 17 May 2021

Test Conditions: 57.18%RH 22.6°C 1012mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
%RH	N.A.	N.A.		48.33	32	N	43	53	0.74	>4:1
°C	N.A.	N.A.		24.29	24	Y	23.29	25.29	0.05	>4:1
mb/hPa	N.A.	N.A.		806.00	812	Y	795	817	0.62	>4:1
mb/hPa	N.A.	N.A.		909.98	914	Y	899	921	0.62	>4:1
mb/hPa	N.A.	N.A.		1018.72	1022	Y	1008	1030	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.

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

Nicol Rodriguez, Quality Manager

Marisa Elms

Marisa Elms, Technical Manager

Note :

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.

Issue Date : 17 May 2020

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

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Control Company is ISO 9001:2015 Quality Certified by DNV GL, Certificate No. CERT-01805-2006-AQ-HOU-ANAB.
International Laboratory Accreditation Cooperation - Multilateral Recognition Arrangement (ILAC-MRA).

MATHESON
"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

Component : Carbon Dioxide
Certified Conc: 20.04% ± 0.04%

Date: 4/3/2017
20.04%
20.04%
20.04%

Date:

Component: Oxygen
Certified Conc: 20.00% ± 0.03%

Date: 4/3/2017
20.02%
20.00%
19.98%

Date:

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. Mont.

Date 4/4/2017

MONITORING INSTRUMENTS

7410 Worthington-Galena Rd
Worthington, Ohio 43085
Phone: (614) 436-4933

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Temperature RTD Calibrator Certificate of Calibration

Instrument: Altek Series 22 T/C
Serial#: 243783
Technician: Sam Shults

Date: 11/3/2020
Due: 11/3/2021

Custom Stack Analysis

Left Slide		Right Slide	
Lab Standard	UUT Reading	Lab Standard	UUT Reading
0.0	-0.5	100.0	99.7
1000.0	1000.6	1100.0	1099.6
2000.0	2000.5	2100.0	2099.2

Accuracy
+/- 1.0 F

Reference Standards
PIE 525B sn.116763 Cal Due:9/28/2021

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

IE MONITORING INSTRUMENTS

7410 Worthington-Galena Rd
Worthington, Ohio 43085
Phone: (614) 436-4933

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Dwyer Digital Manometer Certificate of Calibration

Instrument: Dwyer 475 Digital Manometer
Serial#: E46Z

Date: 11/3/2020
Technician: Sam Shults

Custom Stack

Positive Port

Calibrated Source	Dwyer Mark III	% Accuracy
0.500	0.498	+/- 0.04" H2O
2.000	2.005	0.3
3.000	3.008	0.3
4.000	4.009	0.2

Negative Port

Calibrated Source	Dwyer Mark III	% Accuracy
0.500	0.501	+/- 0.04" H2O
2.000	2.008	0.4
3.000	3.009	0.3
4.000	4.005	0.1

Allowable Tolerance +\- 1.0% "H2O FS

Reference Standards
Druck 740 DPI sn.74001549, Cal Due: 12/13/2020

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

MATHESON
ask. . .The Gas Professionals™
1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: WHS 109
Y-TOWN

Part # G2695803

		Protocol:	Reference #:	Lot#:
Cylinder Number:	CC78213	G1	T270458-01	9000406167
Cylinder Pressure:	2000 psig			
Last Analysis Date:	8/24/2020			
Expiration Date:	8/24/2023			

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

REPLICATE RESPONSES

				Date: 8/17/2020	Date: 8/24/2020
Component:	Nitrogen Dioxide			49.4	49.6
				49.3	49.5
Certified Conc:	49.5 ppm	+/- 0.9 ppm	ABS	49.3	49.7

BALANCE GAS: AIR

REFERENCE STANDARDS:

Component: Nitrogen Dioxide
Reference Standard: GMIS
Cylinder #: E80097397
Concentration: 47.8 +/- 0.8 ppm ABS
Exp Date: 9/21/2021

Component: Nitrogen Dioxide
Reference Standard: PRM
Cylinder #: D562925
Concentration: 75.0 +/- 1.1 ppm ABS
Exp Date: 2/2/2019
SRM #: -
NIST Sample #: -

CERTIFICATION INSTRUMENTS

Component: Nitrogen Dioxide
Make/Model: CAI 600
Serial Number: Y09003
Measurement Principle: CHEMI
Last Calibration: 8/24/2020

Notes:

The certification was performed by Global Calibration Gases, LLC, Sarasota, FL and according to EPA Traceability Protocol for Assay and Certification Standards May 2012, using procedure G1 and/or G2. U.S. EPA PGVP Vendor ID number: N22020
The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at level of confidence of 95%

Analyst: Signature on file Date: 8/24/2020

QA: Ashley Smallwood Date: 9/1/2020
Ashley Smallwood

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 M. Zadravec

Judy Zadravec - Analyst | 02/13/2017 Date

Judith M. Zadravec

Judy Zadravec - QA Approval | 02/13/2017 Date

Certificate of Batch Analysis

MATHESON

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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
24595
BA-1429
NK00455
7899
O6572
784192
3697456Y
SG904256
935285
46-1392

Component	Specification	Certified Concentration	Units	Analytical Method
Oxygen	20 - 22	20.8	%	J
THC	<0.1	0.0[illegible]	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.

Lot No: 118K41520

Fill Date: 4/28/2015

Analytical Method Key

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

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

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

595572

FOR Custom Stack 593P

14614 Canfield St Alliance Ohio

P.O. ______ DATE 5/12/20

☐ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
☐ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
☐ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
☐ 490 S. Mapleton St. **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
☐ 2351 Jaclyn Court **SOUTH BEND**, IN 46614
☐ 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. 2019-0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: MP.
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	Navigator	1119252404	Lab	2,100g	0.1g	HI 2000 / LO Ø	6months	YES	YES ✓ / NO	11/2020

WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1 200	200.0	Ø		NO	200.0	
2 500	500.0	Ø		NO	500.0	
3 1000	1000.0	Ø		NO	1000.0	
4						
5						
6						

PARTS USED ______

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

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584495

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

☐ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
☐ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
☐ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
☐ 490 S. Mapleton St. **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 Galaso 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 Finclay 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
☐ 2351 Jaclyn Court **SOUTH BEND**, IN 46614
☐ 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. 2019. 087

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: MC (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
-	OHAUS	ADVENTURER	1203240794	LAB	4100 g	.1 g	HI - g	6 Months	YES	YES ✓	11/2020
	-	-	-				LO - g			NO	

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10.0	ϕ	+/-.2%	YES / NO	10.0	CALIBRATED
2	20g	20.0	ϕ	+/-.2%	YES / NO	20.0	
3	50g	50.0	ϕ	+/-.2%	YES / NO	50.0	
4	100g	100.0	ϕ	+/-.2%	YES / NO	100.0	
5	1kg	999.7	-.3	+/-.2%	YES / NO	1000.0	
6	2kg	1999.4	-.6	+/-.2%	YES / NO	2000.0	

PARTS USED

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

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584497

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!!

DATE 5/12/20

❑ 14941 Liberty Hi Rd.
BOWLING GREEN, OH 43402
419-354-2030

❑ 4005 South Ave.
YOUNGSTOWN, OH 44512
330-259-0414

❑ 1424 Scale St. S.W.
CANTON, OH 44706-3096
330-453-2424

❑ 490 S. Mapleton St.
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

❑ 2351 Jaclyn Court
SOUTH BEND, IN 46614

❑ 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. 2019-0187

WEIGHT S/N'S Colam kit #3

SCALE TECHNICIAN: M.P. 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
-	OHAUS	SCOUT PRO	7124111434	LAB	2000 –	.1 --	HI 2000 --	6 Months	YES	YES ✓	11/2020
	-	-	-				LO 500 --			NO	

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	500	500.0	Ø	+/-.2%	YES / NO	500.0	
2	1000	1000.0	Ø	+/-.2%	YES / NO	1000.0	
3	1500	1500.0	Ø	+/-.2%	YES / NO	1500.0	
4	2000	2000.0	Ø	+/-.2%	YES / NO	2000.0	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584496

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

❑ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030

❑ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414

☒ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424

❑ 490 S. Mapleton St. **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

❑ 2351 Jaclyn Court **SOUTH BEND**, IN 46614

❑ 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. 2019-0182

WEIGHT S/N'S Ceram kit #3

SCALE TECHNICIAN: MP 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
-	SARTORIUS	A2005	39080133	LAB	100 GM g	0.1 g	HI - g	6 Months	YES	YES ✓	11/2020
	-	-	-				LO - g			NO	

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10000.9	+0.9	+/-.2%	YES / NO	10000.0	CALIBRATED
2	20g	20001.3	+1.3	+/-.2%	YES / NO	20000.0	
3	50g	50004.5	+4.5	+/-.2%	YES / NO	50000.0	
4	100g	100010.8	+10.8	+/-.2%	YES / NO	100000.0	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584489

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

❑ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
❑ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
❑ 1424 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
❑ 490 S. Mapleton St. 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
❑ 2351 Jaclyn Court SOUTH BEND, IN 46614
❑ 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. 2019-018t

WEIGHT S/N'S Gram kit # 3

PARTS USED

SCALE TECHNICIAN: M.L. SIGNATURE

ACCEPTED BY: [signature] SIGNATURE

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	11/2020

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	9.9995	-.0005		YES / NO	10.0000	CALIBRATED
2	20g	19.9996	-.0004		YES / NO	20.0000	
3	50g	49.9997	-.0003		YES / NO	50.0000	
4	100g	99.9980	-.0020		YES / NO	100.0000	
5	200g	199.9970	-.0030		YES / NO	200.0000	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584490

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

❑ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
❑ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
❑ 1424 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
❑ 490 S. Mapleton St. 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
❑ 2351 Jaclyn Court SOUTH BEND, IN 46614
❑ 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. 2019 - 0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: M.T.

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
-	US SOLID	NONE	NONE	TRAVELLER	500 g	0.001 g	HI 200 g / LO 10 g	6 Months	YES	YES ✓ / NO	11/2020

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10.000	0		YES / NO	10.000	
2	20g	20.000	0		YES / NO	20.000	
3	50g	50.000	0		YES / NO	50.000	
4	100g	100.000	0		YES / NO	100.000	
5	200g	200.000	0		YES / NO	200.000	
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.

#

BRECHBUHLER SCALES, INC.

Jim Gray
330-831-2???

SCALE INSPECTION REPORT

584488

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!!

DATE 5/12/20

❑ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
❑ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
❑ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
❑ 490 S. Mapleton St. **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
❑ 2351 Jaclyn Court **SOUTH BEND**, IN 46614
❑ 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. 2019-0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: M.T. 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
-	A&D	GF1200	14632225	LAB	1210 g	0.01 g	HI 1000 g / LO 200 g	6 Months	YES	YES ✓ / NO	11-2020

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	200g	200.00	0		YES / NO	200.00	
2	500g	500.00	0		YES / NO	500.00	
3	1000g	1000.00	0		YES / NO	1000.00	
4	g				YES / NO		
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.

MONITORING INSTRUMENTS

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

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Temperature Calibration Certificate

Instrument: H-B Thermometer
Serial #: 4A6108

Date: 4/6/2020
Technician: Sam Shults

Lab Standard	Thermometer Mark
169.9	170.0
190.0	190.0
204.8	205.0
214.6	215.0

Accuracy = 1 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 9/6/2020
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 #: 4B5200

Date: 4/6/2020
Technician: Sam Shults

Lab Standard	Thermometer Mark
30.1	30.0
50.1	50.0
70.0	70.0
88.0	88.0

Accuracy = 1 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 9/6/2020
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 12/28/2020 BY Matt Ashbrook 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	32	212	212
O-2	32	32	212	212
O-3	32	31	212	211
O-4	32	31	212	211
O-5	32	32	212	212
O-6	32	31	212	211
O-7	32	31	212	211
O-8	32	32	212	212
O-9	32	32	212	212
O-10	32	32	212	212
O-11	32	31	212	211
O-12	32	31	212	211
STACK THERMOCOUPLES				
2S-1	32	31	212	211
2S-2	32	31	212	211
2S-3	32	33	212	213
3S-1	32	32	212	212
3S-2	32	31	212	211
3S-3	32	32	212	212
3S-4	32	32	212	212
3S-5	32	33	212	313
4S-1	32	31	212	211
4S-2	32	31	212	211
4S-3	32	32	212	212
4S-4	32	33	212	213
4S-5	32	32	212	212
4S-6	32	32	212	212
5S-1	32	31	212	211
5S-2	32	31	212	211
5S-3	32	33	212	213
6S-1	32	32	212	212
6S-2	32	32	212	212
6S-3	32	31	212	211
6S-4	32	32	212	212
8S-1	32	32	212	212
8S-2	32	33	212	213
10S-1	32	31	212	211
10S-2	32	32	212	212
12S-1	32	32	212	212

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 12/28/2020 BY Matt Ashbrook 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	31	212	211
C-4	32	33	212	213
C-5	32	31	212	211
C-6	32	31	212	211
C-7	32	32	212	212
C-8	32	32	212	212
C-9	32	31	212	211
PROBE THERMOCOUPLES				
2P-1	32	32	212	212
2P-2	32	32	212	212
2P-3	32	33	212	213
3P-1	32	31	212	211
3P-2	32	31	212	211
3P-3	32	32	212	212
3P-4	32	32	212	212
3P-5	32	33	212	213
4P-1	32	31	212	211
4P-2	32	31	212	211
4P-3	32	32	212	212
40-4	32	32	212	212
4P-5	32	32	212	212
4P-6	32	31	212	211
5P-1	32	31	212	211
5P-2	32	33	212	213
5P-3	32	32	212	212
6P-1	32	32	212	212
6P-2	32	33	212	213
6P-3	32	31	212	211
6P-4	32	31	212	211
8P-1	32	33	212	213
8P-2	32	33	212	213
10P-1	32	31	212	211
10P-2	32	32	212	212
12P-1	32	32	212	212

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 12/28/2020 BY Matt Ashbrooke 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	31	212	211
BH-2	32	32	212	212
BH-3	32	31	212	211
BH-4	32	33	212	213
BH-5	32	32	212	212
BH-6	32	32	212	212
BH-7	32	31	212	211
BH-8	32	31	212	211
BH-9	32		212	
SPLIT BOX OVEN THERMOCOUPLES				
SB-1	32	33	212	213
SB-2	32	32	212	212
SB-3	32	33	212	213

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 12/28/2020 BY Matt Ashbrook 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
METER THERMOCOUPLES				
1M-1	32	32	212	212
1M-2	32	32	212	212
2M-1	32	31	212	211
2M-2	32	33	212	213
3M-1	32	32	212	212
3M-2	32	32	212	212
4M-1	32	31	212	211
4M-2	32	33	212	213
5M-1	32	32	212	212
5M-2	32	32	212	212
6M-1	32	32	212	212
6M-2	32	31	212	211
7M-1	32	31	212	211
7M-2	32	32	212	212
8M-1	32	33	212	213
8M-2	32	32	212	212
9M-1	32	31	212	211
9M-2	32	32	212	212
10M-1	32	33	212	213
10M-2	32	31	212	211
15M-1	32	32	212	212
15M-2	32	33	212	213
17M-1	32	32	212	212
17M-2	32	32	212	212
18M-1	32	33	212	213
18M-2	32	31	212	211

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.

Client: Meggitt

Pitot Tube Inspection

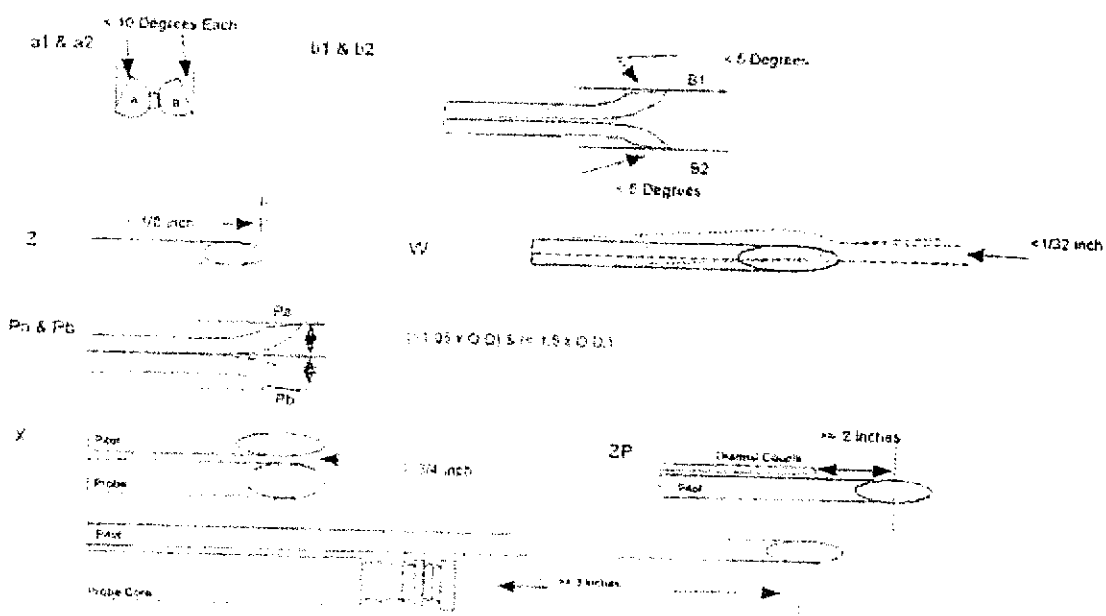
Date: 4-14-21

Probe/Pitot Number	6P-4	A (Pa + Pb)	1.027
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)	.511
a_2 (-10° < a_2< +10°)	0	P_b (1.05 D_t < P_b < 1.5 D_t)	.516
b_1 (-5° < b_1< +5°)	0	Pa = Pb ± 0.063"	.005
b_2 (-5° < b_2< +5°)	0		
	0		

Probe Minimum Interferences

Y (>= 3.0")		D_n	
X (> .75")		X /D_n (>= 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

Meggitt Aircraft Braking Systems Corporation
P039 Accutherm Outlet

Nox	Gas	Cal
High	46.93	47.20
Mid	25.30	25.10
Zero	0.00	0.40

NO2	Gas	Cal
	49.50	48.70

VOC	Gas
High	47.05
Mid	24.70
Low	13.70
Zero	0.00

O2	Gas	Cal
High	20	20
Mid	10	10.1
Zero	0	0.1

CO2	Gas	Cal
High	20.04	20
Mid	9.72	9.8
Zero	0	0

CO	Gas	Cal
High	29.76	30
Mid	14.42	14.6
Zero	0	0

CO2	O2	CO	VOC	NOx	Time Stamp	
-0.03	0.04	-0.01	0.14	25.15	4/15/2021 11:43:53 AM	Nox Bias VOC Zero
-0.04	0.41	-0.02	0.57	25.12	4/15/2021 11:44:53 AM	
-0.01	11.35	-0.02	2.22	22.73	4/15/2021 11:45:53 AM	
0.02	15.53	0.04	44.22	12.51	4/15/2021 11:46:54 AM	
-0.02	20.96	0.03	47.13	0.58	4/15/2021 11:47:54 AM	
-0.03	20.91	-0.02	47.42	0.04	4/15/2021 11:48:55 AM	VOC High
-0.03	20.91	0.00	46.91	0.04	4/15/2021 11:49:55 AM	
-0.03	20.92	-0.01	46.96	0.04	4/15/2021 11:50:55 AM	
-0.03	18.42	0.13	4.36	0.04	4/15/2021 11:51:56 AM	
-0.04	0.75	6.99	0.33	0.04	4/15/2021 11:52:56 AM	
-0.04	0.17	13.92	0.27	0.04	4/15/2021 11:53:57 AM	
-0.04	0.02	14.02	0.24	0.04	4/15/2021 11:54:57 AM	Co Bias CO2 O2 Zero
-0.04	0.02	13.97	0.23	0.04	4/15/2021 11:55:58 AM	
-0.04	0.02	13.96	0.18	0.04	4/15/2021 11:56:58 AM	
-0.03	4.09	13.93	4.77	0.04	4/15/2021 11:57:58 AM	
-0.02	13.18	6.60	13.08	0.04	4/15/2021 11:58:59 AM	
-0.04	20.81	0.26	13.19	0.04	4/15/2021 11:59:59 AM	VOC Low
-0.03	20.93	0.10	10.59	0.04	4/15/2021 12:01:00 PM	
-0.02	20.93	0.10	6.79	0.04	4/15/2021 12:02:00 PM	
-0.01	20.97	0.10	24.55	0.04	4/15/2021 12:03:00 PM	
-0.04	21.05	0.02	24.62	0.04	4/15/2021 12:04:01 PM	VOC Bias CO Zero
-0.04	21.04	0.04	18.16	0.04	4/15/2021 12:05:01 PM	
-0.02	20.99	0.00	1.89	0.04	4/15/2021 12:06:02 PM	
0.13	20.72	0.01	2.44	0.04	4/15/2021 12:07:02 PM	
8.34	11.94	-0.05	0.32	0.04	4/15/2021 12:08:03 PM	
9.79	10.07	-0.20	0.25	0.04	4/15/2021 12:09:03 PM	O2 CO2 Bias Nox Zero
9.80	10.09	-0.15	0.48	0.04	4/15/2021 12:10:03 PM	
5.51	14.40	-0.23	0.65	0.04	4/15/2021 12:11:04 PM	
0.38	20.91	-0.07	0.80	0.04	4/15/2021 12:12:04 PM	
0.09	20.93	0.01	0.81	0.04	4/15/2021 12:13:05 PM	
0.07	20.93	0.00	0.79	0.04	4/15/2021 12:14:05 PM	
0.06	20.93	0.03	0.72	0.04	4/15/2021 12:15:05 PM	
0.05	20.93	0.01	0.72	0.04	4/15/2021 12:16:06 PM	
0.04	20.93	0.03	0.71	0.04	4/15/2021 12:17:06 PM	
0.04	20.93	0.02	0.72	0.04	4/15/2021 12:18:07 PM	
0.04	20.93	0.03	0.72	0.04	4/15/2021 12:19:07 PM	
0.03	20.93	0.07	0.72	0.04	4/15/2021 12:20:08 PM	
0.03	20.93	0.00	0.72	0.04	4/15/2021 12:21:08 PM	
0.04	20.93	-0.01	0.68	0.04	4/15/2021 12:22:08 PM	
0.04	20.93	0.01	0.71	0.04	4/15/2021 12:23:09 PM	
0.04	20.93	-0.02	0.64	0.04	4/15/2021 12:24:09 PM	
0.03	20.93	-0.04	0.61	0.04	4/15/2021 12:25:10 PM	
0.04	20.93	0.02	0.65	0.04	4/15/2021 12:26:10 PM	
0.04	20.93	0.00	0.66	0.04	4/15/2021 12:27:11 PM	

0.04	20.93	-0.01	0.68	0.04	4/15/2021 12:28:11 PM
0.04	20.93	0.01	0.69	0.04	4/15/2021 12:29:11 PM
0.04	20.93	0.01	0.65	0.04	4/15/2021 12:30:12 PM
0.04	20.93	-0.01	0.67	0.04	4/15/2021 12:31:12 PM
0.04	20.93	0.06	0.71	0.04	4/15/2021 12:32:13 PM
0.04	20.93	0.01	0.71	0.04	4/15/2021 12:33:13 PM
0.04	20.93	0.01	0.71	0.04	4/15/2021 12:34:14 PM
0.05	20.93	0.04	0.71	0.04	4/15/2021 12:35:14 PM
0.05	20.93	0.02	0.68	0.04	4/15/2021 12:36:14 PM
0.04	20.93	-0.03	0.68	0.04	4/15/2021 12:37:15 PM
0.04	20.93	0.00	0.70	0.04	4/15/2021 12:38:15 PM
0.05	20.93	-0.01	0.70	0.04	4/15/2021 12:39:16 PM
0.05	20.94	-0.01	0.65	0.04	4/15/2021 12:40:16 PM
0.05	20.94	-0.02	0.64	0.04	4/15/2021 12:41:17 PM
0.05	20.94	-0.01	0.70	0.04	4/15/2021 12:42:17 PM
0.05	20.94	0.00	0.69	0.04	4/15/2021 12:43:17 PM
0.05	20.94	0.01	0.69	0.04	4/15/2021 12:44:18 PM
0.05	20.93	0.02	0.66	0.04	4/15/2021 12:45:18 PM
0.05	20.93	0.02	0.64	0.04	4/15/2021 12:46:19 PM
0.06	20.93	0.02	0.70	0.04	4/15/2021 12:47:19 PM
0.06	20.93	0.00	0.69	0.04	4/15/2021 12:48:19 PM
0.06	20.93	0.02	0.71	0.04	4/15/2021 12:49:20 PM
0.06	20.93	-0.02	0.71	0.05	4/15/2021 12:50:20 PM
0.06	20.93	0.01	0.72	0.04	4/15/2021 12:51:21 PM
0.06	20.93	0.01	0.70	0.05	4/15/2021 12:52:21 PM
0.06	20.93	0.00	0.69	0.06	4/15/2021 12:53:22 PM
0.06	20.93	-0.03	0.70	0.06	4/15/2021 12:54:22 PM
0.06	20.94	0.01	0.74	0.04	4/15/2021 12:55:22 PM
0.07	20.94	0.00	0.72	0.04	4/15/2021 12:56:23 PM
0.07	20.93	0.00	0.77	0.04	4/15/2021 12:57:23 PM
0.07	20.93	0.03	0.72	0.04	4/15/2021 12:58:24 PM
0.07	20.93	0.03	0.75	0.04	4/15/2021 12:59:24 PM
0.07	20.93	0.02	0.73	0.04	4/15/2021 1:00:25 PM
0.08	20.93	0.03	0.71	0.05	4/15/2021 1:01:25 PM
0.08	20.93	0.02	0.71	0.06	4/15/2021 1:02:25 PM
0.08	20.93	0.01	0.71	0.05	4/15/2021 1:03:26 PM
0.08	20.93	0.02	0.71	0.06	4/15/2021 1:04:26 PM
0.08	20.93	-0.02	0.73	0.05	4/15/2021 1:05:27 PM
0.08	20.93	0.02	0.72	0.06	4/15/2021 1:06:27 PM
0.08	20.93	0.00	0.70	0.06	4/15/2021 1:07:27 PM
0.08	20.93	-0.02	0.68	0.06	4/15/2021 1:08:28 PM
0.08	20.93	-0.02	0.72	0.04	4/15/2021 1:09:28 PM
0.09	20.93	-0.02	0.76	0.04	4/15/2021 1:10:29 PM
0.09	20.93	-0.02	0.75	0.04	4/15/2021 1:11:29 PM
0.09	20.93	-0.02	0.72	0.04	4/15/2021 1:12:30 PM
0.09	20.93	0.00	0.72	0.04	4/15/2021 1:13:30 PM
0.09	20.93	-0.02	0.73	0.04	4/15/2021 1:14:30 PM
0.09	20.93	-0.03	0.76	0.05	4/15/2021 1:15:31 PM
0.09	20.93	-0.01	0.74	0.05	4/15/2021 1:16:31 PM
0.09	20.93	0.02	0.74	0.04	4/15/2021 1:17:32 PM
0.09	20.93	-0.01	0.75	0.05	4/15/2021 1:18:32 PM
0.09	20.93	-0.01	0.69	0.05	4/15/2021 1:19:32 PM
0.10	20.93	0.00	0.72	0.04	4/15/2021 1:20:33 PM
0.09	20.93	-0.01	0.74	0.04	4/15/2021 1:21:33 PM
0.10	20.93	0.00	0.72	0.04	4/15/2021 1:22:34 PM
0.10	20.93	0.01	0.72	0.04	4/15/2021 1:23:34 PM
0.10	20.93	0.00	0.73	0.06	4/15/2021 1:24:35 PM
0.10	20.93	-0.02	0.74	0.05	4/15/2021 1:25:35 PM
0.10	20.93	0.00	0.77	0.06	4/15/2021 1:26:35 PM
0.11	20.93	-0.06	0.79	0.04	4/15/2021 1:27:36 PM
0.11	20.93	-0.03	0.80	0.04	4/15/2021 1:28:36 PM
0.11	20.93	-0.02	0.80	0.04	4/15/2021 1:29:37 PM
0.11	20.93	-0.05	0.77	0.04	4/15/2021 1:30:37 PM

0.11	20.93	-0.06	0.80	0.04	4/15/2021 1:31:38 PM	
0.11	20.93	-0.05	0.81	0.04	4/15/2021 1:32:38 PM	
0.11	20.93	-0.03	0.81	0.04	4/15/2021 1:33:38 PM	
0.11	20.93	-0.05	0.80	0.04	4/15/2021 1:34:39 PM	
0.11	20.93	-0.03	0.79	0.04	4/15/2021 1:35:39 PM	
0.11	20.93	-0.04	0.76	0.04	4/15/2021 1:36:40 PM	
0.10	20.94	-0.06	0.79	0.04	4/15/2021 1:37:40 PM	
0.09	20.94	-0.10	0.76	0.04	4/15/2021 1:38:40 PM	
0.11	20.93	-0.02	1.49	0.04	4/15/2021 1:39:41 PM	
1.25	17.26	-0.04	1.54	13.12	4/15/2021 1:40:41 PM	
2.80	15.06	0.60	1.18	22.64	4/15/2021 1:41:42 PM	
2.94	14.85	0.62	0.96	23.14	4/15/2021 1:42:42 PM	
3.32	14.31	0.42	0.88	24.48	4/15/2021 1:43:43 PM	
3.50	14.05	0.53	0.82	25.35	4/15/2021 1:44:43 PM	
3.52	14.03	0.34	0.82	25.65	4/15/2021 1:45:43 PM	Start Run 1
3.49	14.08	0.19	0.82	25.44	4/15/2021 1:46:44 PM	
3.51	14.06	0.07	0.82	25.33	4/15/2021 1:47:44 PM	
3.57	13.99	0.13	0.82	25.47	4/15/2021 1:48:45 PM	
3.54	14.04	0.09	0.81	25.24	4/15/2021 1:49:45 PM	
3.54	14.04	0.09	0.82	25.26	4/15/2021 1:50:46 PM	
3.55	14.02	0.06	0.82	25.32	4/15/2021 1:51:46 PM	
3.57	13.98	0.05	0.82	25.47	4/15/2021 1:52:46 PM	
3.56	14.00	0.09	0.82	25.46	4/15/2021 1:53:47 PM	
3.53	14.03	0.04	0.82	25.34	4/15/2021 1:54:47 PM	
3.54	14.03	0.08	0.82	25.25	4/15/2021 1:55:48 PM	
3.56	14.00	0.05	0.82	25.42	4/15/2021 1:56:48 PM	
3.57	14.00	0.04	0.82	25.43	4/15/2021 1:57:48 PM	
3.55	14.02	0.05	0.82	25.20	4/15/2021 1:58:49 PM	
3.52	14.07	0.04	0.82	25.21	4/15/2021 1:59:49 PM	
3.55	14.03	-0.01	0.82	25.28	4/15/2021 2:00:50 PM	
3.48	14.13	0.02	0.82	25.04	4/15/2021 2:01:50 PM	
3.54	14.03	0.01	0.82	25.21	4/15/2021 2:02:51 PM	
3.52	14.05	0.07	0.82	25.37	4/15/2021 2:03:51 PM	
3.53	14.03	0.07	0.82	25.29	4/15/2021 2:04:51 PM	
3.56	13.99	0.04	0.82	25.37	4/15/2021 2:05:52 PM	
3.53	14.06	0.05	0.82	25.44	4/15/2021 2:06:52 PM	
3.55	14.02	0.05	0.82	25.39	4/15/2021 2:07:53 PM	
3.42	14.07	0.04	0.82	25.23	4/15/2021 2:08:53 PM	
3.49	14.06	0.02	0.80	25.15	4/15/2021 2:09:54 PM	
3.49	14.06	0.02	0.82	25.07	4/15/2021 2:10:54 PM	
3.45	14.07	0.02	0.82	25.08	4/15/2021 2:11:54 PM	
3.20	14.32	0.00	0.83	24.76	4/15/2021 2:12:55 PM	
3.03	14.53	-0.06	0.82	24.25	4/15/2021 2:13:55 PM	
2.91	14.56	-0.02	0.84	23.96	4/15/2021 2:14:56 PM	
2.87	14.69	-0.05	0.85	23.85	4/15/2021 2:15:56 PM	
2.74	14.82	-0.03	0.87	23.30	4/15/2021 2:16:56 PM	
2.61	14.89	-0.04	0.84	23.18	4/15/2021 2:17:57 PM	
2.62	14.84	-0.05	0.85	23.15	4/15/2021 2:18:57 PM	
2.86	14.69	-0.04	0.82	23.27	4/15/2021 2:19:58 PM	
2.97	14.50	-0.03	0.82	23.91	4/15/2021 2:20:58 PM	
2.95	14.46	-0.05	0.82	24.09	4/15/2021 2:21:59 PM	
2.94	14.45	-0.02	0.82	24.11	4/15/2021 2:22:59 PM	
3.05	14.49	-0.05	0.81	24.15	4/15/2021 2:23:59 PM	
3.07	14.50	-0.04	0.79	23.90	4/15/2021 2:25:00 PM	
3.48	14.12	-0.12	0.78	25.37	4/15/2021 2:26:00 PM	
3.28	14.25	-0.05	0.80	25.13	4/15/2021 2:27:01 PM	
3.23	14.39	-0.09	0.82	24.54	4/15/2021 2:28:01 PM	
3.04	14.53	-0.06	0.78	24.27	4/15/2021 2:29:02 PM	
3.06	14.55	-0.08	0.79	23.98	4/15/2021 2:30:02 PM	
3.05	14.49	-0.05	0.79	23.98	4/15/2021 2:31:03 PM	
3.03	14.56	-0.05	0.81	24.12	4/15/2021 2:32:03 PM	
3.05	14.60	-0.08	0.80	23.76	4/15/2021 2:33:03 PM	

