

# ANEXOS



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

[www.oefa.gob.pe](http://www.oefa.gob.pe)  
Dirección de Evaluación

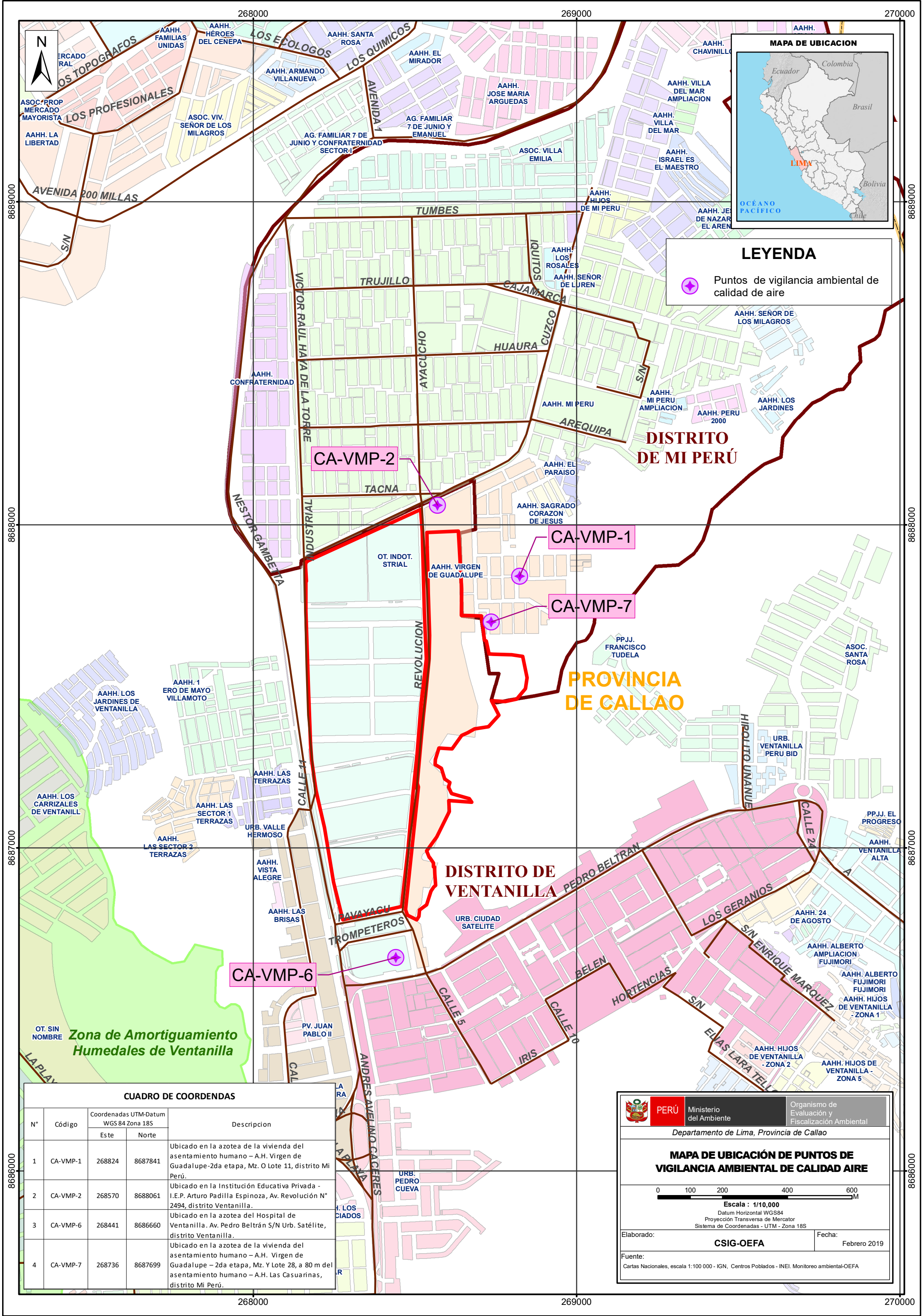
Av. Faustino Sánchez Carrión  
N° 603, 607 y 615  
Jesús María - Lima, Perú  
Teléf.: (511) 204 9900

# ANEXO N° 1



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## Mapa de ubicación de las estaciones de monitoreo de calidad de aire



**LEYENDA**

Puntos de vigilancia ambiental de calidad de aire

0006898

0007898

0009898

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0006898

0007898

0009898

| CUADRO DE COORDENADAS |          |                                       |         |  |
|-----------------------|----------|---------------------------------------|---------|--|
| N°                    | Código   | Coordenadas UTM-Datum WGS 84 Zona 18S |         | Descripcion  |
|                       |          | Este                                  | Norte   |  |
| 1                     | CA-VMP-1 | 268824                                | 8687841 | Ubicado en la azotea de la vivienda del asentamiento humano - A.H. Virgen de Guadalupe-2da etapa, Mz. O Lote 11, distrito Mi Perú.   |
| 2                     | CA-VMP-2 | 268570                                | 8688061 | Ubicado en la Institución Educativa Privada - I.E.P. Arturo Padilla Espinoza, Av. Revolución N° 2494, distrito Ventanilla.   |
| 3                     | CA-VMP-6 | 268441                                | 8686660 | Ubicado en la azotea del Hospital de Ventanilla. Av. Pedro Beltrán S/N Urb. Satélite, distrito Ventanilla.   |
| 4                     | CA-VMP-7 | 268736                                | 8687699 | Ubicado en la azotea de la vivienda del asentamiento humano - A.H. Virgen de Guadalupe - 2da etapa, Mz. Y Lote 28, a 80 m del asentamiento humano - A.H. Las Casuarinas, distrito Mi Perú. |

**PERÚ**

Ministerio del Ambiente

Organismo de Evaluación y Fiscalización Ambiental

Departamento de Lima, Provincia de Callao

**MAPA DE UBICACIÓN DE PUNTOS DE VIGILANCIA AMBIENTAL DE CALIDAD AIRE**

0 100 200 400 600 M

Escala : 1/10,000

Datum Horizontal WGS84  
Proyección Transversa de Mercator  
Sistema de Coordenadas - UTM - Zona 18S

Elaborado: **CSIG-OEFA**

Fuente: Cartas Nacionales, escala 1:100 000 - IGN, Centros Poblados - INEI, Monitoreo ambiental-OEFA

Fecha: Febrero 2019

# ANEXO N° 2




Organismo  
de Evaluación  
y Fiscalización  
Ambiental


## Ficha Fotográfica

**Vigilancia ambiental de calidad del aire en el ámbito de la zona industrial de Ventanilla y distrito Mi Perú**  
**AIRE**

**CUE: 2019-02-0013**

**CUC:001-3-2019-401**

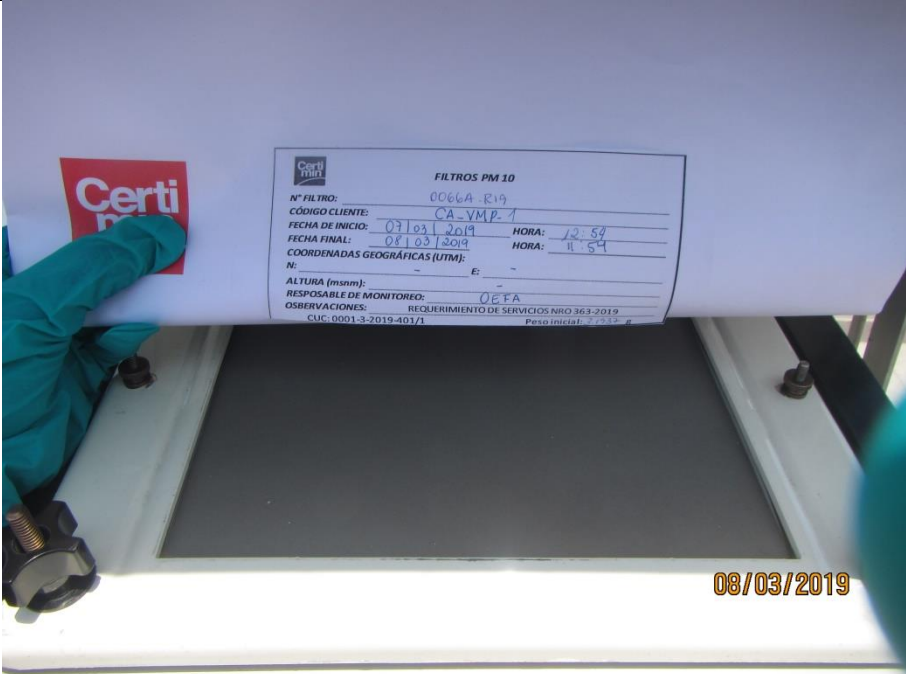
| Distrito                               | Mi Perú | Provincia   | Constitucional del Callao | Departamento | Lima |
|--|---------|---|---------------------------|--------------|------|
| <b>Fotografía 1</b><br><b>CA-VMP-1</b> |         |  |                           |              |      |
| Fecha: 29/03/2019                      |         |   |                           |              |      |
| Hora: 12:55                            |         |   |                           |              |      |
| Coordenadas UTM -WGS 84 – Zona 18L     |         |   |                           |              |      |
| Este (m): 268824                       |         |   |                           |              |      |
| Norte (m): 8687841                     |         |   |                           |              |      |
| Altitud (m s. n. m.): 106              |         |   |                           |              |      |
| Precisión: ± 3 m                       |         |   |                           |              |      |
| Descripción:                           |         | Vivienda ubicada en el Asentamiento Humano Mz. O Lote 11, distrito de Mi Perú.      |                           |              |      |

