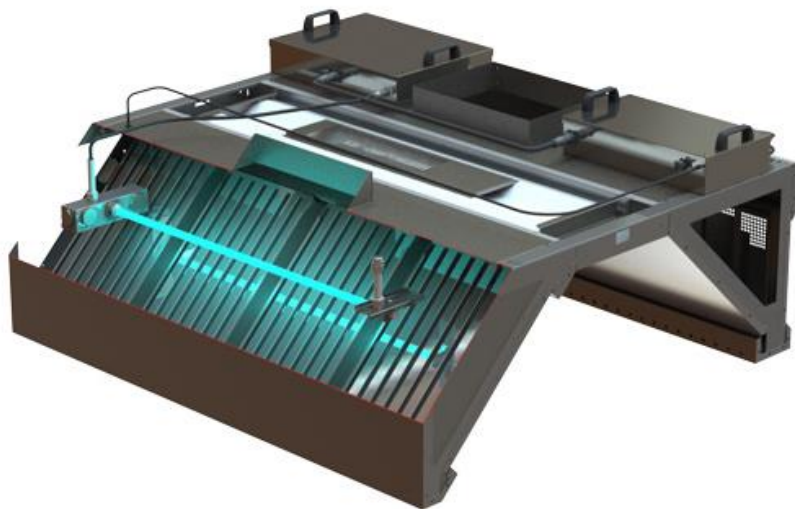


## DATA BOOK Sistema OGR®

### Tecnologia de Limpeza Automática de Sistemas de Exaustão



<b>Emissão</b> <b>MACOM - OGR</b>	<b>Data</b> <b>05/01/2021</b>	<b>Responsável</b> <b>Engº RAFAEL MENDES SANTOS</b>
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## 1. A EMPRESA

A AÇOS MACOM é reconhecida como líder na fabricação de equipamentos e sistemas para cozinhas profissionais da América Latina. Desde a sua fundação em 1972, a empresa valoriza acima de tudo a qualidade de seus produtos e mantém-se fiel aos seus valores: Integridade, Experiência e Inovação. Sua trajetória sempre foi marcada por uma permanente evolução técnica, pelo desenvolvimento de produtos inovadores e por manter um relacionamento próximo e duradouro com clientes, parceiros e colaboradores.

Desde 19 de julho de 2013 a MACOM faz parte do Grupo HOSHIZAKI, segundo maior fabricante de equipamentos para food service do mundo, operando em mais de 60 países e oferecendo as melhores máquinas de gelo do mercado com quatro tipos de gelo (meia-lua gourmet, cubelet, flocos, cubo). Para maiores informações sobre o Grupo Hoshizaki acesse o site: <https://www.hoshizaki.co.jp/en/>

A AÇOS MACOM e a BIOZONE firmaram uma parceria de exclusividade em território nacional de fornecimento de coifas para cozinhas profissionais do sistema automático de higienização através de lâmpadas ultravioleta.

A BioZone Scientific International, Inc. é fornecedor global de equipamentos e tecnologia nas indústrias de alimentos HVAC e higiene para desinfecção de ar e superfície e sistemas de manutenção preventiva. A BioZone está sediada em Orlando, Flórida, com escritórios corporativos em Londres-Reino Unido, Helsinque-Finlândia e Hong Kong e uma rede de distribuidores profissionais e parceiros de vendas em todo o mundo. A linha de produtos de grande sucesso da BioZone inclui o reconhecimento de várias patentes e prêmios, incluindo o Prêmio de Inovações em Cozinha da National Restaurant Association.

A família de produtos BioZone OGR é um sistema baseado em luz ultravioleta livre de produtos químicos que automatiza a remoção de gordura e odores de sistemas de exaustão de exaustores de cozinha e dutos comerciais. OGR é um sistema patenteado (registrado sob a patente dos EUA número 10337749) que foi instalado em milhares de exaustores de cozinha comerciais e foi aprovado por vários órgãos reguladores municipais e empresas de gestão de propriedades para o tratamento do ar de exaustão da cozinha. OGR foi testado por terceiros e demonstrou remover até 95% de gordura e atenuação do odor do ar de exaustão da cozinha (<https://biozonescientific.com/odor-grease-removal/>).

## 2. DESCRITIVO TÉCNICO DOS SISTEMAS

### 2.1 COIFAS OGR®

As coifas da Aços Macom foram desenvolvidas para serem elementos de extração beneficiando através de captação e contenção os vapores provenientes dos processos de cocção.

Nosso corpo técnico norteia-se através das normas NBR14518, ASHRAE, NSF, UL, CE e NFPA. Especificamente para as Coifas OGR no tocante a tratamento de gordura, o equipamento atende aos requisitos da UL710C (segurança) e os artigos 98 e 99 do Decreto Municipal RJ 22.281/2002.

Dentre as características de construção estão a fabricação do corpo em aço inoxidável AISI 304 #20, filtros inercias extratores de gordura removíveis para lavagem fabricados em aço inoxidável AISI 304, iluminação LED IP66 embutida no patamar da coifa e lâmpadas germicidas ultravioletas UVC com comprimento de onda de 264nm e 185nm.

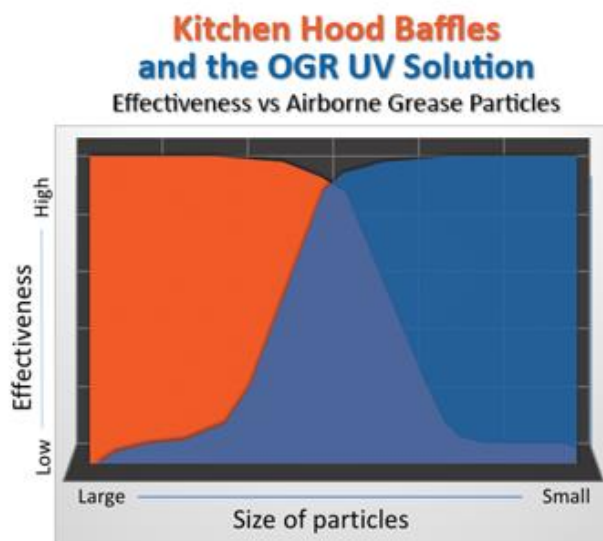
Corpo com calhas inferiores coletora de gordura em todo perímetro de aço inoxidável e drenos rosqueados para escoamento além de acabamento escovado.

Os tirantes roscados em aço galvanizado, com fixadores superiores e fixadores junto a coifa são expedidos e previamente alocados garantindo segura distribuição de carga.

O sistema OGR Ultravioleta da Aços Macom automatiza a remoção de gordura de ambientes de cozinhas profissionais beneficiando as coifas de cocção e a rede de dutos com periodicidade prolongada de higienização bem como redução nos riscos de incêndio.

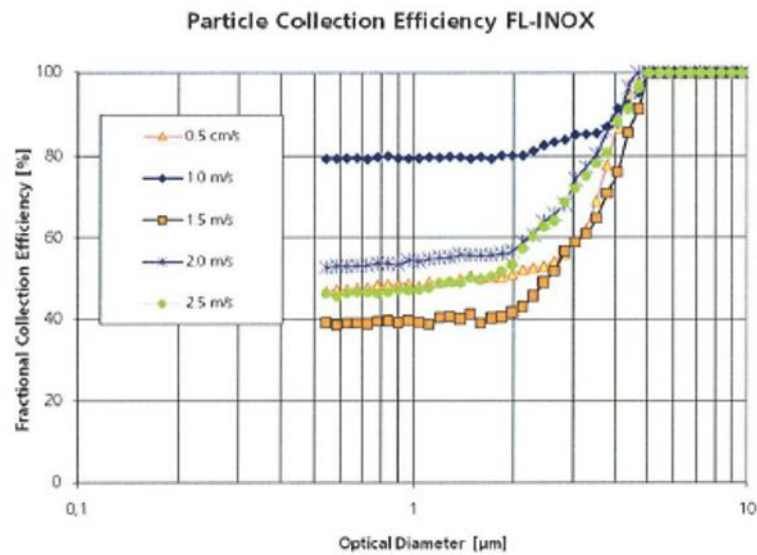
As Coifas OGR® são dotadas de 2 etapas no tratamento dos vapores gordurosos provenientes dos processos de cocção.