3.07	14.57	-0.05	0.80	23.91	4/15/2021 2:34:04 PM	
3.07	14.52	-0.06	0.78	23.90	4/15/2021 2:35:04 PM	
2.74	14.82	-0.06	1.32	23.84	4/15/2021 2:36:05 PM	
3.05	14.49	-0.05	0.76	23.85	4/15/2021 2:37:05 PM	
3.38	14.18	-0.11	0.81	24.60	4/15/2021 2:38:06 PM	
3.24	14.33	-0.08	0.80	25.24	4/15/2021 2:39:06 PM	
3.14	14.35	-0.05	0.77	25.15	4/15/2021 2:40:06 PM	
3.14	14.34	-0.06	0.67	25.13	4/15/2021 2:41:07 PM	
3.05	14.47	-0.09	0.70	25.16	4/15/2021 2:42:07 PM	
3.07	14.47	0.05	0.66	24.79	4/15/2021 2:43:07 PM	
3.32	14.21	0.23	0.67	25.18	4/15/2021 2:44:08 PM	
3.28	14.30	0.05	0.67	24.76	4/15/2021 2:45:08 PM	Stop Run 1
3.26	14.29	0.01	0.81	24.73		Avg
3.25	14.35	0.00	0.63	24.58	4/15/2021 2:46:09 PM	
3.21	14.30	-0.02	0.62	24.62	4/15/2021 2:47:09 PM	
3.23	14.34	-0.02	0.92	24.64	4/15/2021 2:48:10 PM	
1.29	16.64	-0.08	0.65	22.90	4/15/2021 2:49:10 PM	
0.05	20.93	-0.12	0.68	13.62	4/15/2021 2:50:10 PM	
0.05	20.94	-0.09	0.74	0.15	4/15/2021 2:51:11 PM	
0.85	17.70	-0.08	0.80	0.18	4/15/2021 2:52:11 PM	
9.49	10.39	-0.20	0.72	0.35	4/15/2021 2:53:12 PM	
9.80	10.12	-0.31	0.67	0.18	4/15/2021 2:54:12 PM	O2 CO2 Bias Nox Zero
9.76	10.14	-0.31	0.67	0.13	4/15/2021 2:55:13 PM	
8.85	10.87	-0.32	0.98	0.14	4/15/2021 2:56:13 PM	
0.10	5.50	1.29	0.80	0.13	4/15/2021 2:57:13 PM	
0.04	0.44	13.98	0.73	0.12	4/15/2021 2:58:14 PM	
0.03	0.26	14.06	0.72	0.13	4/15/2021 2:59:14 PM	Co Bias CO2 O2 Zero
0.03	0.26	14.12	0.88	0.13	4/15/2021 3:00:15 PM	
0.02	9.54	12.06	15.26	0.13	4/15/2021 3:01:15 PM	
0.04	19.83	1.79	23.83	0.14	4/15/2021 3:02:16 PM	
0.05	20.93	-0.10	24.08	0.14	4/15/2021 3:03:16 PM	
0.05	20.94	-0.13	24.17	0.14	4/15/2021 3:04:16 PM	VOC Bias CO Zero
0.04	20.94	-0.11	20.11	0.14	4/15/2021 3:05:17 PM	
0.05	13.11	-0.13	0.92	12.95	4/15/2021 3:06:17 PM	
0.05	0.46	-0.14	0.81	23.29	4/15/2021 3:07:18 PM	
0.05	0.30	-0.14	0.81	25.42	4/15/2021 3:08:18 PM	
0.04	0.30	-0.19	0.80	25.36	4/15/2021 3:09:18 PM	Nox Bias VOC Zero
0.05	1.30	-0.16	1.06	25.18	4/15/2021 3:10:19 PM	
0.05	11.67	-0.16	0.80	22.94	4/15/2021 3:11:19 PM	
0.05	20.72	-0.06	0.73	12.62	4/15/2021 3:12:20 PM	
0.05	20.92	-0.03	0.81	0.13	4/15/2021 3:13:20 PM	
0.05	20.92	-0.06	0.81	0.13	4/15/2021 3:14:21 PM	
0.05	20.92	-0.08	0.81	0.13	4/15/2021 3:15:21 PM	
0.05	20.92	-0.05	0.81	0.13	4/15/2021 3:16:21 PM	
0.05	20.92	-0.05	0.80	0.13	4/15/2021 3:17:22 PM	
0.05	20.92	-0.03	0.81	0.13	4/15/2021 3:18:22 PM	
0.05	20.92	-0.08	0.81	0.13	4/15/2021 3:19:23 PM	
0.05	20.92	-0.09	0.81	0.13	4/15/2021 3:20:23 PM	
0.05	20.92	-0.05	0.82	0.13	4/15/2021 3:21:23 PM	
0.05	20.92	-0.06	0.81	0.13	4/15/2021 3:22:24 PM	
0.05	20.91	-0.05	1.10	0.13	4/15/2021 3:23:24 PM	
2.55	14.96	0.07	0.89	17.86	4/15/2021 3:24:25 PM	
3.15	14.38	0.40	0.71	23.84	4/15/2021 3:25:25 PM	
3.63	13.89	0.39	0.70	25.15	4/15/2021 3:26:26 PM	
3.48	13.97	0.35	0.63	25.13	4/15/2021 3:27:26 PM	Start Run 2
3.52	13.96	0.26	0.63	24.87	4/15/2021 3:28:27 PM	
3.45	14.00	0.23	0.63	24.72	4/15/2021 3:29:27 PM	
3.65	14.06	0.20	0.63	24.54	4/15/2021 3:30:27 PM	
3.47	14.11	0.17	0.64	24.34	4/15/2021 3:31:28 PM	
3.40	14.17	0.20	0.66	24.24	4/15/2021 3:32:28 PM	
3.30	14.27	0.17	0.64	24.03	4/15/2021 3:33:29 PM	

3.33	14.16	0.17	0.64	24.07	4/15/2021 3:34:29 PM	
3.30	14.24	0.18	0.67	24.25	4/15/2021 3:35:29 PM	
3.35	14.22	0.19	0.65	23.97	4/15/2021 3:36:30 PM	
3.36	14.18	0.18	0.66	24.31	4/15/2021 3:37:30 PM	
3.32	14.16	0.20	0.65	24.29	4/15/2021 3:38:31 PM	
3.33	14.17	0.17	0.67	24.37	4/15/2021 3:39:31 PM	
3.25	14.27	0.15	0.72	24.20	4/15/2021 3:40:32 PM	
3.21	14.37	0.17	0.74	23.93	4/15/2021 3:41:32 PM	
3.09	14.53	0.17	0.74	23.45	4/15/2021 3:42:32 PM	
3.05	14.49	0.19	0.78	23.44	4/15/2021 3:43:33 PM	
2.83	14.74	0.14	0.81	23.16	4/15/2021 3:44:33 PM	
2.62	14.90	0.15	0.83	22.67	4/15/2021 3:45:34 PM	
2.52	15.03	0.14	0.89	23.34	4/15/2021 3:46:34 PM	
3.03	14.42	0.14	0.94	23.74	4/15/2021 3:47:34 PM	
3.07	14.43	0.12	0.99	24.04	4/15/2021 3:48:35 PM	
2.87	14.67	0.11	1.02	24.10	4/15/2021 3:49:35 PM	
3.05	14.95	0.09	1.07	24.29	4/15/2021 3:50:36 PM	
3.48	15.08	0.08	1.06	23.71	4/15/2021 3:51:36 PM	
3.48	15.09	0.05	1.14	23.83	4/15/2021 3:52:37 PM	
3.05	14.51	0.08	1.18	24.28	4/15/2021 3:53:37 PM	
2.90	14.69	0.09	1.26	24.63	4/15/2021 3:54:37 PM	
2.48	15.02	0.03	1.25	24.89	4/15/2021 3:55:38 PM	
3.50	14.92	0.02	1.25	24.68	4/15/2021 3:56:38 PM	
2.48	14.99	0.07	1.32	24.84	4/15/2021 3:57:39 PM	
3.21	14.32	0.05	1.35	24.26	4/15/2021 3:58:39 PM	
3.03	14.46	0.04	1.34	24.57	4/15/2021 3:59:39 PM	
3.11	14.41	0.05	1.29	24.65	4/15/2021 4:00:40 PM	
3.33	14.12	0.04	1.32	25.06	4/15/2021 4:01:40 PM	
3.02	14.47	0.04	1.39	24.89	4/15/2021 4:02:41 PM	
2.97	14.68	0.02	1.41	25.07	4/15/2021 4:03:41 PM	
2.97	14.68	0.01	1.44	24.82	4/15/2021 4:04:42 PM	
2.85	14.77	0.04	1.49	24.90	4/15/2021 4:05:42 PM	
2.66	14.82	0.06	1.43	24.46	4/15/2021 4:06:43 PM	
2.73	14.78	0.09	1.53	24.71	4/15/2021 4:07:43 PM	
2.54	15.04	0.07	1.53	25.24	4/15/2021 4:08:43 PM	
2.53	15.03	0.06	1.56	25.09	4/15/2021 4:09:44 PM	
2.42	15.10	0.02	1.57	24.95	4/15/2021 4:10:44 PM	
2.38	15.17	0.01	1.53	24.64	4/15/2021 4:11:45 PM	
2.33	15.09	0.02	1.57	24.95	4/15/2021 4:12:45 PM	
2.23	15.29	0.02	1.62	24.67	4/15/2021 4:13:45 PM	
2.11	15.41	0.03	1.57	24.14	4/15/2021 4:14:46 PM	
2.27	15.25	0.02	1.61	24.48	4/15/2021 4:15:46 PM	
2.51	15.14	0.02	1.60	24.26	4/15/2021 4:16:47 PM	
2.51	14.94	-0.02	1.61	24.24	4/15/2021 4:17:47 PM	
2.60	14.84	-0.02	1.62	24.13	4/15/2021 4:18:48 PM	
2.71	14.84	0.01	1.62	24.09	4/15/2021 4:19:48 PM	
2.62	14.84	0.00	1.65	24.19	4/15/2021 4:20:48 PM	
2.62	14.85	0.00	1.73	24.22	4/15/2021 4:21:49 PM	
2.82	14.66	0.00	1.78	24.61	4/15/2021 4:22:49 PM	
2.64	14.84	0.01	1.78	24.20	4/15/2021 4:23:50 PM	
2.73	14.79	0.00	1.79	24.13	4/15/2021 4:24:50 PM	
2.71	14.78	0.01	1.76	24.03	4/15/2021 4:25:51 PM	
2.73	14.76	0.04	1.81	24.29	4/15/2021 4:26:51 PM	
2.52	14.95	-0.01	1.79	24.86	4/15/2021 4:27:51 PM	Stop Run 2
2.93	14.65	0.09	1.20	24.35		Avg
2.54	14.93	0.01	1.79	24.79	4/15/2021 4:28:52 PM	
2.57	14.89	0.01	1.80	24.78	4/15/2021 4:29:52 PM	
2.60	14.88	0.00	1.79	24.93	4/15/2021 4:30:53 PM	
2.64	14.83	0.00	1.77	24.96	4/15/2021 4:31:53 PM	
2.84	14.74	0.01	1.78	24.22	4/15/2021 4:32:53 PM	
2.75	14.79	0.02	1.81	24.26	4/15/2021 4:33:54 PM	
1.05	18.93	-0.02	9.26	12.87	4/15/2021 4:34:54 PM	

0.03	20.92	0.01	24.74	0.46	4/15/2021 4:35:55 PM	
0.02	20.93	-0.02	24.73	0.13	4/15/2021 4:36:55 PM	VOC Bias CO Zero
0.01	20.93	-0.06	20.93	0.13	4/15/2021 4:37:56 PM	
0.01	14.60	0.23	0.67	0.13	4/15/2021 4:38:56 PM	
0.01	1.44	6.43	0.63	0.13	4/15/2021 4:39:56 PM	
0.01	0.27	14.41	0.59	0.13	4/15/2021 4:40:57 PM	
0.01	0.28	14.42	0.53	0.14	4/15/2021 4:41:57 PM	Co Bias CO2 O2 Zero
0.00	0.31	14.23	0.61	0.14	4/15/2021 4:42:58 PM	
0.86	7.00	11.15	0.46	0.14	4/15/2021 4:43:58 PM	
9.02	9.90	0.23	0.44	0.14	4/15/2021 4:44:58 PM	
9.64	9.91	-0.44	0.43	0.14	4/15/2021 4:45:59 PM	O2 CO2 Bias Nox Zero
9.63	9.91	-0.44	0.42	0.15	4/15/2021 4:46:59 PM	
9.22	9.23	-0.45	0.72	1.06	4/15/2021 4:48:00 PM	
1.40	1.98	-0.37	0.54	21.83	4/15/2021 4:49:00 PM	
0.05	0.22	-0.20	0.52	25.86	4/15/2021 4:50:01 PM	
0.05	0.21	-0.22	0.50	25.92	4/15/2021 4:51:01 PM	Nox Bias VOC Zero
0.05	0.34	-0.18	0.79	25.79	4/15/2021 4:52:01 PM	
0.05	12.28	-0.17	0.85	22.64	4/15/2021 4:53:02 PM	
0.05	20.72	-0.09	0.84	1.52	4/15/2021 4:54:02 PM	
0.05	20.92	-0.14	0.81	0.13	4/15/2021 4:55:03 PM	
0.05	20.92	-0.09	0.81	0.13	4/15/2021 4:56:03 PM	
0.05	20.92	-0.08	0.81	0.13	4/15/2021 4:57:03 PM	
0.05	20.92	-0.05	0.81	0.13	4/15/2021 4:58:04 PM	
0.05	20.92	-0.12	0.79	0.13	4/15/2021 4:59:04 PM	
1.22	17.50	-0.04	0.85	1.59	4/15/2021 5:00:05 PM	
3.74	13.81	0.57	0.82	23.73	4/15/2021 5:01:05 PM	
3.75	13.71	2.68	0.79	26.16	4/15/2021 5:02:06 PM	
3.75	13.76	3.44	0.72	26.14	4/15/2021 5:03:06 PM	
3.81	13.71	2.30	0.72	25.90	4/15/2021 5:04:07 PM	Start Run 3
3.80	13.74	1.41	0.72	25.76	4/15/2021 5:05:07 PM	
3.80	13.72	0.96	0.72	25.67	4/15/2021 5:06:07 PM	
3.80	13.72	0.69	0.71	25.35	4/15/2021 5:07:08 PM	
3.81	13.71	0.53	0.71	25.32	4/15/2021 5:08:08 PM	
3.79	13.72	0.54	0.71	25.20	4/15/2021 5:09:09 PM	
3.77	13.72	0.42	0.69	25.10	4/15/2021 5:10:09 PM	
3.77	13.73	0.38	0.68	24.96	4/15/2021 5:11:10 PM	
3.80	13.72	0.29	0.72	24.85	4/15/2021 5:12:10 PM	
3.80	13.72	0.31	0.70	24.89	4/15/2021 5:13:10 PM	
3.75	13.70	0.25	0.71	24.81	4/15/2021 5:14:11 PM	
3.79	13.70	0.25	0.71	24.92	4/15/2021 5:15:11 PM	
3.85	13.68	0.22	0.71	24.77	4/15/2021 5:16:11 PM	
3.78	13.73	0.25	0.71	24.86	4/15/2021 5:17:12 PM	
3.77	13.72	0.25	0.71	24.73	4/15/2021 5:18:12 PM	
3.78	13.72	0.17	0.72	24.90	4/15/2021 5:19:13 PM	
3.84	13.68	0.15	0.72	24.92	4/15/2021 5:20:13 PM	
3.80	13.73	0.17	0.71	24.86	4/15/2021 5:21:14 PM	
3.80	13.75	0.15	0.71	24.76	4/15/2021 5:22:14 PM	
3.73	13.75	0.16	0.69	24.73	4/15/2021 5:23:15 PM	
3.65	13.75	0.14	0.72	24.71	4/15/2021 5:24:15 PM	
3.62	13.77	0.15	0.71	24.86	4/15/2021 5:25:15 PM	
3.63	13.81	0.12	0.70	24.81	4/15/2021 5:26:16 PM	
3.50	13.84	0.15	0.72	24.82	4/15/2021 5:27:16 PM	
3.50	13.85	0.13	0.72	24.73	4/15/2021 5:28:17 PM	
3.61	13.84	0.10	0.70	24.80	4/15/2021 5:29:17 PM	
3.49	13.85	0.12	0.67	24.80	4/15/2021 5:30:18 PM	
3.57	13.92	0.05	0.67	24.75	4/15/2021 5:31:18 PM	
3.54	13.87	0.05	0.69	24.70	4/15/2021 5:32:18 PM	
3.51	13.96	0.11	0.70	24.73	4/15/2021 5:33:19 PM	
3.53	13.93	0.07	0.68	24.63	4/15/2021 5:34:19 PM	
3.53	13.92	0.12	0.68	24.76	4/15/2021 5:35:20 PM	
3.51	13.99	0.11	0.67	24.55	4/15/2021 5:36:20 PM	
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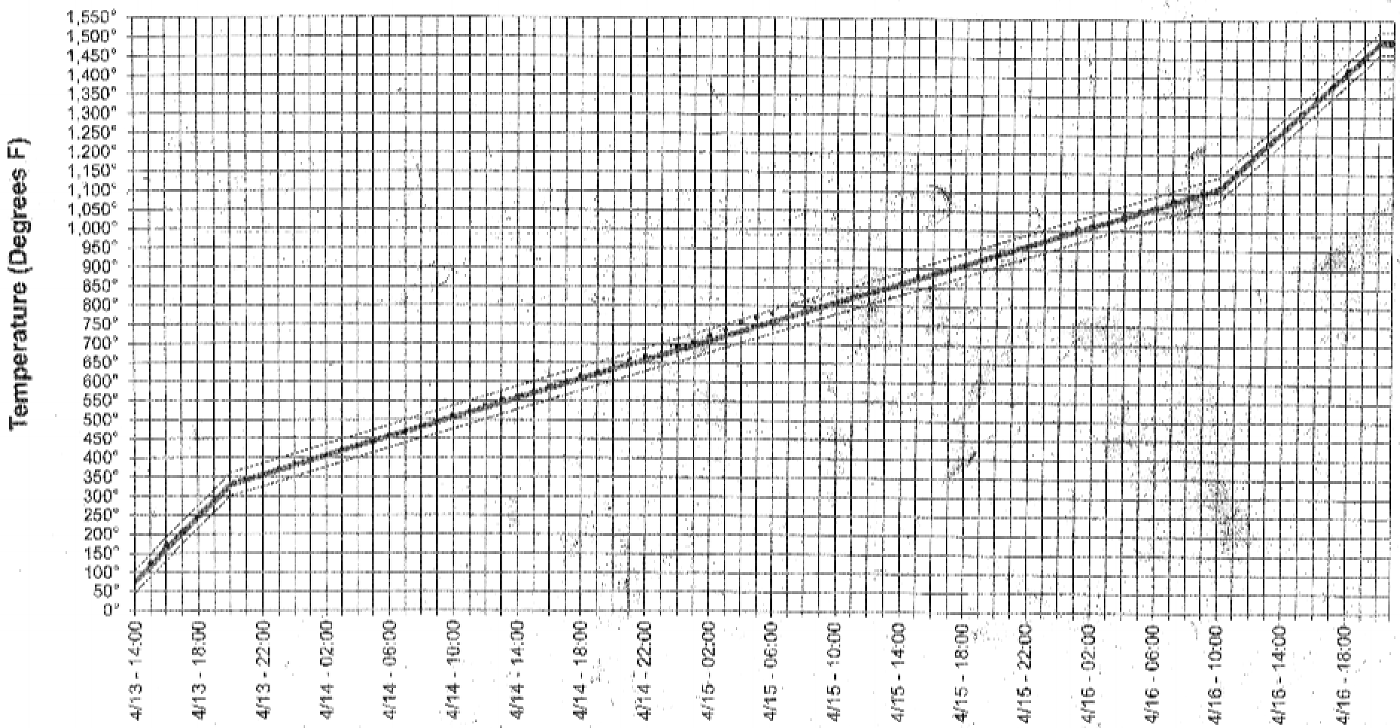
3.44	13.96	0.08	0.67	24.70	4/15/2021 5:38:21 PM	
3.52	14.00	0.08	0.69	24.59	4/15/2021 5:39:21 PM	
3.40	14.03	0.09	0.65	24.55	4/15/2021 5:40:22 PM	
3.42	14.04	0.04	0.65	24.43	4/15/2021 5:41:22 PM	
3.41	14.07	0.05	0.67	24.53	4/15/2021 5:42:22 PM	
3.40	14.17	0.01	0.69	24.34	4/15/2021 5:43:23 PM	
3.29	14.21	0.04	0.71	24.20	4/15/2021 5:44:23 PM	
3.03	14.40	0.02	0.70	23.84	4/15/2021 5:45:24 PM	
3.15	14.40	0.00	0.71	23.86	4/15/2021 5:46:24 PM	
2.87	14.57	-0.02	0.71	23.38	4/15/2021 5:47:25 PM	
2.83	14.59	-0.03	0.72	23.39	4/15/2021 5:48:25 PM	
2.81	14.60	-0.02	0.73	23.25	4/15/2021 5:49:25 PM	
2.82	14.63	-0.03	0.72	23.15	4/15/2021 5:50:26 PM	
2.71	14.75	-0.01	0.68	23.17	4/15/2021 5:51:26 PM	
2.83	14.60	0.00	0.74	22.97	4/15/2021 5:52:27 PM	
2.60	14.82	-0.03	0.76	23.03	4/15/2021 5:53:27 PM	
2.59	14.82	-0.04	0.74	22.63	4/15/2021 5:54:28 PM	
2.53	14.81	-0.03	0.76	22.87	4/15/2021 5:55:28 PM	
2.55	14.86	-0.03	0.79	22.69	4/15/2021 5:56:28 PM	
2.55	14.89	-0.04	0.77	22.45	4/15/2021 5:57:29 PM	
2.55	14.90	0.00	0.77	22.83	4/15/2021 5:58:29 PM	
2.53	14.81	-0.03	0.77	22.54	4/15/2021 5:59:30 PM	
2.57	14.78	0.00	0.82	22.99	4/15/2021 6:00:30 PM	
2.43	14.99	-0.03	0.81	22.45	4/15/2021 6:01:31 PM	
2.46	15.02	-0.01	0.87	22.55	4/15/2021 6:02:31 PM	
2.11	15.43	-0.03	0.88	21.67	4/15/2021 6:03:32 PM	
2.09	15.35	-0.02	0.83	21.34	4/15/2021 6:04:32 PM	Stop Run 3
3.31	14.15	0.19	0.72	24.20		Avg
2.31	15.03	-0.02	0.84	21.85	4/15/2021 6:05:32 PM	
2.15	15.29	-0.03	0.89	22.32	4/15/2021 6:06:33 PM	
1.89	15.58	-0.06	1.10	21.16	4/15/2021 6:07:33 PM	
0.87	16.90	-0.05	2.02	20.38	4/15/2021 6:08:34 PM	
0.05	20.81	-0.05	1.99	1.13	4/15/2021 6:09:34 PM	
0.05	17.69	-0.09	1.07	0.36	4/15/2021 6:10:34 PM	
0.05	5.50	-0.11	0.81	8.81	4/15/2021 6:11:35 PM	
0.05	0.53	-0.10	0.81	24.51	4/15/2021 6:12:35 PM	
0.05	0.35	-0.10	0.81	24.92	4/15/2021 6:13:36 PM	
0.05	0.28	-0.10	0.74	24.87	4/15/2021 6:14:36 PM	Nox Bias VOC Zero
0.05	0.21	-0.10	0.92	24.91	4/15/2021 6:15:37 PM	
0.05	6.85	-0.09	0.63	24.03	4/15/2021 6:16:37 PM	
1.22	10.27	-0.15	0.63	14.15	4/15/2021 6:17:37 PM	
9.61	10.15	-0.31	0.63	0.22	4/15/2021 6:18:38 PM	
9.62	10.14	-0.25	0.63	0.20	4/15/2021 6:19:38 PM	
9.62	10.08	-0.29	0.63	0.13	4/15/2021 6:20:38 PM	O2 CO2 Bias Nox Zero
9.62	10.07	-0.24	0.70	0.13	4/15/2021 6:21:39 PM	
8.48	10.75	0.16	1.69	0.15	4/15/2021 6:22:39 PM	
0.05	19.55	0.60	24.83	0.15	4/15/2021 6:23:40 PM	
0.05	20.92	0.00	24.87	0.13	4/15/2021 6:24:40 PM	
0.05	20.92	0.00	24.92	0.13	4/15/2021 6:25:41 PM	VOC Bias CO Zero
0.05	20.92	0.09	24.91	0.19	4/15/2021 6:26:41 PM	
0.05	20.93	0.10	24.86	0.17	4/15/2021 6:27:42 PM	
0.05	11.73	6.06	1.87	0.13	4/15/2021 6:28:42 PM	
0.04	0.45	14.40	0.97	0.13	4/15/2021 6:29:42 PM	
0.04	0.24	14.40	0.90	0.14	4/15/2021 6:30:43 PM	Co Bias CO2 O2 Zero
0.05	0.24	14.40	0.90	0.14	4/15/2021 6:31:43 PM	
0.04	0.23	14.40	0.91	0.14	4/15/2021 6:32:44 PM	
0.04	8.46	6.02	0.93	0.14	4/15/2021 6:33:44 PM	
0.04	20.17	0.02	0.92	0.14	4/15/2021 6:34:45 PM	
0.04	20.92	0.00	0.91	0.14	4/15/2021 6:35:45 PM	
0.04	20.92	-0.05	0.90	0.14	4/15/2021 6:36:45 PM	

Appendix #5

Process Data

ACCUTHERM RAMP CHART

Run Start Date: **4/13/2021** Run # **CB1-10321**



Public Notice
Ohio Environmental Protection Agency
Draft State Implementation Plan
VOC Reasonably Available Control Technology (RACT)
for Meggitt Aircraft Braking Systems Corp. (Facility ID1677010999)

Summit County

Notice is hereby given that the Director of the Ohio Environmental Protection Agency, (Ohio EPA) is submitting to the United States Environmental Protection Agency (U.S. EPA) Reasonably Available Control Technology (RACT) for Meggitt Aircraft Braking Systems Corp, LLC (Facility ID 1677010999) for approval into Ohio's state implementation plan (SIP) for the 2015 ozone National Ambient Air Quality Standard (NAAQS).

On March 17, 2025, Ohio submitted a revision to Ohio's SIP to address RACT requirements for the 2015 8-hour ozone NAAQS. As noted in this submittal, Ohio Administrative Code (OAC) rule 3745-21-11(B) requires facilities that have the potential to emit of fifty tons per year or more, but less than one hundred tons per year of volatile organic compounds (VOC) and are located in nonattainment counties to submit a RACT study for sources not controlled by Ohio's Control Technique Guideline (CTG) regulations in OAC Chapter 3745-21 or by categorical non-CTG RACT in OAC rules 3745-21-12, 3745-21-14, 3745-21-16, 3745-21-21 and 3745-21-25.

Ohio is now submitting source-specific VOC RACT for Meggitt Aircraft Braking Systems Corp (Facility ID 1677010999) for approval into Ohio's SIP. This facility is located in the Cleveland 2015 ozone maintenance area and has no prior existing source-specific RACT established in OAC rule 3745-21-09.

The updated RACT Study was submitted per OAC rule 3745-21-11(B). Ohio has determined that the updated RACT study, along with supplemental information submitted subsequently, is sufficient to justify the continued use of the existing thermal oxidizer with an overall control efficiency of at least 99% pursuant to OAC rule 3745-31-05(D) proposed by the facility to act as RACT for the carbon furnaces under the 2015 ozone standard.

Ohio EPA is now requesting approval of the proposed RACT for Meggitt Aircraft Braking Systems Corp into Ohio's SIP.

Ohio EPA is seeking public comment to satisfy U.S. EPA requirements for public involvement in SIP related activities in accordance with 40 CFR 51.102.

The public comment period will run until October 12, 2026. Written comments should be submitted at: https://ohioepa.commentinput.com - Search by entering the permit # (P0129464 for Meggitt Aircraft Braking Systems Corp) in the "Search Projects" search box.

A public hearing on this action may be requested by contacting Kathryn Jobe at 614-728-0671 or kathryn.jobe@epa.ohio.gov no later than 30 days from the draft public notice. If a public hearing is requested, a new notification will be published to identify the time and location of the public hearing. The public hearing will be held at least 30 days after the date of the new notification.

All interested persons are entitled to comment on these changes. All comments submitted to the above address by the close of business 30 days from when the draft public notice is issued will be considered by Ohio EPA prior to final action on this action. Written statements submitted after this time period may be considered as time and circumstances permit but will not be part of the official record.

Questions or comments about this document should be directed to Kathryn Jobe at 614-728-0671 or kathryn.jobe@epa.ohio.gov.

DATE

Ms. Anne Vogel
Regional Administrator
U.S. EPA, Region 5
77 West Jackson Blvd.
Chicago, Illinois 60604

Re: Revision to Ohio's Reasonably Available Control Technology (RACT) State Implementation Plan for the 2015 Ozone National Ambient Air Quality Standards – Source-Specific Volatile Organic Compound (VOC*)* RACT for Meggitt Aircraft Braking Systems Corp. (Facility ID 1677010999)

Dear Administrator Vogel:

On March 17, 2025, Ohio submitted a revision to Ohio's State Implementation Plan (SIP) to address Reasonably Available Control Technology (RACT) requirements for the 2015 8-hour ozone National Ambient Air Quality Standards (NAAQS) for areas classified as serious. As noted in this submittal, Ohio EPA adopted requirements in Ohio Administrative Code (OAC) rule 3745-21-11 for facilities in the nonattainment areas that emit fifty tons per year or more, but less than one hundred tons per year of volatile organic compounds (VOC) from sources not controlled by Ohio's CTG regulations in OAC Chapter 3745-21 or by categorical non-CTG RACT in OAC rules 3745-21-12, 3745-21-14, 3745-21-16, 3745-21-21 and 3745-21-25 to submit an updated RACT study within one year of the effective date of the rule. Upon review of the RACT study, Ohio EPA evaluated if the RACT proposed by the facility is appropriate to satisfy RACT requirements under the 2015 ozone standard.

Ohio is now submitting source-specific VOC RACT for Meggitt Aircraft Braking Systems Corp. (Facility ID 1677010999) for approval into Ohio's SIP. This facility is located in the Cleveland 2015 ozone maintenance area and has no prior existing source-specific RACT established in OAC rule 3745-21-09.

The updated VOC RACT Study was submitted per OAC rule 3745-21-11. Ohio has determined that the updated RACT study, along with supplemental information submitted subsequently, is sufficient to justify the continued use of the existing thermal oxidizer with an overall control efficiency of at least 99% pursuant to OAC rule 3745-31-05(D) proposed by the facility to act as RACT for the carbon furnaces under the 2015 ozone standard. The RACT study is provided in Appendix A, and the permit that incorporated RACT is provided as Appendix B. Within the permit, we have highlighted the terms and conditions associated with RACT and request only those provisions are subject to this SIP revision request. Appendix C provides the permit strategy write-up for the permit.

Ohio held a public comment period on Ohio's RACT determination from September 10 to October 12, 2026. Appendix D contains the public notice. ***[Ohio's response to comments received during the public comment period is in Appendix E/No comments were received during the public comment period].***

This SIP does not include the relaxation of any existing requirements and therefore will not interfere with the attainment or maintenance of the NAAQS in accordance with section 110(l) of the CAA.

Ohio EPA is now requesting approval of the proposed RACT for Meggitt Aircraft Braking Systems Corp. into Ohio's SIP.

Ohio EPA is submitting this SIP via U.S. EPA's State Planning Electronic Collaboration System (SPeCS). If you have questions, please contact Jennifer Van Vlerah in our Division of Air Pollution Control at (614) 644-3696.

Sincerely,

John Logue
Director

Cc: Bob Hodanbosi, Chief, Division of Air Pollution Control, Ohio EPA

Enclosures

VOC RACT STUDY
CARBON PROCESSING FURNACES

MEGGITT

Meggitt Aircraft Braking Systems Corporation

Prepared By:

TRINITY CONSULTANTS
400 Polaris Parkway
Suite 275
Westerville, Ohio 43082

Initial Submission:	March 2026
Revision 1:	May 2026
Revision 2:	July 2026

Project 253601.0166

Trinity Consultants

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1. BACKGROUND

On March 17, 2022, Ohio EPA promulgated revisions to the existing volatile organic compound (VOC) regulations under Chapter 3745-21 of the Ohio Administrative Code (OAC) due to the downgrade to moderate nonattainment status for the Cleveland area with respect to the 2015 8-hr Ozone National Ambient Air Quality Standard (NAAQS) as well as the change to marginal nonattainment status for the Cincinnati area.

Changes in the revised standards include but are not limited to:

- Extension of existing VOC Reasonably Available Control Technology (RACT) rules in OAC 3745-21 to the Cincinnati area; and
- Requirement for major VOC emitters (from non-control technique guidelines (CTG) sources) in the Cincinnati and Cleveland areas to conduct a detailed engineering study pursuant to OAC 3745-21-11.

Chapter 3745-21-11 requires facilities located in Butler, Clermont, Cuyahoga, Geauga, Hamilton, Lake, Lorain, Medina, Portage, Summit, or Warren County that have potential VOC emissions greater than 100 tons per year (tpy) from non-CTG sources to conduct a detailed engineering study to determine the technical and economic feasibility of reducing VOC emissions and define RACT for the affected sources. Additionally, it requires that any facility that has an existing site-specific definition of RACT in Chapter 3745-12-09 of the OAC submit an updated RACT study. In both cases the engineering study must be submitted to Ohio EPA within one (1) year of the effective date of the rule (i.e., by March 27, 2023).

On April 1, 2025, Ohio EPA promulgated revisions to the existing volatile organic compound (VOC) regulations under Chapter 3745-21 of the Ohio Administrative Code (OAC) following the classification of the Cleveland area to serious nonattainment status for the 2015 8-hr Ozone NAAQS in the Cleveland area.

Changes included in the revised standards include but are not limited to:

- ► Requirement for major VOC emitters (from non-CTG sources) in the Cleveland area to conduct a detailed engineering study pursuant to OAC 3745-21-11.

Chapter 3745-21-11 requires facilities located in Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, or Summit County that have potential VOC emissions greater than 50 tpy from non-CTG sources to conduct a detailed engineering study to determine the technical and economic feasibility of reducing VOC emissions and define RACT for the affected sources. Additionally, it requires that any facility that has an existing site-specific definition of RACT in Chapter 3745-12-09 of the OAC submit an updated RACT study. In both cases the engineering study must be submitted to Ohio EPA within one (1) year of the effective date of the rule (i.e., by April 1, 2026).

Meggitt Aircraft and Braking Systems Corporation’s manufacturing facility located in Akron, Ohio, is subject to a non-CTG RACT determination pursuant to OAC 3745-21-11. Accordingly, the facility is required to submit a VOC RACT study by April 1, 2026. The following sections comprise the required VOC RACT study for the Meggitt Aircraft Braking Systems Corporation Akron, Ohio Facility.

2. FACILITY OVERVIEW

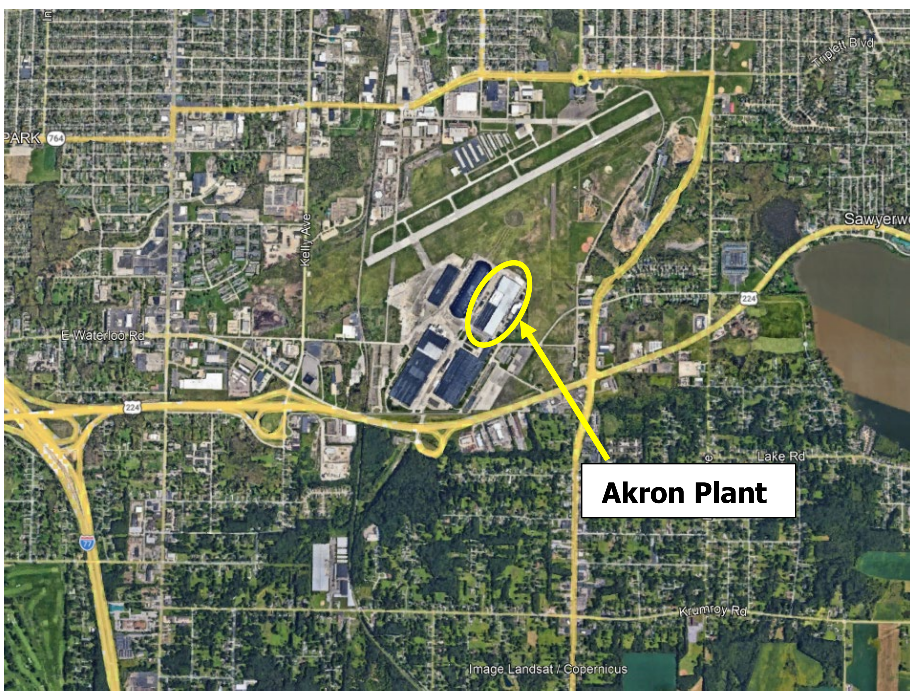
2.1 General Facility Information

Meggitt Aircraft Braking Systems Corporation (Meggitt) owns and operates an aircraft parts and auxiliary equipment manufacturing facility Summit County. The facility is located at 1204 Massillon Road, Akron, Ohio 44306. The Akron Facility manufactures advanced aircraft braking systems. These include:

- Wheels
- Carbon brakes
- Brake control systems
- Landing gear components.

Figure 2-1 is an area map that shows the site location relative to predominant geographical features such as highways and railroads.

Figure 2-1. Area Map for Meggitt



Facility information required by sections (1) through (4) of OAC 3745-21-11(B) is provided as follows:

a) The complete facility name, Ohio EPA air program facility identification number, and address:

Meggitt Aircraft Braking System Corporation
Facility ID 1677010999
1204 Massillon Road
Akron, OH 44306

b) The name, title, address and telephone number of the owner or operator's representative within the company who is the contact person for this facility regarding the engineering study and affected sources, and

Gary Scotton
EHS Manager
1204 Massillon Road
Akron, OH 44306
(330) 796-5933
Gary.Scotton@parker.com

c) The name, title, address, and telephone number of the official who is responsible for approval of the engineering study:

Patrick Sines
Senior Manager, Site Operations
1204 Massillon Road
Akron, OH 44306
(330) 208-3634
Patrick.Sines@parker.com

d) The standard industrial classification code and source classification code numbers which are applicable to the facility's operation:

SIC Code:	*3728*
SCC:	*3-09-900-03*

2.2 Permitted VOC Sources

Table 2-1 summarizes the PTIO permitted VOC sources at the Akron Facility. A detailed documentation of the approach for calculating potential to emit (PTE) is provided in Appendix A.