| Distrito                               | Mi Perú | Provincia   | Constitucional del Callao | Departamento | Lima |
|--|---------|---|---------------------------|--------------|------|
| <b>Fotografía 2</b><br><b>CA-VMP-1</b> |         |   |                           |              |      |
| Fecha: 16/03/2019                      |         |   |                           |              |      |
| Hora: 11:45                            |         |   |                           |              |      |
| Coordenadas UTM -WGS 84 – Zona 18L     |         |   |                           |              |      |
| Este (m): 268824                       |         |   |                           |              |      |
| Norte (m): 8687841                     |         |   |                           |              |      |
| Altitud (m s. n. m.): 106              |         |   |                           |              |      |
| Precisión: ± 3 m                       |         |   |                           |              |      |
| Descripción:                           |         | Equipos de monitoreo ambiental ubicado en la vivienda ubicada en el Asentamiento Humano Mz. O Lote 11, distrito de Mi Perú. |                           |              |      |

Vigilancia ambiental de calidad del aire en el ámbito de la zona industrial de Ventanilla y distrito Mi Perú  
AIRE

CUE: 2019-02-0013

CUC:001-3-2019-401

| Distrito                                     | Mi Perú   | Provincia | Constitucional del Callao | Departamento | Lima |
|--|---|-----------|---------------------------|--------------|------|
| <b>Fotografía 3</b><br>CA-VMP-1              |  |           |                           |              |      |
| Fecha: 08/03/2019                            |   |           |                           |              |      |
| Hora: 11:58                                  |   |           |                           |              |      |
| <b>Coordenadas</b><br>UTM -WGS 84 – Zona 18L |   |           |                           |              |      |
| Este (m): 268824                             |   |           |                           |              |      |
| Norte (m): 8687841                           |   |           |                           |              |      |
| Altitud (m s. n. m.): 106                    |   |           |                           |              |      |
| Precisión: ± 3 m                             |   |           |                           |              |      |

**Descripción:** Filtro de PM<sub>10</sub> del punto CA-VMP-1 colocado el 7 de marzo y retirado el 8 de marzo de 2019, ubicado en el Asentamiento Humano Mz. O Lote 11, distrito de Mi Perú.

| Distrito                                     | Mi Perú  | Provincia | Constitucional del Callao | Departamento | Lima |
|--|--|-----------|---------------------------|--------------|------|
| <b>Fotografía 4</b><br>CA-VMP-1              |  |           |                           |              |      |
| Fecha: 30/03/2019                            |  |           |                           |              |      |
| Hora: 12:30                                  |  |           |                           |              |      |
| <b>Coordenadas</b><br>UTM -WGS 84 – Zona 18L |  |           |                           |              |      |
| Este (m): 268824                             |  |           |                           |              |      |
| Norte (m): 8687841                           |  |           |                           |              |      |
| Altitud (m s. n. m.): 106                    |  |           |                           |              |      |
| Precisión: ± 3 m                             |  |           |                           |              |      |

**Descripción:** Filtro de PM<sub>10</sub> del punto CA-VMP-1 colocado el día 29 de marzo y retirado el 30 de marzo de 2019, ubicado en el Asentamiento Humano Mz. O Lote 11, distrito de Mi Perú.

**Vigilancia ambiental de calidad del aire en el ámbito de la zona industrial de Ventanilla y distrito Mi Perú AIRE**

**CUE: 2019-02-0013**

**CUC:001-3-2019-401**


| Distrito                                      | Ventanilla   | Provincia | Constitucional del Callao | Departamento | Lima |
|---|--|-----------|---------------------------|--------------|------|
| <b>Fotografía 5<br/>CA-VMP-2</b>              |  |           |                           |              |      |
| <b>Fecha:</b> 29/03/2019                      |  |           |                           |              |      |
| <b>Hora:</b> 13:25                            |  |           |                           |              |      |
| <b>Coordenadas<br/>UTM -WGS 84 – Zona 18L</b> |  |           |                           |              |      |
| <b>Este (m):</b> 268570                       |  |           |                           |              |      |
| <b>Norte (m):</b> 8688061                     |  |           |                           |              |      |
| <b>Altitud (m s. n. m.):</b> 80               |  |           |                           |              |      |
| <b>Precisión:</b> ± 3 m                       |  |           |                           |              |      |
| <b>Descripción:</b>                           | Institución Educativa Privada Arturo Padilla Espinoza, distrito de Ventanilla. |           |                           |              |      |

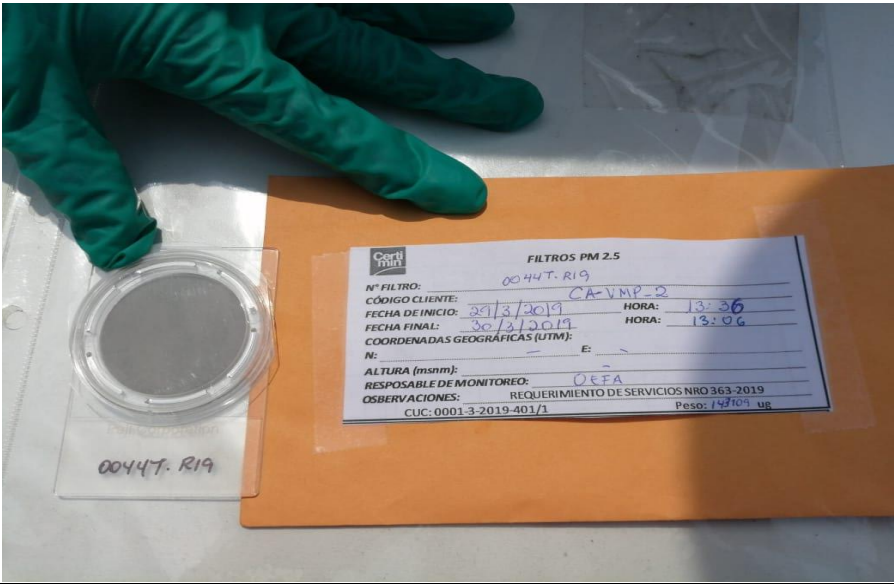
| Distrito                                      | Ventanilla  | Provincia | Constitucional del Callao | Departamento | Lima |
|---|---|-----------|---------------------------|--------------|------|
| <b>Fotografía 6<br/>CA-VMP-2</b>              |   |           |                           |              |      |
| <b>Fecha:</b> 20/03/2019                      |   |           |                           |              |      |
| <b>Hora:</b> 11:50                            |   |           |                           |              |      |
| <b>Coordenadas<br/>UTM -WGS 84 – Zona 18L</b> |   |           |                           |              |      |
| <b>Este (m):</b> 268570                       |   |           |                           |              |      |
| <b>Norte (m):</b> 8688061                     |   |           |                           |              |      |
| <b>Altitud (m s. n. m.):</b> 80               |   |           |                           |              |      |
| <b>Precisión:</b> ± 3 m                       |   |           |                           |              |      |
| <b>Descripción:</b>                           | Equipos de monitoreo ambiental ubicado en la Institución Educativa Privada Arturo Padilla Espinoza, distrito de Ventanilla. |           |                           |              |      |

Vigilancia ambiental de calidad del aire en el ámbito de la zona industrial de Ventanilla y distrito Mi Perú AIRE