O gráfico abaixo ilustra como as etapas no tratamento de gorduras se comportam; **os filtros inerciais tem ação mais eficiente em partículas maiores de gordura e a medida que as partículas diminuem de tamanho sua eficiência diminui**, a tecnologia ultravioleta atua nas partículas menores com alta eficiência, ou seja as etapas se combinam e complementam-se atingindo resultados de até 95% de eficiência no tratamento das gorduras.



## FILTROS INERCIAIS

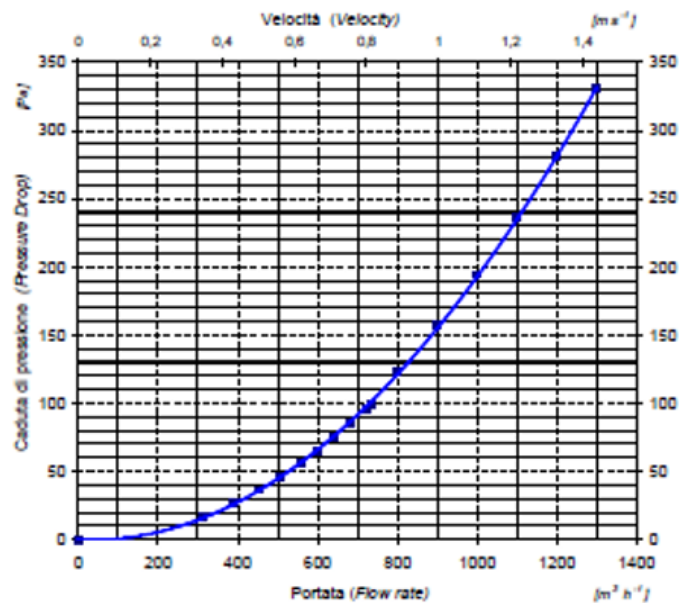
As coifas são equipadas com extratores de gordura fabricados em aço inoxidável 304. Os filtros carregam as certificações NSF e UL1046. A eficiência da extração de gordura é de 78% em partículas com diâmetro de  $4\mu\text{m}$  e 98% em partículas com diâmetro de  $5\mu\text{m}$ , em conformidade com testes realizados por laboratório segundo requerimentos da UL1046. A perda de carga sobre os filtros não deve exceder 13 mmca nas vazões de exaustão certificadas pela UL para operações classificadas como severas. Os níveis de ruído não devem exceder a classificação 55dBA:



**PERDITA DI CARICO** (conforme alla UNI EN ISO 5167)  
**PRESSURE DROP** (compliant to UNI EN ISO 5167)



Certificato dall' Università Politecnica delle Marche  
 Tested by Marche's Polytechnic University



## OGR®

O processo de ação ultravioleta nos vapores contaminados se dá em 2 frentes:

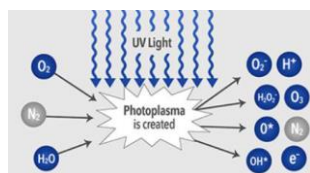
- FOTÓLISE: processo responsável por conversão da gordura capturada em compostos inertes para eliminação pelo sistema de exaustão no plenum da coifa;
- OZONÓLISE: processo responsável pela inertização de odores presentes no ar de exaustão.

Assim, todo o tratamento consiste em:

- FOTÓLISE: processo responsável por conversão da gordura capturada em compostos inertes para eliminação pelo sistema de exaustão:

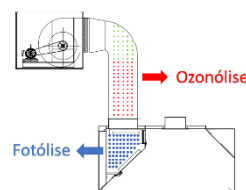
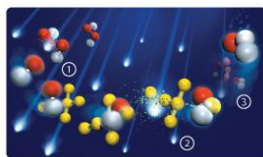
Os vapores contaminados provenientes dos processos de cocção são expostos a luz ultravioleta tipo C. Uma reação fotoquímica causada pelos comprimentos de onda, 185 e 264nm, emitidos pelas lâmpadas converte os compostos voláteis em dióxido de carbono, vapor de água e compostos finos não combustíveis, quebrando as cadeias longas em cadeias curtas. O resultado desta ação garante que os plenums das coifas de cocção permaneçam praticamente isentos de gordura.

As lâmpadas UV são distribuídas em posição estratégica com instalação centralizada em relação aos colarinhos de exaustão, de modo a garantir sua abrangência e ação em todo o volume da coifa. Esse fator, associado à velocidade de face das coifas de 0,4m/s (encosto) e 0,64m/s (centro) e a seu volume, forçam toda a massa de ar contaminado capturado pelo sistema de exaustão a manter efetivo contato com as emissões das lâmpadas.



- OZONÓLISE:- processo responsável pela oxidação de odores presentes no ar contaminado.

O processo de ozonólise consiste na adição de átomos de oxigênio gerados na exposição da luz ultravioleta tipo C. Como resultado desta ação química, são gerados átomos de ozônio que se conectam aos compostos orgânicos no fluxo de ar de exaustão, convertendo-os em H<sub>2</sub>O e CO<sub>2</sub>.



*Recomendasse tempo de reação mínimo de 0,5 segundos, considerando a intensidade relativa das lâmpadas Biozone que equipam as coifas da Aços Macom de 750µW/cm<sup>2</sup> e dissipação de ozônio de 3.10ppm (máximo de 0.5ppm na descarga á 10m). Essa reação se dá pelo próprio processo de exaustão em que o ar exaurido pela coifa em seu fluxo "arrasta" as moléculas de oxigênio. Desta forma recomenda-se que a velocidade média nos dutos de exaustão seja entre 5 e 10 m/s e comprimento da linha de dutos de pelo menos 10 metros, o tempo de contato entre fluxo de ar e oxigênio será de pelo menos 5 segundos, excedendo à recomendação e garantindo o tratamento de odores a níveis aceitáveis de acordo com a norma NBR14518:2020 além de atender aos artigos 2º, 50º Inciso e 51º Inciso do Decreto Municipal do Rio Janeiro 22.281/2002.*

## COMPARATIVO entre Tecnologias de Tratamento de Gordura

As coifas industriais tem por objetivo captar e conter os vapores gordurosos e tratar as partículas maiores através de filtros inercias e de acordo com a severidade do bloco cocção se equipam com tratamento adicional requerido em normativo específico.

As tradicionais coifas lavadoras através de aspersão continua da mistura água e detergente, condensam os vapores residuais e coletam através de calha fazendo expurgo por drenos hidráulicos ligados as caixas de gordura. Este processo tem eficiência aproximada de 40% para partículas de 5µm.

As coifas OGR tratam a gordura residual através das lâmpadas ultravioletas através do processo de fotólise com eficiência de até 95% para partículas de 5µm além de oxidar as partículas através de ozônio dissipado atenuando os odores nas descargas (ozonólise).