As shown in Table 2-1, Meggitt operates a touch up booth (i.e., K008), three portable parts washers (i.e., L007), a Grieve oven (i.e., P023), a foam packaging system (i.e., Z706), and a research and development furnace (TMP187138) that are de minimis sources of VOC emissions which are excluded from the RACT study.

The Akron Facility operates eight carbon processing electric induction coil furnaces (i.e., P036-P039, P041, P044, and P048-P049) that are subject to a non-CTG RACT determination at OAC 3745-21-11. The remainder of this study provides proposed VOC RACT determinations for these sources.

Table 2-1. PTIO Permitted VOC Sources at the Akron Facility[a]

Emission Unit ID	Emission Unit Description	Current VOC Control	VOC PTE (tpy)	Current VOC Emission Limit(s)	VOC RACT Applicability
P036, P037, P038, P041, P044, P048, and P049[b]	Carbon Processing Furnaces	Thermal Oxidizer	11.3	11.67	RACT Study
P039[b]	Accutherm Carbonization Furnace		0.4		

a. Excludes de-minimis and insignificant sources.
b. P036-P039, P041, P044, and P048-P049 are subject to a combined VOC emission limit of 11.67 tons per rolling, 12-month period.

3. RACT DETERMINATION

As discussed in Section 1 above, Meggitt is required to perform a RACT study for carbon processing furnaces (i.e, Ohio EPA Emission Unit IDs P036, P037, P038, P039, P041, P044, P048, and P049) pursuant to OAC 3745-21-11. Appendix B provides source specific information required by OAC 3745-21-11(B)(1) through (7). The following sections include a detailed description of the source followed by the top-down RACT analysis.

3.1 Source Overview

Meggitt operates carbon processing electric induction coil furnaces (i.e, Ohio EPA Emission Unit IDs P036, P037, P038, P039, P041, P044, P048, and P049), which are industrial thermal treatment units used to heat carbon-containing materials to high temperatures under controlled conditions. The furnaces perform processes such as carbonization, heat treatment, or stabilization to modify the physical and mechanical properties of the material, including strength, hardness, and thermal resistance.

Carbonization is a controlled thermal treatment process in which carbon-containing materials are heated in a high-temperature furnace operated under oxygen-limited or inert conditions. The purpose of the process is to thermally decompose organic constituents and remove volatile material while converting the processed material into a carbon-rich solid with improved structural and thermal properties.

The furnace is operated using controlled heating rates dependent on product requirements. The process environment prevents oxidation and open combustion; no direct flame contact occurs between the heating source and the material being processed.

VOC emissions associated with carbonization are generated as process emissions resulting from thermal decomposition of organic binders, resins, or other carbon-containing constituents within the material. As temperature increases, volatile organic compounds, moisture, and light hydrocarbons are driven off as off-gas.

The carbonization process itself is not a combustion process. Any fuel firing associated with the unit is limited to indirect heating of the furnace chamber and does not constitute a primary source of VOC emissions.

Off-gases from the carbonization furnace may contain, VOCs, Carbon Monoxide (CO), Methane and other hydrocarbons, and Carbon Dioxide (CO_2). Emission composition and quantity depend on material type, throughput, and operating temperature.

The carbonization process at Meggitt's Akron facility does not include coating operations, or cleanup solvents. Therefore, the requirements of OAC 3745-21(B)(7)(e) and (f), which are for coating operations and solvent cleaning activities, do not apply to Meggitt.

3.2 Control Overview

The carbon furnaces are equipped with thermal oxidizers, which are an air pollution control device used to control VOC emissions generated as process off-gases from the carbonization process. There are two thermal oxidizers associated with P036-P038, P041, P044, and P048-P049, and an additional thermal oxidizer associated with P039. Process exhaust gases from the carbonization furnaces are ducted directly to the thermal oxidizers, where VOCs and other combustibles are destroyed through high-temperature oxidation prior to atmospheric release.

The thermal oxidizers are regulated through Permit-to-Install and Operate (PTIO) P0129464, which contains enforceable operating parameters, including continuous monitoring and recordkeeping, to maintain minimum combustion temperatures. Additionally, the PTIO requires stack testing to demonstrate compliance with the allowable mass emission rates for VOC, organic hazardous air pollutants (HAPs), and organic material (OM). Appendix C provides a copy of the most recent stack test as required by OAC 3745-21-11(B)(7)(h).

A top-down RACT analysis was not performed for the carbon furnaces because the units are already equipped with thermal oxidizers that represent the highest level of reasonably available VOC control technology for this source category. Exhaust gases from the carbon furnaces are routed to thermal oxidizers designed and operated to achieve a VOC destruction efficiency of 99%.

Capture efficiency is estimated to exceed 99% because furnace exhaust is conveyed through a dedicated closed-duct system directly to a thermal oxidizer, and the furnaces are maintained under vacuum throughout the carbonization process. The integrity of the exhaust ductwork is critical because the introduction of oxygen into a furnace during carbonization could create a significant safety hazard, including the potential for fire or other upset conditions.

Thermal oxidation is widely recognized as the most effective and commonly implemented control technology for high-temperature, continuous industrial furnace exhaust streams containing VOCs. The installed thermal oxidizers provide near-complete oxidation of organic compounds and represents the upper bound of feasible VOC control performance for this type of process. Alternative control technology evaluated under a traditional top-down analysis (i.e., carbon adsorption, catalytic incinerator, condenser, scrubber, or alternative combustion-based controls) would not provide a materially higher level of control than the existing 99% destruction efficiency, nor would they be technically practicable for the furnace exhaust conditions.

Because the unit already achieves VOC emission reductions consistent with the most stringent level of control that is reasonably available, there are no technically feasible or economically reasonable control options that would result in a meaningful incremental reduction in VOC emissions beyond the existing configuration. Therefore, a top-down RACT analysis would not identify any additional RACT-level controls and would not materially inform the determination of RACT for this emission unit.

Accordingly, the existing carbon furnaces equipped with thermal oxidizers with a destruction efficiency of 99% are considered to meet RACT, and no further controls are evaluated.

3.3 Source Modification/Replacement

In accordance with OAC 3745-21-11(B)(11), this RACT evaluation includes consideration of process modifications or operational changes that could reduce or eliminate VOC emissions at the source.

The carbonization furnaces are integral to Meggitt's operations. These emission units are used to thermally process materials under controlled conditions to achieve required product characteristics and performance specifications. Continuous and reliable operation of the carbonization furnaces is necessary to meet production demands and maintain product quality and consistency.

Potential pollution prevention measures, including reductions in furnace operating frequency or limitations on operating hours, or elimination of carbonization activities, were evaluated. However, implementation of such measures would directly interfere with the Meggitt facility’s ability to meet its manufacturing, quality assurance, and customer requirements and would not be consistent with the intended function of the source. The furnaces are operated in accordance with established production and operating practices designed to optimize thermal efficiency and minimize unnecessary material throughput, thereby limiting VOC generation to the extent practicable.

Based on this evaluation, elimination or substantial modification of the carbonization furnace operations is not technically feasible.

3.4 RACT Determination

The proposed RACT determination for VOC emissions from the carbon furnace is the continued operation of the existing thermal oxidizers in accordance with the operating requirements specified in PTIO P0129464. The thermal oxidizers are designed and operated to achieve a VOC capture and destruction efficiency of 99% and represent the most effective and commonly applied control technology for this type of emission source.

Continued operation of the thermal oxidizers ensures that VOC emissions from the carbon furnaces are controlled to a level consistent with the maximum degree of emission reduction that is reasonably available. No additional add-on controls or process modifications have been identified that would result in a meaningful incremental reduction in VOC emissions beyond the performance achieved by the existing control device. Therefore, continued operation and proper maintenance of the thermal oxidizer is proposed as RACT for the carbon furnace.

APPENDIX A. POTENTIAL-TO-EMIT DOCUMENTATION

REDACTED

REDACTED

MEGGITT AIRCRAFT BRAKING SYSTEMS CORPORATION
AKRON, OHIO

EMISSION CALCULATIONS

REDACTED

REDACTED

REDACTED

Appendix Table B-1. General Source Information

Emission Unit ID	Emission Unit Description	Installation Date (Month and Year)	Operating Schedule (hrs/day / days/week/ weeks/yr)	Control Equipment	Control Device Installation Date
P036	Carbon Processing Furnace	11/1996	24/7/52	Thermal Oxidizer	8/1/1996
P037	Carbon Processing Furnace	11/1996	24/7/52	Thermal Oxidizer	8/1/1996
P038	Carbon Processing Furnace	11/1996	24/7/52	Thermal Oxidizer	8/1/1996
P039	Accutherm Carbonization Furnace	6/1996	24/7/52	Thermal Oxidizer	3/1/1996
P041	Carbon Processing Furnace	12/1998	24/7/52	Thermal Oxidizer	8/1/1996
P044	Carbon Processing Furnace	7/1999	24/7/52	Thermal Oxidizer	8/1/1996
P048	Carbon Processing Furnace	11/1996	24/7/52	Thermal Oxidizer	8/1/1996
P049	Carbon Processing Furnace	11/1996	24/7/52	Thermal Oxidizer	8/1/1996

Appendix Table B-2. Annual Production Rates for 2022-2024

Emission Unit ID	Production Units	Average Daily Production Rates			Maximum Daily Production Rates			Annual Production Rates		
		2023	2024	2025	2023	2024	2025	2023	2024	2025
P036	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
P037, P038, P041, P044, P048, and P049	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
P039	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

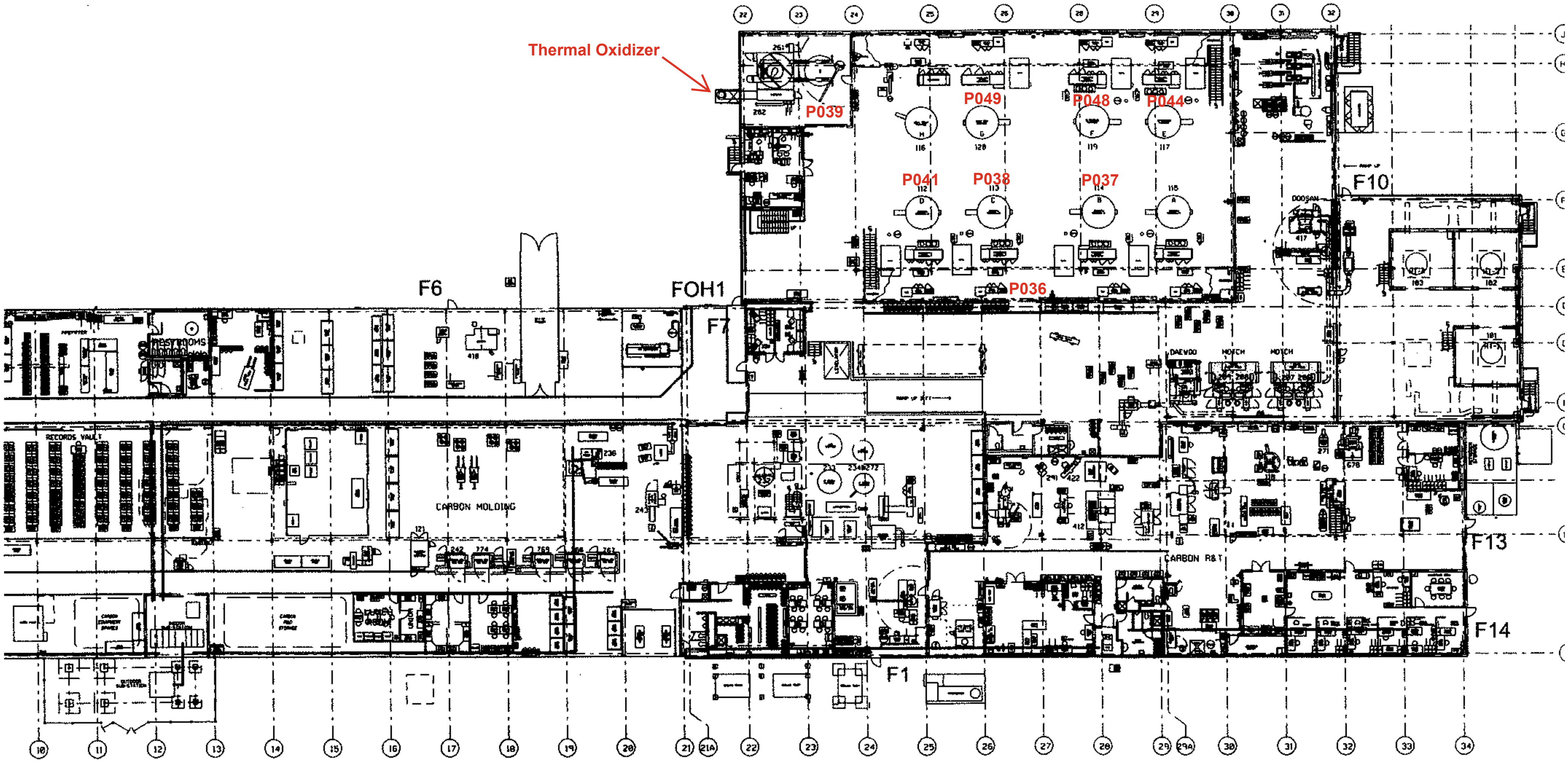
Appendix Table B-3. Average and Maximum Daily and Annual Actual VOC Emissions[a]

OEPA Emission Unit ID	Emission Unit Description	Average Daily VOC Emissions (lb/day)	Maximum Daily VOC Emissions (lb/day)	Maximum Annual VOC Emissions (tpy)
P036	Carbon Processing Furnaces		Did not operate	
P037, P038, P041, P044, P048, and P049	Carbon Processing Furnaces	0.61	0.78	0.11
P039	Accutherm Carbonization Furnace	0.68	0.35	0.05

[a] As specified by OAC 3745-21-11(B)(7) the average daily, maximum daily, and maximum annual VOC emissions are based upon the highest production rates for each of the three full calendar years preceding submission of the RACT study (i.e., 2023-2025).

Appendix Figure B-1. Facility Plot Plan

Meggitt Facility
Derby Downs Dr
Massillon Rd
Exeter Rd
Image Landsat / Copernicus



Thermal Oxidizer
P039
P049
P048
P044
P041
P038
P037
P036
F6
FOH1
F7
F10
F13
F14
F1
CARBON MOLDING
RECORDS VAULT
RESTROOMS
CARBON R&T
DAEWOO
DOOSAN

APPENDIX C. THERMAL OXIDIZER STACK TEST RESULTS

Custom Stack Analysis, LLC.

1-800-824-4274

Meggitt Aircraft Braking Systems Corporation
1204 Massillon Road
Akron, Ohio 44306

Report

Performed Velocity, Moisture, Temperature, Volumetric Flow Rate and Volatile Organic Compounds Emissions Testing

Sampling performed on the North & South Afterburner Outlets

Akron, OH

Test Date: 12/7/20 & 12/8/20

Meggitt Aircraft Braking Systems Corporation
1204 Massillon Road
Akron, Ohio 44306

Report

Performed Velocity, Moisture, Temperature, Volumetric Flow Rate and Volatile Organic Compounds Emissions Testing

Sampling performed on the North & South Afterburner Outlets

Akron, OH

Test Date: 12/7/20 & 12/8/20

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.

Brian E.Lemasters

TABLE OF CONTENTS

APPENDIX

EXECUTIVE SUMMARY

Custom Stack Analysis, LLC. conducted emissions sampling using USEPA Methods 1-4 and 25A at Facility ID# - 1677010999. Testing was conducted on the North & South Afterburner Outlets on December 7th & 8th, 2020 for compliance purposes - Permit # - P0121253 (see Table 1.2).

The Custom Stack Analysis, LLC. test crew consisted of Mr. James Gray, Mr. Brian Lemasters and Mr. Ethan Minor. The testing procedures were coordinated by Mr. Jim Davies and Mr. Jon Carver of Meggitt Aircraft Braking Systems Corporation (see Table 1.1).

Table 1.1: Emissions Testing Program Contact Personnel

Name, Title	Company Address	Phone, Fax, email
Mr. Jim Davies Mr.Jon Carver	Meggitt Aircraft Braking Corporation 1204 Massillon Road Akron, OH 44306	(330) 796-1743 (Phone)
Mr. James Gray Owner Mr. Brian Lemasters Project Manager Mr. Ethan Minor Project Technicians	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 pages 3-4. A description of the testing protocol is included on pages 5-6. All testing calculations are located on pages 11-18. 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.

Table 1.2 demonstrates how Meggitt Aircraft Baking Systems Corporation in Akron, 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
Volatile Organic Compounds	See below	**North Afterburner** 0.00415 lbs/hr 0.0182 tons/yr **South Afterburner** 0.00166 lbs/hr 0.00726 tons/yr	Yes Yes Yes Yes

Individual unit VOC limitations:

- from emissions units P036 and P048, combined, 2.5 lb/hr and 10.95 ton/yr
- from emissions units P037 and P049, combined, 2.5 lb/hr and 10.95 ton/yr
- from emissions unit P038, 2.5 lb/hr and 10.95 ton/yr
- from emissions unit P041, 2.5 lb/hr and 10.95 ton/yr
- from emissions unit P044, 2.47 lb/hr and 10.82 ton/yr

The overall combined VOC emissions from emissions units P036, P037, P038, P041, P044, P048 and P049 are limited to 11.31 ton/yr.

Test Results

Meggitt Aircraft Braking Systems Corporation - North Afterburner Outlet
12/7/2020
Methods 1-4 & 25A

	Run #1	Run #2	Run #3	Avg.
Stack Gas Velocity (ft/sec)	37.31	38.22	38.31	37.95
Standard Cubic Feet an Hour	227,390	230,154	232,946	230,163
Actual Cubic Feet per Minute	15,822	16,212	16,246	16,093
Moisture %	8.18%	8.70%	8.48%	8.45%
Carbon Dioxide %	4.33%	4.17%	4.17%	4.22%
Oxygen %	12.17%	12.33%	12.17%	12.22%
Nitrogen %	83.50%	83.50%	83.66%	83.55%

Method 25A

		Run #1	Run #2	Run #3	Avg.
VOC	**(ppm)**	0.20	0.19	0.20	0.19
	(lbs/hr Carbon)	4.17E-03	4.01E-03	4.29E-03	4.15E-03
	(tons/yr)	1.83E-02	1.76E-02	1.88E-02	1.82E-02

Test Results

Meggitt Aircraft Braking Systems Corporation - South Afterburner Outet
12/8/2020
Methods 1-4 & 25A

	Run #1	Run #2	Run #3	Avg.
Stack Gas Velocity (ft/sec)	30.58	30.95	30.53	30.69
Standard Cubic Feet an Hour	197,116	195,080	190,059	194,085
Actual Cubic Feet per Minute	12,968	13,128	12,950	13,015
Moisture %	8.46%	8.80%	8.39%	8.55%
Carbon Dioxide %	4.83%	4.83%	4.83%	4.83%
Oxygen %	11.67%	11.67%	11.50%	11.61%
Nitrogen %	83.50%	83.50%	83.67%	83.56%

Method 25A

		Run #1	Run #2	Run #3	Avg.
VOC	**(ppm)**	0.11	0.09	0.08	0.09
	(lbs/hr Carbon)	2.01E-03	1.60E-03	1.36E-03	1.66E-03
	(tons/yr)	8.82E-03	7.01E-03	5.95E-03	7.26E-03

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 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.

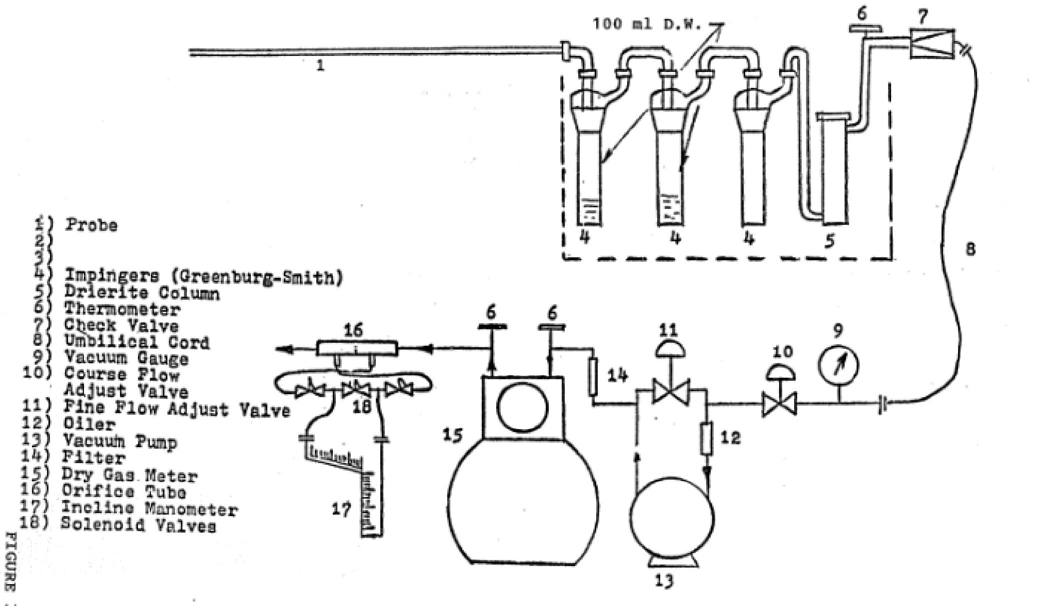
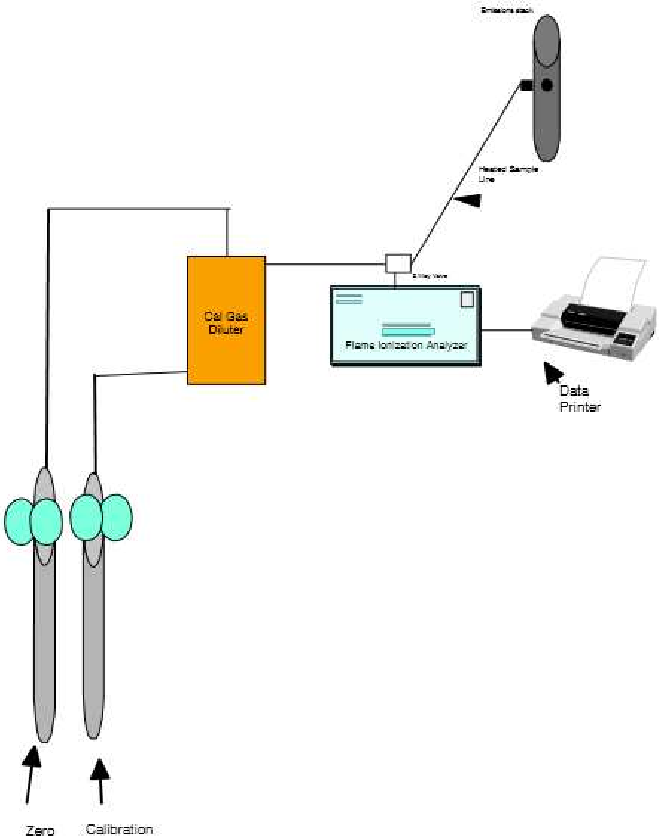


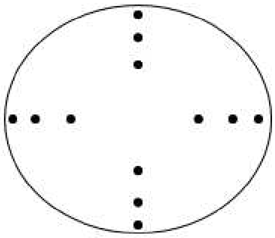
FIGURE 3

METHOD 4 SAMPLE TRAIN
FOR MOISTURE DETERMINATION

25A Sampling System

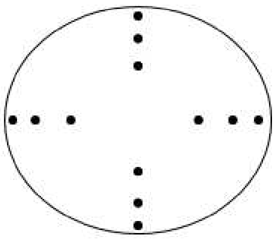


Location of Sampling Points



Location:		North Afterburner Outlet	
Upstream		3'	
Downstream		15'	
Stack Diameter		36	Inches
Sample Point #			
	1	1.6	Inches
	2	5.3	
	3	10.7	
	4	25.3	
	5	30.7	
	6	34.4	

Location of Sampling Points



Location:		South Afterburner Outlet	
Upstream		3'	
Downstream		15'	
Stack Diameter		36	Inches
Sample Point #			
	1	1.6	Inches
	2	5.3	
	3	10.7	
	4	25.3	
	5	30.7	
	6	34.4	

CALCULATIONS

North Afterburner Outlet

		RUN #1	RUN #2	RUN #3		
1.	**Vm (std)**	42.74	42.04	42.21	=	$VM * 17.64 * \frac{PBAR + \frac{^H}{13.6}}{Tm} * Y$

			RUN #1	RUN #2	RUN #3
Vm (std)	= Volume of gas collected, corrected to standard conditions, cuft.	=	42.74	42.04	42.21
Vm	= Volume of gas sampled at meter box, cuft.	=	45.13	44.39	44.53
17.64	= Standard temperature, 528 Rankine / std pressure, 29.92.	=	17.64	17.64	17.64
Tm	= Average dry gas meter temperature, + 460 Rankine.	=	538.58333	538.58333	538.16667
Pbar	= Barometric pressure, inches of mercury (Hg)	=	28.76	28.76	28.76
^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.	=	1.0004	1.0004	1.0004

		RUN #1	RUN #2	RUN #3		
2.	**Vw (std)**	3.81	4.01	3.91	=	$Vlc * \frac{P\ H20}{Mh20} * \frac{R\ Tstd}{Pstd} = K2 * Vlc$

			RUN #1	RUN #2	RUN #3
Vlc	= Volume of water and silica colected.	=	80.8	85	83
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**	0.08180	0.08698	0.08481	=	$\frac{Vw(std)}{Vm(std) + Vw(std)}$

			RUN #1	RUN #2	RUN #3
Bws	= Water vapor in the gas stream, proportion.	=	0.08180	0.08698	0.08481
Vw(std)	= Volume of water vapor in the gas sample, scf.	=	3.81	4.01	3.91
Vm(std)	= Volume of gas sampled at meter box, scf.	=	42.74	42.04	42.21

		RUN #1	RUN #2	RUN #3		
4.	**Md**	29.1796	29.1604	29.154	=	0.44 (%CO2) + 0.32 (%O2) + 0.28 (%N2) + %CO)

			RUN #1	RUN #2	RUN #3
Md	= Dry molecular weight, lb / lb-mole.	=	29.18	29.16	29.15
0.44	= Molecular weight of CO2 divided by 100.	=	0.44	0.44	0.44
0.32	= Molecular weight of O2 divided by 100.	=	0.32	0.32	0.32
0.28	= Molecular weight of N2 or CO divided by 100.	=	0.28	0.28	0.28

Co2, O2, N2, and CO are in percent by volume, dry basis.

		RUN #1	RUN #2	RUN #3		
5.	**Ms**	28.27	28.19	28.21	=	Md * (1-Bws) + M H20 * (Bws)

			RUN #1	RUN #2	RUN #3
Ms	= Molecular weight of gas , wet basis, lb /lb-mole.	=	28.27	28.19	28.21
M H20	= Molecular weight of water, 18 lb / lb-mole.	=	18	18	18

		RUN #1	RUN #2	RUN #3		
6.	**Vs**	37.31	38.22	38.31	=	$85.49 * Cp * \sqrt{\text{^p}} * \sqrt{\frac{Ts + 460}{Ps * Ms}}$

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	37.31	38.22	38.31
85.49	= Pitot tube constant, ft / sec.	=	85.49	85.49	85.49
Cp	= Pitot tube coefficient, dimensionless.	=	0.84	0.84	0.84
^P	= Velocity head of stack gas, avg. sq rt.	=	0.33580	0.34248	0.34462
Ts	= Temperature of stack gas, + 460 (Rankine).	=	1948.2083	1961	1946
Ps	= Absolute stack gas pressure, barometric + static.	=	28.80	28.80	28.80
Ms	= Molecular weight of stack gas, wet basis.	=	28.27	28.19	28.21

		RUN #1	RUN #2	RUN #3		
7.	**ACFM**	15821.95	16211.57	16246.01	=	Stack Area * 60 * Vs

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	37.31	38.22	38.31

		RUN #1	RUN #2	RUN #3		
8	**SCFH**	227390	230154	232946	=	$3600 * (1 - Bws) * Vs * A * \frac{Tstd}{Ts} * \frac{Ps}{Pstd}$

				RUN #1	RUN #2	RUN #3
3600	=	Seconds per hour.	=	3600	3600	3600
Bws	=	Water vapor in the gas stream, proportion.	=	0.0817974	0.0869803	0.084805
A	=	Area of stack in sq ft.	=	7.07	7.07	7.07
Tstd	=	Standard absolute temperature, 528 R.	=	528	528	528
Pstd	=	Standard absolute pressure, 29.92 in. Hg.	=	29.92	29.92	29.92
Ts	=	Temperature of stack gas, + 460 (Rankine).		1948.2083	1961	1946
Ps	=	Absolute stack gas pressure, barometric + static.		28.76	28.76	28.76
Vs	=	Average stack gas velocity, ft / sec.		37.31	38.22	38.31

CALCULATIONS

VOC

		RUN #1	RUN #2	RUN #3		
1.	**Lbs/Hr Propane**	0.00510	0.00490	0.00524	=	0.11443 * SCFH * PPM * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	227390	230154	232946
PPM	=	PPM	=	0.1960352	0.1861953	0.1966794

		RUN #1	RUN #2	RUN #3		
2.	**Lbs/Hr Carbon**	0.00417	0.00401	0.00429	=	0.031182 * SCFH * PPM * 3 * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	227390	230154	232946
PPM	=	PPM	=	0.1960352	0.1861953	0.1966794
3	=	Carbon equivalent correction factor for propane.	=	3	3	3

CALCULATIONS

South Afterburner Outlet

		RUN #1	RUN #2	RUN #3		
1.	**Vm (std)**	43.20	42.42	42.83	=	$VM * 17.64 * \frac{PBAR + \frac{\Delta H}{13.6}}{Tm} * Y$

			RUN #1	RUN #2	RUN #3
Vm (std)	= Volume of gas collected, corrected to standard conditions, cuft.	=	43.20	42.42	42.83
Vm	= Volume of gas sampled at meter box, cuft.	=	45.21	44.38	44.80
17.64	= Standard temperature, 528 Rankine / std pressure, 29.92.	=	17.64	17.64	17.64
Tm	= Average dry gas meter temperature, + 460 Rankine.	=	535.58333	535.33333	535.20833
Pbar	= Barometric pressure, inches of mercury (Hg)	=	28.85	28.85	28.85
^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.	=	1.0004	1.0004	1.0004

		RUN #1	RUN #2	RUN #3		
2.	**Vw (std)**	3.99	4.09	3.92	=	$Vlc * \frac{P\ H20}{Mh20} * \frac{R\ Tstd}{Pstd} = K2 * Vlc$

			RUN #1	RUN #2	RUN #3
Vlc	= Volume of water and silica colected.	=	84.7	86.9	83.2
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**	0.08458	0.08803	0.08385	=	$\frac{Vw(std)}{Vm(std) + Vw(std)}$

			RUN #1	RUN #2	RUN #3
Bws	= Water vapor in the gas stream, proportion.	=	0.08458	0.08803	0.08385
Vw(std)	= Volume of water vapor in the gas sample, scf.	=	3.99	4.09	3.92
Vm(std)	= Volume of gas sampled at meter box, scf.	=	43.20	42.42	42.83

		RUN #1	RUN #2	RUN #3		
4.	**Md**	29.2396	29.2396	29.2328	=	0.44 (%CO2) + 0.32 (%O2) + 0.28 (%N2) + %CO)

			RUN #1	RUN #2	RUN #3
Md	= Dry molecular weight, lb / lb-mole.	=	29.24	29.24	29.23
0.44	= Molecular weight of CO2 divided by 100.	=	0.44	0.44	0.44
0.32	= Molecular weight of O2 divided by 100.	=	0.32	0.32	0.32
0.28	= Molecular weight of N2 or CO divided by 100.	=	0.28	0.28	0.28

Co2, O2, N2, and CO are in percent by volume, dry basis.

		RUN #1	RUN #2	RUN #3		
5.	**Ms**	28.29	28.25	28.29	=	Md * (1-Bws) + M H20 * (Bws)

			RUN #1	RUN #2	RUN #3
Ms	= Molecular weight of gas , wet basis, lb /lb-mole.	=	28.29	28.25	28.29
M H20	= Molecular weight of water, 18 lb / lb-mole.	=	18	18	18

		RUN #1	RUN #2	RUN #3		
6.	**Vs**	30.58	30.95	30.53	=	$85.49 * Cp * \sqrt{\text{^p}} * \sqrt{\frac{Ts + 460}{Ps * Ms}}$

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	30.58	30.95	30.53
85.49	= Pitot tube constant, ft / sec.	=	85.49	85.49	85.49
Cp	= Pitot tube coefficient, dimensionless.	=	0.84	0.84	0.84
^P	= Velocity head of stack gas, avg. sq rt.	=	0.28360	0.28421	0.27818
Ts	= Temperature of stack gas, + 460 (Rankine).	=	1842.2083	1877	1909
Ps	= Absolute stack gas pressure, barometric + static.	=	28.89	28.89	28.89
Ms	= Molecular weight of stack gas, wet basis.	=	28.29	28.25	28.29

		RUN #1	RUN #2	RUN #3		
7.	**ACFM**	12967.65	13127.84	12949.88	=	Stack Area * 60 * Vs

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	30.58	30.95	30.53

		RUN #1	RUN #2	RUN #3		
8	**SCFH**	197116	195080	190059	=	$3600 * (1 - Bws) * Vs * A * \frac{Tstd}{Ts} * \frac{Ps}{Pstd}$

				RUN #1	RUN #2	RUN #3
3600	=	Seconds per hour.	=	3600	3600	3600
Bws	=	Water vapor in the gas stream, proportion.	=	0.0845824	0.0880319	0.0838546
A	=	Area of stack in sq ft.	=	7.07	7.07	7.07
Tstd	=	Standard absolute temperature, 528 R.	=	528	528	528
Pstd	=	Standard absolute pressure, 29.92 in. Hg.	=	29.92	29.92	29.92
Ts	=	Temperature of stack gas, + 460 (Rankine).		1842.2083	1877	1909
Ps	=	Absolute stack gas pressure, barometric + static.		28.85	28.85	28.85
Vs	=	Average stack gas velocity, ft / sec.		30.58	30.95	30.53

CALCULATIONS

VOC

		RUN #1	RUN #2	RUN #3		
1.	**Lbs/Hr Propane**	0.00246	0.00196	0.00166	=	0.11443 * SCFH * PPM * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	197116	195080	190059
PPM	=	PPM	=	0.1092398	0.0877224	0.0764071

		RUN #1	RUN #2	RUN #3		
2.	**Lbs/Hr Carbon**	0.00201	0.00160	0.00136	=	0.031182 * SCFH * PPM * 3 * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	197116	195080	190059
PPM	=	PPM	=	0.1092398	0.0877224	0.0764071
3	=	Carbon equivalent correction factor for propane.	=	3	3	3

Appendix #1

Test Data

Custom Stack Analysis, LLC.