CUE: 2019-02-0013

CUC:001-3-2019-401

| Distrito                                     | Ventanilla  | Provincia | Constitucional del Callao | Departamento | Lima |
|--|---|-----------|---------------------------|--------------|------|
| <b>Fotografía 7</b><br>CA-VMP-2              |    |           |                           |              |      |
| Fecha: 30/03/2019                            |   |           |                           |              |      |
| Hora: 13:09                                  |   |           |                           |              |      |
| <b>Coordenadas</b><br>UTM -WGS 84 – Zona 18L |   |           |                           |              |      |
| Este (m): 268570                             |   |           |                           |              |      |
| Norte (m): 8688061                           |   |           |                           |              |      |
| Altitud (m s. n. m.): 80                     |   |           |                           |              |      |
| Precisión: ± 3 m                             |   |           |                           |              |      |
| <b>Descripción:</b>                          | Filtro de PM <sub>10</sub> del punto CA-VMP-2 colocado el 29 de marzo y retirado el 30 de marzo de 2019, ubicado en la Institución Educativa Privada Arturo Padilla Espinoza. |           |                           |              |      |

| Distrito                                     | Ventanilla   | Provincia | Constitucional del Callao | Departamento | Lima |
|--|--|-----------|---------------------------|--------------|------|
| <b>Fotografía 8</b><br>CA-VMP-2              |    |           |                           |              |      |
| Fecha: 30/03/2019                            |  |           |                           |              |      |
| Hora: 13:10                                  |  |           |                           |              |      |
| <b>Coordenadas</b><br>UTM -WGS 84 – Zona 18L |  |           |                           |              |      |
| Este (m): 268570                             |  |           |                           |              |      |
| Norte (m): 8688061                           |  |           |                           |              |      |
| Altitud (m s. n. m.): 80                     |  |           |                           |              |      |
| Precisión: ± 3 m                             |  |           |                           |              |      |
| <b>Descripción:</b>                          | Filtro de PM <sub>2.5</sub> del punto CA-VMP-2 colocado el 29 de marzo y retirado el 30 de marzo de 2019, ubicado en la Institución Educativa Privada Arturo Padilla Espinoza. |           |                           |              |      |

**Vigilancia ambiental de calidad del aire en el ámbito de la zona industrial de Ventanilla y distrito Mi Perú AIRE**

**CUE: 2019-02-0013**

**CUC:001-3-2019-401**

| Distrito                                  | Ventanilla | Provincia                                       | Constitucional del Callao | Departamento | Lima |
|---|------------|---|---------------------------|--------------|------|
| <b>Fotografía 9 CA-VMP-6</b>              |            |   |                           |              |      |
| Fecha: 29/03/2019                         |            |   |                           |              |      |
| Hora: 11:32                               |            |   |                           |              |      |
| <b>Coordenadas UTM -WGS 84 – Zona 18L</b> |            |   |                           |              |      |
| Este (m): 268441                          |            |   |                           |              |      |
| Norte (m): 8686660                        |            |   |                           |              |      |
| Altitud (m s. n. m.): 50                  |            |   |                           |              |      |
| Precisión: ± 3 m                          |            |   |                           |              |      |
| <b>Descripción:</b>                       |            | Hospital de Ventanilla, distrito de Ventanilla. |                           |              |      |

| Distrito                                  | Ventanilla | Provincia  | Constitucional del Callao | Departamento | Lima |
|---|------------|--|---------------------------|--------------|------|
| <b>Fotografía 10 CA-VMP-6</b>             |            |  |                           |              |      |
| Fecha: 20/03/2019                         |            |  |                           |              |      |
| Hora: 11:05                               |            |  |                           |              |      |
| <b>Coordenadas UTM -WGS 84 – Zona 18L</b> |            |  |                           |              |      |
| Este (m): 268441                          |            |  |                           |              |      |
| Norte (m): 8686660                        |            |  |                           |              |      |
| Altitud (m s. n. m.): 50                  |            |  |                           |              |      |
| Precisión: ± 3 m                          |            |  |                           |              |      |
| <b>Descripción:</b>                       |            | Equipos de monitoreo ambiental ubicado en el Hospital de Ventanilla, distrito de Ventanilla. |                           |              |      |

**Vigilancia ambiental de calidad del aire en el ámbito de la zona industrial de Ventanilla y distrito Mi Perú AIRE**

**CUE: 2019-02-0013**

**CUC:001-3-2019-401**

| Distrito                                      | Ventanilla | Provincia  | Constitucional del Callao | Departamento | Lima |
|---|------------|--|---------------------------|--------------|------|
| <b>Fotografía 11<br/>CA-VMP-6</b>             |            |  |                           |              |      |
| Fecha: 08/03/2019                             |            |  |                           |              |      |
| Hora: 11:11                                   |            |  |                           |              |      |
| <b>Coordenadas<br/>UTM -WGS 84 – Zona 18L</b> |            |  |                           |              |      |
| Este (m): 268441                              |            |  |                           |              |      |
| Norte (m): 8686660                            |            |  |                           |              |      |
| Altitud (m s. n. m.): 50                      |            |  |                           |              |      |
| Precisión: ± 3 m                              |            |  |                           |              |      |
| <b>Descripción:</b>                           |            | Filtro de PM <sub>10</sub> del punto CA-VMP-6 colocado el 7 de marzo y retirado el 8 de marzo de 2019, ubicado en el Hospital de Ventanilla. |                           |              |      |

| Distrito                                      | Ventanilla | Provincia  | Constitucional del Callao | Departamento | Lima |
|---|------------|--|---------------------------|--------------|------|
| <b>Fotografía 12<br/>CA-VMP-6</b>             |            |  |                           |              |      |
| Fecha: 14/03/2019                             |            |  |                           |              |      |
| Hora: 14:09                                   |            |  |                           |              |      |
| <b>Coordenadas<br/>UTM -WGS 84 – Zona 18L</b> |            |  |                           |              |      |
| Este (m): 268441                              |            |  |                           |              |      |
| Norte (m): 8686660                            |            |  |                           |              |      |
| Altitud (m s. n. m.): 50                      |            |  |                           |              |      |
| Precisión: ± 3 m                              |            |  |                           |              |      |
| <b>Descripción:</b>                           |            | Filtro de PM <sub>10</sub> del punto CA-VMP-6 colocado el 13 de marzo y retirado el 14 de marzo de 2019, ubicado en el Hospital de Ventanilla. |                           |              |      |

**Vigilancia ambiental de calidad del aire en el ámbito de la zona industrial de Ventanilla y distrito Mi Perú AIRE**

**CUE: 2019-02-0013**

**CUC:001-3-2019-401**


| Distrito                                  | Mi Perú | Provincia  | Constitucional del Callao | Departamento | Lima |
|---|---------|--|---------------------------|--------------|------|
| <b>Fotografía 13 CA-VMP-7</b>             |         |  |                           |              |      |
| Fecha: 29/03/2019                         |         |  |                           |              |      |
| Hora: 11:59                               |         |  |                           |              |      |
| <b>Coordenadas UTM -WGS 84 – Zona 18L</b> |         |  |                           |              |      |
| Este (m): 268736                          |         |  |                           |              |      |
| Norte (m): 8687699                        |         |  |                           |              |      |
| Altitud (m s. n. m.): 86                  |         |  |                           |              |      |
| Precisión: ± 3 m                          |         |  |                           |              |      |
| <b>Descripción:</b>                       |         | Vivienda ubicada en el Asentamiento Humano Mz. Y Lote 28, distrito de Mi Perú. |                           |              |      |


| Distrito                                  | Mi Perú | Provincia  | Constitucional del Callao | Departamento | Lima |
|---|---------|--|---------------------------|--------------|------|
| <b>Fotografía 14 CA-VMP-7</b>             |         |  |                           |              |      |
| Fecha: 14/03/2019                         |         |  |                           |              |      |
| Hora: 14:20                               |         |  |                           |              |      |
| <b>Coordenadas UTM -WGS 84 – Zona 18L</b> |         |  |                           |              |      |
| Este (m): 268736                          |         |  |                           |              |      |
| Norte (m): 8687699                        |         |  |                           |              |      |
| Altitud (m s. n. m.): 86                  |         |  |                           |              |      |
| Precisión: ± 3 m                          |         |  |                           |              |      |
| <b>Descripción:</b>                       |         | Equipo de monitoreo ambiental ubicado en la vivienda ubicada en el Asentamiento Humano Mz. Y Lote 28, distrito de Mi Perú. |                           |              |      |

Vigilancia ambiental de calidad del aire en el ámbito de la zona industrial de Ventanilla y distrito Mi Perú  
AIRE