Abaixo segue estudo comparativo dos sistemas:

	Método Filtragem	Certificação	Eficiência Filtragem@1m/s		Custos de Instalação*	Custos Método Filtragem			Valor das Coifas
			<10µm	>10µm		Consumo de Água Mensal* + Detergente	***Higienização da Rede de Dutos Mensal		
<b>Lavadora</b>	mecânico	n/a	28%	5%	R\$ 1.200,00	R\$ 130,80	R\$ 750,00	R\$ 39.000,00	
	aspersão por água	n/a	35%	42%					
<b>OGR*</b>	mecânico UL certified	UL1046	100%	40 - 80%	R\$ -	R\$ -	R\$ -	R\$ 49.578,35	
	químico	UL710C	-	98%					

	Lavadora	OGR*
1ºmês	R\$ 40.200,00	R\$ 49.578,35
3ºmês	R\$ 41.961,60	R\$ 49.578,35
5ºmês	R\$ 43.723,20	R\$ 49.578,35
7ºmês	R\$ 45.484,80	R\$ 49.578,35
9ºmês	R\$ 47.246,40	R\$ 49.578,35
11ºmês	R\$ 49.008,00	R\$ 49.578,35
13ºmês	R\$ 50.769,60	R\$ 49.578,35
15ºmês	R\$ 52.531,20	R\$ 49.578,35
17ºmês	R\$ 54.292,80	R\$ 49.578,35
19ºmês	R\$ 56.054,40	R\$ 49.578,35
21ºmês	R\$ 57.816,00	R\$ 49.578,35
23ºmês	R\$ 59.577,60	R\$ 49.578,35

\*Custo médio para instalação de tubulação em aço inox das linhas hidráulicas de fornecimento Ø3/4" e expurgo Ø2"

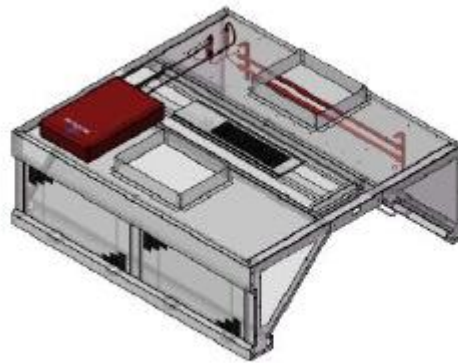
\*\*Custo SABESP Categoria Comercial Consumo de até 20m³ custo de R\$10,58/m³ Consumo adotado: 10m³ São Paulo/SP

\*\*\*Custo para serviços noturnos para higienização de rede de dutos na cidade de São Paulo



**Características e aprovações abrangentes:**

As coifas equipadas com tecnologia ultravioleta da Aços Macom atendem aos requisitos da NBR14518:2019, ULs, ETL e NSF





TESTES OGR®



6790 New Tampa Highway, Suite 107  
Lakeland, Florida 33815  
863-937-9922  
www.airanalyticsllc.com

September 18, 2019

Mr. David Borman  
National Design and Construction Director  
Aramark  
5404 Hoover Blvd, Tampa, FL 33634

RE: OGR System Efficiency Testing  
Burger-Fi- University of South Florida Location  
4210 USF Holly Drive, Tampa, FL 33620  
AA File No. 19-24044

Dear Mr. Borman:

Pursuant to your request, Air Analytics, LLC (AA) performed an OGR system efficiency test for the system installed at the Burger-Fi USF location. The purpose of this evaluation was to compare grease collection performance with the OGR system added to the canopy hood installation. To do this, comparable production was monitored continuously for 24 hours each day for two (2) days. Based on visual observations and gravimetric testing, effective grease reduction settlement was confirmed during our testing. Included in this report, we present our methodology, results, conclusions, and photographic documentation of the study.

Air Analytics, LLC appreciates the opportunity to be of assistance in this regard. Should you have any questions or comments concerning the information provided or if we may be of further assistance, please do not hesitate to call.

AIR ANALYTICS, LLC



Adelmarte Bones, MSPH, CIH, CSP  
Senior Industrial Hygienist

---

Winter Springs - Lakeland - Tampa



**Air Analytics, LLC.**  
6790 New Tampa Hwy., Suite 107  
Lakeland, Florida 33815  
863-937-9922


## OGR SYSTEM EFFICIENCY TESTING

**Prepared for:** **Aramark**  
5404 Hoover Blvd.  
Tampa, FL 33634

**Facility Name:** **BURGER-FI UNIVERSITY OF SOUTH FLORIDA**  
4210 USF HOLLY DRIVE,  
TAMPA, FL 33620

**Date of Survey:** August 27, 2019 to August 28, 2019

**AA FILE NO:** 19-24044

  
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Adelmara Bones MSPH, CIH, CSP  
Senior Industrial Hygienist

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- A. Sample Locations
- B. Air Sampling Results-Oil Mist
- C. Photographic Documentation Log
- D. Calibration Certificates

## 1.0 PURPOSE

The purpose of this evaluation was to compare grease reduction and collection performance with the OGR system installed to the existing canopy hood. In addition, the evaluation would help determine if volatile organic compounds (VOCs) and air velocity introduce changes with an operational OGR system to perform this evaluation, the comparable production was monitored continuously for 24 hours each day for two (2) days. The site is located at 4210 USF Holly Drive, Tampa, FL 33620. The survey was conducted from August 27, 2019 to August 29, 2019.

## 2.0 METHODOLOGY

### 2.1 Gravimetric Reduction Test

To measure the oil mist (grease) creation and capturing capacity surrounding the kitchen area of Burger-FI, six (6) petri dishes and five (5) slides were pre-weighed, numbered, and placed in selected areas surrounding the kitchen ventilation hood. The process was repeated for two days with 2 monitoring periods. Monitoring period 1 started on August 27, 2019 at 9:00 AM and concluded on August 28, 2019 at 9:00 AM; monitoring period 2 started on August 28, 2019 9:00 AM and concluded on August 29, 2019 9:00 AM. During monitoring period 1, samples were left over night without the OGR UV cleaning system running and during monitoring period 2 samples were left with the OGR UV cleaning system running. At the end of each monitoring period all petri dishes and slides were collected and post-weighed. Petri dishes and slide samples were placed in the same locations during both monitoring periods.

### 2.2 Oil Mist Air Sampling

Two (2) air samples were placed in the kitchen to assess the relative amount of oil mist being dispersed throughout the air during cooking hours. One sample was placed underneath the ventilation hood while the other was placed in the surrounding area. Air samples for oil mist and minerals were collected and analyzed in accordance with the National Institute of Occupational Safety and Health (NIOSH) Method 5026 Issue 2. Air samples were collected using a 37-millimeter (mm) diameter pre-weighed MCE filter cassette. The flow rate was pre and post calibrated at 2 liters per minute (lpm) using a primary calibration device. For monitoring period 1, the air samples were collected for approximately 6 hours without the OGR UV cleaning system on. For monitoring period 2, two (2) new sets of air samples were placed in the same locations with the OGR UV cleaning system operating. All samples were sent to Analytic Corporation, an Independent AIHA-accredited laboratory in Ashland, Virginia. Only samples underneath the hood were sent to be analyzed. These results were then compared with the limits of detection calculated for each sample and any regulatory permissible limits, including the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for oil mist. Laboratory results and chain of custodies can be found in Appendix B.

## 2.3 Environmental Parameters, Volatile Organic Compounds (VOCs) and Air Velocity Monitoring

Random environmental parameter measurements (carbon dioxide, temperature, and relative humidity) were taken using a TSI Q-Trak Plus Indoor Air Quality (IAQ) Meter, Model 8554. Volatile Organic Compounds and Air Velocity were taken using a TSI Velocicalc Meter with VOC Probe Model 985 and Air Velocity Probe Model 964.

## 3.0 RESULTS

### 3.1 Gravimetric Reduction Test

Table I presents the slides test and Table II presents the petri dishes gravimetric reduction test. Both monitoring periods (with and without OGR system operational) are presented in the tables.

**Table I-Slides Sample Weight with and without the OGR System**

Slides	Slides Pre-Weight (kg)	Slides Post-Weight (kg)	Sample Weight (kg)
<b>Monitoring Period No. 1 (Without OGR System)</b>			
81	0.00506	0.00510	0.00004
82	0.00580	0.00580	0.00000
83	0.00536	0.00554	0.00018
84	0.00501	0.00502	0.00001
85	0.00508	0.00510	0.00002
<b>Average Sample Weight Without OGR System</b>			<b>0.00013</b>
<b>Monitoring Period No. 2 (with OGR System)</b>			
86	0.00501	0.00501	0
87	0.00511	0.00511	0
88	0.00501	0.00509	0.00008
89	0.00505	0.00517	0.00012
810	0.00512	0.00512	0
<b>Average Sample Weight with OGR System</b>			<b>0.00004</b>

**Table II- Petri Dishes Sample Weight with and without the OGR System**

OGR System Efficiency Testing  
 Burger-FI USF 19-24044

Petri Dishes	Petri Dish Pre-Weight (kg)	Petri Dish Post Weight (kg)	Sample Weight (kg)
<b>Monitoring Period No. 1 (Without OGR System)</b>			
P1	0.00778	0.00782	0.00004
P2	0.00778	0.00804	0.00026
P3	0.00759	0.00762	0.00003
P4	0.00761	0.00761	0
P6	0.0077	0.00784	0.00017
P8	0.00759	0.00761	0.00002
<b>Average Sample Weight Without OGR System</b>			<b>0.00007</b>
<b>Monitoring Period No. 2 (with OGR System)</b>			
P7	0.00776	0.00868	0.00092
P8	0.00775	0.00775	0
P9	0.00757	0.00762	0.00005
P10	0.00778	0.00782	0.00004
P11	0.00778	0.00784	0.00006
P12	0.00760	0.00763	0.00003
<b>Average Sample Weight with OGR System</b>			<b>0.00018</b>

### 3.2 Oil Mist Air Sampling Results

Table III presents the air sampling results for oil mist.