Pitot Traverse Data Sheet

Plant :ggitt Aircraft BrakingSystems Corporat   Date 12/7/2020

Location North Afterburner   By Ethan M

Run No.	Pre 1		Post 1		Post 2		Post 3	
Point #	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**
A-1	0.16	1658	0.06	1547	0.08	1651	0.07	1733
2	0.18	1689	0.05	1599	0.10	1692	0.08	1762
3	0.26	1602	0.15	1671	0.11	1669	0.11	1593
4	0.22	1548	0.10	1292	0.09	1545	0.11	1448
5	0.18	1355	0.07	1074	0.07	1295	0.09	1233
6	0.10	1157	0.06	1048	0.06	1198	0.08	1054
B-1	0.04	1680	0.15	1578	0.14	1660	0.11	1634
2	0.05	1720	0.17	1673	0.17	1697	0.22	1726
3	0.04	1612	0.22	1702	0.20	1633	0.22	1630
4	0.07	1413	0.19	1645	0.18	1524	0.16	1349
5	0.07	1235	0.16	1478	0.15	1475	0.14	1150
6	0.06	1118	0.11	1392	0.10	1289	0.11	1032

			Run #1		Run #2		Run #3	
			0.34	1488.21	0.34	1501.13	0.34	1486.33
	0.328	1502	0.343	1475	0.342	1527	0.347	1445
Static:	0.53		0.54		0.55		0.53	

TEST DATA

COMPANY NAME	Meggitt Aircraft Braking Systems Corporation -
ADDRESS	1204 Massillon Road
CITY	Akron
STATE	OH
ZIP	44306
TEST METHODS	Methods 1-4 & 25A
CREW MEMBERS	Brian L. Ethan M
LOCATION	Outlet
SOURCE	North Afterburner
CONTROL	

	RUN #1	RUN #2	RUN #3
DATE	12/7/2020	12/7/2020	12/7/2020
RUN LENGTH (min)	60	60	60
VOLUME (cubic feet)	45.125	44.390	44.529
Y FACTOR	1.0004	1.0004	1.0004
BAROMETRIC	28.76	28.76	28.76
METER TEMP. (R)	538.58	538.58	538.17
STACK TEMP. (R)	1948.21	1961.13	1946.33
AVERAGE ^P	0.34	0.34	0.34
AVERAGE ^H	2.00	2.00	2.00
IMPINGER VOLUME	80.80	85.00	83.00
PITOT COEF.	0.84	0.84	0.84
STATIC PRESSURE	0.54	0.55	0.54
STACK AREA	7.07	7.07	7.07
CARBON DIOXIDE	4.33	4.17	4.17
OXYGEN	12.17	12.33	12.17
NITROGEN	**83.50**	**83.50**	**83.66**

TEST RESULTS

North Afterburner Outlet
12/7/2020

	RUN #1	RUN #2	RUN #3
VM (std)	42.741	42.044	42.209
VW (std)	3.808	4.005	3.911
BWS	0.082	0.087	0.085
MD	29.180	29.160	29.154
MS	28.265	28.190	28.208
VS (ft/sec)	37.306	38.224	38.306
SCFH	227389.53	230153.95	232946.44
ACFM	15821.95	16211.57	16246.01
DCFM	3789.83	3835.90	3882.44

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

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

Bws = Stack moisture content.

Md = Determination of dry molecular weight of stack gas.

Ms = Determination of stack gas molecular weight.
Vs = Average gas stack velocity. (ft/sec.)

ACFM = Actual cubic feet per minute of gas velocity.

DCFM = Dry standard cubic feet per minute of gas velocity.

TEST RESULTS

North Afterburner Outlet

12/7/2020

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (lbs/hr propane)	0.005	0.005	0.005
VOC (lbs/hr carbon)	0.004	0.004	0.004

TEST DATA

North Afterburner Outlet

12/7/2020

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (ppm)	0.20	0.19	0.20

Custom Stack Analysis, L.L.C.
Method 4

Plant: ɘggitt Aircraft Braking Systems Corporati   Date : 12/7/2020

North Afterburner Outlet

		Meter Box	
Barometer (Pg)	28.76	ID:	1
Ambient Temp		Y	1.0004
		ΔH	1.986
		ΔH Set Point :	2.0

	Time	Run Time
Start:	12:14	60
Stop:	13:14	

Run #1

Cold Box #					
9	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	478.000	77	75	41	3
5	481.764	78	76	41	3
10	485.534	79	76	40	3
15	489.282	80	76	40	3
20	493.042	82	77	41	3
25	496.631	81	77	42	3
30	500.430	81	77	43	3
35	504.175	81	78	43	3
40	508.275	81	79	45	3
45	511.755	81	77	44	3
50	515.450	81	77	44	3
55	519.230	81	78	45	3
60	523.125				
Vm	45.125				
	AVG:	79		42.4	3.0

Leak Rate @	5.5	" Hg =	0.000

	Time	Run Time
Start:	13:45	60
Stop:	14:45	

Run #2

Cold Box #					
6	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	526.364	79	77	42	4
5	530.111	79	77	40	4
10	533.812	79	77	39	4
15	537.549	79	77	40	4
20	541.278	80	77	41	4
25	544.972	80	77	42	4
30	548.684	80	77	43	4
35	552.372	80	77	43	4
40	556.058	80	78	45	4
45	559.751	80	78	44	4
50	563.435	80	78	44	4
55	566.535	81	79	46	4
60	570.754				
Vm	44.390				
	AVG:	79		42.4	4.0

Leak Rate @	8.0	" Hg =	0.000

	Time	Run Time
Start:	15:13	60
Stop:	16:13	

Run #3

Cold Box #					
11	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	571.148	78	77	39	4
5	574.893	78	77	1	4
10	578.625	79	77	41	4
15	582.387	79	77	43	4
20	586.065	79	78	44	4
25	589.731	80	77	44	4
30	593.435	80	78	45	4
35	597.210	80	78	45	5
40	600.935	79	77	47	5
45	604.645	79	77	45	5
50	608.345	80	77	46	5
55	612.153	79	76	46	5
60	615.677				
Vm	44.529				
	AVG:	78		40.5	5.0

Leak Rate @	8.5	" Hg =	0.000

Custom Stack Analysis, LLC.

Pitot Traverse Data Sheet

Plant ggitt Aircraft Braking Systems Corpor   Date 12/8/2020

Location South Afterburner   By Ethan M

Run No.	Pre 1		Post 1		Post 2		Post 3	
Point #	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**
A-1	0.06	1743	0.08	1231	0.07	1356	0.07	1595
2	0.10	1703	0.11	1449	0.09	1523	0.10	1633
3	0.08	1538	0.11	1435	0.07	1701	0.08	1523
4	0.07	1144	0.10	1395	0.11	1658	0.07	1176
5	0.10	1236	0.09	1121	0.08	1432	0.06	1062
6	0.08	1087	0.07	1046	0.06	1134	0.07	1087
B-1	0.06	1153	0.06	1467	0.05	1473	0.06	1543
2	0.07	1326	0.08	1692	0.08	1657	0.11	1687
3	0.06	1648	0.10	1581	0.07	1682	0.11	1654
4	0.08	1305	0.07	1411	0.10	1519	0.09	1521
5	0.10	1212	0.09	1275	0.09	1389	0.06	1362
6	0.06	1189	0.07	1168	0.06	1222	0.07	1198

			Run #1		Run #2		Run #3	
			0.28	1382.21	0.28	1417.38	0.28	1449.46
	0.276	1409	0.292	1356	0.277	1479	0.280	1420
Static:	0.53		0.57		0.55		0.53	

TEST DATA

COMPANY NAME	Meggitt Aircraft Braking Systems Corporation -
ADDRESS	1204 Massillon Road
CITY	Akron
STATE	OH
ZIP	44306
TEST METHODS	Methods 1-4 & 25A
CREW MEMBERS	Brian L. Ethan M
LOCATION	Outlet
SOURCE	South Afterburner
CONTROL	

	RUN #1	RUN #2	RUN #3
DATE	12/8/2020	12/8/2020	12/8/2020
RUN LENGTH (min)	60	60	60
VOLUME (cubic feet)	45.212	44.380	44.801
Y FACTOR	1.0004	1.0004	1.0004
BAROMETRIC	28.85	28.85	28.85
METER TEMP. (R)	535.58	535.33	535.21
STACK TEMP. (R)	1842.21	1877.38	1909.46
AVERAGE ^P	0.28	0.28	0.28
AVERAGE ^H	2.00	2.00	2.00
IMPINGER VOLUME	84.70	86.90	83.20
PITOT COEF.	0.84	0.84	0.84
STATIC PRESSURE	0.55	0.56	0.54
STACK AREA	7.07	7.07	7.07
CARBON DIOXIDE	4.83	4.83	4.83
OXYGEN	11.67	11.67	11.50
NITROGEN	**83.50**	**83.50**	**83.67**

TEST RESULTS

South Afterburner Outet
12/8/2020

	RUN #1	RUN #2	RUN #3
VM (std)	43.197	42.422	42.834
VW (std)	3.991	4.095	3.921
BWS	0.085	0.088	0.084
MD	29.240	29.240	29.233
MS	28.289	28.250	28.291
VS (ft/sec)	30.576	30.954	30.534
SCFH	197115.57	195079.74	190058.77
ACFM	12967.65	13127.84	12949.88
DCFM	3285.26	3251.33	3167.65

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

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

Bws = Stack moisture content.

Md = Determination of dry molecular weight of stack gas.

Ms = Determination of stack gas molecular weight.
Vs = Average gas stack velocity. (ft/sec.)

ACFM = Actual cubic feet per minute of gas velocity.

DCFM = Dry standard cubic feet per minute of gas velocity.

TEST RESULTS

South Afterburner Outet

12/8/2020

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (lbs/hr propane)	0.002	0.002	0.002
VOC (lbs/hr carbon)	0.002	0.002	0.001

TEST DATA

South Afterburner Outet

12/8/2020

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (ppm)	0.11	0.09	0.08

Custom Stack Analysis, L.L.C.

Method 4

Plant: eggitt Aircraft Braking Systems Corporati   Date : 12/8/2020

South Afterburner Outet

		Meter Box	
Barometer (Pg)	28.85	ID:	1
Ambient Temp	30	Y	1.0004
		ΔH	1.986
		ΔH Set Point :	2.0

	Time	Run Time
Start:	8:40	60
Stop:	9:40	

Run #1

Cold Box #					
12	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	669.947	77	75	37	4
5	673.645	75	75	38	4
10	677.430	77	77	36	4
15	681.450	77	77	39	4
20	685.020	75	75	39	4
25	688.905	75	76	40	4
30	692.605	76	74	40	4
35	696.250	77	75	43	4
40	700.100	76	74	41	4
45	703.955	77	74	43	4
50	707.740	76	74	42	4
55	711.462	76	74	43	4
60	715.159				
Vm	45.212				
	AVG:	76		40.1	4.0

Leak Rate @	7.5	" Hg =	0.000

	Time	Run Time
Start:	10:40	60
Stop:	11:40	

Run #2

Cold Box #					
11	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	716.015	76	74	39	5
5	719.788	76	74	41	5
10	723.551	76	74	43	5
15	727.279	77	75	42	5
20	731.004	76	74	42	5
25	734.717	76	75	44	5
30	738.405	76	75	45	5
35	742.091	77	74	46	5
40	745.754	77	74	46	5
45	749.512	76	75	47	5
50	753.100	77	74	47	5
55	756.862	76	74	48	5
60	760.395				
Vm	44.380				
	AVG:	75		44.2	5.0

Leak Rate @	10.0	" Hg =	0.000

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

Run #3

Cold Box #					
9	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	761.450	75	74	42	5
5	765.015	76	74	43	5
10	768.815	77	74	43	5
15	772.445	76	74	44	5
20	776.295	77	74	46	5
25	780.225	76	75	46	5
30	783.825	77	74	47	5
35	787.550	76	74	47	5
40	791.281	77	74	46	5
45	795.039	76	75	46	5
50	798.793	76	74	48	5
55	802.514	76	74	46	5
60	806.251				
Vm	44.801				
	AVG:	75		45.3	5.0

Leak Rate @	9.5	" Hg =	0.000

Fyrite

Date: 12-7-20 Technician: Ethan

		1		2		3		Avg
Run #1	Time	12;15	Time	12:45	Time	13:07		
	CO^2	4.5	CO^2	4.0	CO^2	4.5	CO^2	4.33
	O^2	12.0	O^2	12.5	O^2	12.0	O^2	12.17

		1		2		3		Avg
Run #2	Time	13:50	Time	14:17	Time	14:42		
	CO^2	4.0	CO^2	4.0	CO^2	4.5	CO^2	4.17
	O^2	12.5	O^2	12.5	O^2	12.0	O^2	12.33

		1		2		3		Avg
Run #3	Time	15:16	Time	15:38	Time	16:00		
	CO^2	4.5	CO^2	4.0	CO^2	4.0	CO^2	4.17
	O^2	12.0	O^2	12.0	O^2	12.5	O^2	12.17

Fyrite

Date: 12-8-20 **Technician:** Ethan M

		1		2		3		Avg
Run #1	Time	8:41	Time	9:16	Time	9:40		
	CO^2	4.5	CO^2	5.0	CO^2	4.5	CO^2	4.83
	O^2	12.0	O^2	11.5	O^2	11.5	O^2	11.67

		1		2		3		Avg
Run #2	Time	10:44	Time	11:09	Time	11:35		
	CO^2	5.0	CO^2	5.0	CO^2	4.5	CO^2	4.83
	O^2	11.5	O^2	11.5	O^2	12.0	O^2	11.67

		1		2		3		Avg
Run #3	Time	12:17	Time	12:46	Time	13:13		
	CO^2	5.0	CO^2	4.5	CO^2	5.0	CO^2	4:83
	O^2	11.5	O^2	11.5	O^2	11.5	O^2	11.5

Appendix #2

Laboratory Data

Lab Data Sheet For: Meggitt Aircraft Braking Systems Corporation - North Afterburner Outlet By: Ethan M

Moisture Weights

Moisture

RUN # 1			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	9	821.3	652.2	537.2				981.5
	Tare		749.7	651.1	536.5				974.1
	Net		71.6	1.1	0.7	0.0	0.0	0.0	7.4
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

Intial Imp mL =	200.0	Impinger Total =	73.4 grams	Total = 80.8 grams

RUN # 2			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	6	688.3	755.3	508.4				956.0
	Tare		612.6	754.1	507.8				948.5
	Net		75.7	1.2	0.6	0.0	0.0	0.0	7.5
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

Intial Imp mL =	200.0	Impinger Total =	77.5 grams	Total = 85 grams

RUN # 3			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	11	802.2	723.5	535.8				997.8
	Tare		729.0	722.6	535.0				989.7
	Net		73.2	0.9	0.8	0.0	0.0	0.0	8.1
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

Intial Imp mL =	200.0	Impinger Total =	74.9 grams	Total = 83 grams

Lab Data Sheet For: Meggitt Aircraft Braking Systems Corporation - South Afterburner Outet By: Ethan M

Moisture Weights

Moisture

RUN # 1			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	12	697.9	546.8	625.2				993.1
	Tare		622.0	546.1	624.8				985.4
	Net		75.9	0.7	0.4	0.0	0.0	0.0	7.7
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

Intial Imp mL = 200.0

Impinger Total = 77 grams Total = 84.7 grams

RUN # 2			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	11	806.6	723.2	535.6				970.4
	Tare		729.2	722.3	535.1				962.3
	Net		77.4	0.9	0.5	0.0	0.0	0.0	8.1
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

Intial Imp mL = 200.0

Impinger Total = 78.8 grams Total = 86.9 grams

RUN # 3			grams	grams	grams	grams	grams	grams	grams
		Box ID	1	2	3	4	5	6	Drierite
	Gross	9	824.8	652.0	536.9				979.0
	Tare		750.0	651.4	536.6				971.5
	Net		74.8	0.6	0.3	0.0	0.0	0.0	7.5
		Reagent	H2O	H2O					
		mLs	100.0	100.0					

Intial Imp mL = 200.0

Impinger Total = 75.7 grams Total = 83.2 grams

Appendix #3

Calibration Data

B21856!

SCOTT GROSS GASES & EQUIPMENT | INDUSTRIAL MEDICAL SPECIALTY

Scott-Gross Co., Inc.
664 Magnolia Ave.
Lexington, KY 40505
(859)231-0225 (888)431-5882

Certificate of Analysis

Certification Date:	12 January 2017
Certificate Number:	0097B-02T5-C01
Mixture Grade:	EPA Protocol Standard Gas Mixture
Lot Number:	0097B-02T5
Expiration Date:	12 January 2025
Cylinder Number:	EB0049442
Part Number:	T5L EPA2RATAP-14

Mixture Components	Requested Composition	Certified Composition	U (Expanded Uncertainty, k=2)
Propane	43 ppm	47.05 PPM	+/- 0.12 PPM (absolute)
Air	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 R12017
Procedure Used:	EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012
Analytical Method:	C3H8: FTIR
Multipoint Calibration Date:	Propane: 12/29/2016

Reference Standards								
Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CAL017809	83-J-12	8/17/2017	SRM	C3H8	Air	48.83 PPM	0.225	1667b

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

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

ACCREDITED
A2LA Certificate No. 1750.01 Calibration

Cert. No.: 3415-11278230

Traceable® Certificate of Calibration for Digital Calipers

Customer :Custom Stack Analysis, LLC ,14614 Cenfield Street NE ,Alliance ,OH-44601 ,U.S.A.

Instrument Identification:

Model: 3415, S/N: 101856179 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Set	99146223	17 Dec 2020	1000449283

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 12 May 2020 Cal Due Date: 12 May 2021

Test Conditions: 55.18%RH 22.45°C 1018mBar

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	0.101	0.0003	3.33:1
in	N.A.	N.A.		2.0000	2.0005	Y	1.998	2.002	0.00033	>4:1
in	N.A.	N.A.		4.0000	4.0005	Y	3.996	4.004	0.0004	>4:1
in	N.A.	N.A.		6.0000	6.0005	Y	5.994	6.006	0.0005	>4:1
in depth	N.A.	N.A.		2.0000	2.000	Y	1.998	2.002	0.00033	>4:1
in inside	N.A.	N.A.		1.0000	1.0005	Y	0.999	1.001	0.00031	3.23:1
in step	N.A.	N.A.		2.0000	1.9985	Y	1.998	2.002	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

Nicol Rodriguez, Quality Manager

Marisa Elms

Marisa Elms, Technical Manager

Note :

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.

Issue Date : 12 May 2020

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.traceable.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 9001:2015 Quality Certified by DNV GL, Certificate No. CERT-01805-2006-AQ-HOU-ANAB.
International Laboratory Accreditation Cooperation - Multilateral Recognition Arrangement (ILAC-MRA).

B219 25 B

Scott-Gross Co., Inc.
664 Magnolia Ave.
Lexington, KY 40505
(859)231-0225 (888)431-5882

GASES & EQUIPMENT | INDUSTRIAL MEDICAL SPECIALTY

Cylinder Number:	CC444989	Certification Date:	28 April 2017
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	29 April 2025
Certificate Number:	1147B-02T5-C01	Lot Number:	1147B-02T5
Cylinder Pressure:	2015 PSIG	Customer Part Number:	T5L EPA2RATAP-19

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Propane	24.7 PPM	+/- 0.2 PPM (absolute)	4/28/2017
Air	Balance		

Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Propane	FTIR	Thermo	Antaris IGS	AWZ1200117	4/17/2017

Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CC459851	2186A-01T5	11/10/2024	GMIS	C3H8	N2	247.7 PPM	0.411	2644a

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

Analyst: Allison Hanover

Reviewer: Jeff Lynn

Production Laboratory:
Tier 5 Labs, LLC
5353 W. Southern Ave.
Indianapolis, IN 46241
PGVP Vendor ID R12017

B21925B

Scott-Gross Co., Inc.
664 Magnolia Ave.
Lexington, KY 40505
(859)231-0225 (888)431-5882

Cylinder Number:	CC444989	Certification Date:	28 April 2017
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	29 April 2025
Certificate Number:	1147B-02T5-C01	Lot Number:	1147B-02T5
Cylinder Pressure:	2015 PSIG	Customer Part Number:	T5L EPA2RATAP-19

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
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Air	Balance		

Analytical Instrumentation

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Analyst: Allison Hanover

Reviewer: Jeff Lynn

Production Laboratory:
Tier 5 Labs, LLC
5353 W. Southern Ave.
Indianapolis, IN 46241
PGVP Vendor ID R12017

LIQUID TECHNOLOGY CORPORATION
"INDUSTRY LEADER IN SPECIALTY GASES"

Certificate of Analysis

- EPA PROTOCOL GAS -

B21477B

Customer	IE Monitoring Instruments (Worthington, OH)
Date	October 06, 2014
Delivery Receipt	DR-53322
Gas Standard	13.8 ppm Propane/Air - EPA PROTOCOL
Final Analysis Date	October 06, 2014
Expiration Date	October 07, 2022

Component	Propane
Balance Gas	Air

Analytical Data:
EPA Protocol, Section No. 2.2, Procedure G-1.

DO NOT USE BELOW 100 psig

Reported Concentrations

Propane: 13.7 ppm +/- 0.1 ppm

Air: Balance

Reference Standards:		GMIS Traceability
SRM/GMIS:	GMIS	SRM-1667b
Cylinder Number:	CC-165367	XF-003853B
Concentration:	20.21 ppm Propane (+/- 0.09 ppm)	49.54 ppm Propane (+/- 0.26 ppm)
Expiration Date:	12/02/18	07/12/15
NIST Sample Number:	NA	83-I-14

Certification Instrumentation

Component:	Propane
Make/Model:	Agilent 7890A
Serial Number:	CN10736166
Principal of Measurement:	GC-FID
Last Calibration:	September 28, 2014

Cylinder Data

Cylinder Serial Number:	EB-0051537	Cylinder Outlet:	CGA 590
Cylinder Volume:	138 Cubic Feet	Cylinder Pressure:	1950 psig, 70°F

Analytical Uncertainty and NIST Traceability are in compliance with EPA-600/R-12/531.

Certified by: Cole Dylewski

Cole Dylewski

PGVP Vendor ID: E12014

"UNMATCHED EXCELLENCE"

2048 APEX COURT, APOPKA, FLORIDA 32703 ~ PHONE (407)-292-2990 FAX (407)-292-3313
WWW.LIQUIDTECHCORP.COM
APOPKA, FL • HOUSTON, TX

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

ACCREDITED
A2LA Certificate No. 1750.01 Calibration

Cert. No.: 1870-11290275

Traceable® Certificate of Calibration for Digital Barometer Module

Customer :Custom Stack Analysis, LLC ,14614 Cenfield Street 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	10 Oct 2020	4000-10785768
Chilled Mirror Hygrometer	31874/1H2048MR	22 Jan 2021	18004
Digital Barometer	D4540001	01 Nov 2020	1000447551

Certificate Information:

Technician: 57 Procedure: CAL-31 Cal Date: 17 May 2020 Cal Due Date: 17 May 2021

Test Conditions: 57.18%RH 22.6°C 1012mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
%RH	N.A.	N.A.		48.33	32	N	43	53	0.74	>4:1
°C	N.A.	N.A.		24.29	24	Y	23.29	25.29	0.05	>4:1
mb/hPa	N.A.	N.A.		806.00	812	Y	795	817	0.62	>4:1
mb/hPa	N.A.	N.A.		909.98	914	Y	899	921	0.62	>4:1
mb/hPa	N.A.	N.A.		1018.72	1022	Y	1008	1030	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.

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Nicol Rodriguez

Nicol Rodriguez, Quality Manager

Marisa Elms

Marisa Elms, Technical Manager

Note :

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.

Issue Date : 17 May 2020

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

ilac-MRA ACCREDITED A2LA Certificate No. 1750.01 Calibration

Cert. No.: 3415-10347847

Traceable® Certificate of Calibration for Digital Calipers

Manufactured for and distributed by : Control Company 12554 Galveston Rd B230, Webster, TX 77598

Instrument Identification:

Model: 3415, S/N: 192125551 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Block Set	99146223	06 Dec 2019	1000434942

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 23 Apr 2019 Cal Due Date: 23 Apr 2021

Test Conditions: 57.01%RH 23.96°C 1018mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
in	N.A.	N.A.		0.1000	0.0995	Y	0.099	0.101	0.0003	3.33:1
in	N.A.	N.A.		2.0000	1.9985	Y	1.998	2.002	0.00033	>4:1
in	N.A.	N.A.		4.0000	3.998	Y	3.996	4.004	0.0004	>4:1
in	N.A.	N.A.		6.0000	5.997	Y	5.994	6.006	0.0005	>4:1
in depth	N.A.	N.A.		2.0000	1.998	Y	1.998	2.002	0.00033	>4:1
in inside	N.A.	N.A.		1.0000	0.9995	Y	0.999	1.001	0.00031	3.23:1
in step	N.A.	N.A.		2.0000	2.000	Y	1.998	2.002	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.

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Nicol Rodriguez

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Note :

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.

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-1423
NK00455
7899
08572
784192
3597456Y
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 Percent oxygen analyzer
- K Specific carbon dioxide analyzer
- L Binary gas mixture analyzer

Lot No: 118K41520

Fill Date: 4/28/2015

IMPORTANT

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™

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

Judy Zadravec - Analyst

02/13/2017
Date

Judith Zadravec

Judy Zadravec - QA Approval

02/13/2017
Date

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

Filename: C:\Customer Project Files\APPENDIX\Cal Sheets\Meter Boxes\[Meter Box 1 5-7-20.xls]A
Revised: 7/25/95 Version: 2.2

CONVERSION FACTORS

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

Model #: 1
Serial #:

Date: ------------------------> 5/7/2020
Barometric Pressure: ---------> 28.44 (in. Hg)
Theoretical Critical Vacuum:---> 13.42 (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-

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)	Ambient Temperature Final (deg F)	Ambient Temperature Average (deg F)	Average Temperatures DGM Outlet (deg R)	Average Temperatures DGM Overall (deg R)	Average Temperatures Ambient Temp (deg R)
0.5	10	311.555	315.488	111.38256	62	61	65	62	12	0.30390681	15	64	64	64	521.5	522.5	524
0.93	10	315.488	320.81	150.71904	67	63	66	63	16	0.41080925	15	64	65	64.5	523	524.75	524.5
1.4	10	320.81	327.085	177.708	66	64	68	65	19	0.48449779	15	65	65	65	524.5	525.75	525
2.1	5	327.085	331.027	111.63744	68	65	69	66	23	0.60910402	15	66	66	66	525.5	527	526
3.8	5	331.027	336.224	147.17904	68	66	70	67	31	0.80595932	15	66	66	66	526.5	527.75	526

** RESULTS **

--- DRY GAS METER --- VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	--- ORIFICE --- VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	-- DRY GAS METER -- CALIBRATION FACTOR Y Value (number)	Y Variation (number)	--- ORIFICE --- CALIBRATION FACTOR dH@ Value (in H2O)	dH@ Value (mm H2O)	dH@ Variation (in H2O)
3.7811759	107.08	3.77576	106.92952	3.94373	0.99857	-0.00186	1.89856015	48.22	-0.08712
5.1002748	144.44	5.1014902	144.4742	5.33353	1.00024	-0.00019	1.92887722	48.99	-0.0568
6.0094088	170.19	6.0136998	170.30798	6.29322	1.00071	0.00029	2.08361031	52.92	0.09793
3.7729909	106.85	3.7765756	106.95262	3.95964	1.00095	0.00052	1.97745971	50.23	-0.00822
4.9888287	141.28	4.9971208	141.51846	5.23935	1.00166	0.00124	2.03987228	51.81	0.0542

Average Y -------> 1.00043 1.98567594 50.44 <------ 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: ______ Brian Lemasters Date:_____ 5/7/2020

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

595572

FOR Custom Stack 593P

14614 Cenfield St Alliance Ohio

P.O. ______ DATE 5/12/20

❑ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
❑ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
❑ 1424 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
❑ 490 S. Mapleton St. 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
❑ 1060 National Parkway MANSFIELD, OH 44906 419-529-3006
❑ 526 31st St. PARKERSBURG, WV 26101 304-428-1792
❑ 2351 Jaclyn Court SOUTH BEND, IN 46614
❑ 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. 2019-0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: MP. (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	Navigator	1119252404	Lab	2,100g	0.1g	HI 2000 LO Ø	6months	YES	YES ✓ NO	11/2020

WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1 200	200.0	Ø		NO	200.0	
2 500	500.0	Ø		NO	500.0	
3 1000	1000.0	Ø		NO	1000.0	
4						
5						
6						

PARTS USED

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

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584495

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!! DATE 5/12/20

❑ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
❑ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
❑ 1424 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
❑ 490 S. Mapleton St. 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
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❑ 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. 2019. 0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: MC 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 - g	6 Months	YES	YES ✓	11/2020
	-	-	-				LO - g			NO	

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10.0	ø	+/-.2%	YES / NO	10.0	CALIBRATED
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	999.7	-.3	+/-.2%	YES / NO	1000.0	
6	2kg	1999.4	-.6	+/- 2%	YES / NO	2000.0	

PARTS USED

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

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584497

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!!

DATE 5/12/20

❑ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
❑ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
❑ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
❑ 490 S. Mapleton St. **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
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❑ 5525 Galaeo Court **INDIANAPOLIS**, IN 46241 317-548-7821
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❑ 1080 National Parkway **MANSFIELD**, OH 44906 419-529-3006
❑ 526 31st St. **PARKERSBURG**, WV 26101 304-428-1792
❑ 2351 Jaclyn Court **SOUTH BEND**, IN 46614
❑ 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. 2019-0182

WEIGHT S/N'S Colom kit #3

SCALE TECHNICIAN: M.P.

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 --	6 Months	YES	YES ✓	11/2020
	-	-	-				LO 500 --			NO	

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	500	500.0	Ø	+/-.2%	YES / NO	500.0	
2	1000	1000.0	Ø	+/-.2%	YES / NO	1000.0	
3	1500	1500.0	Ø	+/-.2%	YES / NO	1500.0	
4	2000	2000.0	Ø	+/-.2%	YES / NO	2000.0	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584496

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

P.O. CODI!!!! DATE 5/12/20

❑ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
❑ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
☒ 424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
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❑ 7550 Jacks Lane **CLAYTON**, OH 45315 937-832-2040
❑ 3306 Cavalier Dr. **FORT WAYNE**, IN 46808 260-496-8469
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❑ 1080 National Parkway **MANSFIELD**, OH 44906 419-529-3006
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❑ 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. 2019-0182

WEIGHT S/N'S Gram kit #3

PARTS USED

SCALE TECHNICIAN: MP SIGNATURE

ACCEPTED BY: [signature] SIGNATURE

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	6 Months	YES	YES ✓	11/2020
	-	-	-				LO - g			NO	

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10000.9	+0.9	+/-.2%	YES / NO	10000.0	CALIBRATED
2	20g	20001.3	+1.3	+/-.2%	YES / NO	20000.0	
3	50g	50004.5	+4.5	+/-.2%	YES / NO	50000.0	
4	100g	100010.8	+10.8	+/-.2%	YES / NO	100000.0	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584489

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

❏ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
❏ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
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❏ 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. 2019-018t

WEIGHT S/N'S 6gram kit # 3

SCALE TECHNICIAN: M.L.

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
-	A&D	HR-200	12323498	LAB	210 g	0.0001 g	HI 200 g / LO 10 g	6 Months	YES	YES ✓ / NO	11/2020

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	9.9995	-.0005		YES / NO	10.0000	CALIBRATED
2	20g	19.9996	-.0004		YES / NO	20.0000	
3	50g	49.9997	-.0003		YES / NO	50.0000	
4	100g	99.9980	-.0020		YES / NO	100.0000	
5	200g	199.9970	-.0030		YES / NO	200.0000	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584490

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

P.O. COD!!!!! DATE 5/12/20

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☐ 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. 2019 - 0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: M.T.
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
-	US SOLID	NONE	NONE	TRAVELLER	500 g	0.001 g	HI 200 g / LO 10 g	6 Months	YES	YES ✓ / NO	11/2020

WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1 10g	10.000	0		YES / NO	10.000	
2 20g	20.000	0		YES / NO	20.000	
3 50g	50.000	0		YES / NO	50.000	
4 100g	100.000	0		YES / NO	100.000	
5 200g	200.000	0		YES / NO	200.000	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584488

Jim Gray
330-821-2?

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

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STATE OF Ohio TRACEABLE TO NIST CALIBRATION LAB TEST REPORT NO. 2019-0187

WEIGHT S/N'S Gram Kit #3

SCALE TECHNICIAN: MT 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
-	A&D	GF1200	14632225	LAB	1210 g	0.01 g	HI 1000 g LO 200 g	6 Months	YES	YES ✓ NO	11/2020

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	200g	200.00	0		YES / NO	200.00	
2	500g	500.00	0		YES / NO	500.00	
3	1000g	1000.00	0		YES / NO	1000.00	
4	g				YES / NO		
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.

MONITORING INSTRUMENTS

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

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Temperature Calibration Certificate

Instrument: H-B Thermometer
Serial #: 4A6108

Date: 4/6/2020
Technician: Sam Shults

Lab Standard	Thermometer Mark
169.9	170.0
190.0	190.0
204.8	205.0
214.6	215.0

Accuracy = 1 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 9/6/2020
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 #: 4B5200

Date: 4/6/2020
Technician: Sam Shults

Lab Standard	Thermometer Mark
30.1	30.0
50.1	50.0
70.0	70.0
88.0	88.0

Accuracy = 1 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 9/6/2020
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 12/23/19 BY ANDREW CANNON Pb 28.76

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	32	212	212
O-2	32	32	212	212
O-3	32	31	212	211
O-4	32	31	212	211
O-5	32	32	212	212
O-6	32	31	212	211
O-7	32	31	212	211
O-8	32	32	212	212
O-9	32	32	212	212
O-10	32	32	212	212
O-11	32	31	212	211
O-12	32	31	212	211
STACK THERMOCOUPLES				
2S-1	32	31	212	211
2S-2	32	31	212	211
2S-3	32	32	212	212
3S-1	32	32	212	212
3S-2	32	31	212	211
3S-3	32	31	212	211
3S-4	32	31	212	211
3S-5	32	31	212	211
4S-1	32	32	212	212
4S-2	32	31	212	211
4S-3	32	31	212	211
4S-4	32	33	212	213
4S-5	32	31	212	211
4S-6	32	32	212	212
5S-1	32	32	212	212
5S-2	32	32	212	212
5S-3	32	33	212	213
6S-1	32	31	212	211
6S-2	32	31	212	211
6S-3	32	31	212	211
6S-4	32	32	212	212
8S-1	32	32	212	212
8S-2	32	32	212	212
10S-1	32	32	212	212
10S-2	32	31	212	211
12S-1	32	31	212	211

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 12/23/19 BY ANDREW CANNON Pb 28.76

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	31	212	211
C-2	32	31	212	211
C-3	32	31	212	211
C-4	32	31	212	211
C-5	32	31	212	211
C-6	32	32	212	212
C-7	32	31	212	211
C-8	32	31	212	211
C-9	32	31	212	211
PROBE THERMOCOUPLES				
2P-1	32	31	212	211
2P-2	32	31	212	211
2P-3	32	31	212	211
3P-1	32	32	212	212
3P-2	32	31	212	211
3P-3	32	31	212	211
3P-4	32	32	212	212
3P-5	32	33	212	213
4P-1	32	32	212	212
4P-2	32	32	212	212
4P-3	32	32	212	212
40-4	32	32	212	212
4P-5	32	32	212	212
4P-6	32	32	212	212
5P-1	32	32	212	212
5P-2	32	31	212	211
5P-3	32	31	212	211
6P-1	32	31	212	211
6P-2	32	31	212	211
6P-3	32	31	212	211
6P-4	32	31	212	211
8P-1	32	32	212	212
8P-2	32	32	212	212
10P-1	32	33	212	213
10P-2	32	32	212	212
12P-1	32	32	212	212

Client: heggitt

Pitot Tube Inspection

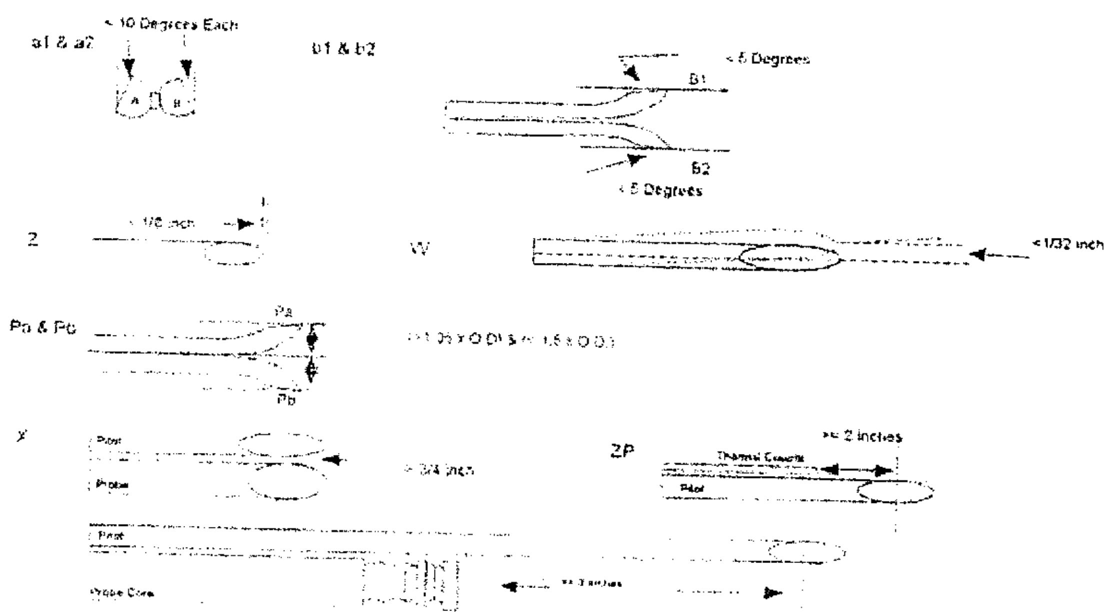
Date: 12-6-20

Probe/Pitot Number	3p-2	A (Pa + Pb)	.957
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)	.471
a_2 (-10° < a_2 < +10°)	0	P_b (1.05 D_t < P_b < 1.5 D_t)	.486
b_1 (-5° < b_1 < -5°)	0	Pa = Pb ± 0.063"	.015
b_2 (-5° < b_2 < +5°)	0		

Probe Minimum Interferences

Y (>= 3.0")		D_n	
X (> .75")		X /D_n (>= 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)



THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 12/23/19 BY ANDREW CANNON Pb 28.76

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	31	212	211
1M-2	32	31	212	211
2M-1	32	32	212	212
2M-2	32	32	212	212
3M-1	32	32	212	212
3M-2	32	32	212	212
4M-1	32	33	212	213
4M-2	32	33	212	213
5M-1	32	32	212	212
5M-2	32	32	212	212
6M-1	32	32	212	212
6M-2	32	31	212	211
7M-1	32	31	212	211
7M-2	32	31	212	211
8M-1	32	31	212	211
8M-2	32	31	212	211
9M-1	32	31	212	211
9M-2	32	31	212	211
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	33	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.