CUE: 2019-02-0013

CUC:001-3-2019-401

| Distrito                                     | Mi Perú   | Provincia | Constitucional del Callao | Departamento | Lima |
|--|---|-----------|---------------------------|--------------|------|
| <b>Fotografía 15</b><br>CA-VMP-7             |    |           |                           |              |      |
| Fecha: 20/03/2019                            |   |           |                           |              |      |
| Hora: 11:26                                  |   |           |                           |              |      |
| <b>Coordenadas</b><br>UTM -WGS 84 – Zona 18L |   |           |                           |              |      |
| Este (m): 268736                             |   |           |                           |              |      |
| Norte (m): 8687699                           |   |           |                           |              |      |
| Altitud (m s. n. m.): 86                     |   |           |                           |              |      |
| Precisión: ± 3 m                             | <p><b>Descripción:</b> Vista panorámica de lo que se visualiza frente a la vivienda ubicada en el Asentamiento Humano Mz. Y Lote 28, distrito de Mi Perú.</p> |           |                           |              |      |

| Distrito                                     | Mi Perú  | Provincia | Constitucional del Callao | Departamento | Lima |
|--|--|-----------|---------------------------|--------------|------|
| <b>Fotografía 16</b><br>CA-VMP-7             |    |           |                           |              |      |
| Fecha: 20/03/2019                            |  |           |                           |              |      |
| Hora: 11:24                                  |  |           |                           |              |      |
| <b>Coordenadas</b><br>UTM -WGS 84 – Zona 18L |  |           |                           |              |      |
| Este (m): 268736                             |  |           |                           |              |      |
| Norte (m): 8687699                           |  |           |                           |              |      |
| Altitud (m s. n. m.): 86                     |  |           |                           |              |      |
| Precisión: ± 3 m                             | <p><b>Descripción:</b> Filtro de PM<sub>10</sub> del punto CA-VMP-7 colocado el 19 de marzo y retirado el 20 de marzo de 2019, ubicado en el Asentamiento Humano Mz. Y Lote 28, distrito de Mi Perú.</p> |           |                           |              |      |

# ANEXO N° 3



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

**Datos de campo,  
cálculos de aire,  
data meteorológica  
y resultados de  
laboratorio**

# ANEXO N° 3.1



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## Datos de campo

DATOS DE CAMPO DE AIRE

EXPEDIENTE: \_\_\_\_\_

CUE: 2019-02-0013 CUC: 001-3-2019-401

PUNTO DE MUESTREO: CA-VMP-1 FECHA DE INICIO: 4/03/19 HORA DE INICIO: 16:18 Hrs.

DESCRIPCIÓN: Vivienda del A.H. Virgen de Guadalupe Mz O Lote 11, Mi Perú

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COORDENADAS UTM WGS 84  
 ZONA: 18L ESTE: 268824 NORTE: 8687841  
 ALTITUD (m s.n.m.): 106 PRECISIÓN: ± 3

ALTO VOLUMEN : MATERIAL PARTICULADO  PM<sub>2.5</sub>  PM<sub>10</sub>

| N.º de medición | Periodo de medición inicial |              | Periodo de medición final |              | Flujo (L/min) |       | Presión (in H <sub>2</sub> O) |       |
|-----------------|-----------------------------|--------------|---------------------------|--------------|---------------|-------|-------------------------------|-------|
|                 | Fecha (dd/mm/aa)            | Hora (hh:mm) | Fecha (dd/mm/aa)          | Hora (hh:mm) | Inicial       | Final | Inicial                       | Final |
| 1               | 4/03/2019                   | 16:43        | 5/03/2019                 | 16:18        | /             | /     | 15,1                          | 15,8  |
| 2               | 7/03/2019                   | 12:54        | 8/03/2019                 | 11:54        |               |       | 14,9                          | 16,1  |
| 3               | 13/03/2019                  | 15:32        | 14/03/2019                | 14:32        |               |       | 13,8                          | 15,5  |
| 4               | 16/03/2019                  | 11:40        | 17/03/2019                | 11:15        |               |       | 15,8                          | 16,6  |
| 5               | 19/03/2019                  | 11:31        | 20/03/2019                | 11:31        |               |       | 15,0                          | 16,0  |
| 6               | 29/03/2019                  | 12:57        | 30/03/2019                | 12:27        |               |       | 14,6                          | 15,6  |

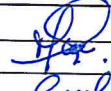

BAJO VOLUMEN: MATERIAL PARTICULADO  PM<sub>2.5</sub>  PM<sub>10</sub>

| N.º de medición | Periodo de medición inicial |              | Periodo de medición final |              | Volumen | Presión | Temperatura |
|-----------------|-----------------------------|--------------|---------------------------|--------------|---------|---------|-------------|
|                 | Fecha (dd/mm/aa)            | Hora (hh:mm) | Fecha (dd/mm/aa)          | Hora (hh:mm) |         |         |             |
| 1               | /                           |              |                           |              | /       | /       | /           |
| 2               | /                           |              |                           |              |         |         |             |
| 3               | /                           |              |                           |              |         |         |             |
| 4               | /                           |              |                           |              |         |         |             |
| 5               | /                           |              |                           |              |         |         |             |
| 6               | /                           |              |                           |              |         |         |             |

DESCRIPCIÓN DE EQUIPOS EMPLEADOS

| N.º | EQUIPOS  | MARCA             | MODELO       | SERIE       |
|-----|--|-------------------|--------------|-------------|
| 1   | Muestreador de Material Particulado < 10 micras  | THERMO SCIENTIFIC | -            | 1547505     |
| 2   | Muestreador de Material Particulado < 2,5 micras | -                 | -            | -           |
| 3   | Motor Venturi                                    | THERMO SCIENTIFIC | HI VOL       | P9307X      |
| 4   | Manómetro  | -                 | -            | -           |
| 5   | Estación meteorológica                           | DAVIS             | VANTAGE PRO2 | BB171204036 |
| 6   | Otros: MANÓMETRO DE AGUA                         | DWYER             | -            | -           |

OBSERVACIONES GENERALES

|                                   |                          |       |   |
|-----------------------------------|--------------------------|-------|---|
| Responsable de grupo de trabajo   | <u>Marietta Abata A.</u> | Firma |  |
| Responsable de la toma de muestra | <u>Cindy Alfaro G.</u>   | Firma |  |

DATOS DE CAMPO DE AIRE

EXPEDIENTE: \_\_\_\_\_

CUE: 2019-02-0013 CUC: 001-3-2019-401

PUNTO DE MUESTREO: CA-VMP-2 FECHA DE INICIO: 4/03/19 HORA DE INICIO: 14:58 Hrs.

DESCRIPCIÓN: I.E.P. Arturo Padilla Espinoza, Av. Revolución N° 2494, Ventanilla

COORDENADAS UTM WGS 84 ZONA: 18L ESTE: 268570 NORTE: 8688061 ALTITUD (m s.n.m.): 80 PRECISIÓN: ± 3

ALTO VOLUMEN : MATERIAL PARTICULADO  PM<sub>2.5</sub>  PM<sub>10</sub>

| N.° de medición | Periodo de medición inicial |              | Periodo de medición final |              | Flujo (L/min) |       | Presión (in H <sub>2</sub> O) |       |
|-----------------|-----------------------------|--------------|---------------------------|--------------|---------------|-------|-------------------------------|-------|
|                 | Fecha (dd/mm/aa)            | Hora (hh:mm) | Fecha (dd/mm/aa)          | Hora (hh:mm) | Inicial       | Final | Inicial                       | Final |
| 1               | 4/03/2019                   | 15:28        | 5/03/2019                 | 14:58        |               |       | 13,9                          | 14,8  |
| 2               | 7/03/2019                   | 11:48        | 8/03/2019                 | 11:18        |               |       | 13,7                          | 15,0  |
| 3               | 13/03/2019                  | 15:47        | 14/03/2019                | 14:47        |               |       | 13,9                          | 15,5  |
| 4               | 16/03/2019                  | 11:53        | 17/03/2019                | 11:25        |               |       | 14,1                          | 14,6  |
| 5               | 19/03/2019                  | 11:44        | 20/03/2019                | 11:44        |               |       | 11,3                          | 13,8  |
| 6               | 29/03/2019                  | 13:36        | 30/03/2019                | 13:06        |               |       | 13,4                          | 14,4  |