Table III-Oil Mist Air Sampling Results

Sample Number	Sample Type	Total Time Monitored (minutes)	Analyte(s)	Monitoring Laboratory Results	OSHA PEL <sup>(1)</sup>
190827-RAF-1	Area Without OGR System	754	Oil Mist	<0.066 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>
190827-RAF-3	Area With OGR System	726	Oil Mist	<0.069 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>

### 3.3 Environmental Parameters, VOCs Air Sampling Results

Table IV presents the VOCs, temperature, pressure and relative humidity monitoring results with and without the OGR system operating. Also presented is the air velocity average on the exhaust hood. In addition, parameters at the outdoor exhaust levels were confirmed.

Table IV-Environmental Parameters, VOCs, Air Velocity Results

Parameter	Indoor by Canopy		Outdoor By Exhaust
	Without OGR	With OGR	
VOC	1 ppm	1 ppm	0 ppm
BP	29.93 inHg	29.90 inHg	29.96 inHg
Temp.	71.4 deg F	89.0 deg F	80.5 deg F
Humidity	49.8 %rh	45.1 %rh	44.9 %rh
Vel	—	1389 ft/min	96 ft/min

## 4.0 DISCUSSION AND CONCLUSIONS

### 4.1 Gravimetric Reduction Test Results Discussion

Based on gravimetric reduction results, microscopic slides settled with the OGR system operating yielded lower mass collection than the slides without the OGR system. Five (5) samples were located within the hood area and weighed at the end of the monitoring period. A critical microscopic slide sample placed in the center of the hood was treated as the most informative. By visual examination alone, it was evident that grease reduction settlement had occurred. The most informative samples were Slide Sample No. 5 and Slide Sample No. 10, placed pre and post the OGR system operating, at the centered location of the hood. This sample was representative of the grease capture and settlement of the system. Results indicate that slide No. 5 and No. 10 were reduced 100% as no grease was captured by the system, these findings were consistent with the grease settlement reduction.

Another gravimetric reduction test was conducted with petri dishes at locations below operational equipment. This data was used as a confirmation that cooking activities were in fact conducted during both periods. Results indicate a 157% increase from grease settled as a result of oil mist while cooking activities were being conducted. Therefore, it was confirmed that

grease oil mist was created at or above the control monitoring period 1 without the OGR system.

#### 4.2 Oil Mist Air Sampling Results Discussion

Based upon the analytical laboratory result; airborne oil mist was found below detectable levels. Therefore, no differences of oil mist were confirmed at breathing zone levels during normal cooking activity hours with or without the OGR system operating.

#### 4.3 Environmental Parameters, VOCs Air Sampling Results Discussion

The values obtained for temperature averaged 71.4 degrees Fahrenheit (°F) without the OGR system operating and 89.0°F with the OGR system operating. ASHRAE Standard 55-2017<sup>(2)</sup> recommends a summer temperature range of 73 to 79 °F and a winter temperature range between approximately 68 to 74°. The values obtained for relative humidity ranged from 49.8 percent (%) without the OGR system operating and 45.1% with the OGR system operating. Hood velocity was confirmed to be above 1,000 feet per minute (fpm) which is the minimum velocity required for a canopy hood with high temperatures. The OGR system did not seem to interfere with the hood efficiency.

## 5.0 ASSUMPTIONS

Note, this evaluation presumes both monitoring periods to be under the same and/or similar conditions. The study was limited in scope with respect to the site conditions while AA personnel was not on-site observing operational activities. It was also assumed that all the mass collected on the slides was grease from production cooking. Other mass contributors were not separated or quantified. Although it was assumed that similar production occurred during both monitoring periods, actual gross sales on Tuesday, August 27, 2018 were \$3,736.88 and \$2,959.81 on Wednesday August 28, 2019. Site digital photographs and data logs were taken during field work and throughout the course of the project and are recorded/maintained in our client project file system for future reference if needed. Upon written request, an electronic copy of these digital images and/or the data logs can be provided.



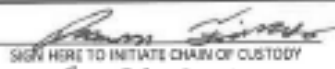

### LABORATORY TEST REQUEST

ACCOUNT NUMBER, NAME AND ADDRESS

Air Analytics, LLC 09709026  
6790 New Tampa Highway Suite 107 Lakeland, FL 33815  
863-937-9922





X242101

DATE SHIPPED <b>8/29/2019</b>	# OF SAMPLES <b>2</b>	SAMPLE TYPE/MEDIA <b>Air</b>	PROJECT NAME OR NUMBER <b>USF OGR System Efficiency</b>	
PURCHASE ORDER NO. <b>19-24044</b>		CONTACT <b>Adelmarie Bones</b>	TELEPHONE NUMBER <b>863-937-9922</b>	
TURN AROUND TIME <input type="checkbox"/> SAME DAY <input type="checkbox"/> 1 DAY <input type="checkbox"/> 2 DAY <input type="checkbox"/> CALL FOR AVAILABILITY		SPECIAL INSTRUCTIONS AND/OR UNUSUAL CONDITIONS: <b>abones@airanalyticsllc.com</b> <b>aarmaiz@airanalyticsllc.com</b>	<input type="checkbox"/> FAX RESULTS FAX NUMBER: ( ) _____ <input checked="" type="checkbox"/> EMAIL RESULTS - EMAIL: <b>abones@airanalyticsllc.com</b>	
<small>FOR LABORATORY USE ONLY</small>	<small>SAMPLE # OR SAMPLE AREA</small>	<small>SAMPLE DATE</small>	<small>SAMPLE VOLUME/LITERS</small>	<small>ANALYSIS REQUESTED - PLEASE USE SEPARATE LABORATORY TEST REQUEST FOR EACH SAMPLE TYPE</small>
	190827-RAF-1	8/27/2019	754	NIOSH 5026 Oil Mist
	190828-RAF-3	8/28/2019	726	NIOSH 5026 Oil Mist
CHAIN OF CUSTODY RECORD				
<small>SAMPLES HAVE BEEN SEALED FOR TRANSPORT AND DELIVERED TO LABORATORY VIA:</small>			 <small>SIGN HERE TO INITIATE CHAIN OF CUSTODY</small> <b>8-29-2019</b> <small>DATE</small>	
<small>CARRIER</small>	<small>IF "ANALYTICS COURIER" SIGN HERE</small>			
<small>DATE/TIME</small>	<small>CONDITION OF SAMPLE</small>	<small>SAMPLES RECEIVED BY:</small> <small>(SIGNATURE/SAMPLE ID#/NAME)</small>	<small>SAMPLES RELEASED BY:</small> <small>(SIGNATURE/SAMPLE ID#/NAME)</small>	
8/29/19	intact		<b>Toni Quander</b>	
		<small>(SIGNATURE/SAMPLE ADMINISTRATION)</small>	<small>(SIGNATURE/SAMPLE ADMINISTRATION)</small>	
		<small>(SIGNATURE/LAB)</small>	<small>(SIGNATURE/LAB)</small>	
		<small>(SIGNATURE/LAB)</small>	<small>(SIGNATURE/LAB)</small>	

PLEASE RETAIN A COPY FOR YOUR RECORDS

2510027-NMS-ISEL



### CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 590 Cardigan Road, Shoreview, MN 55126 USA  
Tel: 1-800-874-2811 1-651-480-2811 Fax: 1-651-490-2824 <http://www.tsi.com>