Appendix #4

Monitoring Data

Meggitt Aircraft Braking Systems Crporation
North Afterburner Outlet

VOC	Conc.
High	47.05
Mid	24.7
Low	13.7

VOC	Time Stamp	
47.21	12/7/2020 11:46:59 AM	High
47.27	12/7/2020 11:48:00 AM	
46.81	12/7/2020 11:49:00 AM	
47.04	12/7/2020 11:50:01 AM	
46.75	12/7/2020 11:51:02 AM	
1.44	12/7/2020 11:52:02 AM	
0.15	12/7/2020 11:53:03 AM	Zero
0.15	12/7/2020 11:54:03 AM	
0.15	12/7/2020 11:55:04 AM	
0.15	12/7/2020 11:56:05 AM	
0.15	12/7/2020 11:57:05 AM	
8.87	12/7/2020 11:58:06 AM	
13.38	12/7/2020 11:59:06 AM	
13.43	12/7/2020 12:00:07 PM	Low
13.55	12/7/2020 12:01:08 PM	
13.44	12/7/2020 12:02:08 PM	
13.62	12/7/2020 12:03:09 PM	
13.49	12/7/2020 12:04:09 PM	
19.58	12/7/2020 12:05:10 PM	
24.60	12/7/2020 12:06:11 PM	
24.76	12/7/2020 12:07:11 PM	Bias
24.77	12/7/2020 12:08:12 PM	
24.20	12/7/2020 12:09:12 PM	
23.85	12/7/2020 12:10:13 PM	
23.63	12/7/2020 12:11:14 PM	
1.57	12/7/2020 12:12:14 PM	
0.16	12/7/2020 12:13:15 PM	
0.15	12/7/2020 12:14:15 PM	Start Run 1
0.15	12/7/2020 12:15:16 PM	
0.18	12/7/2020 12:16:11PM	
0.15	12/7/2020 12:17:12 PM	
0.15	12/7/2020 12:18:12 PM	
0.15	12/7/2020 12:19:13 PM	
0.23	12/7/2020 12:20:13 PM	
0.19	12/7/2020 12:21:14 PM	
0.15	12/7/2020 12:22:14 PM	
0.15	12/7/2020 12:23:15 PM	
0.15	12/7/2020 12:24:16 PM	
0.40	12/7/2020 12:25:16 PM	
0.25	12/7/2020 12:26:17 PM	
0.17	12/7/2020 12:27:18 PM	
0.15	12/7/2020 12:28:18 PM	
0.15	12/7/2020 12:29:19 PM	
0.15	12/7/2020 12:30:19 PM	
0.15	12/7/2020 12:31:20 PM	
0.15	12/7/2020 12:32:20 PM	
0.15	12/7/2020 12:33:21 PM	
0.21	12/7/2020 12:34:22 PM	
0.15	12/7/2020 12:35:22 PM	
0.15	12/7/2020 12:36:23 PM	
0.15	12/7/2020 12:37:24 PM	
0.15	12/7/2020 12:38:24 PM	

0.24	12/7/2020 12:39:25 PM	
0.38	12/7/2020 12:40:25 PM	
0.16	12/7/2020 12:41:26 PM	
0.26	12/7/2020 12:42:26 PM	
0.15	12/7/2020 12:43:27 PM	
0.15	12/7/2020 12:44:28 PM	
0.18	12/7/2020 12:45:28 PM	
0.16	12/7/2020 12:46:29 PM	
0.15	12/7/2020 12:47:29 PM	
0.15	12/7/2020 12:48:30 PM	
0.15	12/7/2020 12:49:31 PM	
0.15	12/7/2020 12:50:31 PM	
0.24	12/7/2020 12:51:32 PM	
0.17	12/7/2020 12:52:32 PM	
0.35	12/7/2020 12:53:33 PM	
0.57	12/7/2020 12:54:34 PM	
0.15	12/7/2020 12:55:34 PM	
0.15	12/7/2020 12:56:35 PM	
0.15	12/7/2020 12:57:36 PM	
0.15	12/7/2020 12:58:36 PM	
0.15	12/7/2020 12:59:37 PM	
0.15	12/7/2020 1:00:37 PM	
0.15	12/7/2020 1:01:38 PM	
0.15	12/7/2020 1:02:38 PM	
0.15	12/7/2020 1:03:39 PM	
0.22	12/7/2020 1:04:40 PM	
0.15	12/7/2020 1:05:40 PM	
0.15	12/7/2020 1:06:41 PM	
0.16	12/7/2020 1:07:42 PM	
0.15	12/7/2020 1:08:42 PM	
0.15	12/7/2020 1:09:43 PM	
0.15	12/7/2020 1:10:43 PM	
0.15	12/7/2020 1:11:44 PM	
0.20	12/7/2020 1:12:45 PM	
0.15	12/7/2020 1:13:45 PM	
0.15	12/7/2020 1:14:46 PM	Stop Run 1
0.18		Avg
0.15	12/7/2020 1:15:46 PM	
0.15	12/7/2020 1:16:47 PM	
0.15	12/7/2020 1:17:48 PM	
0.15	12/7/2020 1:18:48 PM	
3.82	12/7/2020 1:19:49 PM	
25.08	12/7/2020 1:20:49 PM	
25.07	12/7/2020 1:21:50 PM	Bias
24.90	12/7/2020 1:22:51 PM	
25.10	12/7/2020 1:23:51 PM	
25.06	12/7/2020 1:24:52 PM	
25.05	12/7/2020 1:25:52 PM	
25.12	12/7/2020 1:26:53 PM	
22.29	12/7/2020 1:27:54 PM	
0.16	12/7/2020 1:28:54 PM	
0.15	12/7/2020 1:29:55 PM	Zero
0.15	12/7/2020 1:30:55 PM	
0.15	12/7/2020 1:31:56 PM	
0.15	12/7/2020 1:32:57 PM	
0.15	12/7/2020 1:33:57 PM	
0.19	12/7/2020 1:34:58 PM	
0.15	12/7/2020 1:35:58 PM	
0.15	12/7/2020 1:36:59 PM	
0.17	12/7/2020 1:38:00 PM	
0.15	12/7/2020 1:39:00 PM	
0.28	12/7/2020 1:40:01 PM	

0.28	12/7/2020 1:40:01 PM	
0.20	12/7/2020 1:41:02 PM	
0.15	12/7/2020 1:42:02 PM	
0.15	12/7/2020 1:43:03 PM	
0.15	12/7/2020 1:44:03 PM	
0.18	12/7/2020 1:45:04 PM	Start Run 2
0.23	12/7/2020 1:46:04 PM	
0.16	12/7/2020 1:47:05 PM	
0.15	12/7/2020 1:48:06 PM	
0.15	12/7/2020 1:49:06 PM	
0.15	12/7/2020 1:50:07 PM	
0.15	12/7/2020 1:51:08 PM	
0.15	12/7/2020 1:52:08 PM	
0.25	12/7/2020 1:53:09 PM	
0.18	12/7/2020 1:54:09 PM	
0.15	12/7/2020 1:55:10 PM	
0.15	12/7/2020 1:56:11 PM	
0.15	12/7/2020 1:57:11 PM	
0.15	12/7/2020 1:58:12 PM	
0.15	12/7/2020 1:59:12 PM	
0.15	12/7/2020 2:00:13 PM	
0.15	12/7/2020 2:01:14 PM	
0.15	12/7/2020 2:02:14 PM	
0.15	12/7/2020 2:03:15 PM	
0.15	12/7/2020 2:04:15 PM	
0.15	12/7/2020 2:05:16 PM	
0.17	12/7/2020 2:06:17 PM	
0.31	12/7/2020 2:07:17 PM	
0.18	12/7/2020 2:08:18 PM	
0.15	12/7/2020 2:09:18 PM	
0.15	12/7/2020 2:10:19 PM	
0.15	12/7/2020 2:11:20 PM	
0.15	12/7/2020 2:12:20 PM	
0.15	12/7/2020 2:13:21 PM	
0.15	12/7/2020 2:14:21 PM	
0.15	12/7/2020 2:15:22 PM	
0.15	12/7/2020 2:16:23 PM	
0.21	12/7/2020 2:17:23 PM	
0.17	12/7/2020 2:18:24 PM	
0.15	12/7/2020 2:19:25 PM	
0.15	12/7/2020 2:20:25 PM	
0.15	12/7/2020 2:21:26 PM	
0.15	12/7/2020 2:22:27 PM	
0.15	12/7/2020 2:23:27 PM	
0.15	12/7/2020 2:24:28 PM	
0.15	12/7/2020 2:25:29 PM	
0.27	12/7/2020 2:26:30 PM	
0.34	12/7/2020 2:27:31 PM	
0.16	12/7/2020 2:28:32 PM	
0.15	12/7/2020 2:29:36 PM	
0.15	12/7/2020 2:30:37 PM	
0.15	12/7/2020 2:31:38 PM	
0.15	12/7/2020 2:32:42 PM	
0.15	12/7/2020 2:33:43 PM	
0.18	12/7/2020 2:34:46 PM	
0.15	12/7/2020 2:35:47 PM	
0.15	12/7/2020 2:36:50 PM	
0.15	12/7/2020 2:37:51 PM	
0.15	12/7/2020 2:28:52 PM	
0.15	12/7/2020 2:39:53 PM	
0.24	12/7/2020 2:40:55 PM	
0.18	12/7/2020 2:41:56 PM	

0.15	12/7/2020 2:42:58 PM	
0.15	12/7/2020 2:43:59 PM	
0.15	12/7/2020 2:44:01 PM	
0.15	12/7/2020 2:45:02 PM	Stop Run 2
0.17		Avg
0.15	12/7/2020 2:46:03 PM	
0.15	12/7/2020 2:47:04 PM	
0.26	12/7/2020 2:48:05 PM	
0.23	12/7/2020 2:49:06 PM	
0.19	12/7/2020 2:50:07 PM	
0.15	12/7/2020 2:51:08 PM	
0.15	12/7/2020 2:52:08 PM	
0.15	12/7/2020 2:53:09 PM	
0.15	12/7/2020 2:54:10 PM	
0.40	12/7/2020 2:55:10 PM	
16.34	12/7/2020 2:56:11 PM	
23.90	12/7/2020 2:57:12 PM	
24.47	12/7/2020 2:58:12 PM	Bias
24.70	12/7/2020 2:59:13 PM	
24.62	12/7/2020 3:00:13 PM	
24.46	12/7/2020 3:01:14 PM	
24.44	12/7/2020 3:02:15 PM	
24.69	12/7/2020 3:03:15 PM	
21.88	12/7/2020 3:04:16 PM	
0.15	12/7/2020 3:05:16 PM	
0.15	12/7/2020 3:06:17 PM	Zero
0.15	12/7/2020 3:07:18 PM	
0.15	12/7/2020 3:08:18 PM	
0.15	12/7/2020 3:09:19 PM	
0.15	12/7/2020 3:10:19 PM	
0.22	12/7/2020 3:11:20 PM	
0.15	12/7/2020 3:12:21 PM	
0.15	12/7/2020 3:13:21 PM	Start Run 3
0.15	12/7/2020 3:14:22 PM	
0.25	12/7/2020 3:15:22 PM	
0.36	12/7/2020 3:16:23 PM	
0.24	12/7/2020 3:17:24 PM	
0.15	12/7/2020 3:18:24 PM	
0.15	12/7/2020 3:19:25 PM	
0.15	12/7/2020 3:20:26 PM	
0.15	12/7/2020 3:21:26 PM	
0.15	12/7/2020 3:22:27 PM	
0.15	12/7/2020 3:23:27 PM	
0.15	12/7/2020 3:24:28 PM	
0.15	12/7/2020 3:25:29 PM	
0.15	12/7/2020 3:26:29 PM	
0.15	12/7/2020 3:27:30 PM	
0.15	12/7/2020 3:28:30 PM	
0.15	12/7/2020 3:29:31 PM	
0.15	12/7/2020 3:30:31 PM	
0.15	12/7/2020 3:31:32 PM	
0.15	12/7/2020 3:32:33 PM	
0.20	12/7/2020 3:33:33 PM	
0.37	12/7/2020 3:34:34 PM	
0.21	12/7/2020 3:35:35 PM	
0.15	12/7/2020 3:36:35 PM	
0.15	12/7/2020 3:37:36 PM	
0.15	12/7/2020 3:38:36 PM	
0.15	12/7/2020 3:39:37 PM	
0.15	12/7/2020 3:40:38 PM	
0.15	12/7/2020 3:41:38 PM	

0.15	12/7/2020 3:41:38 PM	
0.15	12/7/2020 3:42:39 PM	
0.15	12/7/2020 3:43:39 PM	
0.15	12/7/2020 3:44:40 PM	
0.15	12/7/2020 3:45:41 PM	
0.15	12/7/2020 3:46:41 PM	
0.24	12/7/2020 3:47:42 PM	
0.46	12/7/2020 3:48:42 PM	
0.31	12/7/2020 3:49:43 PM	
0.18	12/7/2020 3:50:44 PM	
0.15	12/7/2020 3:51:44 PM	
0.15	12/7/2020 3:52:45 PM	
0.15	12/7/2020 3:53:45 PM	
0.15	12/7/2020 3:54:46 PM	
0.17	12/7/2020 3:55:47 PM	
0.15	12/7/2020 3:56:47 PM	
0.15	12/7/2020 3:57:48 PM	
0.15	12/7/2020 3:58:48 PM	
0.15	12/7/2020 3:59:49 PM	
0.15	12/7/2020 4:00:50 PM	
0.15	12/7/2020 4:01:50 PM	
0.15	12/7/2020 4:02:51 PM	
0.23	12/7/2020 4:03:51 PM	
0.29	12/7/2020 4:04:52 PM	
0.20	12/7/2020 4:05:53 PM	
0.15	12/7/2020 4:06:53 PM	
0.15	12/7/2020 4:07:54 PM	
0.15	12/7/2020 4:08:54 PM	
0.15	12/7/2020 4:09:55 PM	
0.16	12/7/2020 4:10:56 PM	
0.15	12/7/2020 4:11:56 PM	
0.15	12/7/2020 4:12:57 PM	
0.17	12/7/2020 4:13:57 PM	Stop Run 3
0.18		Avg
0.15	12/7/2020 4:14:58 PM	
0.15	12/7/2020 4:15:59 PM	
0.15	12/7/2020 4:16:59 PM	
0.27	12/7/2020 4:17:01 PM	
0.19	12/7/2020 4:18:02 PM	
0.15	12/7/2020 4:19:02 PM	
0.15	12/7/2020 4:20:03 PM	
0.15	12/7/2020 4:21:03 PM	
0.15	12/7/2020 4:22:04 PM	
1.05	12/7/2020 4:23:04 PM	
22.63	12/7/2020 4:24:05 PM	
24.79	12/7/2020 4:25:06 PM	
25.52	12/7/2020 4:26:06 PM	Bias
25.51	12/7/2020 4:27:07 PM	
25.05	12/7/2020 4:28:07 PM	
25.50	12/7/2020 4:29:08 PM	
25.64	12/7/2020 4:30:08 PM	
25.67	12/7/2020 4:31:09 PM	
10.69	12/7/2020 4:32:10 PM	
0.15	12/7/2020 4:33:10 PM	Zero
0.15	12/7/2020 4:34:11 PM	
0.15	12/7/2020 4:35:12 PM	

Meggitt Aircraft Braking Systems Corporation
South Afterburner Outlet

VOC	Conc.
High	47.05
Mid	24.7
Low	13.7

VOC	Time Stamp	
46.92	12/8/2020 7:59:44 AM	
47.22	12/8/2020 8:00:45 AM	High
47.23	12/8/2020 8:01:45 AM	
47.22	12/8/2020 8:02:46 AM	
47.41	12/8/2020 8:03:46 AM	
47.67	12/8/2020 8:04:47 AM	
47.86	12/8/2020 8:05:48 AM	
12.15	12/8/2020 8:06:48 AM	
0.02	12/8/2020 8:07:49 AM	
0.02	12/8/2020 8:08:50 AM	Zero
0.02	12/8/2020 8:09:50 AM	
0.02	12/8/2020 8:10:51 AM	
0.79	12/8/2020 8:11:51 AM	
0.02	12/8/2020 8:12:52 AM	
0.02	12/8/2020 8:13:52 AM	
1.08	12/8/2020 8:14:53 AM	
12.10	12/8/2020 8:15:54 AM	
13.10	12/8/2020 8:16:54 AM	
13.40	12/8/2020 8:17:55 AM	Low
13.43	12/8/2020 8:18:56 AM	
13.36	12/8/2020 8:19:56 AM	
12.95	12/8/2020 8:20:57 AM	
12.75	12/8/2020 8:21:57 AM	
12.80	12/8/2020 8:22:58 AM	
12.03	12/8/2020 8:23:59 AM	
19.00	12/8/2020 8:24:59 AM	
23.96	12/8/2020 8:26:00 AM	
24.87	12/8/2020 8:27:00 AM	Bias
24.84	12/8/2020 8:28:01 AM	
24.94	12/8/2020 8:29:02 AM	
24.50	12/8/2020 8:30:02 AM	
24.36	12/8/2020 8:31:03 AM	
24.37	12/8/2020 8:32:03 AM	
20.03	12/8/2020 8:33:04 AM	
0.03	12/8/2020 8:34:05 AM	
0.02	12/8/2020 8:35:05 AM	
0.02	12/8/2020 8:36:06 AM	
0.49	12/8/2020 8:37:06 AM	
0.21	12/8/2020 8:38:07 AM	
0.02	12/8/2020 8:39:08 AM	
0.02	12/8/2020 8:40:08 AM	Start Run 1
0.02	12/8/2020 8:41:09 AM	
0.02	12/8/2020 8:42:10 AM	
0.48	12/8/2020 8:43:10 AM	
0.15	12/8/2020 8:44:11 AM	
0.02	12/8/2020 8:45:11 AM	
0.02	12/8/2020 8:46:12 AM	
0.02	12/8/2020 8:47:12 AM	
0.02	12/8/2020 8:48:13 AM	
0.02	12/8/2020 8:49:14 AM	
0.34	12/8/2020 8:50:14 AM	

0.15	12/8/2020 8:51:15 AM	
0.02	12/8/2020 8:52:15 AM	
0.02	12/8/2020 8:53:16 AM	
0.02	12/8/2020 8:54:17 AM	
0.02	12/8/2020 8:55:17 AM	
0.02	12/8/2020 8:56:18 AM	
0.07	12/8/2020 8:57:18 AM	
0.02	12/8/2020 8:58:19 AM	
0.02	12/8/2020 8:59:20 AM	
0.02	12/8/2020 9:00:20 AM	
0.02	12/8/2020 9:01:21 AM	
0.47	12/8/2020 9:02:22 AM	
0.02	12/8/2020 9:03:22 AM	
0.02	12/8/2020 9:04:23 AM	
0.02	12/8/2020 9:05:23 AM	
0.25	12/8/2020 9:06:24 AM	
0.02	12/8/2020 9:07:25 AM	
0.02	12/8/2020 9:08:25 AM	
0.06	12/8/2020 9:09:26 AM	
0.02	12/8/2020 9:10:26 AM	
0.02	12/8/2020 9:11:27 AM	
0.18	12/8/2020 9:12:27 AM	
0.02	12/8/2020 9:13:28 AM	
0.02	12/8/2020 9:14:29 AM	
0.02	12/8/2020 9:15:29 AM	
0.61	12/8/2020 9:16:30 AM	
0.02	12/8/2020 9:17:31 AM	
0.02	12/8/2020 9:18:31 AM	
0.02	12/8/2020 9:19:32 AM	
0.26	12/8/2020 9:20:32 AM	
0.11	12/8/2020 9:21:33 AM	
0.02	12/8/2020 9:22:34 AM	
0.02	12/8/2020 9:23:34 AM	
0.02	12/8/2020 9:24:35 AM	
0.51	12/8/2020 9:25:35 AM	
0.02	12/8/2020 9:26:36 AM	
0.02	12/8/2020 9:27:37 AM	
0.07	12/8/2020 9:28:37 AM	
0.02	12/8/2020 9:29:38 AM	
0.09	12/8/2020 9:30:39 AM	
0.02	12/8/2020 9:31:39 AM	
0.02	12/8/2020 9:32:40 AM	
0.67	12/8/2020 9:33:40 AM	
0.41	12/8/2020 9:34:41 AM	
0.07	12/8/2020 9:35:42 AM	
0.02	12/8/2020 9:36:42 AM	
0.02	12/8/2020 9:37:43 AM	
0.02	12/8/2020 9:38:43 AM	
0.02	12/8/2020 9:39:44 AM	
0.13	12/8/2020 9:40:44 AM	Stop Run 1
0.10		Avg
0.02	12/8/2020 9:41:45 AM	
0.02	12/8/2020 9:42:46 AM	
0.37	12/8/2020 9:43:46 AM	
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0.02	12/8/2020 9:45:48 AM	
0.61	12/8/2020 9:46:48 AM	
22.83	12/8/2020 9:47:49 AM	
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24.41	12/8/2020 9:49:50 AM	
24.37	12/8/2020 9:50:51 AM	
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24.44	12/8/2020 9:52:52 AM	
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0.02	12/8/2020 10:03:58 AM	
0.08	12/8/2020 10:04:59 AM	
0.02	12/8/2020 10:06:00 AM	
0.02	12/8/2020 10:07:00 AM	
0.02	12/8/2020 10:08:01 AM	
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0.02	12/8/2020 10:10:02 AM	
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0.33	12/8/2020 10:17:06 AM	
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0.02	12/8/2020 10:19:07 AM	
0.15	12/8/2020 10:20:08 AM	
0.02	12/8/2020 10:21:09 AM	
0.06	12/8/2020 10:22:09 AM	
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0.02	12/8/2020 10:30:14 AM	
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0.02	12/8/2020 10:33:16 AM	
0.02	12/8/2020 10:34:17 AM	
0.11	12/8/2020 10:35:17 AM	
0.02	12/8/2020 10:36:18 AM	
0.02	12/8/2020 10:37:18 AM	
0.02	12/8/2020 10:38:19 AM	
0.02	12/8/2020 10:39:19 AM	
0.05	12/8/2020 10:40:20 AM	Start Run 2
0.02	12/8/2020 10:41:21 AM	
0.02	12/8/2020 10:42:21 AM	
0.02	12/8/2020 10:43:22 AM	
0.25	12/8/2020 10:44:23 AM	
0.02	12/8/2020 10:45:23 AM	
0.02	12/8/2020 10:46:24 AM	
0.51	12/8/2020 10:47:24 AM	
0.02	12/8/2020 10:48:25 AM	
0.02	12/8/2020 10:49:26 AM	
0.02	12/8/2020 10:50:26 AM	
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0.02	12/8/2020 10:55:29 AM	
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0.02	12/8/2020 10:58:31 AM	
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0.02	12/8/2020 11:03:34 AM	
0.02	12/8/2020 11:04:35 AM	
0.08	12/8/2020 11:05:35 AM	
0.02	12/8/2020 11:06:36 AM	
0.02	12/8/2020 11:07:37 AM	
0.02	12/8/2020 11:08:37 AM	
0.02	12/8/2020 11:09:38 AM	
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0.42	12/8/2020 11:17:42 AM	
0.02	12/8/2020 11:18:43 AM	
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0.02	12/8/2020 11:23:46 AM	
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0.02	12/8/2020 11:36:54 AM	
0.07	12/8/2020 11:37:55 AM	
0.02	12/8/2020 11:38:55 AM	
0.02	12/8/2020 11:39:56 AM	
0.02	12/8/2020 11:40:57 AM	Stop Run 2
0.08		Avg
0.02	12/8/2020 11:41:57 AM	
0.06	12/8/2020 11:42:58 AM	
0.02	12/8/2020 11:43:58 AM	
0.02	12/8/2020 11:44:59 AM	
0.02	12/8/2020 11:46:00 AM	
0.09	12/8/2020 11:47:00 AM	
0.02	12/8/2020 11:48:01 AM	
0.05	12/8/2020 11:49:01 AM	
5.11	12/8/2020 11:50:02 AM	
24.40	12/8/2020 11:51:02 AM	
24.71	12/8/2020 11:52:03 AM	
25.01	12/8/2020 11:53:04 AM	Bias
24.95	12/8/2020 11:54:04 AM	
25.02	12/8/2020 11:55:05 AM	
25.03	12/8/2020 11:56:05 AM	

25.04	12/8/2020 11:57:06 AM	
25.05	12/8/2020 11:58:07 AM	
7.72	12/8/2020 11:59:07 AM	
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0.02	12/8/2020 12:01:08 PM	
0.02	12/8/2020 12:02:09 PM	
0.02	12/8/2020 12:03:10 PM	Zero
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0.02	12/8/2020 12:06:11 PM	
0.11	12/8/2020 12:07:12 PM	
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0.37	12/8/2020 12:19:19 PM	
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0.02	12/8/2020 12:42:33 PM	
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0.02	12/8/2020 12:44:35 PM	
0.02	12/8/2020 12:45:35 PM	
0.02	12/8/2020 12:46:36 PM	
0.25	12/8/2020 12:47:36 PM	
0.02	12/8/2020 12:48:37 PM	
0.02	12/8/2020 12:49:38 PM	
0.19	12/8/2020 12:50:38 PM	
0.02	12/8/2020 12:51:39 PM	
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0.02	12/8/2020 12:53:40 PM	
0.05	12/8/2020 12:54:40 PM	
0.02	12/8/2020 12:55:41 PM	
0.02	12/8/2020 12:56:42 PM	
0.06	12/8/2020 12:57:42 PM	
0.02	12/8/2020 12:58:43 PM	

0.02	12/8/2020 12:59:44 PM	
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0.02	12/8/2020 1:01:45 PM	
0.31	12/8/2020 1:02:45 PM	
0.02	12/8/2020 1:03:46 PM	
0.02	12/8/2020 1:04:47 PM	
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0.02	12/8/2020 1:14:53 PM	
0.03	12/8/2020 1:15:53 PM	Stop Run 3
0.07		Avg
0.02	12/8/2020 1:16:54 PM	
0.02	12/8/2020 1:17:55 PM	
0.10	12/8/2020 1:18:55 PM	
0.02	12/8/2020 1:19:56 PM	
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0.02	12/8/2020 1:21:57 PM	
0.13	12/8/2020 1:22:57 PM	
0.02	12/8/2020 1:23:58 PM	
18.19	12/8/2020 1:24:59 PM	
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26.00	12/8/2020 1:31:02 PM	
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26.02	12/8/2020 1:33:04 PM	
26.02	12/8/2020 1:34:04 PM	
25.82	12/8/2020 1:35:05 PM	
1.67	12/8/2020 1:36:05 PM	
0.15	12/8/2020 1:37:06 PM	
0.02	12/8/2020 1:38:07 PM	
0.02	12/8/2020 1:39:07 PM	Zero
0.03	12/8/2020 1:40:08 PM	

Meggitt Aircraft Braking Systems Corporation
1204 Massillon Road
Akron, Ohio 44306

Report

Performed Velocity, Moisture, Temperature, Volumetric Flow Rate, Oxygen, Carbon Dioxide, Nitrogen Oxide, Carbon Monoxide and Volatile Organic Compounds Emissions Testing

Sampling performed on the P039 Accutherm Thermal Oxidizer Outlet

Akron, OH

Test Date: 4/15/2021

Meggitt Aircraft Braking Systems Corporation
1204 Massillon Road
Akron, Ohio 44306

Report

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Akron, OH

Test Date: 4/15/2021

Brian E Lemasters

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.

Brian E. Lemasters

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Custom Stack Analysis, LLC. conducted emissions sampling using USEPA Methods 1-4, 3A, 7E, 10 and 25A. Testing was conducted on the P039 Accutherm Outlet on April 15th, 2021. The testing was conducted at Meggitt Aircraft Braking Systems Corporation (Facility ID – 16-77-01-0999) on P039 Accutherm Outlet to determine compliance status with Permit No. – P0121253 (see Table 1.2).

The Custom Stack Analysis, LLC. test crew consisted of Mr. James Gray, Mr. Dylan Gray and Mr. Brian Lemasters. The testing procedures were coordinated by Mr. Jim Davies of Meggitt Aircraft Braking Systems Corporation. All testing procedures were witnessed by Mr. Connor Moroney of the Akron Regional Air Quality Management District (see Table 1.1).

Table 1.1: Emissions Testing Program Contact Personnel

Name, Title	Company Address	Phone, Fax, email
Mr. Jim Davies	Meggitt Aircraft Braking Systems Corporation 1204 Massillon Road Akron, OH 44306	(330) 796-1743 (Phone)
Mr. Connor Moroney	Akron Regional Air Quality Management District 1867 W. Market St, Akron, OH 44313	(330) 812-3904 (Phone)
Mr. James Gray Owner Mr. Brian Lemasters Project Manager Mr. Dylan Gray 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 15-22. 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 process data.

Table 1.2 demonstrates how Meggitt Aircraft Braking Systems Corporation in Akron, 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
Nitrogen Oxide		0.637 tons/yr	
Volatile Organic Compounds	0.36 tons/yr	0.0199 tons/yr	Yes
Carbon Monoxide		0.0023 tons/yr	

Test Results

Meggitt Aircraft Braking Systems Corporation - P039 Accutherm Outlet
4/15/2021
Methods 1-4, 3A, 7E, 10 and 25A

		Run #1	Run #2	Run #3	Avg.
Stack Gas	Velocity (ft/sec)	12.70	13.02	13.18	12.97
Standard Cubic Feet an Hour		50,567	50,007	49,802	50,125
Actual Cubic Feet per Minute		2,394	2,454	2,484	2,444
Moisture %		5.33%	6.49%	6.14%	5.99%
Carbon Dioxide %		3.24%	2.92%	3.32%	3.16%
Oxygen %		14.21%	14.76%	14.27%	14.41%
Nitrogen %		82.55%	82.33%	82.41%	82.43%
CO	(ppm)	0.07	0.17	0.20	0.14
CO	(lbs/hr)	0.0002	0.0006	0.0007	0.0005
CO	(tons/yr)	0.0011	0.0026	0.0032	0.0023
Nox	(ppm)	24.77	24.02	24.11	24.30
Nox	(lbs/hr)	0.1496	0.1434	0.1433	0.1454
Nox	(tons/yr)	0.6551	0.6282	0.6278	0.6370
VOC	(ppm)	0.86	1.28	0.77	0.97
VOC	(lbs/hr Carbon)	0.0040	0.0060	0.0036	0.0045
VOC	(tons/yr)	0.0177	0.0263	0.0157	0.0199

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.

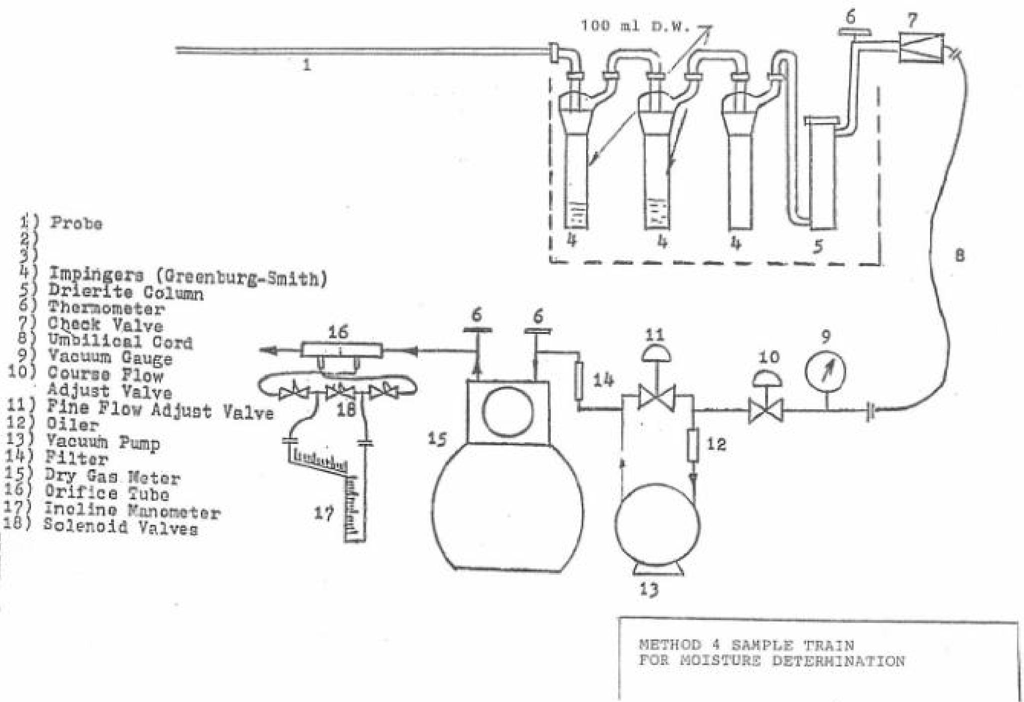
METHOD 10 TESTING DESCRIPTION

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.