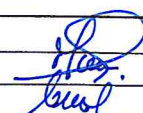
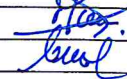
BAJO VOLUMEN: MATERIAL PARTICULADO  PM<sub>2.5</sub>  PM<sub>10</sub>

| N.° de medición | Periodo de medición inicial |              | Periodo de medición final |              | Volumen | Presión | Temperatura |
|-----------------|-----------------------------|--------------|---------------------------|--------------|---------|---------|-------------|
|                 | Fecha (dd/mm/aa)            | Hora (hh:mm) | Fecha (dd/mm/aa)          | Hora (hh:mm) |         |         |             |
| 1               | 4/03/2019                   | 15:28        | 5/03/2019                 | 14:58        | 23,52   | 754     | 24,3        |
| 2               | 7/03/2019                   | 11:48        | 8/03/2019                 | 11:18        | 23,52   | 753     | 24,8        |
| 3               | 13/03/2019                  | 15:47        | 14/03/2019                | 14:47        | 23,02   | 754     | 24,0        |
| 4               | 16/03/2019                  | 11:53        | 17/03/2019                | 11:23        | 23,40   | 754     | 23,4        |
| 5               | 19/03/2019                  | 11:44        | 20/03/2019                | 11:44        | 24,03   | 755     | 23,7        |
| 6               | 29/03/2019                  | 13:36        | 30/03/2019                | 13:06        | 23,51   | 755     | 23,5        |

DESCRIPCIÓN DE EQUIPOS EMPLEADOS

| N.° | EQUIPOS  | MARCA             | MODELO | SERIE   |
|-----|--|-------------------|--------|---------|
| 1   | Muestreador de Material Particulado < 10 micras  | THERMO SCIENTIFIC | -      | 1547905 |
| 2   | Muestreador de Material Particulado < 2.5 micras | -                 | -      | -       |
| 3   | Motor Venturi                                    | THERMO SCIENTIFIC | H1-VOL | P9309X  |
| 4   | Manómetro  | -                 | -      | -       |
| 5   | Estación meteorológica                           | -                 | -      | -       |
| 6   | Otros: MANÓMETRO DE AGUA                         | DWYER             | -      | -       |

OBSERVACIONES GENERALES

|                                   |                          |       |   |
|-----------------------------------|--------------------------|-------|---|
| Responsable de grupo de trabajo   | <u>Mariella Atala A.</u> | Firma |  |
| Responsable de la toma de muestra | <u>Cindy Alfaro G.</u>   | Firma |  |

## DATOS DE CAMPO DE AIRE

|                        |   |                    |                                    |
|------------------------|---|--------------------|------------------------------------|
| EXPEDIENTE:            | -   |                    |                                    |
| CUE:                   | 2019-02-0013  | CUC:               | 001-3-2019-401                     |
| PUNTO DE MUESTREO:     | CA-VMP-6  | FECHA DE INICIO:   | 4/03/19 HORA DE INICIO: 14:03 hrs. |
| DESCRIPCIÓN:           | Hospital de Ventanilla, Av. Pedro Beltrán s/n, Ventanilla |                    |                                    |
| COORDENADAS UTM WGS 84 | ZONA: 18L ESTE: 268441 NORTE: 8686660                     | ALTITUD (m s.n.m): | 50 PRECISIÓN: ± 3                  |

| ALTO VOLUMEN: MATERIAL PARTICULADO <input type="checkbox"/> PM <sub>2.5</sub> <input checked="" type="checkbox"/> PM <sub>10</sub> |                             |              |                           |              |               |       |                               |       |
|--|-----------------------------|--------------|---------------------------|--------------|---------------|-------|-------------------------------|-------|
| N.º de medición  | Periodo de medición inicial |              | Periodo de medición final |              | Flujo (L/min) |       | Presión (in H <sub>2</sub> O) |       |
|  | Fecha (dd/mm/aa)            | Hora (hh:mm) | Fecha (dd/mm/aa)          | Hora (hh:mm) | Inicial       | Final | Inicial                       | Final |
| 1  | 4/03/2019                   | 14:03        | 5/03/2019                 | 14:03        | /             | /     | 13,7                          | 14,5  |
| 2  | 7/03/2019                   | 11:25        | 8/03/2019                 | 11:09        | /             | /     | 15,0                          | 15,7  |
| 3  | 13/03/2019                  | 14:56        | 14/03/2019                | 14:07        | /             | /     | 15,0                          | 15,6  |
| 4  | 16/03/2019                  | 10:20        | 17/03/2019                | 10:43        | /             | /     | 15,0                          | 15,6  |
| 5  | 19/03/2019                  | 11:00        | 20/03/2019                | 11:00        | /             | /     | 15,7                          | 16,5  |
| 6  | 29/03/2019                  | 11:30        | 30/03/2019                | 11:30        | /             | /     | 14,9                          | 15,1  |

| BAJO VOLUMEN: MATERIAL PARTICULADO <input type="checkbox"/> PM <sub>2.5</sub> <input type="checkbox"/> PM <sub>10</sub> |                             |              |                           |              |         |         |             |
|---|-----------------------------|--------------|---------------------------|--------------|---------|---------|-------------|
| N.º de medición   | Periodo de medición inicial |              | Periodo de medición final |              | Volumen | Presión | Temperatura |
|   | Fecha (dd/mm/aa)            | Hora (hh:mm) | Fecha (dd/mm/aa)          | Hora (hh:mm) |         |         |             |
| 1   | /                           | /            | /                         | /            | /       | /       | /           |
| 2   | /                           | /            | /                         | /            | /       | /       | /           |
| 3   | /                           | /            | /                         | /            | /       | /       | /           |
| 4   | /                           | /            | /                         | /            | /       | /       | /           |
| 5   | /                           | /            | /                         | /            | /       | /       | /           |
| 6   | /                           | /            | /                         | /            | /       | /       | /           |

| DESCRIPCIÓN DE EQUIPOS EMPLEADOS |  |                   |              |             |
|----------------------------------|--|-------------------|--------------|-------------|
| N.º                              | EQUIPOS  | MARCA             | MODELO       | SERIE       |
| 1                                | Muestreador de Material Particulado < 10 micras  | THERMO SCIENTIFIC | -            | 1548805     |
| 2                                | Muestreador de Material Particulado < 2,5 micras | "                 | -            | -           |
| 3                                | Motor Venturi                                    | THERMO SCIENTIFIC | HI VOL       | P9328X      |
| 4                                | Manómetro DE AGUA                                | DWYER             | -            | -           |
| 5                                | Estación meteorológica                           | DAVIS             | VANTAGE PRO2 | BB180411015 |
| 6                                | Otros:   | -                 | -            | -           |

OBSERVACIONES GENERALES

|                                   |                   |       |  |
|-----------------------------------|-------------------|-------|--|
| Responsable de grupo de trabajo   | Mariella Atala A. | Firma |  |
| Responsable de la toma de muestra | Cindy Alfaro G.   | Firma |  |

DATOS DE CAMPO DE AIRE

EXPEDIENTE: \_\_\_\_\_

CUE: 2019-02-0013 CUC: 001-3-2019-401

PUNTO DE MUESTREO: CA-VMP-7 FECHA DE INICIO: 4.3.19 HORA DE INICIO: 16:23 hrs.

DESCRIPCIÓN: Vivienda del A.H. Virgen de Guadalupe Mz Y Lote 28, Mi Perú


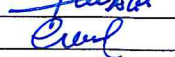
COORDENADAS UTM WGS 84 ZONA: 18L ESTE: 268736 NORTE: 8687699 ALTITUD (m s.n.m.): 86 PRECISIÓN: ± 3

| ALTO VOLUMEN : MATERIAL PARTICULADO <input type="checkbox"/> PM <sub>2.5</sub> <input checked="" type="checkbox"/> PM <sub>10</sub> |                             |              |                           |              |               |       |                               |       |
|---|-----------------------------|--------------|---------------------------|--------------|---------------|-------|-------------------------------|-------|
| N.º de medición   | Periodo de medición inicial |              | Periodo de medición final |              | Flujo (L/min) |       | Presión (in H <sub>2</sub> O) |       |
|   | Fecha (dd/mm/aa)            | Hora (hh:mm) | Fecha (dd/mm/aa)          | Hora (hh:mm) | Inicial       | Final | Inicial                       | Final |
| 1   | 4/03/2019                   | 16:23        | 5/03/2019                 | 15:53        | /             | /     | 14,6                          | 15,2  |
| 2   | 7/03/2019                   | 12:35        | 8/03/2019                 | 11:35        | /             | /     | 14,9                          | 15,9  |
| 3   | 13/03/2019                  | 15:17        | 14/03/2019                | 14:17        | /             | /     | 14,7                          | 16,2  |
| 4   | 16/03/2019                  | 10:45        | 17/03/2019                | 10:15        | /             | /     | 15,0                          | 15,5  |
| 5   | 19/03/2019                  | 11:21        | 20/03/2019                | 11:21        | /             | /     | 15,0                          | 16,3  |
| 6   | 29/03/2019                  | 12:10        | 30/03/2019                | 12:00        | /             | /     | 14,8                          | 15,3  |