ENVIRONMENT CONDITIONS			MODEL	<b>9565-P</b>
TEMPERATURE	73.5 (23.1)	°F (°C)	SERIAL NUMBER	<b>9565P1815020</b>
RELATIVE HUMIDITY	22	%RH		
BAROMETRIC PRESSURE	28.86 (977.3)	inHg (hPa)		

AS LEFT                                  IN TOLERANCE  
 AS FOUND                                    OUT OF TOLERANCE

**- CALIBRATION VERIFICATION RESULTS -**

THERMO COUPLE <sup>a</sup>				Unit: °F ( °C )			
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	72.5 (22.5)	72.6 (22.6)	70.5-74.5 (21.4-23.6)				


DIFFERENTIAL PRESSURE				Unit: inH <sub>2</sub> O ( Pa )			
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	-3.996 (-995.0)	-3.991 (-993.8)	-4.043- -3.952 (-1006.0- -984.0)	3	8.120 (2024.4)	8.107 (2018.6)	8.044-8.214 (2003.0- 2045.3)
2	2.253 (561.0)	2.244 (538.8)	2.226-2.280 (554.3-567.7)	4	14.088 (3597.9)	14.074 (3594.4)	13.943-14.233 (3471.8-3544.0)

BAROMETRIC PRESSURE				Unit: inHg ( hPa )			
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	19.72 (667.8)	19.71 (667.5)	19.33-20.31 (654.6-681.0)	3	34.34 (1162.9)	34.35 (1163.2)	33.65-35.03 (1139.5-1180.3)
2	28.88 (978.0)	28.88 (978.0)	28.30-29.46 (958.3-997.6)				

<sup>a</sup>- Circuit portion of temperature measurement only, not including probe.

*TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to its Found data) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted value's of physical constants. TSI's calibration system is registered to ISO-9001:2015.*

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Measurement Variable</th> <th>System ID</th> <th>Last Cal.</th> <th>Cal. Due</th> </tr> <tr> <td>Temperature</td> <td>E003170</td> <td>02-21-19</td> <td>02-29-20</td> </tr> <tr> <td>Pressure</td> <td>E003982</td> <td>02-07-19</td> <td>08-31-19</td> </tr> </table>	Measurement Variable	System ID	Last Cal.	Cal. Due	Temperature	E003170	02-21-19	02-29-20	Pressure	E003982	02-07-19	08-31-19	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Measurement Variable</th> <th>System ID</th> <th>Last Cal.</th> <th>Cal. Due</th> </tr> <tr> <td>Pressure</td> <td>E005254</td> <td>10-29-18</td> <td>10-31-19</td> </tr> <tr> <td>DC Voltage</td> <td>EE01493</td> <td>06-25-18</td> <td>08-31-19</td> </tr> </table>	Measurement Variable	System ID	Last Cal.	Cal. Due	Pressure	E005254	10-29-18	10-31-19	DC Voltage	EE01493	06-25-18	08-31-19
Measurement Variable	System ID	Last Cal.	Cal. Due																						
Temperature	E003170	02-21-19	02-29-20																						
Pressure	E003982	02-07-19	08-31-19																						
Measurement Variable	System ID	Last Cal.	Cal. Due																						
Pressure	E005254	10-29-18	10-31-19																						
DC Voltage	EE01493	06-25-18	08-31-19																						




CALIBRATED

April 11, 2019

DATE

Doc. #1 DM5, DEM, REC, TR



## CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA  
 Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-5824 <http://www.tsi.com>

ENVIRONMENT CONDITIONS		MODEL	985
TEMPERATURE	73.7 (23.2) °F (°C)	SERIAL NUMBER	P11180021
RELATIVE HUMIDITY	43 %RH		
BAROMETRIC PRESSURE	29.25 (990.5) inHg (kPa)		

AS LEFT  IN TOLERANCE  
 AS FOUND  OUT OF TOLERANCE

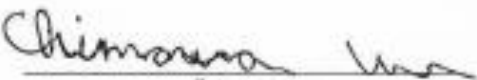
- CALIBRATION VERIFICATION RESULTS -

TEMPERATURE VERIFICATION				SYSTEM T-101			Unit: °F (°C)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	32.0 (0.0)	32.3 (0.2)	31.0-33.0 (-0.6-0.0)	2	140.0 (60.0)	140.8 (60.5)	139.0-141.0 (59.4-100.0)

GAS VOC HIGH VERIFICATION				SYSTEM G-101			Unit: ppm
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	100.00	101.41	90.00-110.00	2	1520.75	1471.90	1368.00-1672.00

TSI also hereby certifies that the above described instrument conforms to the original manufacturer's specifications (not applicable to As Found items) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to environmental whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI's calibration system is registered to ISO 9001:2008.

<b>Measurement Variable</b>	<b>System ID</b>	<b>Last Cal.</b>	<b>Cal. Due</b>	<b>Measurement Variable</b>	<b>System ID</b>	<b>Last Cal.</b>	<b>Cal. Due</b>
Temperature	E003986	02-12-19	08-31-19	Temperature	ED03987	02-12-19	08-31-19
5000 CO2	T7261177	03-17-19	03-17-22	200 CO	CC563	05-07-19	05-07-22
N2	HT09960	06-12-19	06-12-24	Air	CT307912	04-09-19	04-09-22
Flow	E003341	09-14-18	09-30-19	Flow	ED03978	02-26-19	02-29-20
Flow	E003502	02-26-19	02-29-20	Flow	ED03501	00-04-18	09-30-19
2000 C4H8	EB0011455	06-27-18	06-26-21	100 C4H8	ED0100212	00-29-17	09-29-21

  
 \_\_\_\_\_  
 CALIBRATED

July 22, 2019  
 \_\_\_\_\_  
 DATE

100-01 CERT-ITEM-VOC-VOC

TSI 041 2008 157



## CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA  
 Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 <http://www.tsi.com>

ENVIRONMENT CONDITIONS			MODEL	964
TEMPERATURE	73.2 (22.9)	T (°C)	SERIAL NUMBER	P15460024
RELATIVE HUMIDITY	44	%RH		
BAROMETRIC PRESSURE	29.25 (989.8)	inHg (hPa)		

<input checked="" type="checkbox"/> AS LEFT	<input checked="" type="checkbox"/> IN TOLERANCE
<input type="checkbox"/> AS FOUND	<input type="checkbox"/> OUT OF TOLERANCE

### - CALIBRATION VERIFICATION RESULTS -

TEMPERATURE VERIFICATION				SYSTEM T-101				Unit: °F (°C)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	32.0 (0.0)	32.3 (0.2)	31.5-32.5 (-0.3-0.2)	2	140.0 (60.0)	140.4 (60.2)	139.5-140.5 (59.7-60.3)	

HUMIDITY VERIFICATION				SYSTEM H-102				Unit: %RH
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	10.0	9.7	7.8-12.2	4	70.0	69.5	67.8-72.2	
2	30.0	29.1	27.8-32.2	5	90.0	88.9	87.8-92.2	
3	50.0	49.7	47.8-52.2					

VELOCITY VERIFICATION				SYSTEM V-107				Unit: ft/min ( m/s )
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	0 (0.00)	0 (0.00)	-3-3 (-0.02-0.02)	7	648 (3.29)	652 (3.31)	628-667 (3.19-3.39)	
2	35 (0.18)	36 (0.18)	32-38 (0.16-0.19)	8	995 (5.00)	987 (5.02)	965-1025 (4.90-5.21)	
3	65 (0.33)	65 (0.33)	62-68 (0.31-0.34)	9	1480 (7.52)	1489 (7.56)	1436-1525 (7.29-7.74)	
4	100 (0.51)	99 (0.50)	97-103 (0.49-0.52)	10	2491 (12.65)	2507 (12.73)	2456-2565 (12.27-13.03)	
5	160 (0.81)	161 (0.82)	156-165 (0.79-0.84)	11	4479 (22.75)	4504 (22.88)	4344-4613 (22.07-23.43)	
6	321 (1.68)	329 (1.67)	321-341 (1.63-1.73)	12	8008 (40.68)	8059 (40.94)	7767-8248 (39.46-41.90)	

TSI does hereby certify that the above described instrument conforms to the original manufacturer's specifications (not applicable to its Found only) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to measurement whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI's calibration system is registered to ISO 9001:2015.