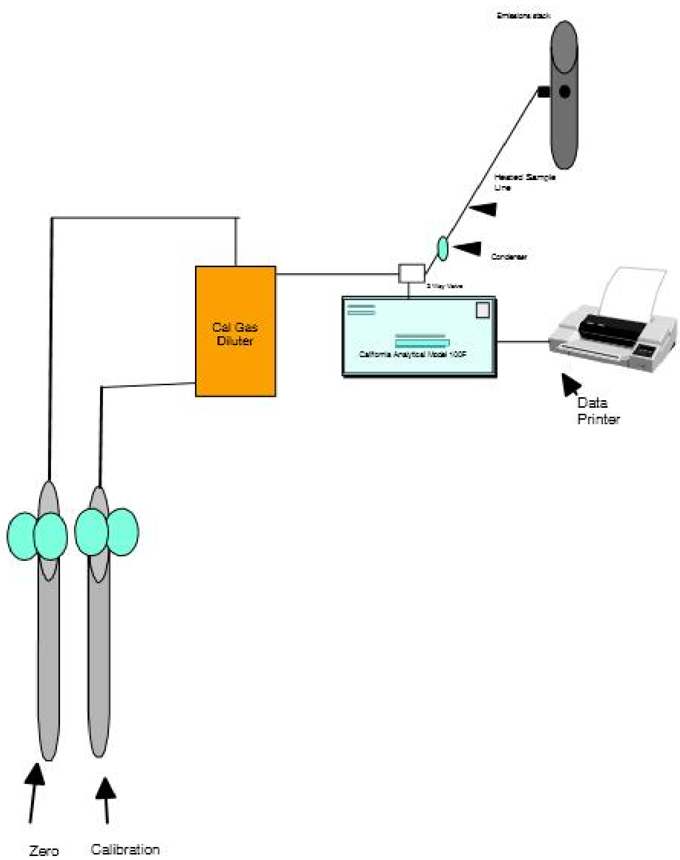
The sampling system is heated up to the proper operating temperature. Within two hours of the start of the test the FIA is calibrated. The calibration range or span is selected to be from 1.5 to 2.5 times the expected concentration. Three calibration ranges are then selected as follows: Low level 25-35% 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.



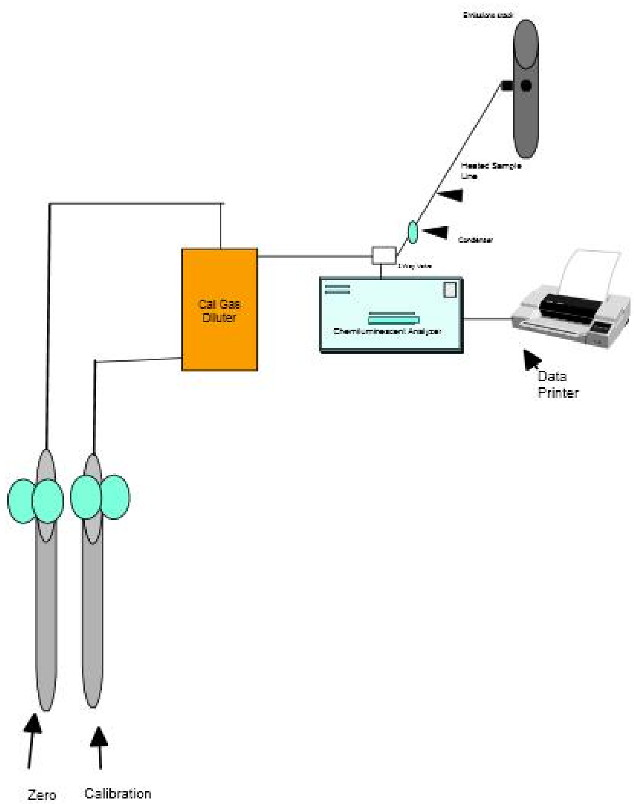
1) Probe
2)
3)
4) Impingers (Greenburg-Smith)
5) Drierite Column
6) Thermometer
7) Check Valve
8) Umbilical Cord
9) Vacuum Gauge
10) Course Flow Adjust Valve
11) Fine Flow Adjust Valve
12) Oiler
13) Vacuum Pump
14) Filter
15) Dry Gas Meter
16) Orifice Tube
17) Incline Manometer
18) Solenoid Valves
100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

FIGURE 3

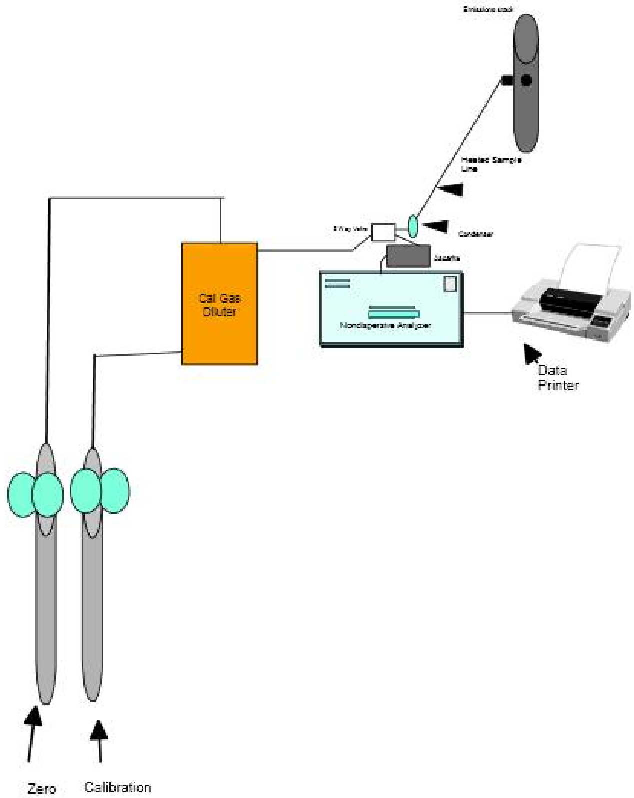
3A Sampling System



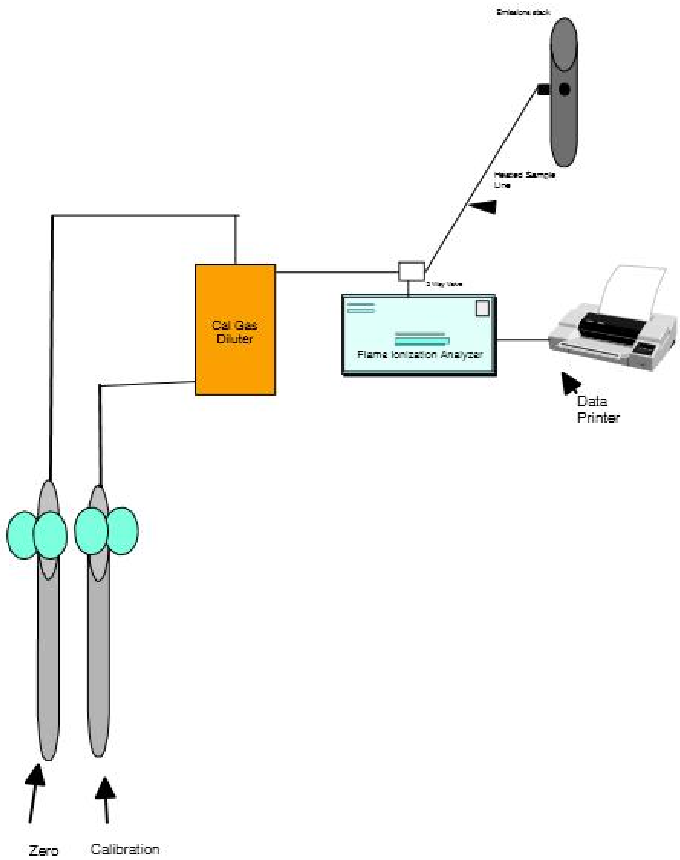
7E Sampling System



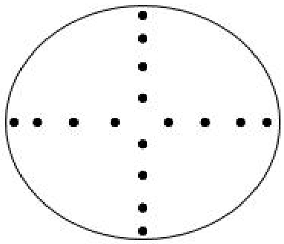
10 Sampling System



25A Sampling System



Location of Sampling Points



Location	Accutherm Outlet	
Upstream	180.0	Inches
Downstream	240	Inches
Stack Diameter	24	Inches
Sample Point #		

1	0.8	Inches
2	2.5	
3	4.7	
4	7.8	
5	16.2	
6	19.3	
7	21.5	
8	23.2	

CALCULATIONS

Outlet

		RUN #1	RUN #2	RUN #3		
1.	**Vm (std)**	43.07	42.45	42.75	=	$VM * 17.64 * \frac{PBAR + \frac{\wedge H}{13.6}}{Tm} * Y$

		RUN #1	RUN #2	RUN #3
Vm (std) = Volume of gas collected, corrected to standard conditions, cuft.	=	43.07	42.45	42.75
Vm = Volume of gas sampled at meter box, cuft.	=	45.02	44.61	45.09
17.64 = Standard temperature, 528 Rankine / std pressure, 29.92.	=	17.64	17.64	17.64
Tm = Average dry gas meter temperature, + 460 Rankine.	=	531.04167	533.75	535.79167
Pbar = Barometric pressure, inches of mercury (Hg)	=	28.64	28.64	28.64
^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.	=	1.0004	1.0004	1.0004

		RUN #1	RUN #2	RUN #3		
2.	**Vw (std)**	2.43	2.95	2.80	=	$Vlc * \frac{P\ H20}{Mh20} * \frac{R\ Tstd}{Pstd} = K2 * Vlc$

		RUN #1	RUN #2	RUN #3
Vlc = Volume of water and silica colected.	=	51.5	62.5	59.4
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**	0.05334	0.06487	0.06145	=	$\frac{Vw(std)}{Vm(std) + Vw(std)}$

		RUN #1	RUN #2	RUN #3
Bws = Water vapor in the gas stream, proportion.	=	0.05334	0.06487	0.06145
Vw(std) = Volume of water vapor in the gas sample, scf.	=	2.43	2.95	2.80
Vm(std) = Volume of gas sampled at meter box, scf.	=	43.07	42.45	42.75

		RUN #1	RUN #2	RUN #3		
4.	**Md**	29.086694	29.056811	29.102617	=	0.44 (%CO2) + 0.32 (%O2) + 0.28 (%N2) + %CO)

			RUN #1	RUN #2	RUN #3
Md	= Dry molecular weight, lb / lb-mole.	=	29.09	29.06	29.10
0.44	= Molecular weight of CO2 divided by 100.	=	0.44	0.44	0.44
0.32	= Molecular weight of O2 divided by 100.	=	0.32	0.32	0.32
0.28	= Molecular weight of N2 or CO divided by 100.	=	0.28	0.28	0.28

Co2, O2, N2, and CO are in percent by volume, dry basis.

		RUN #1	RUN #2	RUN #3		
5.	**Ms**	28.50	28.34	28.42	=	Md * (1-Bws) + M H20 * (Bws)

			RUN #1	RUN #2	RUN #3
Ms	= Molecular weight of gas , wet basis, lb /lb-mole.	=	28.50	28.34	28.42
M H20	= Molecular weight of water, 18 lb / lb-mole.	=	18	18	18

		RUN #1	RUN #2	RUN #3		
6.	**Vs**	12.70	13.02	13.18	=	$85.49 * Cp * \sqrt{\hat{}p} * \sqrt{\frac{Ts + 460}{Ps * Ms}}$

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	12.70	13.02	13.18
85.49	= Pitot tube constant, ft / sec.	=	85.49	85.49	85.49
Cp	= Pitot tube coefficient, dimensionless.	=	0.84	0.84	0.84
^P	= Velocity head of stack gas, avg. sq rt.	=	0.13704	0.13847	0.13895
Ts	= Temperature of stack gas, + 460 (Rankine).	=	1359.625	1393	1420
Ps	= Absolute stack gas pressure, barometric + static.	=	28.65	28.65	28.65
Ms	= Molecular weight of stack gas, wet basis.	=	28.50	28.34	28.42

		RUN #1	RUN #2	RUN #3		
7.	**ACFM**	2393.78	2454.40	2483.86	=	Stack Area * 60 * Vs

			RUN #1	RUN #2	RUN #3
Vs	= Average stack gas velocity, ft / sec.	=	12.70	13.02	13.18

		RUN #1	RUN #2	RUN #3		
8	SCFH	50567	50007	49802	=	$3600 * (1 - Bws) * Vs * A * \frac{Tstd}{Ts} * \frac{Ps}{Pstd}$

				RUN #1	RUN #2	RUN #3
3600	=	Seconds per hour.	=	3600	3600	3600
Bws	=	Water vapor in the gas stream, proportion.	=	0.0533415	0.0648732	0.0614459
A	=	Area of stack in sq ft.	=	3.14	3.14	3.14
Tstd	=	Standard absolute temperature, 528 R.	=	528	528	528
Pstd	=	Standard absolute pressure, 29.92 in. Hg.	=	29.92	29.92	29.92
Ts	=	Temperature of stack gas, + 460 (Rankine).		1359.625	1393	1420
Ps	=	Absolute stack gas pressure, barometric + static.		28.64	28.64	28.64
Vs	=	Average stack gas velocity, ft / sec.		12.70	13.02	13.18

CALCULATIONS

VOC

		RUN #1	RUN #2	RUN #3		
1.	**Lbs/Hr Propane**	0.00495	0.00734	0.00437	=	0.11443 * SCFH * PPM * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	50567	50007	49802
PPM	=	PPM	=	0.8556412	1.2832484	0.7671375

		RUN #1	RUN #2	RUN #3		
2.	**Lbs/Hr Carbon**	0.00405	0.00600	0.00357	=	0.031182 * SCFH * PPM * 3 * 10^- 6

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	50567	50007	49802
PPM	=	PPM	=	0.8556412	1.2832484	0.7671375
3	=	Carbon equivalent correction factor for propane.	=	3	3	3

CALCULATIONS

NOX

		RUN #1	RUN #2	RUN #3		
1.	**Lbs/Hr**	0.14956	0.14341	0.14333	=	1.194 * SCFH * PPM * 10^- 7

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	50567	50007	49802
PPM	=	PPM corrected	=	24.77	24.02	24.10

		RUN #1	RUN #2	RUN #3		
2	**PPM Corr.**	24.77	24.02	24.10	=	$C_{gas} = (C - C_o)\dfrac{C_{ma}}{C_m - C_o}$

				RUN #1	RUN #2	RUN #3
Co	=	Average of initial and final system calibration bias check responses for the zero gas, ppm.	=	0.11	0.16	0.135
C	=	Effluent gas concentration, dry basis, ppm.	=	24.73	24.35	24.2
Cm	=	Average of initial and final system calibration bias check responses for the upscale gas, ppm.	=	25.255	25.64	25.395
Cma	=	Actual concentration of the upscale calibration gas, ppm.	=	25.3	25.3	25.3

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

CALCULATIONS

CO

		RUN #1	RUN #2	RUN #3		
1	**Lbs/Hr**	0.00	0.00	0.00	=	.726 * SCFH * PPM * 10^- 7

				RUN #1	RUN #2	RUN #3
scfh	=	Standard stack volumetric flow rate.	=	50566.76	50007	49802
PPM	=	PPM	=	0.07	0.17	0.20

		RUN #1	RUN #2	RUN #3		
2	**PPM Corr.**	0.0665	0.1662	0.2	=	$Cgas = (C - Co) \dfrac{Cma}{Cm - Co}$

				RUN #1	RUN #2	RUN #3
Co	=	Average of initial and final system calibratio bias check responses for the zero gas, ppm	=	-0.055	-0.075	-0.01
C	=	Effluent gas concentration, dry basis, ppm.	=	0.01	0.09	0.19
Cm	=	Average of initial and final system calibration bias check responses for the upscale gas, p	=	14.04	14.24	14.41
Cma	=	Actual concentration of the upscale calibration gas, ppm.	=	14.42	14.42	14.42

CALCULATIONS

O2

		RUN #1	RUN #2	RUN #3		
1	**% Corr.**	14.21	14.76	14.27	=	$Cgas = (C - Co) \frac{Cma}{Cm - Co}$

				RUN #1	RUN #2	RUN #3
Co	=	Average of initial and final system cali bias check responses for the zero gas	=	0.14	0.27	0.26
C	=	Effluent gas concentration, dry basis,	=	14.29	14.65	14.15
Cm	=	Average of initial and final system calibration bias check responses for the upscale	=	10.095	10.015	9.995
Cma	=	Actual concentration of the upscale calibration gas, ppm.	=	10.00	10.00	10.00

CALCULATIONS

CO_2

		RUN #1	RUN #2	RUN #3		
1	**% Corr.**	3.24	2.92	3.32	=	$Cgas = (C - Co)\dfrac{Cma}{Cm - Co}$

				RUN #1	RUN #2	RUN #3
Co	=	Average of initial and final system cali bias check responses for the zero gas	=	-0.005	0.02	0.025
C	=	Effluent gas concentration, dry basis,	=	3.26	2.93	3.31
Cm	=	Average of initial and final system calibration bias check responses for the upscale	=	9.795	9.72	9.63
Cma	=	Actual concentration of the upscale calibration gas, ppm.	=	9.72	9.72	9.72

Appendix #1

Test Data

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

Plant Meggitt Aircraft Braking   Date 4/15/2021

Location P039 Accutherm Outlet   By Jim G, Brian L, Dylan G

Point #	Angle
1	3
2	3
3	1
4	0
5	2
6	0
7	1
8	1
B-1	2
2	1
3	3
4	4
5	2
6	2
7	1
8	0
Avg	2

Custom Stack Analysis, LLC.

Pitot Traverse Data Sheet

Plant Meggitt Aircraft Braking Systems Corporation   Date 4/15/2021

Location P039 Accutherm Outlet   By Brian L

Run No.	Pre 1		Post 1		Post 2		Post 3	
Point #	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**	**Pitot Δ P**	**°F**
A-1	0.022	878	0.023	892	0.019	921	0.022	942
2	0.024	881	0.023	895	0.021	926	0.025	948
3	0.019	882	0.020	908	0.022	935	0.021	953
4	0.025	883	0.023	915	0.022	940	0.024	958
5	0.018	884	0.019	921	0.020	947	0.020	969
6	0.016	882	0.018	926	0.018	951	0.017	974
7	0.015	880	0.017	931	0.016	958	0.016	979
8	0.012	881	0.015	933	0.014	966	0.014	985
B-1	0.018	865	0.018	902	0.021	932	0.019	960
2	0.020	867	0.019	907	0.024	937	0.020	967
3	0.022	872	0.020	913	0.020	943	0.022	973
4	0.021	874	0.022	918	0.024	950	0.022	981
5	0.018	880	0.019	924	0.021	954	0.019	989
6	0.017	882	0.019	930	0.018	961	0.020	994
7	0.016	883	0.018	934	0.016	965	0.017	998
8	0.014	884	0.015	937	0.013	968	0.015	1002

			Run #1		Run #2		Run #3	
			0.14	899.63	0.14	932.50	0.14	960.19
	0.136	881	0.138	918	0.138	947	0.139	973
Static:	0.186		0.189		0.189		0.192	

TEST DATA

COMPANY NAME	Meggitt Aircraft Braking Systems Corporation -
ADDRESS	1204 Massillon Road
CITY	Akron
STATE	OH
ZIP	44306
TEST METHODS	Methods 1-4, 3A, 7E, 10 and 25A
CREW MEMBERS	Jim G, Brian L, Dylan G
LOCATION	Outlet
SOURCE	P039 Accutherm
CONTROL	

	RUN #1	RUN #2	RUN #3
DATE	4/15/2021	4/15/2021	4/15/2021
RUN LENGTH (min)	60	60	60
VOLUME (cubic feet)	45.022	44.605	45.093
Y FACTOR	1.0004	1.0004	1.0004
BAROMETRIC	28.64	28.64	28.64
METER TEMP. (R)	531.04	533.75	535.79
STACK TEMP. (R)	1359.63	1392.50	1420.19
AVERAGE ^P	0.137	0.138	0.139
AVERAGE ^H	2.00	2.00	2.00
IMPINGER VOLUME	51.50	62.50	59.40
PITOT COEF.	0.84	0.84	0.84
STATIC PRESSURE	0.188	0.189	0.191
STACK AREA	3.14	3.14	3.14
CARBON DIOXIDE	3.24	2.92	3.32
OXYGEN	14.21	14.76	14.27
NITROGEN	**82.55**	**82.33**	**82.41**

TEST RESULTS

P039 Accutherm Outlet
4/15/2021

	RUN #1	RUN #2	RUN #3
VM (std)	43.069	42.454	42.755
VW (std)	2.427	2.945	2.799
BWS	0.053	0.065	0.061
MD	29.087	29.057	29.103
MS	28.495	28.340	28.420
VS (ft/sec)	12.699	13.021	13.177
SCFH	50566.76	50006.76	49802.36
ACFM	2393.78	2454.40	2483.86
DCFM	842.78	833.45	830.04

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

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

Bws = Stack moisture content.

Md = Determination of dry molecular weight of stack gas.

Ms = Determination of stack gas molecular weight.
Vs = Average gas stack velocity. (ft/sec.)

ACFM = Actual cubic feet per minute of gas velocity.

DCFM = Dry standard cubic feet per minute of gas velocity.

TEST RESULTS

P039 Accutherm Outlet

4/15/2021

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (lbs/hr propane)	0.005	0.007	0.004
VOC (lbs/hr carbon)	0.004	0.006	0.004
NOX (lbs/hr)	0.150	0.143	0.143
CO (lbs/hr)	0.000	0.001	0.001
O2 %	14.214	14.756	14.268
CO2 %	3.238	2.916	3.324

TEST DATA

P039 Accutherm Outlet

4/15/2021

	RUN #1	RUN #2	RUN #3
CEM MONITORING			
VOC (ppm)	0.86	1.28	0.77
NOX (ppm)	24.73	24.35	24.20
CO (ppm)	0.01	0.09	0.19
O2 (%)	14.29	14.65	14.15
CO2 (%)	3.26	2.93	3.31

NOX CAL. CORR.			
INITIAL ZERO	0.04	0.18	0.14
INITIAL UPSCALE	25.15	25.36	25.92
FINAL ZERO	0.18	0.14	0.13
FINAL UPSCALE	25.36	25.92	24.87
ACTUAL UPSCALE	25.30	25.3	25.3
NOX (ppm corrected)	24.77	24.02	24.10

CO CAL. CORR.			
INITIAL ZERO	0.02	-0.13	-0.02
INITIAL UPSCALE	14.02	14.06	14.42
FINAL ZERO	-0.13	-0.02	0
FINAL UPSCALE	14.06	14.42	14.4
ACTUAL UPSCALE	14.42	14.42	14.42
CO (ppm corrected)	0.07	0.17	0.20

O2 CAL CORR.			
INITIAL ZERO	0.02	0.26	0.28
INITIAL UPSCALE	10.07	10.12	9.91
FINAL ZERO	0.26	0.28	0.24
FINAL UPSCALE	10.12	9.91	10.08
ACTUAL UPSCALE	10.00	10	10
O2 (% corrected)	14.21	14.76	14.27

CO2 CAL CORR.			
INITIAL ZERO	-0.04	0.03	0.01
INITIAL UPSCALE	9.79	9.8	9.64
FINAL ZERO	0.03	0.01	0.04
FINAL UPSCALE	9.80	9.64	9.62
ACTUAL UPSCALE	9.72	9.72	9.72
CO2 (% corrected)	3.24	2.92	3.32

Custom Stack Analysis, L.L.C.

Method 4

Plant: eggitt Aircraft Braking Systems Corporati   Date : 4/15/2021

		Meter Box	
Barometer (Pg)	28.64	ID:	1
Ambient Temp	50	Y	1.0004
		ΔH	1.986
		ΔH Set Point :	2.0

	Time	Run Time
Start:	13:45	60
Stop:	14:45	

Run #1

Cold Box #					
11	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	170.240	68	64.0	63	5
5	174.012	71	66.0	56	5
10	177.793	72	66.0	54	5
15	181.546	74	67.0	53	5
20	185.323	74	68.0	57	5
25	189.058	75	68.0	57	5
30	192.762	75	69.0	58	5
35	196.477	75	69.0	60	5
40	200.211	75	70.0	61	5
45	203.991	76	70.0	62	5
50	207.748	76	70.0	62	5
55	211.510	76	71.0	63	5
60	215.262				
Vm	45.022				
	AVG:	71		58.8	5.0

Leak Rate @	9.0	" Hg =	0.000

	Time	Run Time
Start:	15:27	60
Stop:	16:27	

Run #2

Cold Box #					
4	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	215.689	73	70	59	6
5	219.412	74	71	52	6
10	223.171	75	72	52	6
15	226.841	75	71	52	6
20	230.576	77	71	53	6
25	234.243	76	71	55	6
30	237.930	76	72	57	6
35	241.628	77	70	56	6
40	245.371	77	72	58	6
45	249.025	77	72	57	6
50	252.831	77	72	57	6
55	256.558	77	75	58	6
60	260.294				
Vm	44.605				
	AVG:	74		55.5	6.0

Leak Rate @	10.5	" Hg =	0.004

	Time	Run Time
Start:	17:04	60
Stop:	18:04	

Run #3

Cold Box #					
6	Meter Volume	Meter Temp		Cond Temp	VAC "Hg
Time					
0	264.046	74	72	58	5
5	267.823	76	73	53	5
10	271.548	77	73	53	5
15	275.332	78	73	54	5
20	279.127	78	73	58	5
25	282.879	78	74	58	5
30	286.626	78	74	57	5
35	290.390	79	74	57	5
40	294.139	79	74	58	5
45	297.893	79	74	56	5
50	301.663	79	75	53	5
55	305.358	80	75	54	5
60	309.139				
Vm	45.093				
	AVG:	76		55.8	5.0

Leak Rate @	10.0	" Hg =	0.000

Appendix #2

Laboratory Data

Lab Data Sheet For: Meggitt Aircraft Braking Systems Corporation - P039 Accutherm Outlet By: Brian L

Moisture Weights

Moisture

RUN # 1		grams	grams	grams	grams	grams	grams	grams
	Box ID	1	2	3	4	5	6	Drierite
Gross	11	812.6	563.0	537.8				968.5
Tare		726.3	610.3	536.6				957.2
Net		86.3	-47.3	1.2	0.0	0.0	0.0	11.3
	Reagent	H_2O	H_2O					
	mLs	100.0	100.0					

Intial Imp mL =	200.0	Impinger Total =	40.2 grams	Total =	51.5 grams

RUN # 2		grams	grams	grams	grams	grams	grams	grams
	Box ID	1	2	3	4	5	6	Drierite
Gross	4	677.5	755.0	626.3				1030.3
Tare		628.1	752.7	625.2				1020.6
Net		49.4	2.3	1.1	0.0	0.0	0.0	9.7
	Reagent	H_2O	H_2O					
	mLs	100.0	100.0					

Intial Imp mL =	200.0	Impinger Total =	52.8 grams	Total =	62.5 grams

RUN # 3		grams	grams	grams	grams	grams	grams	grams
	Box ID	1	2	3	4	5	6	Drierite
Gross	6	792.8	655.7	488.4				969.2
Tare		750.5	650.4	487.0				958.8
Net		42.3	5.3	1.4	0.0	0.0	0.0	10.4
	Reagent	H_2O	H_2O					
	mLs	100.0	100.0					

Intial Imp mL =	200.0	Impinger Total =	49.0 grams	Total =	59.4 grams

Scale Serial # 1203240794

Appendix #3

Calibration Data

ilac-MRA ACCREDITED A2LA Certificate No. 1750.01 Calibration

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

Cert. No.: 3415-10347847

Traceable® Certificate of Calibration for Digital Calipers

Manufactured for and distributed by : Control Company 12554 Galveston Rd B230, Webster, TX 77598

Instrument Identification:

Model: 3415, S/N: 192125551 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Block Set	99146223	06 Dec 2019	1000434942

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 23 Apr 2019 Cal Due Date: 23 Apr 2021

Test Conditions: 57.01%RH 23.96°C 1018mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
in	N.A.	N.A.		0.1000	0.0995	Y	0.099	0.101	0.0003	3.33:1
in	N.A.	N.A.		2.0000	1.9985	Y	1.998	2.002	0.00033	>4:1
in	N.A.	N.A.		4.0000	3.998	Y	3.996	4.004	0.0004	>4:1
in	N.A.	N.A.		6.0000	5.997	Y	5.994	6.006	0.0005	>4:1
in depth	N.A.	N.A.		2.0000	1.998	Y	1.998	2.002	0.00033	>4:1
in inside	N.A.	N.A.		1.0000	0.9995	Y	0.999	1.001	0.00031	3.23:1
in step	N.A.	N.A.		2.0000	2.000	Y	1.998	2.002	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

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Note :

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.

B22438B

AMERICAN WELDING & GAS PurityPlus

AMERICAN WELDING AND GAS
1210 GLENDALE-MILFORD
CINCINNATI, OH 45215
513-772-8786

Cylinder Number:	EB0052956	Certification Date:	07 April 2019
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	08 April 2027
Certificate Number:	0869C-01T5-C01	Lot Number:	0869C-01T5
Cylinder Fill Pressure:	2015 PSIG	Customer Part Number:	T5E 4800001-A1-2

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Oxygen	10.0%	+/- 0.10% (absolute)	4/7/2019
Carbon Dioxide	9.72%	+/- 0.04% (absolute)	4/7/2019
Nitrogen	Balance		

Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Oxygen	GC-TCD	Shimadzu	GC-8A	C10495021497SA	3/25/2019
Carbon Dioxide	GC-TCD	Shimadzu	GC-8A	C10495021497SA	3/27/2019

Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
D685109	VSL	9/14/2023	PRM	O2	N2	21.00%	0.100	VSL
FF13624	9-D-37	3/8/2021	SRM	CO2	N2	16.08%	0.124	2745

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. Mixture stability is certified according to maximum certification periods set forth by Table 2-3 of EPA 600/R-12/531 May 2012. The listed expiration date may be extended by special request. The nitrogen used as a component or balance gas as well as the oxygen used in air mixtures meets the requirements set forth in EPA 1065.750. 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

Preparer: Allison Hanover

Reviewer: Abby Helman

Production Laboratory:
Tier 5 Labs, LLC
5353 W. Southern Ave.
Indianapolis, IN 46241
PGVP Vendor ID R12019

B21856

GASES & EQUIPMENT
INDUSTRIAL MEDICAL SPECIALTY

Scott-Gross Co., Inc.
664 Magnolia Ave.
Lexington, KY 40505
(859)231-0225 (888)431-5882

Certificate of Analysis

Certification Date:	12 January 2017
Certificate Number:	0097B-02T5-C01
Mixture Grade:	EPA Protocol Standard Gas Mixture
Lot Number:	0097B-02T5
Expiration Date:	12 January 2025
Cylinder Number:	EB0049442
Part Number:	T5L EPA2RATAP-14

Mixture Components	Requested Composition	Certified Composition	U (Expanded Uncertainty, k=2)
Propane	43 ppm	47.05 PPM	+/- 0.12 PPM (absolute)
Air	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 R12017
Procedure Used:	EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012
Analytical Method:	C3H8: FTIR
Multipoint Calibration Date:	Propane: 12/29/2016

Reference Standards								
Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CAL017809	83-J-12	8/17/2017	SRM	C3H8	Air	48.83 PPM	0.225	1667b

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

LIQUID TECHNOLOGY CORPORATION
"INDUSTRY LEADER IN SPECIALTY GASES"

Certificate of Analysis
- EPA PROTOCOL GAS -

Customer	IE Monitoring Instruments (Worthington, OH)
Date	October 06, 2014
Delivery Receipt	DR-53322
Gas Standard	13.8 ppm Propane/Air - EPA PROTOCOL
Final Analysis Date	October 06, 2014
Expiration Date	October 07, 2022

B21477B

Component	Propane
Balance Gas	Air

Analytical Data:
EPA Protocol, Section No. 2.2, Procedure G-1.

DO NOT USE BELOW 100 psig

Reported Concentrations
Propane: 13.7 ppm +/- 0.1 ppm
Air: Balance

Reference Standards:		GMIS Traceability
SRM/GMIS:	GMIS	SRM-1667b
Cylinder Number:	CC-165367	XF-00385: B
Concentration:	20.21 ppm Propane (+/- 0.09 ppm)	49.54 ppm Propane (+/- 0.26 ppm)
Expiration Date:	12/02/18	07/12/15
NIST Sample Number:	NA	83-I-14

Certification Instrumentation

Component:	Propane
Make/Model:	Agilent 7890A
Serial Number:	CN10736166
Principal of Measurement:	GC-FID
Last Calibration:	September 28, 2014

Cylinder Data

Cylinder Serial Number:	EB-0051537	Cylinder Outlet:	CGA 590
Cylinder Volume:	138 Cubic Feet	Cylinder Pressure:	1950 psig, 70°F

Analytical Uncertainty and NIST Traceability are in compliance with EPA-600/R-12/531.

Certified by: Cole Dylewski

Cole Dylewski

PGVP Vendor ID: E12014

"UNMATCHED EXCELLENCE"

2048 APEX COURT, APOPKA, FLORIDA 32703 ~ PHONE (407)-292-2990 FAX (407)-292-3313
WWW.LIQUIDTECHCORP.COM
APOPKA, FL • HOUSTON, TX

B219 25 B

Scott-Gross Co., Inc.
664 Magnolia Ave.
Lexington, KY 40505
(859)231-0225 (888)432-5882

GASES & EQUIPMENT — INDUSTRIAL MEDICAL SPECIALTY

Cylinder Number:	CC444989	Certification Date:	28 April 2017
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	29 April 2025
Certificate Number:	1147B-02T5-C01	Lot Number:	1147B-02T5
Cylinder Pressure:	2015 PSIG	Customer Part Number:	T5L EPA2RATAP-19

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Propane	24.7 PPM	+/- 0.2 PPM (absolute)	4/28/2017
Air	Balance		

Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Propane	FTIR	Thermo	Antaris IGS	AWZ1200117	4/17/2017

Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CC459851	2186A-01T5	11/10/2024	GMIS	C3H8	N2	247.7 PPM	0.411	2644a

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

Analyst: Allison Hanover

Reviewer: Jeff Lynn

Production Laboratory.
Tier 5 Labs, LLC
5353 W. Southern Ave.
Indianapolis, IN 46241
PGVP Vendor ID R12017

b225736

TIER 5 LABS
5353 W. SOUTHERN AVE.
INDIANAPOLIS, IN 46241
317-636-6690

Cylinder Number:	CC514251	Certification Date:	15 July 2020
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	15 July 2023
Certificate Number:	1690A-07T5-C01	Lot Number:	1690A-07T5
Cylinder Fill Pressure:	2015 PSIG	Customer Part Number:	T5E AM0001-A1-15

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Sulfur Dioxide	26.7 PPM	+/- 0.2 PPM (absolute)	7/6/2020, 7/15/2020
Nitric Oxide	25.3 PPM	+/- 0.11 PPM (absolute)	6/23/2020, 6/30/2020
Nitrogen	Balance		

Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Sulfur Dioxide	NDIR	Horiba	VA-3111	PC062W1E	6/25/2020
Nitric Oxide	Chemiluminescence	Thermo	42iQ	1200906802	6/25/2020

Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CC473760	3108A-02T5	1/23/2027	GMIS	SO2	N2	102.13 PPM	0.798	1694a
CC480411	1847A-02T5	10/4/2025	GMIS	NO	N2	300.03 PPM	0.437	2735

Notes

NOx = 25.6 ppm REFERENCE VALUE ONLY

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. The nitrogen used as a component or balance gas as well as the oxygen used in air mixtures meets the requirements set forth in EPA 1065.750. 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

Christopher Haas
Preparer: Christopher Haas

Reviewer: Allison Martinez

Production Laboratory:
Tier 5 Labs, LLC
5353 W. Southern Ave.
Indianapolis, IN 46241
PGVP Vendor ID R12020

Airgas.
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
12722 S. Wentworth Ave.
Chicago, IL 60628
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0163	Reference Number:	54-401724343-1
Cylinder Number:	CC265467	Cylinder Volume:	144.3 Cubic Feet
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12020	Valve Outlet:	660
Gas Code:	NO,NOX,BALN	Certification Date:	Feb 18, 2020

Expiration Date: Feb 18, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	46.93 PPM	G1	+/- 1.1% NIST Traceable	02/10/2020, 02/18/2020
NITRIC OXIDE	45.00 PPM	46.93 PPM	G1	+/- 1.1% NIST Traceable	02/10/2020, 02/18/2020
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16060650	CC442691	50.42 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jun 27, 2020
PRM	12386	D685025	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 20, 2020
GMIS	7302017104	CC506604	4.426 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1%	Jul 03, 2022

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900100	FTIR	Feb 03, 2020
Nicolet 6700 AMP0900100	FTIR	Feb 03, 2020

Triad Data Available Upon Request

Approved for Release

Airgas.
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
12722 S. Wentworth Ave.
Chicago, IL 60628
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A1129	Reference Number:	54-401830766-1
Cylinder Number:	CC267139	Cylinder Volume:	144.3 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12020	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Jun 11, 2020

Expiration Date: Jun 11, 2028

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	15.00 PPM	14.42 PPM	G1	+/- 0.4% NIST Traceable	06/11/2020
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	150102	KAL004704	24.35 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Sep 04, 2021

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
(CO-4) Thermo 48i-TLE 1406960657	NDIR	Jun 01, 2020

Triad Data Available Upon Request

Approved for Release

Airgas.
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
12722 S. Wentworth Ave.
Chicago, IL 60628
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0497	Reference Number:	54-401871452-1
Cylinder Number:	XC026367B	Cylinder Volume:	144.3 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12020	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Aug 03, 2020

Expiration Date: Aug 03, 2028

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	30.00 PPM	29.76 PPM	G1	+/- 0.6% NIST Traceable	08/03/2020
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	09010228	KAL004841	98.48 PPM CARBON MONOXIDE/NITROGEN	+/- 0.5%	Oct 16, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO-1 SIEMENS ULTRAMAT 6E N1J5700	NDIR	Jul 15, 2020

Triad Data Available Upon Request

Approved for Release

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

Filename: C:\Customer Project Files\APPENDIX\Cal Sheets\Meter Boxes\[Meter Box 1 5-7-20.xls]A
Revised: 7/25/95 Version: 2.2

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

Model #: 1
Serial #:

Date. ------------------------> 5/7/2020
Barometric Pressure: ----------> 28.44 (in. Hg)
Theoretical Critical Vacuum:---> 13.42 (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-

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)	-- Average Temperatures -- DGM Outlet (deg R)	DGM Overall (deg R)	Ambient Temp (deg R)
0.5	10	311.555	315.488	111.38256	62	61	65	62	12	0.30390681	15	64	64	64	521.5	522.5	524
0.93	10	315.488	320.81	150.71904	67	63	66	63	16	0.41080925	15	64	65	64.5	523	524.75	524.5
1.4	10	320.81	327.085	177.708	66	64	68	65	19	0.46449779	15	65	65	65	524.5	525.75	525
2.1	5	327.085	331.027	111.63744	68	65	69	66	23	0.60910402	15	66	66	66	525.5	527	526
3.8	5	331.027	336.224	147.17904	66	66	70	67	31	0.80595932	15	66	66	66	526.5	527.75	526

** RESULTS **

--- DRY GAS METER --- VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	------- ORIFICE ------- VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	-- DRY GAS METER -- CALIBRATION FACTOR Y Value (number)	Variation (number)	------- ORIFICE ------- CALIBRATION FACTOR dH@ Value (in H2O)	Value (mm H2O)	Variation (in H2O)
3.7811759	107.08	3.77576	106.92952	3.94373	0.99857	-0.00186	1.89856015	48.22	-0.08712
5.1002748	144.44	5.1014902	144.4742	5.33353	1.00024	-0.00019	1.92887722	48.99	-0.0568
6.0094088	170.19	6.0136998	170.30798	6.29322	1.00071	0.00029	2.08361031	52.92	0.09793
3.7729909	106.85	3.7765756	106.95262	3.95964	1.00095	0.00052	1.97745971	50.23	-0.00822
4.9888287	141.28	4.9971208	141.51846	5.23935	1.00166	0.00124	2.03987228	51.81	0.0542
			Average Y ------->		1.00043		1.98567594	50.44	<------ 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:________ Brian Lemasters Date:______ 5/7/2020

ilac-MRA A2LA ACCREDITED
A2LA Certificate No. 1750.01 Calibration

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

Cert. No.: 3415-11278230

Traceable® Certificate of Calibration for Digital Calipers

Customer :Custom Stack Analysis, LLC ,14614 Cenfield Street NE ,Alliance ,OH-44601 ,U.S.A.