| BAJO VOLUMEN: MATERIAL PARTICULADO <input type="checkbox"/> PM <sub>2.5</sub> <input type="checkbox"/> PM <sub>10</sub> |                             |              |                           |              |         |         |             |
|---|-----------------------------|--------------|---------------------------|--------------|---------|---------|-------------|
| N.º de medición   | Periodo de medición inicial |              | Periodo de medición final |              | Volumen | Presión | Temperatura |
|   | Fecha (dd/mm/aa)            | Hora (hh:mm) | Fecha (dd/mm/aa)          | Hora (hh:mm) |         |         |             |
| 1   | /                           | /            | /                         | /            | /       | /       | /           |
| 2   | /                           | /            | /                         | /            | /       | /       | /           |
| 3   | /                           | /            | /                         | /            | /       | /       | /           |
| 4   | /                           | /            | /                         | /            | /       | /       | /           |
| 5   | /                           | /            | /                         | /            | /       | /       | /           |
| 6   | /                           | /            | /                         | /            | /       | /       | /           |

| DESCRIPCIÓN DE EQUIPOS EMPLEADOS |  |                   |        |          |
|----------------------------------|--|-------------------|--------|----------|
| N.º                              | EQUIPOS  | MARCA             | MODELO | SERIE    |
| 1                                | Muestreador de Material Particulado < 10 micras  | THERMO SCIENTIFIC | -      | 15482 05 |
| 2                                | Muestreador de Material Particulado < 2,5 micras | -                 | -      | -        |
| 3                                | Motor Venturi                                    | THERMO SCIENTIFIC | -      | P9308 X  |
| 4                                | Manómetro DE AGUA                                | DWYER             | -      | -        |
| 5                                | Estación meteorológica                           | -                 | -      | -        |
| 6                                | Otros:   | -                 | -      | -        |

OBSERVACIONES GENERALES

|                                   |                       |       |   |
|-----------------------------------|-----------------------|-------|---|
| Responsable de grupo de trabajo   | <u>Mariella Atala</u> | Firma |  |
| Responsable de la toma de muestra | <u>Cindy Alfaro</u>   | Firma |  |

# ANEXO N° 3.2



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## Cálculos de Aire



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## MONITOREO DE LA CALIDAD DEL AIRE RESUMEN DE LOS DATOS DE METEOROLOGÍA

### DATOS GENERALES

|         |                        |                        |               |                 |             |
|---------|------------------------|------------------------|---------------|-----------------|-------------|
| CUC N°: | 0001-3-2019-401        | ESTACIÓN DE MONITOREO: | CA-VMP-1      | DÍAS EVALUADOS: | 6           |
| EQUIPO: | ESTACIÓN METEOROLÓGICA |                        |               |                 |             |
| MARCA:  | Davis                  | MODELO:                | Vantage Pro 2 | SERIE:          | BB171204036 |

### MEDICIONES PROMEDIO (DATOS DIÁRIOS)

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 1 | INICIO: | 04/03/2019 16:43 | FINAL: | 05/03/2019 16:18 | PERIODO : | 23:35 horas | 1415 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 26,1 | Presión (mm Hg):          | 752,1 | Humedad (%):                | 72  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 0,9 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 2 | INICIO: | 07/03/2019 12:54 | FINAL: | 08/03/2019 11:54 | PERIODO : | 23:00 horas | 1380 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 23 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 26,1 | Presión (mm Hg):          | 751,3 | Humedad (%):                | 71  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 1,0 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 3 | INICIO: | 13/03/2019 15:32 | FINAL: | 14/03/2019 14:32 | PERIODO : | 23:00 horas | 1380 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 23 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 25,5 | Presión (mm Hg):          | 751,5 | Humedad (%):                | 73  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 0,9 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 4 | INICIO: | 16/03/2019 11:40 | FINAL: | 17/03/2019 11:15 | PERIODO : | 23:35 horas | 1415 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 24,9 | Presión (mm Hg):          | 751,7 | Humedad (%):                | 72  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 0,9 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 5 | INICIO: | 19/03/2019 11:31 | FINAL: | 20/03/2019 11:31 | PERIODO : | 24:00 horas | 1440 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 24,2 | Presión (mm Hg):          | 752,8 | Humedad (%):                | 71  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 1,1 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 6 | INICIO: | 29/03/2019 12:57 | FINAL: | 30/03/2019 12:27 | PERIODO : | 23:30 horas | 1410 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 23 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 24,5 | Presión (mm Hg):          | 752,7 | Humedad (%):                | 72  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 1,0 |



## MONITOREO DE LA CALIDAD DEL AIRE

### HOJA DE CÁLCULO PARA ESTIMAR LAS CONCENTRACIONES DE MATERIAL PARTICULADO ALTO VOLUMEN

**ESTACIÓN DE MONITOREO:** CA-VMP-1      **PROCEDENCIA:** CALLAO

**UBICACIÓN:**      **ESTE:** 268824      **NORTE:** 8687841      **ZONA:** 18 L      **ALTITUD:** 106      **PRECISIÓN GPS:** ± 3

**DESCRIPCIÓN:** Ubicado en la azotea de la vivienda del A.H. Virgen de Guadalupe-2da etapa, Mz. O Lote 11, distrito de Mi Perú

**PARÁMETROS:** PM-10 y Metales en PM-10

| N° | Parámetro        | N° Filtro | Fecha Inicio     | Fecha Final      | Periodo (minutos) | Temperatura ambiental (°C) | Presión ambiental (mm Hg) | Po/Pa | Flujo de muestreo (m <sup>3</sup> /min) | Volumen muestreado real (m <sup>3</sup> ) | Volumen muestreado estándar (m <sup>3</sup> ) | ΔPeso (μg) * | Concentración de partículas (μg/m <sup>3</sup> ) |
|----|------------------|-----------|------------------|------------------|-------------------|----------------------------|---------------------------|-------|---|---|---|--------------|--|
| 1  | PM-10            | 0058A.R19 | 04/03/2019 16:43 | 05/03/2019 16:18 | 1415              | 26,1                       | 752,1                     | 0,962 | 1,179                                   | 1668,57                                   | 1645,15                                       | 113500       | 68,99  |
| 2  |                  | 0066A.R19 | 07/03/2019 12:54 | 08/03/2019 11:54 | 1380              | 26,1                       | 751,3                     | 0,961 | 1,178                                   | 1625,85                                   | 1601,33                                       | 187100       | 116,84   |
| 3  |                  | 0069A.R19 | 13/03/2019 15:32 | 14/03/2019 14:32 | 1380              | 25,5                       | 751,5                     | 0,964 | 1,181                                   | 1629,78                                   | 1608,85                                       | 125300       | 77,88  |
| 4  |                  | 0073A.R19 | 16/03/2019 11:40 | 17/03/2019 11:15 | 1415              | 24,9                       | 751,7                     | 0,960 | 1,175                                   | 1662,34                                   | 1644,74                                       | 167000       | 101,54   |
| 5  |                  | 0077A.R19 | 19/03/2019 11:31 | 20/03/2019 11:31 | 1440              | 24,2                       | 752,8                     | 0,962 | 1,176                                   | 1693,87                                   | 1682,34                                       | 150600       | 89,52  |
| 6  |                  | 0081A.R19 | 29/03/2019 12:57 | 30/03/2019 12:27 | 1410              | 24,5                       | 752,7                     | 0,963 | 1,178                                   | 1660,98                                   | 1647,79                                       | 178600       | 108,39   |
| 1  | Metales en PM 10 | 0058A.R19 | 04/03/2019 16:43 | 05/03/2019 16:18 | 1415              | 26,1                       | 752,1                     | 0,962 | 1,179                                   | 1668,57                                   | 1645,15                                       | -            | -  |
| 2  |                  | 0066A.R19 | 07/03/2019 12:54 | 08/03/2019 11:54 | 1380              | 26,1                       | 751,3                     | 0,961 | 1,178                                   | 1625,85                                   | 1601,33                                       | -            | -  |
| 3  |                  | 0069A.R19 | 13/03/2019 15:32 | 14/03/2019 14:32 | 1380              | 25,5                       | 751,5                     | 0,964 | 1,181                                   | 1629,78                                   | 1608,85                                       | -            | -  |
| 4  |                  | 0073A.R19 | 16/03/2019 11:40 | 17/03/2019 11:15 | 1415              | 24,9                       | 751,7                     | 0,960 | 1,175                                   | 1662,34                                   | 1644,74                                       | -            | -  |
| 5  |                  | 0077A.R19 | 19/03/2019 11:31 | 20/03/2019 11:31 | 1440              | 24,2                       | 752,8                     | 0,962 | 1,176                                   | 1693,87                                   | 1682,34                                       | -            | -  |
| 6  |                  | 0081A.R19 | 29/03/2019 12:57 | 30/03/2019 12:27 | 1410              | 24,5                       | 752,7                     | 0,963 | 1,178                                   | 1660,98                                   | 1647,79                                       | -            | -  |

#### OBSERVACIONES:

(1) El cálculo de volumen estándar para material particulado, se realizó en base a las condiciones de temperatura estándar (T= 25°C ó 298,15 °K) y presión estándar (760 mmHg ó 1013,25 mBar), establecidas en el Protocolo de Monitoreo de la Calidad del aire y Gestión de los datos de la DIGESA (2005).