Measurement Variable	System ID	Last Cal.	Cal. Exp.	Measurement Variable	System ID	Last Cal.	Cal. Exp.
Temperature	E003986	02-12-19	08-31-19	Temperature	E003987	02-12-19	08-31-19
Humidity	E003539	02-15-19	08-31-19	DC Voltage	E001653	02-01-18	08-31-19
Temperature	E001643	04-11-19	10-31-19	Pressure	E001718	07-15-19	01-31-20
Pressure	E002389	07-15-19	01-31-20	Velocity	E009916	06-14-17	08-31-20

*Kolberg*  
 \_\_\_\_\_  
 CALIBRATOR

July 24, 2019  
 \_\_\_\_\_  
 DATE

DOC ID: COFF\_GRM\_WCC

TSI Form 25000702

Data Sheet Filtrós UL1046



**FILTRO A LABIRINTO**  
**BAFFLE FILTER**





**Modello: FL INOX**

Telaio : Inox AISI 304  
Listelli : Inox AISI 304  
Protezione: Film in PVC sul telaio


**Type: FL INOX**

Frame: Stainless steel AISI 304  
Profiles: Stainless steel AISI 304  
Cover: PVC - film in on frame

 **Certificato secondo UL 1046 FILE: (MH46731)**

 **Compliant to UL 1046 FILE: (MH46731)**

 **Testato secondo la DIN 18869-5 !!**

 **Compliant to DIN 18869-5 !!**

- ✓ **FILTRI PER IMPIEGO IN CUCINE INDUSTRIALI !!**
- ✓ **FILTERS FOR INDUSTRIAL KITCHENS USE !!**
- ✓ **FILTRI CON ALTA EFFICIENZA FILTRANTE !!**
- ✓ **FILTERS WITH HIGH EFFICIENCY !!**
- ✓ **LAVABILI IN LAVASTOVILIE AD ALTA TEMPERATURA!!**
- ✓ **WASHABLE AT HIGH TEMPERATURE IN DISHWASHER !!**



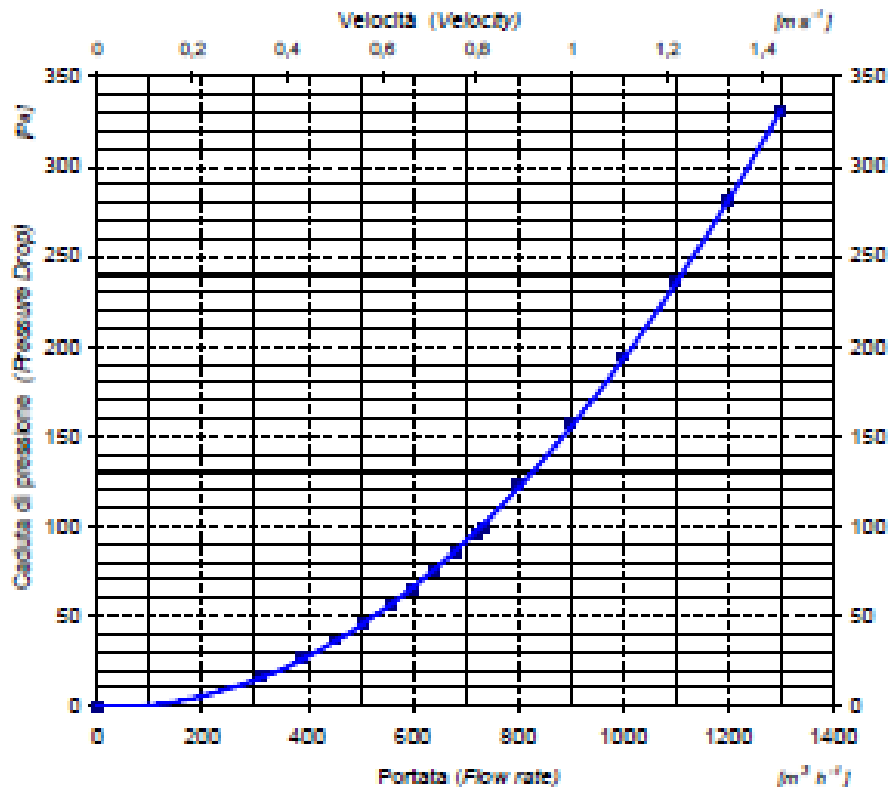
		BASE "B" [mm]						
		300	350	400	450	500	550	600
ALTEZZA "A" [mm] HEIGHT	200							
	250							
	300							
	350							
	400							
	450							
	500							
SPESSORE STANDARD "C" = 25mm THICKNESS STANDARD "C" = 25mm								
Filtro standard Filter standard				Filtro su richiesta Filter on demand				

**PRESTAZIONI DEL FILTRO**  
**FILTER'S PERFORMANCE**

**PERDITA DI CARICO** (conforme alla UNI EN ISO 5167)  
**PRESSURE DROP** (compliant to UNI EN ISO 5167)



Certificato dall' Università Politecnica delle Marche  
Tested by Marche's Polytechnic University



Prova valida per il filtro di dimensioni: 500(H)x500x25 mm  
In condizioni di riferimento:

- pressione: 101325 Pa  
- temperatura: 20°C

Incertezza: portata: ± 1.5%  
caduta di pressione: ± 2.3 Pa

Portata:  $Q = (A \times v) \times 3600 / 1000000$  [m³/h]  
A = area del filtro  
v = velocità

Valid test for filter dimension: 500(H)x500x25 mm  
In reference conditions:

- pressure: 101325 Pa  
- temperature: 20°C

Uncertainty: flow rate: ± 1.5%  
pressure drop: ± 2.3 Pa

Flow rate:  $Q = (A \times v) \times 3600 / 1000000$  [m³/h]  
A = filter section  
v = velocity

**EFFICIENZA** (rispetto la norma VDI 2052)

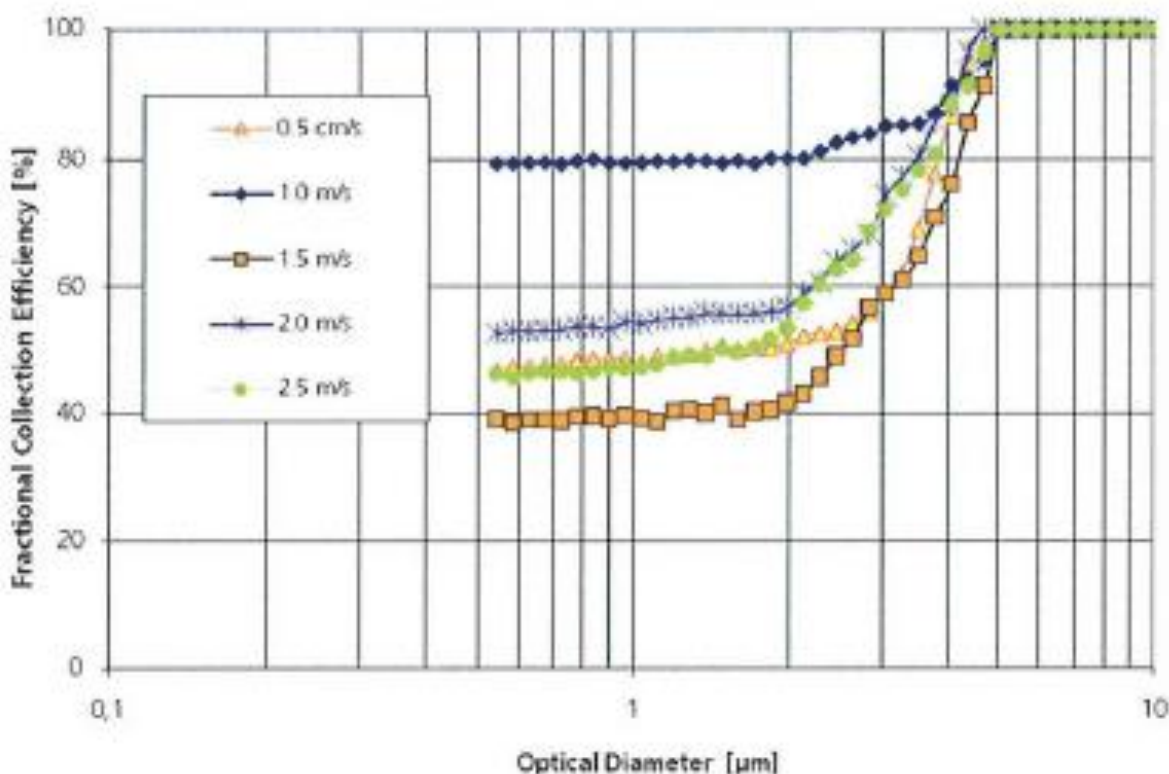
**EFFICIENCY** (compliant to VDI 2052)