Instrument Identification:

Model: 3415, S/N: 101856179 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Gage Set	99146223	17 Dec 2020	1000449283

Certificate Information:

Technician: 57 Procedure: CAL-05 Cal Date: 12 May 2020 Cal Due Date: 12 May 2021

Test Conditions: 55.18%RH 22.45°C 1018mBar

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	0.101	0.0003	3.33:1
in	N.A.	N.A.		2.0000	2.0005	Y	1.998	2.002	0.00033	>4:1
in	N.A.	N.A.		4.0000	4.0005	Y	3.996	4.004	0.0004	>4:1
in	N.A.	N.A.		6.0000	6.0005	Y	5.994	6.006	0.0005	>4:1
in depth	N.A.	N.A.		2.0000	2.000	Y	1.998	2.002	0.00033	>4:1
in inside	N.A.	N.A.		1.0000	1.0005	Y	0.999	1.001	0.00031	3.23:1
in step	N.A.	N.A.		2.0000	1.9985	Y	1.998	2.002	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

Nicol Rodriguez, Quality Manager

Marisa Elms

Marisa Elms, Technical Manager

Note :

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.

Issue Date : 12 May 2020

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

ACCREDITED
A2LA Certificate No. 1750.01 Calibration

Cert. No.: 1870-11290275

Traceable® Certificate of Calibration for Digital Barometer Module

Customer :Custom Stack Analysis, LLC ,14614 Cenfield Street 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	10 Oct 2020	4000-10785768
Chilled Mirror Hygrometer	31874/1H2048MR	22 Jan 2021	18004
Digital Barometer	D4540001	01 Nov 2020	1000447551

Certificate Information:

Technician: 57 Procedure: CAL-31 Cal Date: 17 May 2020 Cal Due Date: 17 May 2021

Test Conditions: 57.18%RH 22.6°C 1012mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
%RH	N.A.	N.A.		48.33	32	N	43	53	0.74	>4:1
°C	N.A.	N.A.		24.29	24	Y	23.29	25.29	0.05	>4:1
mb/hPa	N.A.	N.A.		806.00	812	Y	795	817	0.62	>4:1
mb/hPa	N.A.	N.A.		909.98	914	Y	899	921	0.62	>4:1
mb/hPa	N.A.	N.A.		1018.72	1022	Y	1008	1030	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.

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

Nicol Rodriguez, Quality Manager

Marisa Elms

Marisa Elms, Technical Manager

Note :

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.

Issue Date : 17 May 2020

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.traceable.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 9001:2015 Quality Certified by DNV GL, Certificate No. CERT-01805-2006-AQ-HOU-ANAB.
International Laboratory Accreditation Cooperation - Multilateral Recognition Arrangement (ILAC-MRA).

MATHESON

"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

Component : Carbon Dioxide
Certified Conc: 20.04% ± 0.04%

Date: 4/3/2017
20.04%
20.04%
20.04%

Date:

Component: Oxygen
Certified Conc: 20.00% ± 0.03%

Date: 4/3/2017
20.02%
20.00%
19.98%

Date:

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. Mot.

Date 4/4/2017

MONITORING INSTRUMENTS

7410 Worthington-Galena Rd
Worthington, Ohio 43085
Phone: (614) 436-4933

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Temperature RTD Calibrator Certificate of Calibration

Instrument: Altek Series 22 T/C
Serial#: 243783
Technician: Sam Shults

Date: 11/3/2020
Due: 11/3/2021

Custom Stack Analysis

Left Slide		Right Slide	
Lab Standard	UUT Reading	Lab Standard	UUT Reading
0.0	-0.5	100.0	99.7
1000.0	1000.6	1100.0	1099.6
2000.0	2000.5	2100.0	2099.2

Accuracy
+/- 1.0 F

Reference Standards
PIE 525B sn.116763 Cal Due:9/28/2021

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

MONITORING INSTRUMENTS

7410 Worthington-Galena Rd
Worthington, Ohio 43085
Phone: (614) 436-4933

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Dwyer Digital Manometer Certificate of Calibration

Instrument: Dwyer 475 Digital Manometer
Serial#: E46Z

Date: 11/3/2020
Technician: Sam Shults

Custom Stack

Positive Port

Calibrated Source	Dwyer Mark III	% Accuracy
0.500	0.498	+/- 0.04" H2O
2.000	2.005	0.3
3.000	3.008	0.3
4.000	4.009	0.2

Negative Port

Calibrated Source	Dwyer Mark III	% Accuracy
0.500	0.501	+/- 0.04" H2O
2.000	2.008	0.4
3.000	3.009	0.3
4.000	4.005	0.1

Allowable Tolerance +\- 1.0% "H2O FS

Reference Standards
Druck 740 DPI sn.74001549, Cal Due: 12/13/2020

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

MATHESON
ask. . .The Gas Professionals™
1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: WHS 109
Y-TOWN

Part # G2695803

		Protocol:	Reference #:	Lot#:
Cylinder Number:	CC78213	G1	T270458-01	9000406167
Cylinder Pressure:	2000 psig			
Last Analysis Date:	8/24/2020			
Expiration Date:	8/24/2023			

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

REPLICATE RESPONSES

				Date: 8/17/2020	Date: 8/24/2020
Component:	Nitrogen Dioxide			49.4	49.6
				49.3	49.5
Certified Conc:	49.5 ppm	+/- 0.9 ppm	ABS	49.3	49.7

BALANCE GAS: AIR

REFERENCE STANDARDS:

Component: Nitrogen Dioxide
Reference Standard: GMIS
Cylinder #: EB0097397
Concentration: 47.8 +/- 0.8 ppm ABS
Exp Date: 9/21/2021

Component: Nitrogen Dioxide
Reference Standard: PRM
Cylinder #: D562925
Concentration: 75.0 +/- 1.1 ppm ABS
Exp Date: 2/2/2019
SRM #: -
NIST Sample #: -

CERTIFICATION INSTRUMENTS

Component: Nitrogen Dioxide
Make/Model: CAI 600
Serial Number: Y09003
Measurement Principle: CHEMI
Last Calibration: 8/24/2020

Notes:

The certification was performed by Global Calibration Gases, LLC, Sarasota, FL and according to EPA Traceability Protocol for Assay and Certification Standards May 2012, using procedure G1 and/or G2. U.S. EPA PGVP Vendor ID number: N22020
The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at level of confidence of 95%

Analyst: Signature on file Date: 8/24/2020

QA: Ashley Smallwood Date: 9/1/2020
Ashley Smallwood

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 M. Zadravec

Judy Zadravec - Analyst

02/13/2017

Date

Judith M. Zadravec

Judy Zadravec - QA Approval

02/13/2017

Date

MATHESON

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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
24595
BA-1429
NK00455
7899
06572
784192
3697456Y
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 Percent oxygen analyzer
K Specific carbon dioxide analyzer
L Binary gas mixture analyzer

Lot No: 118K41520

Fill Date: 4/28/2015

IMPORTANT

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

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

595572

FOR Custom Stack 593P

14614 Cenfield St Alliance Ohio

P.O. ____ DATE 5/12/20

☐ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
☐ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
☐ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
☐ 490 S. Mapleton St. **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
☐ 2351 Jaclyn Court **SOUTH BEND**, IN 46614
☐ 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. 2019-0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: MP

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	Navigator	1119252404	Lab	2,100g	0.1g	HI 2000 LO Ø	6months	YES	YES ✓ NO	11/2020

WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1 200	200.0	Ø		NO	200.0	
2 500	500.0	Ø		NO	500.0	
3 1000	1000.0	Ø		NO	1000.0	
4						
5						
6						

PARTS USED

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

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584495

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

❑ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
❑ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
❑ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
❑ 490 S. Mapleton St. **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
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❑ 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
❑ 2351 Jaclyn Court **SOUTH BEND**, IN 46614
❑ 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. 2019. 0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: MC

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 - g LO - g	6 Months	YES	YES ✓ NO	11/2020

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10.0	∅	+/-.2%	YES / NO	10.0	CALIBRATED
2	20g	20.0	∅	+/-.2%	YES / NO	20.0	
3	50g	50.0	∅	+/-.2%	YES / NO	50.0	
4	100g	100.0	∅	+/-.2%	YES / NO	100.0	
5	1kg	999.7	-.3	+/-.2%	YES / NO	1000.0	
6	2kg	1999.4	-.6	+/-.2%	YES / NO	2000.0	

PARTS USED

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

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584497

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

☐ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
☐ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
☐ 1424 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
☐ 490 S. Mapleton St. 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
☐ 2351 Jaclyn Court SOUTH BEND, IN 46614
☐ 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. 2019-0187

WEIGHT S/N'S Colam kit #3

SCALE TECHNICIAN: M.P.
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 --	6 Months	YES	YES ✓	11/2020
	-	-	-				LO 500 --			NO	

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	500	500.0	0	+/-.2%	YES / NO	500.0	
2	1000	1000.0	0	+/-.2%	YES / NO	1000.0	
3	1500	1500.0	0	+/-.2%	YES / NO	1500.0	
4	2000	2000.0	0	+/-.2%	YES / NO	2000.0	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584496

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

- ❑ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
- ❑ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
- ☒ 1424 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
- ❑ 490 S. Mapleton St. 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 Gaiaeo 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
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- ❑ 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
- ❑ 2351 Jaclyn Court SOUTH BEND, IN 46614
- ❑ 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. 2019-0182

WEIGHT S/N'S Cream kit #3

SCALE TECHNICIAN: MP 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
-	SARTORIUS	A2005	39080133	LAB	100 GM g	0.1 g	HI - g	6 Months	YES	YES ✓	11/2020
	-	-	-				LO - g			NO	

	WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1	10g	10000.9	+0.9	+/-.2%	YES / NO	10000.0	CALIBRATED
2	20g	20001.3	+1.3	+/-.2%	YES / NO	20000.0	
3	50g	50004.5	+4.5	+/-.2%	YES / NO	50000.0	
4	100g	100010.8	+10.8	+/-.2%	YES / NO	100000.0	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584489

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

☐ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
☐ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
☐ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
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☐ 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
☐ 2351 Jaclyn Court **SOUTH BEND**, IN 46614
☐ 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. 2019-018t

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: M.L. 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
-	A&D	HR-200	12323498	LAB	210 g	0.0001 g	HI 200 g / LO 10 g	6 Months	YES	YES ✓ / NO	11/2020

WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1 10g	9.9995	-.0005		YES / NO	10.0000	CALIBRATED
2 20g	19.9996	-.0004		YES / NO	20.0000	
3 50g	49.9997	-.0003		YES / NO	50.0000	
4 100g	99.9980	-.0020		YES / NO	100.0000	
5 200g	199.9970	-.0030		YES / NO	200.0000	
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.

#

BRECHBUHLER SCALES, INC.

SCALE INSPECTION REPORT

584490

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

14614 CENFIELD ST ALLIANCE, OH 44601

P.O. COD!!!!! DATE 5/12/20

❑ 14941 Liberty Hi Rd. BOWLING GREEN, OH 43402 419-354-2030
❑ 4005 South Ave. YOUNGSTOWN, OH 44512 330-259-0414
❑ 1424 Scale St. S.W. CANTON, OH 44706-3096 330-453-2424
❑ 490 S. Mapleton St. 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
❑ 2351 Jaclyn Court SOUTH BEND, IN 46614
❑ 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. 2019-0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: M.T.
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
-	US SOLID	NONE	NONE	TRAVELLER	500 g	0.001 g	HI 200 g / LO 10 g	6 Months	YES	YES ✓ / NO	11/2020

WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1 10g	10.000	0		YES / NO	10.000	
2 20g	20.000	0		YES / NO	20.000	
3 50g	50.000	0		YES / NO	50.000	
4 100g	100.000	0		YES / NO	100.000	
5 200g	200.000	0		YES / NO	200.000	
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.

#

BRECHBUHLER SCALES, INC.

Jim Gray
330-531-2?

SCALE INSPECTION REPORT

584488

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

P.O. COD!!!!!

DATE 5/12/20

❑ 14941 Liberty Hi Rd. **BOWLING GREEN**, OH 43402 419-354-2030
❑ 4005 South Ave. **YOUNGSTOWN**, OH 44512 330-259-0414
❑ 1424 Scale St. S.W. **CANTON**, OH 44706-3096 330-453-2424
❑ 490 S. Mapleton St. **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
❑ 2351 Jaclyn Court **SOUTH BEND**, IN 46614
❑ 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. 2019-0187

WEIGHT S/N'S Gram kit #3

SCALE TECHNICIAN: M.T.
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
-	A&D	GF1200	14632225	LAB	1210 g	0.01 g	HI 1000 g / LO 200 g	6 Months	YES	YES ✓ / NO	11-2020

WGHT USED	AS FOUND	DEV.	TOL. +/-	ADJUSTED	AS LEFT	COMMENTS
1 200g	200.00	0		YES / NO	200.00	
2 500g	500.00	0		YES / NO	500.00	
3 1000g	1000.00	0		YES / NO	1000.00	
4 g				YES / NO		
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.

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: 4/6/2020
Technician: Sam Shults

Lab Standard	Thermometer Mark
169.9	170.0
190.0	190.0
204.8	205.0
214.6	215.0

Accuracy = 1 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 9/6/2020
Hart 9103 Temp Dry Well

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

MONITORING INSTRUMENTS

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

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Temperature Calibration Certificate

Instrument: H-B Thermometer
Serial #: 4B5200

Date: 4/6/2020
Technician: Sam Shults

Lab Standard	Thermometer Mark
30.1	30.0
50.1	50.0
70.0	70.0
88.0	88.0

Accuracy = 1 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 9/6/2020
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 12/28/2020 BY Matt Ashbrook 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	32	212	212
O-2	32	32	212	212
O-3	32	31	212	211
O-4	32	31	212	211
O-5	32	32	212	212
O-6	32	31	212	211
O-7	32	31	212	211
O-8	32	32	212	212
O-9	32	32	212	212
O-10	32	32	212	212
O-11	32	31	212	211
O-12	32	31	212	211
STACK THERMOCOUPLES				
2S-1	32	31	212	211
2S-2	32	31	212	211
2S-3	32	33	212	213
3S-1	32	32	212	212
3S-2	32	31	212	211
3S-3	32	32	212	212
3S-4	32	32	212	212
3S-5	32	33	212	313
4S-1	32	31	212	211
4S-2	32	31	212	211
4S-3	32	32	212	212
4S-4	32	33	212	213
4S-5	32	32	212	212
4S-6	32	32	212	212
5S-1	32	31	212	211
5S-2	32	31	212	211
5S-3	32	33	212	213
6S-1	32	32	212	212
6S-2	32	32	212	212
6S-3	32	31	212	211
6S-4	32	32	212	212
8S-1	32	32	212	212
8S-2	32	33	212	213
10S-1	32	31	212	211
10S-2	32	32	212	212
12S-1	32	32	212	212

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 12/28/2020 BY Matt Ashbrooke 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	31	212	211
C-4	32	33	212	213
C-5	32	31	212	211
C-6	32	31	212	211
C-7	32	32	212	212
C-8	32	32	212	212
C-9	32	31	212	211
PROBE THERMOCOUPLES				
2P-1	32	32	212	212
2P-2	32	32	212	212
2P-3	32	33	212	213
3P-1	32	31	212	211
3P-2	32	31	212	211
3P-3	32	32	212	212
3P-4	32	32	212	212
3P-5	32	33	212	213
4P-1	32	31	212	211
4P-2	32	31	212	211
4P-3	32	32	212	212
40-4	32	32	212	212
4P-5	32	32	212	212
4P-6	32	31	212	211
5P-1	32	31	212	211
5P-2	32	33	212	213
5P-3	32	32	212	212
6P-1	32	32	212	212
6P-2	32	33	212	213
6P-3	32	31	212	211
6P-4	32	31	212	211
8P-1	32	33	212	213
8P-2	32	33	212	213
10P-1	32	31	212	211
10P-2	32	32	212	212
12P-1	32	32	212	212

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 12/28/2020 BY Matt Ashbrooke 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	31	212	211
BH-2	32	32	212	212
BH-3	32	31	212	211
BH-4	32	33	212	213
BH-5	32	32	212	212
BH-6	32	32	212	212
BH-7	32	31	212	211
BH-8	32	31	212	211
BH-9	32		212	
SPLIT BOX OVEN THERMOCOUPLES				
SB-1	32	33	212	213
SB-2	32	32	212	212
SB-3	32	33	212	213

THERMOCOUPLE CALIBRATIONS FOR SOURCE SAMPLING APPARATUS

CALIBRATION DATE 12/28/2020 BY Matt Ashbrook 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	31	212	211
2M-2	32	33	212	213
3M-1	32	32	212	212
3M-2	32	32	212	212
4M-1	32	31	212	211
4M-2	32	33	212	213
5M-1	32	32	212	212
5M-2	32	32	212	212
6M-1	32	32	212	212
6M-2	32	31	212	211
7M-1	32	31	212	211
7M-2	32	32	212	212
8M-1	32	33	212	213
8M-2	32	32	212	212
9M-1	32	31	212	211
9M-2	32	32	212	212
10M-1	32	33	212	213
10M-2	32	31	212	211
15M-1	32	32	212	212
15M-2	32	33	212	213
17M-1	32	32	212	212
17M-2	32	32	212	212
18M-1	32	33	212	213
18M-2	32	31	212	211

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.

Pitot Tube Inspection

Client: Meggitt

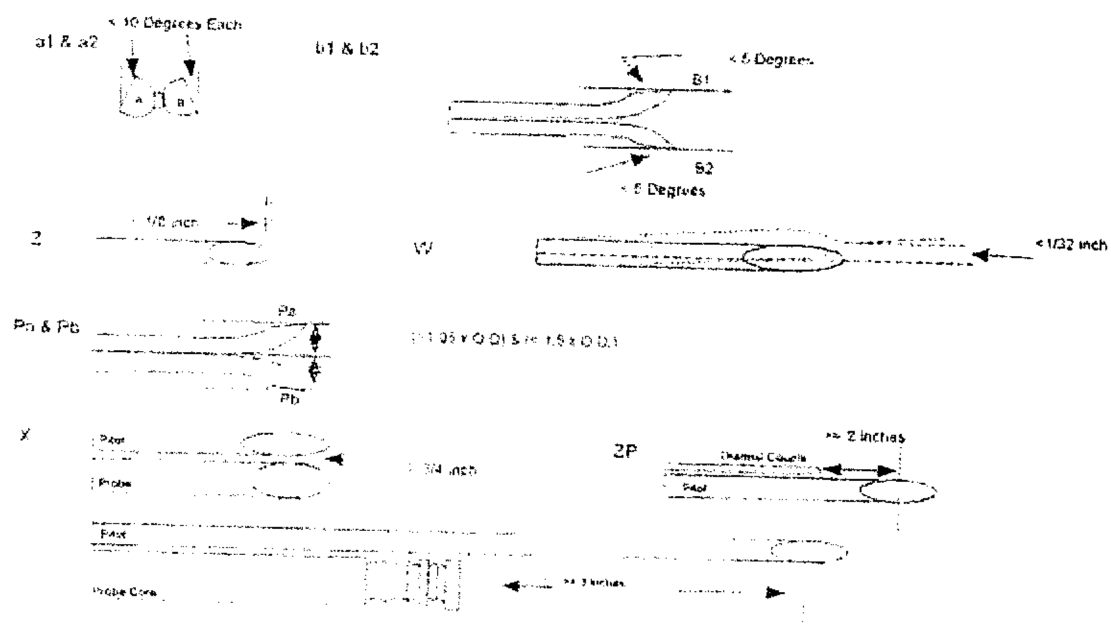
Date: 4-14-21

Probe/Pitot Number	6P-4	A (Pa + Pb)	1.027
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)	.511
a_2 (-10° < a_2 < +10°)	0	P_b (1.05 D_t < P_b < 1.5 D_t)	.516
b_1 (-5° < b_1 < +5°)	0	Pa = Pb ± 0.063"	.005
b_2 (-5° < b_2 < +5°)	0		
	0		

Probe Minimum Interferences

Y (>= 3.0")		D_n	
X (> .75")		X /D_n (>= 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

Meggitt Aircraft Braking Systems Corporation
P039 Accutherm Outlet

Nox	Gas	Cal
High	46.93	47.20
Mid	25.30	25.10
Zero	0.00	0.40

NO2	Gas	Cal
	49.50	48.70

VOC	Gas
High	47.05
Mid	24.70
Low	13.70
Zero	0.00

O2	Gas	Cal
High	20	20
Mid	10	10.1
Zero	0	0.1

CO2	Gas	Cal
High	20.04	20
Mid	9.72	9.8
Zero	0	0

CO	Gas	Cal
High	29.76	30
Mid	14.42	14.6
Zero	0	0

CO2	O2	CO	VOC	NOx	Time Stamp	
-0.03	0.04	-0.01	0.14	25.15	4/15/2021 11:43:53 AM	Nox Bias VOC Zero
-0.04	0.41	-0.02	0.57	25.12	4/15/2021 11:44:53 AM	
-0.01	11.35	-0.02	2.22	22.73	4/15/2021 11:45:53 AM	
0.02	15.53	0.04	44.22	12.51	4/15/2021 11:46:54 AM	
-0.02	20.96	0.03	47.13	0.58	4/15/2021 11:47:54 AM	
-0.03	20.91	-0.02	47.42	0.04	4/15/2021 11:48:55 AM	VOC High
-0.03	20.91	0.00	46.91	0.04	4/15/2021 11:49:55 AM	
-0.03	20.92	-0.01	46.96	0.04	4/15/2021 11:50:55 AM	
-0.03	18.42	0.13	4.36	0.04	4/15/2021 11:51:56 AM	
-0.04	0.75	6.99	0.33	0.04	4/15/2021 11:52:56 AM	
-0.04	0.17	13.92	0.27	0.04	4/15/2021 11:53:57 AM	
-0.04	0.02	14.02	0.24	0.04	4/15/2021 11:54:57 AM	Co Bias CO2 O2 Zero
-0.04	0.02	13.97	0.23	0.04	4/15/2021 11:55:58 AM	
-0.04	0.02	13.96	0.18	0.04	4/15/2021 11:56:58 AM	
-0.03	4.09	13.93	4.77	0.04	4/15/2021 11:57:58 AM	
-0.02	13.18	6.60	13.08	0.04	4/15/2021 11:58:59 AM	
-0.04	20.81	0.26	13.19	0.04	4/15/2021 11:59:59 AM	VOC Low
-0.03	20.93	0.10	10.59	0.04	4/15/2021 12:01:00 PM	
-0.02	20.93	0.10	6.79	0.04	4/15/2021 12:02:00 PM	
-0.01	20.97	0.10	24.55	0.04	4/15/2021 12:03:00 PM	
-0.04	21.05	0.02	24.62	0.04	4/15/2021 12:04:01 PM	VOC Bias CO Zero
-0.04	21.04	0.04	18.16	0.04	4/15/2021 12:05:01 PM	
-0.02	20.99	0.00	1.89	0.04	4/15/2021 12:06:02 PM	
0.13	20.72	0.01	2.44	0.04	4/15/2021 12:07:02 PM	
8.34	11.94	-0.05	0.32	0.04	4/15/2021 12:08:03 PM	
9.79	10.07	-0.20	0.25	0.04	4/15/2021 12:09:03 PM	O2 CO2 Bias Nox Zero
9.80	10.09	-0.15	0.48	0.04	4/15/2021 12:10:03 PM	
5.51	14.40	-0.23	0.65	0.04	4/15/2021 12:11:04 PM	
0.38	20.91	-0.07	0.80	0.04	4/15/2021 12:12:04 PM	
0.09	20.93	0.01	0.81	0.04	4/15/2021 12:13:05 PM	
0.07	20.93	0.00	0.79	0.04	4/15/2021 12:14:05 PM	
0.06	20.93	0.03	0.72	0.04	4/15/2021 12:15:05 PM	
0.05	20.93	0.01	0.72	0.04	4/15/2021 12:16:06 PM	
0.04	20.93	0.03	0.71	0.04	4/15/2021 12:17:06 PM	
0.04	20.93	0.02	0.72	0.04	4/15/2021 12:18:07 PM	
0.04	20.93	0.03	0.72	0.04	4/15/2021 12:19:07 PM	
0.03	20.93	0.07	0.72	0.04	4/15/2021 12:20:08 PM	
0.03	20.93	0.00	0.72	0.04	4/15/2021 12:21:08 PM	
0.04	20.93	-0.01	0.68	0.04	4/15/2021 12:22:08 PM	
0.04	20.93	0.01	0.71	0.04	4/15/2021 12:23:09 PM	
0.04	20.93	-0.02	0.64	0.04	4/15/2021 12:24:09 PM	
0.03	20.93	-0.04	0.61	0.04	4/15/2021 12:25:10 PM	
0.04	20.93	0.02	0.65	0.04	4/15/2021 12:26:10 PM	
0.04	20.93	0.00	0.66	0.04	4/15/2021 12:27:11 PM	

0.04	20.93	-0.01	0.68	0.04	4/15/2021 12:28:11 PM
0.04	20.93	0.01	0.69	0.04	4/15/2021 12:29:11 PM
0.04	20.93	0.01	0.65	0.04	4/15/2021 12:30:12 PM
0.04	20.93	-0.01	0.67	0.04	4/15/2021 12:31:12 PM
0.04	20.93	0.06	0.71	0.04	4/15/2021 12:32:13 PM
0.04	20.93	0.01	0.71	0.04	4/15/2021 12:33:13 PM
0.04	20.93	0.01	0.71	0.04	4/15/2021 12:34:14 PM
0.05	20.93	0.04	0.71	0.04	4/15/2021 12:35:14 PM
0.05	20.93	0.02	0.68	0.04	4/15/2021 12:36:14 PM
0.04	20.93	-0.03	0.68	0.04	4/15/2021 12:37:15 PM
0.04	20.93	0.00	0.70	0.04	4/15/2021 12:38:15 PM
0.05	20.93	-0.01	0.70	0.04	4/15/2021 12:39:16 PM
0.05	20.94	-0.01	0.65	0.04	4/15/2021 12:40:16 PM
0.05	20.94	-0.02	0.64	0.04	4/15/2021 12:41:17 PM
0.05	20.94	-0.01	0.70	0.04	4/15/2021 12:42:17 PM
0.05	20.94	0.00	0.69	0.04	4/15/2021 12:43:17 PM
0.05	20.94	0.01	0.69	0.04	4/15/2021 12:44:18 PM
0.05	20.93	0.02	0.66	0.04	4/15/2021 12:45:18 PM
0.05	20.93	0.02	0.64	0.04	4/15/2021 12:46:19 PM
0.06	20.93	0.02	0.70	0.04	4/15/2021 12:47:19 PM
0.06	20.93	0.00	0.69	0.04	4/15/2021 12:48:19 PM
0.06	20.93	0.02	0.71	0.04	4/15/2021 12:49:20 PM
0.06	20.93	-0.02	0.71	0.05	4/15/2021 12:50:20 PM
0.06	20.93	0.01	0.72	0.04	4/15/2021 12:51:21 PM
0.06	20.93	0.01	0.70	0.05	4/15/2021 12:52:21 PM
0.06	20.93	0.00	0.69	0.06	4/15/2021 12:53:22 PM
0.06	20.93	-0.03	0.70	0.06	4/15/2021 12:54:22 PM
0.06	20.94	0.01	0.74	0.04	4/15/2021 12:55:22 PM
0.07	20.94	0.00	0.72	0.04	4/15/2021 12:56:23 PM
0.07	20.93	0.00	0.77	0.04	4/15/2021 12:57:23 PM
0.07	20.93	0.03	0.72	0.04	4/15/2021 12:58:24 PM
0.07	20.93	0.03	0.75	0.04	4/15/2021 12:59:24 PM
0.07	20.93	0.02	0.73	0.04	4/15/2021 1:00:25 PM
0.08	20.93	0.03	0.71	0.05	4/15/2021 1:01:25 PM
0.08	20.93	0.02	0.71	0.06	4/15/2021 1:02:25 PM
0.08	20.93	0.01	0.71	0.05	4/15/2021 1:03:26 PM
0.08	20.93	0.02	0.71	0.06	4/15/2021 1:04:26 PM
0.08	20.93	-0.02	0.73	0.05	4/15/2021 1:05:27 PM
0.08	20.93	0.02	0.72	0.06	4/15/2021 1:06:27 PM
0.08	20.93	0.00	0.70	0.06	4/15/2021 1:07:27 PM
0.08	20.93	-0.02	0.68	0.06	4/15/2021 1:08:28 PM
0.08	20.93	-0.02	0.72	0.04	4/15/2021 1:09:28 PM
0.09	20.93	-0.02	0.76	0.04	4/15/2021 1:10:29 PM
0.09	20.93	-0.02	0.75	0.04	4/15/2021 1:11:29 PM
0.09	20.93	-0.02	0.72	0.04	4/15/2021 1:12:30 PM
0.09	20.93	0.00	0.72	0.04	4/15/2021 1:13:30 PM
0.09	20.93	-0.02	0.73	0.04	4/15/2021 1:14:30 PM
0.09	20.93	-0.03	0.76	0.05	4/15/2021 1:15:31 PM
0.09	20.93	-0.01	0.74	0.05	4/15/2021 1:16:31 PM
0.09	20.93	0.02	0.74	0.04	4/15/2021 1:17:32 PM
0.09	20.93	-0.01	0.75	0.05	4/15/2021 1:18:32 PM
0.09	20.93	-0.01	0.69	0.05	4/15/2021 1:19:32 PM
0.10	20.93	0.00	0.72	0.04	4/15/2021 1:20:33 PM
0.09	20.93	-0.01	0.74	0.04	4/15/2021 1:21:33 PM
0.10	20.93	0.00	0.72	0.04	4/15/2021 1:22:34 PM
0.10	20.93	0.01	0.72	0.04	4/15/2021 1:23:34 PM
0.10	20.93	0.00	0.73	0.06	4/15/2021 1:24:35 PM
0.10	20.93	-0.02	0.74	0.05	4/15/2021 1:25:35 PM
0.10	20.93	0.00	0.77	0.06	4/15/2021 1:26:35 PM
0.11	20.93	-0.06	0.79	0.04	4/15/2021 1:27:36 PM
0.11	20.93	-0.03	0.80	0.04	4/15/2021 1:28:36 PM
0.11	20.93	-0.02	0.80	0.04	4/15/2021 1:29:37 PM
0.11	20.93	-0.05	0.77	0.04	4/15/2021 1:30:37 PM