(2) El cálculo de volumen estándar para metales en PM<sub>10</sub> se realizó en base a las condiciones de temperatura estándar (T= 25°C ó 298,15 °K) y presión estándar (760 mmHg ó 1013,25 mBar).

(\*) Fuente: Informe de Ensayo N° ABR1065.R19 del laboratorio Certimin S.A.

"-" : No aplica.

**NOMBRE DEL PROYECTO:**

VIGILANCIA AMBIENTAL DE LA CALIDAD DEL AIRE EN EL ÁMBITO DE INFLUENCIA DE LA ZONA INDUSTRIAL DE VENTANILLA-MI PERÚ, UBICADO EN LOS DISTRITOS DE VENTANILLA Y MI PERÚ, PROVINCIA CONSTITUCIONAL DEL CALLAO, DURANTE EL MES DE MARZO 2019

| RESULTADOS DE LABORATORIO        |        |            |            |            |            |            |            |      |
|----------------------------------|--------|------------|------------|------------|------------|------------|------------|------|
| Metal medido en PM <sub>10</sub> | Unidad | CA-VMP-1   |            |            |            |            |            |      |
|                                  |        | 04/03/2019 | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |      |
| Plata                            | Ag     | µg/mtra    | <1         | 1          | <1         | <1         | <1         | <1   |
| Aluminio                         | Al     | µg/mtra    | 1156       | 1869       | 1104       | 1388       | 1044       | 1608 |
| Arsenico                         | As     | µg/mtra    | <9         | <9         | 17         | 12         | <9         | <9   |
| Bario                            | Ba     | µg/mtra    | 23         | 43         | 23         | 27         | 22         | 35   |
| Berilio                          | Be     | µg/mtra    | <1         | <1         | <1         | <1         | <1         | <1   |
| Bismuto                          | Bi     | µg/mtra    | <350       | <350       | <350       | <350       | <350       | <350 |
| Boro                             | B      | µg/mtra    | 35         | 30         | 55         | 47         | 12         | 96   |
| Calcio                           | Ca     | µg/mtra    | 3759       | 6245       | 3687       | 4245       | 3752       | 4760 |
| Cadmio                           | Cd     | µg/mtra    | 3          | 6          | 3          | 3          | 3          | 12   |
| Cobalto                          | Co     | µg/mtra    | <6         | <6         | <6         | <6         | <6         | <6   |
| Cromo                            | Cr     | µg/mtra    | 47         | 30         | 39         | 35         | 31         | 43   |
| Cobre                            | Cu     | µg/mtra    | 285        | 517        | 301        | 281        | 324        | 396  |
| Hierro                           | Fe     | µg/mtra    | 2071       | 3284       | 2009       | 2300       | 1872       | 2784 |
| Potasio                          | K      | µg/mtra    | 624        | 982        | 668        | 813        | 671        | 947  |
| Mercurio                         | Hg     | µg/mtra    | <20        | <20        | <20        | <20        | <20        | <20  |
| Litio                            | Li     | µg/mtra    | <2         | <2         | <2         | <2         | <2         | <2   |
| Magnesio                         | Mg     | µg/mtra    | 1326       | 1991       | 1447       | 1717       | 1554       | 1635 |
| Manganeso                        | Mn     | µg/mtra    | 44         | 79         | 43         | 49         | 44         | 56   |
| Molibdeno                        | Mo     | µg/mtra    | 97         | 156        | 17         | 5          | 4          | 34   |
| Sodio                            | Na     | µg/mtra    | 6110       | 9050       | 7780       | 9462       | 8806       | 8283 |
| Niquel                           | Ni     | µg/mtra    | 13         | 20         | 19         | <5         | 17         | 11   |
| Fosforo                          | P      | µg/mtra    | 240        | 405        | 244        | 273        | 152        | 320  |
| Plomo                            | Pb     | µg/mtra    | 339        | 1024       | 459        | 447        | 753        | 1224 |
| Antimonio                        | Sb     | µg/mtra    | <9         | 25         | <9         | <9         | <9         | 14   |
| Selenio                          | Se     | µg/mtra    | <55        | <55        | <55        | <55        | <55        | <55  |
| Silicio                          | Si     | µg/mtra    | 2507       | 3412       | 2546       | 2302       | 2053       | 2541 |
| Estaño                           | Sn     | µg/mtra    | <15        | <15        | <15        | <15        | <15        | <15  |
| Estroncio                        | Sr     | µg/mtra    | 17,6       | 28,7       | 18,6       | 21         | 18,9       | 22,5 |
| Titanio                          | Ti     | µg/mtra    | 52         | 85         | 48         | 62         | 43         | 73   |
| Talio                            | Tl     | µg/mtra    | <60        | <60        | <60        | <60        | <60        | <60  |
| Vanadio                          | V      | µg/mtra    | 78,1       | 62,2       | 84,1       | 52,1       | 70,2       | 40,7 |
| Zinc                             | Zn     | µg/mtra    | 202        | 415        | 301        | 230        | 193        | 446  |

<: Debajo del límite de detección

Fuente: Informe de Ensayo N° ABR1065.R19 del laboratorio Certimin S.A.

| CONCENTRACIÓN DE METALES                |        |                   |                |                |                |                |                |       |
|---|--------|-------------------|----------------|----------------|----------------|----------------|----------------|-------|
| Metal medido en PM <sub>10</sub>        | Unidad | CA-VMP-1          |                |                |                |                |                |       |
|   |        | 04/03/2019        | 07/03/2019     | 13/03/2019     | 16/03/2019     | 19/03/2019     | 29/03/2019     |       |
| <b>Volumen estándar (m<sup>3</sup>)</b> |        | <b>1645,15</b>    | <b>1601,33</b> | <b>1608,85</b> | <b>1644,74</b> | <b>1682,34</b> | <b>1647,79</b> |       |
| Plata                                   | Ag     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Aluminio                                | Al     | µg/m <sup>3</sup> | 0,70           | 1,17           | 0,69           | 0,84           | 0,62           | 0,98  |
| Arsenico                                | As     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Bario                                   | Ba     | µg/m <sup>3</sup> | 0,014          | 0,027          | 0,014          | 0,016          | 0,013          | 0,021 |
| Berilio                                 | Be     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Bismuto                                 | Bi     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Boro                                    | B      | µg/m <sup>3</sup> | 0,021          | 0,019          | 0,034          | 0,029          | 0,007          | 0,058 |
| Calcio                                  | Ca     | µg/m <sup>3</sup> | 2,28           | 3,90           | 2,29           | 2,58           | 2,23           | 2,89  |
| Cadmio                                  | Cd     | µg/m <sup>3</sup> | 0,002          | 0,004          | 0,002          | 0,002          | 0,002          | 0,007 |
| Cobalto                                 | Co     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Cromo                                   | Cr     | µg/m <sup>3</sup> | 0,029          | 0,019          | 0,024          | 0,021          | 0,018          | 0,026 |
| Cobre                                   | Cu     | µg/m <sup>3</sup> | 0,173          | 0,323          | 0,187          | 0,171          | 0,193          | 0,240 |
| Hierro                                  | Fe     | µg/m <sup>3</sup> | 1,26           | 2,05           | 1,25           | 1,40           | 1,11           | 1,69  |
| Potasio                                 | K      | µg/m <sup>3</sup> | 0,379          | 0,613          | 0,415          | 0,494          | 0,399          | 0,575 |
| Mercurio                                | Hg     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Litio                                   | Li     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Magnesio                                | Mg     | µg/m <sup>3</sup> | 0,81           | 1,24           | 0,90           | 1,04           | 0,92           | 0,99  |
| Manganeso                               | Mn     | µg/m <sup>3</sup> | 0,027          | 0,049          | 0,027          | 0,030          | 0,026          | 0,034 |
| Molibdeno                               | Mo     | µg/m <sup>3</sup> | 0,059          | 0,097          | 0,011          | 0,003          | 0,002          | 0,021 |
| Sodio                                   | Na     | µg/m <sup>3</sup> | 3,71           | 5,65           | 4,84           | 5,75           | 5,23           | 5,03  |
| Niquel                                  | Ni     | µg/m <sup>3</sup> | 0,008          | 0,012          | 0,012          | N.D.           | 0,010          | 0,007 |
| Fosforo                                 | P      | µg/m <sup>3</sup> | 0,146          | 0,253          | 0,152          | 0,166          | 0,090          | 0,194 |
| Plomo                                   | Pb     | µg/m <sup>3</sup> | 0,206          | 0,639          | 0,285          | 0,272          | 0,448          | 0,743 |
| Antimonio                               | Sb     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | 0,008 |
| Selenio                                 | Se     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Silicio                                 | Si     | µg/m <sup>3</sup> | 1,52           | 2,13           | 1,58           | 1,40           | 1,22           | 1,54  |
| Estaño                                  | Sn     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Estroncio                               | Sr     | µg/m <sup>3</sup> | 0,011          | 0,018          | 0,012          | 0,013          | 0,011          | 0,014 |
| Titanio                                 | Ti     | µg/m <sup>3</sup> | 0,032          | 0,053          | 0,030          | 0,038          | 0,026          | 0,044 |
| Talio                                   | Tl     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Vanadio                                 | V      | µg/m <sup>3</sup> | 0,047          | 0,039          | 0,052          | 0,032          | 0,042          | 0,025 |
| Zinc                                    | Zn     | µg/m <sup>3</sup> | 0,123          | 0,259          | 0,187          | 0,140          | 0,115          | 0,271 |