Certificato dal laboratorio Fiatec Filter e Aerosol Technologie GmbH

Tested by Laboratory Fiatec Filter e Aerosol Technologie GmbH



### Particle Collection Efficiency FL-INOX





**Underwriters  
Laboratories**

VP Engineering  
SIPIM SRL  
VIA IGNAZIO SILONE 3  
60035 JESI AN ITALY

Date: 2010/02/09  
Subscriber: 100504966  
PartySite: 1735472  
File No: MH46731  
Project No: 10SR5505166  
FD No: 10S00095  
Type: R  
PO Number:

Subject: Procedure And/Or Report Material

The following material resulting from the investigation under the above numbers is enclosed.

Issue

<u>Date</u>	<u>Vol</u>	<u>Sec</u>	<u>Pages</u>	<u>Revised Date</u>
2005/03/16	1	1	Add New Volume	

\*

Resend documents for File MH46731 and R20682 per SR5505166-T001.

\*

Inspections at your plant will be conducted under the supervision of ALBERTO DUCCO, UL INSPECTION CENTER ITALY, UL INTERNATIONAL ITALIA S R L, VIA DELLE INDUSTRIE 6, CARUGATE, MI, Italy, 20041., PHONE: 02-92503535, FAX: 02-92503568, EMAIL: ALBERTO.DUCCO@IT.UL.COM

Please file revised pages and illustrations in place of material of like identity. New material should be filed in its proper numerical order.

NOTE: Follow-Up Service Procedure revisions DO NOT include Cover Pages, Test Records and Conclusion Pages. Report revisions DO NOT include Authorization Pages, Indices, Section General Pages and Appendixes.

Please review this material and report any inaccuracies to UL Canada Customer Service, PHONE: 1-866-9373ULC (1-866-937-3852), FAX: 1-416-757-8727, E-MAIL: CustomerService.ca@ca.ul.com, referring to the above Project and/or FD Numbers.

This material is provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

NBK File

UL INSPECTION CENTER 357



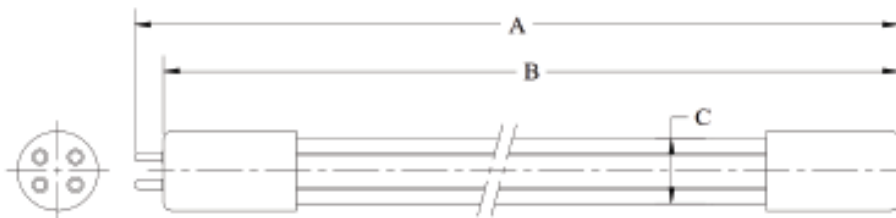
## Data Sheet Lâmpadas

As lâmpadas UVC da Aços Macom tem níveis de dissipação de ozônio de 3.10ppm. Recomendasse velocidade do ar na rede de dutos de 8m/s. O tempo recomendado para exposição do ar contaminado na rede de dutos é de 1,5s.

# BIOZONE®

## UV Lamp Data Sheet

**PART NUMBER: 10-U60100**



### DIMENSIONS

*( nominal values )*

A - Pin to end of lamp	1562 mm
B - Base face to base face length	1554 mm
C - Diameter	19.0 mm (T6)
BASE	4 Pin, Single-end

### ELECTRICAL DATA

*( nominal values )*

Lamp Wattage	320 W
Lamp Current	2.1 A
Lamp Voltage	154 V

### PHYSICAL DATA

*( nominal values )*

UV Output 254nm (100hr)	105 W
Intensity @ 1m	750 $\mu\text{W}/\text{cm}^2$
Rated Average Life	12000 hrs

Note: Performance data is valid under laboratory conditions

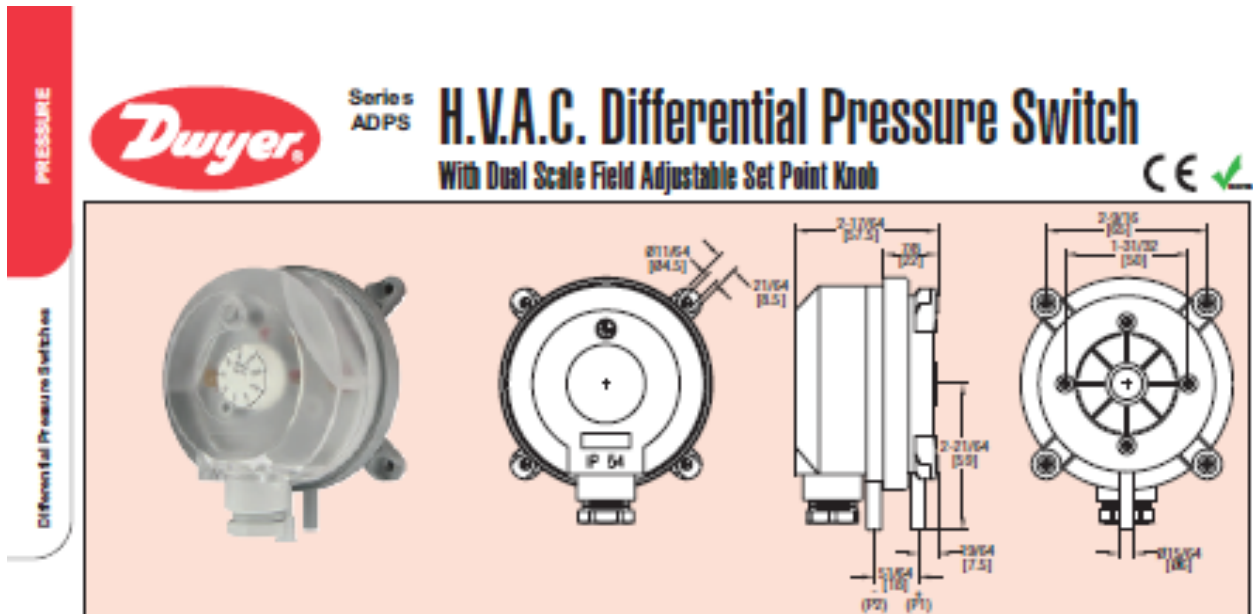
© BioZone Scientific International, Inc.

7616 Southland Blvd  
 Suite 114  
 Orlando, FL 32809  
 USA



Phone: 407-876-2900 | Fax: 407-876-7619 | Web: [biozonescientific.com](http://biozonescientific.com) | Email: [usa@biozonescientific.com](mailto:usa@biozonescientific.com) | Printed in USA

Data Sheet Pressostato



The Series ADPS Adjustable Differential Pressure Switch is designed for pressure, vacuum, and differential pressure. The dual scaled adjustment knob in inches water column and pascals allows changes to the switching pressure to be made without a pressure gauge. The ADPS is available with settings from 0.06" w.c. (20 Pa) up to 10" w.c. (4000 Pa). The silicone diaphragm and PA 6.6 body make the series ADPS ideal for use with air and other noncombustible gases. The compact size, adjustment knob and low cost make the ADPS the perfect choice for H.V.A.C. applications.