0.11	20.93	-0.06	0.80	0.04	4/15/2021 1:31:38 PM	
0.11	20.93	-0.05	0.81	0.04	4/15/2021 1:32:38 PM	
0.11	20.93	-0.03	0.81	0.04	4/15/2021 1:33:38 PM	
0.11	20.93	-0.05	0.80	0.04	4/15/2021 1:34:39 PM	
0.11	20.93	-0.03	0.79	0.04	4/15/2021 1:35:39 PM	
0.11	20.93	-0.04	0.76	0.04	4/15/2021 1:36:40 PM	
0.10	20.94	-0.06	0.79	0.04	4/15/2021 1:37:40 PM	
0.09	20.94	-0.10	0.76	0.04	4/15/2021 1:38:40 PM	
0.11	20.93	-0.02	1.49	0.04	4/15/2021 1:39:41 PM	
1.25	17.26	-0.04	1.54	13.12	4/15/2021 1:40:41 PM	
2.80	15.06	0.60	1.18	22.64	4/15/2021 1:41:42 PM	
2.94	14.85	0.62	0.96	23.14	4/15/2021 1:42:42 PM	
3.32	14.31	0.42	0.88	24.48	4/15/2021 1:43:43 PM	
3.50	14.05	0.53	0.82	25.35	4/15/2021 1:44:43 PM	
3.52	14.03	0.34	0.82	25.65	4/15/2021 1:45:43 PM	Start Run 1
3.49	14.08	0.19	0.82	25.44	4/15/2021 1:46:44 PM	
3.51	14.06	0.07	0.82	25.33	4/15/2021 1:47:44 PM	
3.57	13.99	0.13	0.82	25.47	4/15/2021 1:48:45 PM	
3.54	14.04	0.09	0.81	25.24	4/15/2021 1:49:45 PM	
3.54	14.04	0.09	0.82	25.26	4/15/2021 1:50:46 PM	
3.55	14.02	0.06	0.82	25.32	4/15/2021 1:51:46 PM	
3.57	13.98	0.05	0.82	25.47	4/15/2021 1:52:46 PM	
3.56	14.00	0.09	0.82	25.46	4/15/2021 1:53:47 PM	
3.53	14.03	0.04	0.82	25.34	4/15/2021 1:54:47 PM	
3.54	14.03	0.08	0.82	25.25	4/15/2021 1:55:48 PM	
3.56	14.00	0.05	0.82	25.42	4/15/2021 1:56:48 PM	
3.57	14.00	0.04	0.82	25.43	4/15/2021 1:57:48 PM	
3.55	14.02	0.05	0.82	25.20	4/15/2021 1:58:49 PM	
3.52	14.07	0.04	0.82	25.21	4/15/2021 1:59:49 PM	
3.55	14.03	-0.01	0.82	25.28	4/15/2021 2:00:50 PM	
3.48	14.13	0.02	0.82	25.04	4/15/2021 2:01:50 PM	
3.54	14.03	0.01	0.82	25.21	4/15/2021 2:02:51 PM	
3.52	14.05	0.07	0.82	25.37	4/15/2021 2:03:51 PM	
3.53	14.03	0.07	0.82	25.29	4/15/2021 2:04:51 PM	
3.56	13.99	0.04	0.82	25.37	4/15/2021 2:05:52 PM	
3.53	14.06	0.05	0.82	25.44	4/15/2021 2:06:52 PM	
3.55	14.02	0.05	0.82	25.39	4/15/2021 2:07:53 PM	
3.42	14.07	0.04	0.82	25.23	4/15/2021 2:08:53 PM	
3.49	14.06	0.02	0.80	25.15	4/15/2021 2:09:54 PM	
3.49	14.06	0.02	0.82	25.07	4/15/2021 2:10:54 PM	
3.45	14.07	0.02	0.82	25.08	4/15/2021 2:11:54 PM	
3.20	14.32	0.00	0.83	24.76	4/15/2021 2:12:55 PM	
3.03	14.53	-0.06	0.82	24.25	4/15/2021 2:13:55 PM	
2.91	14.56	-0.02	0.84	23.96	4/15/2021 2:14:56 PM	
2.87	14.69	-0.05	0.85	23.85	4/15/2021 2:15:56 PM	
2.74	14.82	-0.03	0.87	23.30	4/15/2021 2:16:56 PM	
2.61	14.89	-0.04	0.84	23.18	4/15/2021 2:17:57 PM	
2.62	14.84	-0.05	0.85	23.15	4/15/2021 2:18:57 PM	
2.86	14.69	-0.04	0.82	23.27	4/15/2021 2:19:58 PM	
2.97	14.50	-0.03	0.82	23.91	4/15/2021 2:20:58 PM	
2.95	14.46	-0.05	0.82	24.09	4/15/2021 2:21:59 PM	
2.94	14.45	-0.02	0.82	24.11	4/15/2021 2:22:59 PM	
3.05	14.49	-0.05	0.81	24.15	4/15/2021 2:23:59 PM	
3.07	14.50	-0.04	0.79	23.90	4/15/2021 2:25:00 PM	
3.48	14.12	-0.12	0.78	25.37	4/15/2021 2:26:00 PM	
3.28	14.25	-0.05	0.80	25.13	4/15/2021 2:27:01 PM	
3.23	14.39	-0.09	0.82	24.54	4/15/2021 2:28:01 PM	
3.04	14.53	-0.06	0.78	24.27	4/15/2021 2:29:02 PM	
3.06	14.55	-0.08	0.79	23.98	4/15/2021 2:30:02 PM	
3.05	14.49	-0.05	0.79	23.98	4/15/2021 2:31:03 PM	
3.03	14.56	-0.05	0.81	24.12	4/15/2021 2:32:03 PM	
3.05	14.60	-0.08	0.80	23.76	4/15/2021 2:33:03 PM	

3.07	14.57	-0.05	0.80	23.91	4/15/2021 2:34:04 PM	
3.07	14.52	-0.06	0.78	23.90	4/15/2021 2:35:04 PM	
2.74	14.82	-0.06	1.32	23.84	4/15/2021 2:36:05 PM	
3.05	14.49	-0.05	0.76	23.85	4/15/2021 2:37:05 PM	
3.38	14.18	-0.11	0.81	24.60	4/15/2021 2:38:06 PM	
3.24	14.33	-0.08	0.80	25.24	4/15/2021 2:39:06 PM	
3.14	14.35	-0.05	0.77	25.15	4/15/2021 2:40:06 PM	
3.14	14.34	-0.06	0.67	25.13	4/15/2021 2:41:07 PM	
3.05	14.47	-0.09	0.70	25.16	4/15/2021 2:42:07 PM	
3.07	14.47	0.05	0.66	24.79	4/15/2021 2:43:07 PM	
3.32	14.21	0.23	0.67	25.18	4/15/2021 2:44:08 PM	
3.28	14.30	0.05	0.67	24.76	4/15/2021 2:45:08 PM	Stop Run 1
3.26	14.29	0.01	0.81	24.73		Avg
3.25	14.35	0.00	0.63	24.58	4/15/2021 2:46:09 PM	
3.21	14.30	-0.02	0.62	24.62	4/15/2021 2:47:09 PM	
3.23	14.34	-0.02	0.92	24.64	4/15/2021 2:48:10 PM	
1.29	16.64	-0.08	0.65	22.90	4/15/2021 2:49:10 PM	
0.05	20.93	-0.12	0.68	13.62	4/15/2021 2:50:10 PM	
0.05	20.94	-0.09	0.74	0.15	4/15/2021 2:51:11 PM	
0.85	17.70	-0.08	0.80	0.18	4/15/2021 2:52:11 PM	
9.49	10.39	-0.20	0.72	0.35	4/15/2021 2:53:12 PM	
9.80	10.12	-0.31	0.67	0.18	4/15/2021 2:54:12 PM	O2 CO2 Bias Nox Zero
9.76	10.14	-0.31	0.67	0.13	4/15/2021 2:55:13 PM	
8.85	10.87	-0.32	0.98	0.14	4/15/2021 2:56:13 PM	
0.10	5.50	1.29	0.80	0.13	4/15/2021 2:57:13 PM	
0.04	0.44	13.98	0.73	0.12	4/15/2021 2:58:14 PM	
0.03	0.26	14.06	0.72	0.13	4/15/2021 2:59:14 PM	Co Bias CO2 O2 Zero
0.03	0.26	14.12	0.88	0.13	4/15/2021 3:00:15 PM	
0.02	9.54	12.06	15.26	0.13	4/15/2021 3:01:15 PM	
0.04	19.83	1.79	23.83	0.14	4/15/2021 3:02:16 PM	
0.05	20.93	-0.10	24.08	0.14	4/15/2021 3:03:16 PM	
0.05	20.94	-0.13	24.17	0.14	4/15/2021 3:04:16 PM	VOC Bias CO Zero
0.04	20.94	-0.11	20.11	0.14	4/15/2021 3:05:17 PM	
0.05	13.11	-0.13	0.92	12.95	4/15/2021 3:06:17 PM	
0.05	0.46	-0.14	0.81	23.29	4/15/2021 3:07:18 PM	
0.05	0.30	-0.14	0.81	25.42	4/15/2021 3:08:18 PM	
0.04	0.30	-0.19	0.80	25.36	4/15/2021 3:09:18 PM	Nox Bias VOC Zero
0.05	1.30	-0.16	1.06	25.18	4/15/2021 3:10:19 PM	
0.05	11.67	-0.16	0.80	22.94	4/15/2021 3:11:19 PM	
0.05	20.72	-0.06	0.73	12.62	4/15/2021 3:12:20 PM	
0.05	20.92	-0.03	0.81	0.13	4/15/2021 3:13:20 PM	
0.05	20.92	-0.06	0.81	0.13	4/15/2021 3:14:21 PM	
0.05	20.92	-0.08	0.81	0.13	4/15/2021 3:15:21 PM	
0.05	20.92	-0.05	0.81	0.13	4/15/2021 3:16:21 PM	
0.05	20.92	-0.05	0.80	0.13	4/15/2021 3:17:22 PM	
0.05	20.92	-0.03	0.81	0.13	4/15/2021 3:18:22 PM	
0.05	20.92	-0.08	0.81	0.13	4/15/2021 3:19:23 PM	
0.05	20.92	-0.09	0.81	0.13	4/15/2021 3:20:23 PM	
0.05	20.92	-0.05	0.82	0.13	4/15/2021 3:21:23 PM	
0.05	20.92	-0.06	0.81	0.13	4/15/2021 3:22:24 PM	
0.05	20.91	-0.05	1.10	0.13	4/15/2021 3:23:24 PM	
2.55	14.96	0.07	0.89	17.86	4/15/2021 3:24:25 PM	
3.15	14.38	0.40	0.71	23.84	4/15/2021 3:25:25 PM	
3.63	13.89	0.39	0.70	25.15	4/15/2021 3:26:26 PM	
3.48	13.97	0.35	0.63	25.13	4/15/2021 3:27:26 PM	Start Run 2
3.52	13.96	0.26	0.63	24.87	4/15/2021 3:28:27 PM	
3.45	14.00	0.23	0.63	24.72	4/15/2021 3:29:27 PM	
3.65	14.06	0.20	0.63	24.54	4/15/2021 3:30:27 PM	
3.47	14.11	0.17	0.64	24.34	4/15/2021 3:31:28 PM	
3.40	14.17	0.20	0.66	24.24	4/15/2021 3:32:28 PM	
3.30	14.27	0.17	0.64	24.03	4/15/2021 3:33:29 PM	

3.33	14.16	0.17	0.64	24.07	4/15/2021 3:34:29 PM	
3.30	14.24	0.18	0.67	24.25	4/15/2021 3:35:29 PM	
3.35	14.22	0.19	0.65	23.97	4/15/2021 3:36:30 PM	
3.36	14.18	0.18	0.66	24.31	4/15/2021 3:37:30 PM	
3.32	14.16	0.20	0.65	24.29	4/15/2021 3:38:31 PM	
3.33	14.17	0.17	0.67	24.37	4/15/2021 3:39:31 PM	
3.25	14.27	0.15	0.72	24.20	4/15/2021 3:40:32 PM	
3.21	14.37	0.17	0.74	23.93	4/15/2021 3:41:32 PM	
3.09	14.53	0.17	0.74	23.45	4/15/2021 3:42:32 PM	
3.05	14.49	0.19	0.78	23.44	4/15/2021 3:43:33 PM	
2.83	14.74	0.14	0.81	23.16	4/15/2021 3:44:33 PM	
2.62	14.90	0.15	0.83	22.67	4/15/2021 3:45:34 PM	
2.52	15.03	0.14	0.89	23.34	4/15/2021 3:46:34 PM	
3.03	14.42	0.14	0.94	23.74	4/15/2021 3:47:34 PM	
3.07	14.43	0.12	0.99	24.04	4/15/2021 3:48:35 PM	
2.87	14.67	0.11	1.02	24.10	4/15/2021 3:49:35 PM	
3.05	14.95	0.09	1.07	24.29	4/15/2021 3:50:36 PM	
3.48	15.08	0.08	1.06	23.71	4/15/2021 3:51:36 PM	
3.48	15.09	0.05	1.14	23.83	4/15/2021 3:52:37 PM	
3.05	14.51	0.08	1.18	24.28	4/15/2021 3:53:37 PM	
2.90	14.69	0.09	1.26	24.63	4/15/2021 3:54:37 PM	
2.48	15.02	0.03	1.25	24.89	4/15/2021 3:55:38 PM	
3.50	14.92	0.02	1.25	24.68	4/15/2021 3:56:38 PM	
2.48	14.99	0.07	1.32	24.84	4/15/2021 3:57:39 PM	
3.21	14.32	0.05	1.35	24.26	4/15/2021 3:58:39 PM	
3.03	14.46	0.04	1.34	24.57	4/15/2021 3:59:39 PM	
3.11	14.41	0.05	1.29	24.65	4/15/2021 4:00:40 PM	
3.33	14.12	0.04	1.32	25.06	4/15/2021 4:01:40 PM	
3.02	14.47	0.04	1.39	24.89	4/15/2021 4:02:41 PM	
2.97	14.68	0.02	1.41	25.07	4/15/2021 4:03:41 PM	
2.97	14.68	0.01	1.44	24.82	4/15/2021 4:04:42 PM	
2.85	14.77	0.04	1.49	24.90	4/15/2021 4:05:42 PM	
2.66	14.82	0.06	1.43	24.46	4/15/2021 4:06:43 PM	
2.73	14.78	0.09	1.53	24.71	4/15/2021 4:07:43 PM	
2.54	15.04	0.07	1.53	25.24	4/15/2021 4:08:43 PM	
2.53	15.03	0.06	1.56	25.09	4/15/2021 4:09:44 PM	
2.42	15.10	0.02	1.57	24.95	4/15/2021 4:10:44 PM	
2.38	15.17	0.01	1.53	24.64	4/15/2021 4:11:45 PM	
2.33	15.09	0.02	1.57	24.95	4/15/2021 4:12:45 PM	
2.23	15.29	0.02	1.62	24.67	4/15/2021 4:13:45 PM	
2.11	15.41	0.03	1.57	24.14	4/15/2021 4:14:46 PM	
2.27	15.25	0.02	1.61	24.48	4/15/2021 4:15:46 PM	
2.51	15.14	0.02	1.60	24.26	4/15/2021 4:16:47 PM	
2.51	14.94	-0.02	1.61	24.24	4/15/2021 4:17:47 PM	
2.60	14.84	-0.02	1.62	24.13	4/15/2021 4:18:48 PM	
2.71	14.84	0.01	1.62	24.09	4/15/2021 4:19:48 PM	
2.62	14.84	0.00	1.65	24.19	4/15/2021 4:20:48 PM	
2.62	14.85	0.00	1.73	24.22	4/15/2021 4:21:49 PM	
2.82	14.66	0.00	1.78	24.61	4/15/2021 4:22:49 PM	
2.64	14.84	0.01	1.78	24.20	4/15/2021 4:23:50 PM	
2.73	14.79	0.00	1.79	24.13	4/15/2021 4:24:50 PM	
2.71	14.78	0.01	1.76	24.03	4/15/2021 4:25:51 PM	
2.73	14.76	0.04	1.81	24.29	4/15/2021 4:26:51 PM	
2.52	14.95	-0.01	1.79	24.86	4/15/2021 4:27:51 PM	Stop Run 2
2.93	14.65	0.09	1.20	24.35		Avg
2.54	14.93	0.01	1.79	24.79	4/15/2021 4:28:52 PM	
2.57	14.89	0.01	1.80	24.78	4/15/2021 4:29:52 PM	
2.60	14.88	0.00	1.79	24.93	4/15/2021 4:30:53 PM	
2.64	14.83	0.00	1.77	24.96	4/15/2021 4:31:53 PM	
2.84	14.74	0.01	1.78	24.22	4/15/2021 4:32:53 PM	
2.75	14.79	0.02	1.81	24.26	4/15/2021 4:33:54 PM	
1.05	18.93	-0.02	9.26	12.87	4/15/2021 4:34:54 PM	

0.03	20.92	0.01	24.74	0.46	4/15/2021 4:35:55 PM	
0.02	20.93	-0.02	24.73	0.13	4/15/2021 4:36:55 PM	VOC Bias CO Zero
0.01	20.93	-0.06	20.93	0.13	4/15/2021 4:37:56 PM	
0.01	14.60	0.23	0.67	0.13	4/15/2021 4:38:56 PM	
0.01	1.44	6.43	0.63	0.13	4/15/2021 4:39:56 PM	
0.01	0.27	14.41	0.59	0.13	4/15/2021 4:40:57 PM	
0.01	0.28	14.42	0.53	0.14	4/15/2021 4:41:57 PM	Co Bias CO2 O2 Zero
0.00	0.31	14.23	0.61	0.14	4/15/2021 4:42:58 PM	
0.86	7.00	11.15	0.46	0.14	4/15/2021 4:43:58 PM	
9.02	9.90	0.23	0.44	0.14	4/15/2021 4:44:58 PM	
9.64	9.91	-0.44	0.43	0.14	4/15/2021 4:45:59 PM	O2 CO2 Bias Nox Zero
9.63	9.91	-0.44	0.42	0.15	4/15/2021 4:46:59 PM	
9.22	9.23	-0.45	0.72	1.06	4/15/2021 4:48:00 PM	
1.40	1.98	-0.37	0.54	21.83	4/15/2021 4:49:00 PM	
0.05	0.22	-0.20	0.52	25.86	4/15/2021 4:50:01 PM	
0.05	0.21	-0.22	0.50	25.92	4/15/2021 4:51:01 PM	Nox Bias VOC Zero
0.05	0.34	-0.18	0.79	25.79	4/15/2021 4:52:01 PM	
0.05	12.28	-0.17	0.85	22.64	4/15/2021 4:53:02 PM	
0.05	20.72	-0.09	0.84	1.52	4/15/2021 4:54:02 PM	
0.05	20.92	-0.14	0.81	0.13	4/15/2021 4:55:03 PM	
0.05	20.92	-0.09	0.81	0.13	4/15/2021 4:56:03 PM	
0.05	20.92	-0.08	0.81	0.13	4/15/2021 4:57:03 PM	
0.05	20.92	-0.05	0.81	0.13	4/15/2021 4:58:04 PM	
0.05	20.92	-0.12	0.79	0.13	4/15/2021 4:59:04 PM	
1.22	17.50	-0.04	0.85	1.59	4/15/2021 5:00:05 PM	
3.74	13.81	0.57	0.82	23.73	4/15/2021 5:01:05 PM	
3.75	13.71	2.68	0.79	26.16	4/15/2021 5:02:06 PM	
3.75	13.76	3.44	0.72	26.14	4/15/2021 5:03:06 PM	
3.81	13.71	2.30	0.72	25.90	4/15/2021 5:04:07 PM	Start Run 3
3.80	13.74	1.41	0.72	25.76	4/15/2021 5:05:07 PM	
3.80	13.72	0.96	0.72	25.67	4/15/2021 5:06:07 PM	
3.80	13.72	0.69	0.71	25.35	4/15/2021 5:07:08 PM	
3.81	13.71	0.53	0.71	25.32	4/15/2021 5:08:08 PM	
3.79	13.72	0.54	0.71	25.20	4/15/2021 5:09:09 PM	
3.77	13.72	0.42	0.69	25.10	4/15/2021 5:10:09 PM	
3.77	13.73	0.38	0.68	24.96	4/15/2021 5:11:10 PM	
3.80	13.72	0.29	0.72	24.85	4/15/2021 5:12:10 PM	
3.80	13.72	0.31	0.70	24.89	4/15/2021 5:13:10 PM	
3.75	13.70	0.25	0.71	24.81	4/15/2021 5:14:11 PM	
3.79	13.70	0.25	0.71	24.92	4/15/2021 5:15:11 PM	
3.85	13.68	0.22	0.71	24.77	4/15/2021 5:16:11 PM	
3.78	13.73	0.25	0.71	24.86	4/15/2021 5:17:12 PM	
3.77	13.72	0.25	0.71	24.73	4/15/2021 5:18:12 PM	
3.78	13.72	0.17	0.72	24.90	4/15/2021 5:19:13 PM	
3.84	13.68	0.15	0.72	24.92	4/15/2021 5:20:13 PM	
3.80	13.73	0.17	0.71	24.86	4/15/2021 5:21:14 PM	
3.80	13.75	0.15	0.71	24.76	4/15/2021 5:22:14 PM	
3.73	13.75	0.16	0.69	24.73	4/15/2021 5:23:15 PM	
3.65	13.75	0.14	0.72	24.71	4/15/2021 5:24:15 PM	
3.62	13.77	0.15	0.71	24.86	4/15/2021 5:25:15 PM	
3.63	13.81	0.12	0.70	24.81	4/15/2021 5:26:16 PM	
3.50	13.84	0.15	0.72	24.82	4/15/2021 5:27:16 PM	
3.50	13.85	0.13	0.72	24.73	4/15/2021 5:28:17 PM	
3.61	13.84	0.10	0.70	24.80	4/15/2021 5:29:17 PM	
3.49	13.85	0.12	0.67	24.80	4/15/2021 5:30:18 PM	
3.57	13.92	0.05	0.67	24.75	4/15/2021 5:31:18 PM	
3.54	13.87	0.05	0.69	24.70	4/15/2021 5:32:18 PM	
3.51	13.96	0.11	0.70	24.73	4/15/2021 5:33:19 PM	
3.53	13.93	0.07	0.68	24.63	4/15/2021 5:34:19 PM	
3.53	13.92	0.12	0.68	24.76	4/15/2021 5:35:20 PM	
3.51	13.99	0.11	0.67	24.55	4/15/2021 5:36:20 PM	
3.52	13.94	0.09	0.71	24.66	4/15/2021 5:37:20 PM	

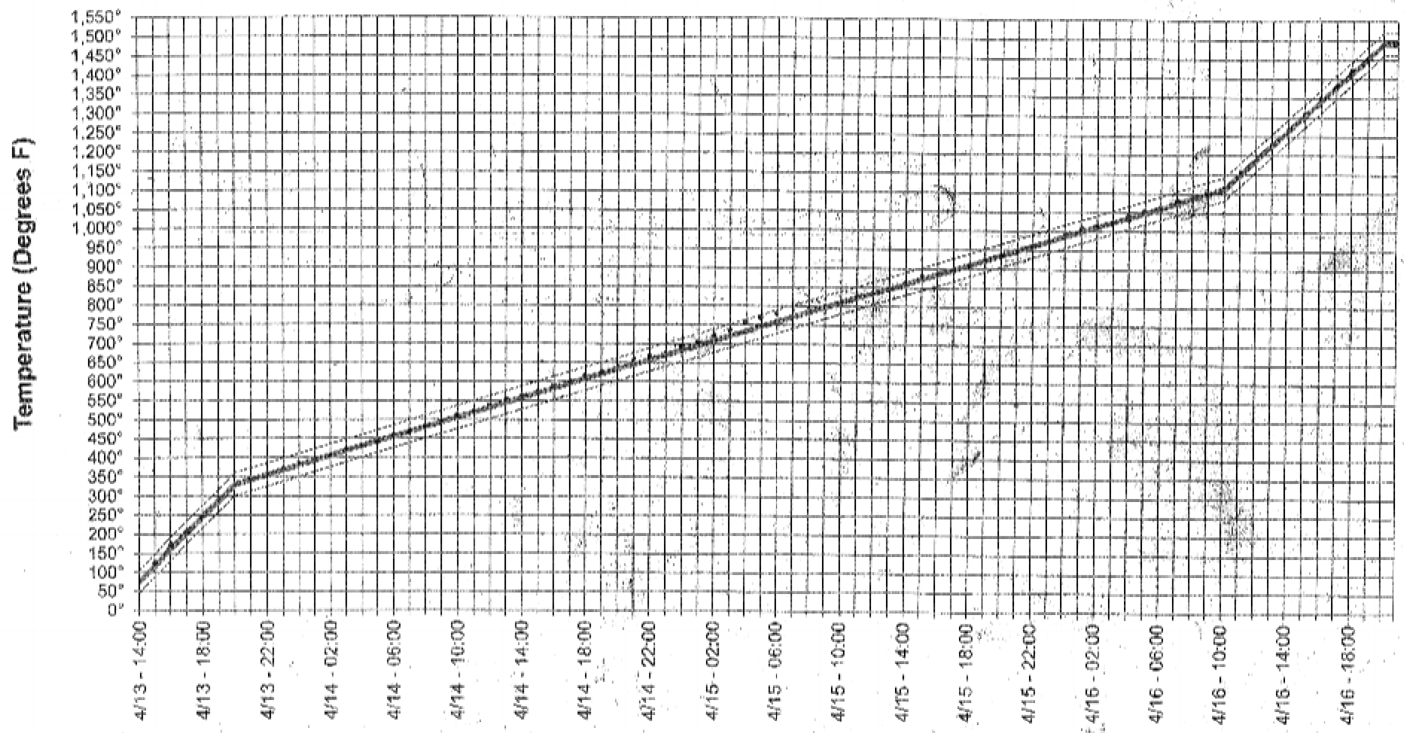
3.44	13.96	0.08	0.67	24.70	4/15/2021 5:38:21 PM	
3.52	14.00	0.08	0.69	24.59	4/15/2021 5:39:21 PM	
3.40	14.03	0.09	0.65	24.55	4/15/2021 5:40:22 PM	
3.42	14.04	0.04	0.65	24.43	4/15/2021 5:41:22 PM	
3.41	14.07	0.05	0.67	24.53	4/15/2021 5:42:22 PM	
3.40	14.17	0.01	0.69	24.34	4/15/2021 5:43:23 PM	
3.29	14.21	0.04	0.71	24.20	4/15/2021 5:44:23 PM	
3.03	14.40	0.02	0.70	23.84	4/15/2021 5:45:24 PM	
3.15	14.40	0.00	0.71	23.86	4/15/2021 5:46:24 PM	
2.87	14.57	-0.02	0.71	23.38	4/15/2021 5:47:25 PM	
2.83	14.59	-0.03	0.72	23.39	4/15/2021 5:48:25 PM	
2.81	14.60	-0.02	0.73	23.25	4/15/2021 5:49:25 PM	
2.82	14.63	-0.03	0.72	23.15	4/15/2021 5:50:26 PM	
2.71	14.75	-0.01	0.68	23.17	4/15/2021 5:51:26 PM	
2.83	14.60	0.00	0.74	22.97	4/15/2021 5:52:27 PM	
2.60	14.82	-0.03	0.76	23.03	4/15/2021 5:53:27 PM	
2.59	14.82	-0.04	0.74	22.63	4/15/2021 5:54:28 PM	
2.53	14.81	-0.03	0.76	22.87	4/15/2021 5:55:28 PM	
2.55	14.86	-0.03	0.79	22.69	4/15/2021 5:56:28 PM	
2.55	14.89	-0.04	0.77	22.45	4/15/2021 5:57:29 PM	
2.55	14.90	0.00	0.77	22.83	4/15/2021 5:58:29 PM	
2.53	14.81	-0.03	0.77	22.54	4/15/2021 5:59:30 PM	
2.57	14.78	0.00	0.82	22.99	4/15/2021 6:00:30 PM	
2.43	14.99	-0.03	0.81	22.45	4/15/2021 6:01:31 PM	
2.46	15.02	-0.01	0.87	22.55	4/15/2021 6:02:31 PM	
2.11	15.43	-0.03	0.88	21.67	4/15/2021 6:03:32 PM	
2.09	15.35	-0.02	0.83	21.34	4/15/2021 6:04:32 PM	Stop Run 3
3.31	14.15	0.19	0.72	24.20		Avg
2.31	15.03	-0.02	0.84	21.85	4/15/2021 6:05:32 PM	
2.15	15.29	-0.03	0.89	22.32	4/15/2021 6:06:33 PM	
1.89	15.58	-0.06	1.10	21.16	4/15/2021 6:07:33 PM	
0.87	16.90	-0.05	2.02	20.38	4/15/2021 6:08:34 PM	
0.05	20.81	-0.05	1.99	1.13	4/15/2021 6:09:34 PM	
0.05	17.69	-0.09	1.07	0.36	4/15/2021 6:10:34 PM	
0.05	5.50	-0.11	0.81	8.81	4/15/2021 6:11:35 PM	
0.05	0.53	-0.10	0.81	24.51	4/15/2021 6:12:35 PM	
0.05	0.35	-0.10	0.81	24.92	4/15/2021 6:13:36 PM	
0.05	0.28	-0.10	0.74	24.87	4/15/2021 6:14:36 PM	Nox Bias VOC Zero
0.05	0.21	-0.10	0.92	24.91	4/15/2021 6:15:37 PM	
0.05	6.85	-0.09	0.63	24.03	4/15/2021 6:16:37 PM	
1.22	10.27	-0.15	0.63	14.15	4/15/2021 6:17:37 PM	
9.61	10.15	-0.31	0.63	0.22	4/15/2021 6:18:38 PM	
9.62	10.14	-0.25	0.63	0.20	4/15/2021 6:19:38 PM	
9.62	10.08	-0.29	0.63	0.13	4/15/2021 6:20:38 PM	O2 CO2 Bias Nox Zero
9.62	10.07	-0.24	0.70	0.13	4/15/2021 6:21:39 PM	
8.48	10.75	0.16	1.69	0.15	4/15/2021 6:22:39 PM	
0.05	19.55	0.60	24.83	0.15	4/15/2021 6:23:40 PM	
0.05	20.92	0.00	24.87	0.13	4/15/2021 6:24:40 PM	
0.05	20.92	0.00	24.92	0.13	4/15/2021 6:25:41 PM	VOC Bias CO Zero
0.05	20.92	0.09	24.91	0.19	4/15/2021 6:26:41 PM	
0.05	20.93	0.10	24.86	0.17	4/15/2021 6:27:42 PM	
0.05	11.73	6.06	1.87	0.13	4/15/2021 6:28:42 PM	
0.04	0.45	14.40	0.97	0.13	4/15/2021 6:29:42 PM	
0.04	0.24	14.40	0.90	0.14	4/15/2021 6:30:43 PM	Co Bias CO2 O2 Zero
0.05	0.24	14.40	0.90	0.14	4/15/2021 6:31:43 PM	
0.04	0.23	14.40	0.91	0.14	4/15/2021 6:32:44 PM	
0.04	8.46	6.02	0.93	0.14	4/15/2021 6:33:44 PM	
0.04	20.17	0.02	0.92	0.14	4/15/2021 6:34:45 PM	
0.04	20.92	0.00	0.91	0.14	4/15/2021 6:35:45 PM	
0.04	20.92	-0.05	0.90	0.14	4/15/2021 6:36:45 PM	

Appendix #5

Process Data

ACCUTHERM RAMP CHART

Run Start Date: **4/13/2021** Run # **CB1-10321**



Public Notice
Ohio Environmental Protection Agency
Draft State Implementation Plan
VOC Reasonably Available Control Technology (RACT)
for Meggitt Aircraft Braking Systems Corp. (Facility ID1677010999)

Summit County

Notice is hereby given that the Director of the Ohio Environmental Protection Agency, (Ohio EPA) is submitting to the United States Environmental Protection Agency (U.S. EPA) Reasonably Available Control Technology (RACT) for Meggitt Aircraft Braking Systems Corp, LLC (Facility ID 1677010999) for approval into Ohio's state implementation plan (SIP) for the 2015 ozone National Ambient Air Quality Standard (NAAQS).

On March 17, 2025, Ohio submitted a revision to Ohio's SIP to address RACT requirements for the 2015 8-hour ozone NAAQS. As noted in this submittal, Ohio Administrative Code (OAC) rule 3745-21-11(B) requires facilities that have the potential to emit of fifty tons per year or more, but less than one hundred tons per year of volatile organic compounds (VOC) and are located in nonattainment counties to submit a RACT study for sources not controlled by Ohio's Control Technique Guideline (CTG) regulations in OAC Chapter 3745-21 or by categorical non-CTG RACT in OAC rules 3745-21-12, 3745-21-14, 3745-21-16, 3745-21-21 and 3745-21-25.

Ohio is now submitting source-specific VOC RACT for Meggitt Aircraft Braking Systems Corp (Facility ID 1677010999) for approval into Ohio's SIP. This facility is located in the Cleveland 2015 ozone maintenance area and has no prior existing source-specific RACT established in OAC rule 3745-21-09.

The updated RACT Study was submitted per OAC rule 3745-21-11(B). Ohio has determined that the updated RACT study, along with supplemental information submitted subsequently, is sufficient to justify the continued use of the existing thermal oxidizer with an overall control efficiency of at least 99% pursuant to OAC rule 3745-31-05(D) proposed by the facility to act as RACT for the carbon furnaces under the 2015 ozone standard.

Ohio EPA is now requesting approval of the proposed RACT for Meggitt Aircraft Braking Systems Corp into Ohio's SIP.

Ohio EPA is seeking public comment to satisfy U.S. EPA requirements for public involvement in SIP related activities in accordance with 40 CFR 51.102.

The public comment period will run until October 12, 2026. Written comments should be submitted at: https://ohioepa.commentinput.com - Search by entering the permit # (P0141227 for Meggitt Aircraft Braking Systems Corp) in the "Search Projects" search box.

A public hearing on this action may be requested by contacting Kathryn Jobe at 614-728-0671 or kathryn.jobe@epa.ohio.gov no later than 30 days from the draft public notice. If a public hearing is requested, a new notification will be published to identify the time and location of the public hearing. The public hearing will be held at least 30 days after the date of the new notification.

All interested persons are entitled to comment on these changes. All comments submitted to the above address by the close of business 30 days from when the draft public notice is issued will be considered by Ohio EPA prior to final action on this action. Written statements submitted after this time period may be considered as time and circumstances permit but will not be part of the official record.

Questions or comments about this document should be directed to Kathryn Jobe at 614-728-0671 or kathryn.jobe@epa.ohio.gov.

Environmental Protection Agency

EPA.Ohio.gov

Mike DeWine, *Governor* Jim Tressel, *Lt. Governor* John Logue, *Director*

DATE

Ms. Anne Vogel
Regional Administrator
U.S. EPA, Region 5
77 West Jackson Blvd.
Chicago, Illinois 60604

Re: Revision to Ohio's Reasonably Available Control Technology (RACT) State Implementation Plan for the 2015 Ozone National Ambient Air Quality Standards – Source-Specific Volatile Organic Compound (VOC) RACT for Meggitt Aircraft Braking Systems Corp. (Facility ID 1677010999)

Dear Administrator Vogel:

On March 17, 2025, Ohio submitted a revision to Ohio's State Implementation Plan (SIP) to address Reasonably Available Control Technology (RACT) requirements for the 2015 8-hour ozone National Ambient Air Quality Standards (NAAQS) for areas classified as serious. As noted in this submittal, Ohio EPA adopted requirements in Ohio Administrative Code (OAC) rule 3745-21-11 for facilities in the nonattainment areas that emit fifty tons per year or more, but less than one hundred tons per year of volatile organic compounds (VOC) from sources not controlled by Ohio's CTG regulations in OAC Chapter 3745-21 or by categorical non-CTG RACT in OAC rules 3745-21-12, 3745-21-14, 3745-21-16, 3745-21-21 and 3745-21-25 to submit an updated RACT study within one year of the effective date of the rule. Upon review of the RACT study, Ohio EPA evaluated if the RACT proposed by the facility is appropriate to satisfy RACT requirements under the 2015 ozone standard.

Ohio is now submitting source-specific VOC RACT for Meggitt Aircraft Braking Systems Corp. (Facility ID 1677010999) for approval into Ohio's SIP. This facility is located in the Cleveland 2015 ozone maintenance area and has no prior existing source-specific RACT established in OAC rule 3745-21-09.

The updated VOC RACT Study was submitted per OAC rule 3745-21-11. Ohio has determined that the updated RACT study, along with supplemental information submitted subsequently, is sufficient to justify the continued use of the existing thermal oxidizer with an overall control efficiency of at least 99% pursuant to OAC rule 3745-31-05(D) proposed by the facility to act as RACT for the carbon furnaces under the 2015 ozone standard. The RACT study is provided in Appendix A, and the permit that incorporated RACT is provided as Appendix B. Within the permit, we have highlighted the terms and conditions associated with RACT and request only those provisions are subject to this SIP revision request. Appendix C provides the permit strategy write-up for the permit.

Ohio held a public comment period on Ohio's RACT determination from September 10 to October 12, 2026. Appendix D contains the public notice. ***[Ohio's response to comments received during the public comment period is in Appendix E/No comments were received during the public comment period].***

This SIP does not include the relaxation of any existing requirements and therefore will not interfere with the attainment or maintenance of the NAAQS in accordance with section 110(l) of the CAA.

Ohio EPA is now requesting approval of the proposed RACT for Meggitt Aircraft Braking Systems Corp. into Ohio's SIP.

Ohio EPA is submitting this SIP via U.S. EPA's State Planning Electronic Collaboration System (SPeCS). If you have questions, please contact Jennifer Van Vlerah in our Division of Air Pollution Control at (614) 644-3696.

Sincerely,

John Logue
Director

Cc: Bob Hodanbosi, Chief, Division of Air Pollution Control, Ohio EPA

Enclosures