**APPLICATIONS**

- Monitoring air filters and ventilators
- Monitoring industrial cooling-air circuits
- Overheating protection for fan heaters
- Monitoring flows in ventilation ducts
- Controlling air and fire-protection dampers
- Frost protection for heat exchangers



**SPECIFICATIONS**

**Service:** Air and non-combustible, compatible gases.  
**Wetted Materials:** Diaphragm material: silicone; Housing material: POM switch body: PA 6.6; Cover: Polystyrene.  
**Temperature Limits:** Process and ambient temperature from -4 to 185°F (-20 to 85°C).  
**Pressure Limits:** Max. operating pressure: 40" w.c. (10 kPa) for all pressure ranges.  
**Switch Type:** Single-pole double-throw (SPDT).  
**Electrical Rating:** Max. 1.5A res./0.4 A ind./250 VAC, 50/60 Hz; Max. switching rate: 6 cycles/min.  
**Electrical Connections:** Push-on screw terminals, M20x1.5 with cable strain relief or optional 1/2" NPT connection.  
**Process Connections:** 5/16" (7.94 mm) outside diameter tubing, 1/4" (6.0 mm) inside diameter tubing.  
**Enclosure Rating:** NEMA 13, IP54.  
**Mounting Orientation:** Vertically, with pressure connections pointing downwards.  
**Mechanical Working Life:** Over 10<sup>6</sup> switching operations.  
**Weight:** 5.6 oz (160 g).  
**Agency Approvals:** CE, RoHS.

Model	Set Point Range in w.c. (Pa)	Approx. Dead Band @ Min Set Point in w.c. (Pa)	Approx. Dead Band @ Max Set Point in w.c. (Pa)
ADPS-03-2-N	0.06 to 1.20 (20-300)	0.04 (10)	0.05 (12)
ADPS-04-2-N	0.12 to 1.60 (30-400)	0.06 (15)	0.09 (22)
ADPS-03-2-N	0.20 to 2.00 (50-500)	0.08 (20)	0.09 (23)
ADPS-05-2-N	0.80 to 4.00 (200-1000)	0.4 (100)	0.5 (130)
ADPS-06-2-N	2.00 to 10.00 (500-2500)	0.6 (150)	0.8 (200)
ADPS-07-2-N	4.00 to 20.00 (1000-5000)	1.0 (250)	1.4 (350)

Note: Models that include installer kit add -C to the end of the model number. Installer kit includes two static tips and 7 ft of PVC tubing. For optional 1/2" NPT conduit connection, change -3-N to -1-N.

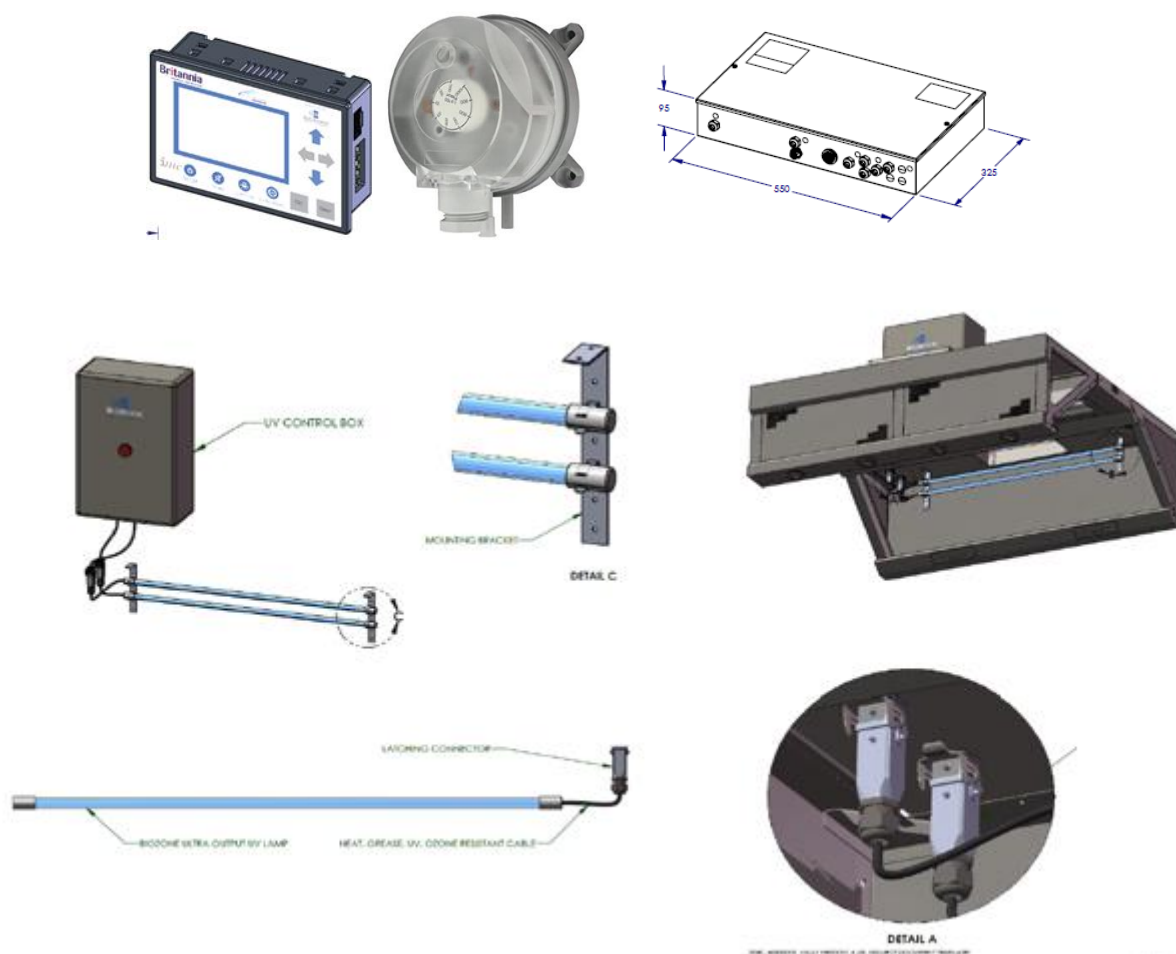
**ACCESSORIES**

- A-289, "L" type metal mounting bracket with screws
- A-289, "S" type metal mounting bracket with screws
- A-480, Plastic static pressure tip
- A-481, Installer kit. Includes 2 plastic static pressure tips and 7 ft (2.1 m) of PVC tubing

### 3. Escopo de fornecimento:

Estão contemplados em nosso escopo de fornecimento, os materiais específicos e auxiliares para montagem do sistema listados abaixo além de treinamento para comissionamento e start up do sistema ultravioleta:

Materiais	
Item	Descrição
1	Control Box
2	Lâmpadas Ultravioleta Ultra Output
3	Filtros Inercias UI1046
4	Luminárias LED IP66
5	Latching Connector
6	Mounting Bracket
7	Display
8	Pressostato
9	Heat Grease Uv Ozone Resistant Cable



## Manutenção Preventiva:

As lâmpadas UVC da Aços Macom suportam temperaturas de até 110°C e tem vida útil de 9000 horas.

O display instalado geralmente na parte frontal da coifa informa o operador da vida útil das lâmpadas e status de funcionamento do sistema

O usuário deve substituir as lâmpadas no período recomendado para que não tenha redução de eficiência de filtragem.

Higienização mensal da superfície das lâmpadas com pano e álcool são recomendadas.

### *Notas importantes para instalação do sistema:*

- 01) Um ponto 220V monofásico deve ser providenciado para alimentação do sistema UV além da iluminação da coifa;*
- 02) A tubulação de exaustão deve estar limpa e isenta de gordura;*
- 03) Os componentes OGR serão enviados em embalagem especial;*

## 4. Garantias:

O sistema OGR® têm garantia de 1 ano após a data de comissionamento e entrega de obra.

Para acionar a garantia, o contratante deve preencher entrar em contato com a Aços Macom através dos canais:

[www.acosmacom.com.br](http://www.acosmacom.com.br)

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