**Observación:** Concentración de metales calculados a T=25 °C ó 298,15 °K

N.D.: No detectable

## MONITOREO DE LA CALIDAD DEL AIRE HOJA DE CÁLCULO PARA ESTIMAR EL VOLUMEN ESTÁNDAR PARA METALES (10°C)

|                               |              |  |               |                     |              |        |                 |     |                       |     |
|-------------------------------|--------------|--|---------------|---------------------|--------------|--------|-----------------|-----|-----------------------|-----|
| <b>ESTACIÓN DE MONITOREO:</b> |              | CA-VMP-1   |               | <b>PROCEDENCIA:</b> |              | CALLAO |                 |     |                       |     |
| <b>UBICACIÓN:</b>             | <b>ESTE:</b> | 268824   | <b>NORTE:</b> | 8687841             | <b>ZONA:</b> | 18 L   | <b>ALTITUD:</b> | 106 | <b>PRECISIÓN GPS:</b> | ± 3 |
| <b>DESCRIPCIÓN:</b>           |              | Ubicado en la azotea de la vivienda del A.H. Virgen de Guadalupe-2da etapa, Mz. O Lote 11, distrito de Mi Perú |               |                     |              |        |                 |     |                       |     |
| <b>PARÁMETROS:</b>            |              | Metales en PM-10   |               |                     |              |        |                 |     |                       |     |

| N° | Parámetro        | N° Filtro | Fecha Inicio     | Fecha Final      | Periodo (minutos) | Temperatura ambiental (°C) | Presión ambiental (mm Hg) | Po/Pa | Flujo de muestreo (m <sup>3</sup> /min) | Volumen muestreado real (m <sup>3</sup> ) | Volumen muestreado estándar (m <sup>3</sup> ) |
|----|------------------|-----------|------------------|------------------|-------------------|----------------------------|---------------------------|-------|---|---|---|
| 1  | Metales PM<br>10 | 0058A.R19 | 04/03/2019 16:43 | 05/03/2019 16:18 | 1415              | 26,1                       | 752,1                     | 0,962 | 1,179                                   | 1668,57                                   | 1562,39                                       |
| 2  |                  | 0066A.R19 | 07/03/2019 12:54 | 08/03/2019 11:54 | 1380              | 26,1                       | 751,3                     | 0,961 | 1,178                                   | 1625,85                                   | 1520,76                                       |
| 3  |                  | 0069A.R19 | 13/03/2019 15:32 | 14/03/2019 14:32 | 1380              | 25,5                       | 751,5                     | 0,964 | 1,181                                   | 1629,78                                   | 1527,91                                       |
| 4  |                  | 0073A.R19 | 16/03/2019 11:40 | 17/03/2019 11:15 | 1415              | 24,9                       | 751,7                     | 0,960 | 1,175                                   | 1662,34                                   | 1561,99                                       |
| 5  |                  | 0077A.R19 | 19/03/2019 11:31 | 20/03/2019 11:31 | 1440              | 24,2                       | 752,8                     | 0,962 | 1,176                                   | 1693,87                                   | 1597,70                                       |
| 6  |                  | 0081A.R19 | 29/03/2019 12:57 | 30/03/2019 12:27 | 1410              | 24,5                       | 752,7                     | 0,963 | 1,178                                   | 1660,98                                   | 1564,89                                       |

### OBSERVACIONES:

(1) El cálculo de volumen estándar para metales en PM<sub>10</sub>, se realizó en base a las condiciones de temperatura estándar (T= 10°C ó 283.15 °K) y presión estándar (760 mmHg ó 1013,25 mBar).  
 "-" : No aplica.

**NOMBRE DEL PROYECTO:**

VIGILANCIA AMBIENTAL DE LA CALIDAD DEL AIRE EN EL ÁMBITO DE INFLUENCIA DE LA ZONA INDUSTRIAL DE VENTANILLA-MI PERÚ, UBICADO EN LOS DISTRITOS DE VENTANILLA Y MI PERÚ, PROVINCIA CONSTITUCIONAL DEL CALLAO, DURANTE EL MES DE MARZO 2019

| RESULTADOS DE LABORATORIO        |        |            |            |            |            |            |            |      |
|----------------------------------|--------|------------|------------|------------|------------|------------|------------|------|
| Metal medido en PM <sub>10</sub> | Unidad | CA-VMP-1   |            |            |            |            |            |      |
|                                  |        | 04/03/2019 | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |      |
| Plata                            | Ag     | µg/mtra    | <1         | 1          | <1         | <1         | <1         | <1   |
| Aluminio                         | Al     | µg/mtra    | 1156       | 1869       | 1104       | 1388       | 1044       | 1608 |
| Arsenico                         | As     | µg/mtra    | <9         | <9         | 17         | 12         | <9         | <9   |
| Bario                            | Ba     | µg/mtra    | 23         | 43         | 23         | 27         | 22         | 35   |
| Berilio                          | Be     | µg/mtra    | <1         | <1         | <1         | <1         | <1         | <1   |
| Bismuto                          | Bi     | µg/mtra    | <350       | <350       | <350       | <350       | <350       | <350 |
| Boro                             | B      | µg/mtra    | 35         | 30         | 55         | 47         | 12         | 96   |
| Calcio                           | Ca     | µg/mtra    | 3759       | 6245       | 3687       | 4245       | 3752       | 4760 |
| Cadmio                           | Cd     | µg/mtra    | 3          | 6          | 3          | 3          | 3          | 12   |
| Cobalto                          | Co     | µg/mtra    | <6         | <6         | <6         | <6         | <6         | <6   |
| Cromo                            | Cr     | µg/mtra    | 47         | 30         | 39         | 35         | 31         | 43   |
| Cobre                            | Cu     | µg/mtra    | 285        | 517        | 301        | 281        | 324        | 396  |
| Hierro                           | Fe     | µg/mtra    | 2071       | 3284       | 2009       | 2300       | 1872       | 2784 |
| Potasio                          | K      | µg/mtra    | 624        | 982        | 668        | 813        | 671        | 947  |
| Mercurio                         | Hg     | µg/mtra    | <20        | <20        | <20        | <20        | <20        | <20  |
| Litio                            | Li     | µg/mtra    | <2         | <2         | <2         | <2         | <2         | <2   |
| Magnesio                         | Mg     | µg/mtra    | 1326       | 1991       | 1447       | 1717       | 1554       | 1635 |
| Manganeso                        | Mn     | µg/mtra    | 44         | 79         | 43         | 49         | 44         | 56   |
| Molibdeno                        | Mo     | µg/mtra    | 97         | 156        | 17         | 5          | 4          | 34   |
| Sodio                            | Na     | µg/mtra    | 6110       | 9050       | 7780       | 9462       | 8806       | 8283 |
| Niquel                           | Ni     | µg/mtra    | 13         | 20         | 19         | <5         | 17         | 11   |
| Fosforo                          | P      | µg/mtra    | 240        | 405        | 244        | 273        | 152        | 320  |
| Plomo                            | Pb     | µg/mtra    | 339        | 1024       | 459        | 447        | 753        | 1224 |
| Antimonio                        | Sb     | µg/mtra    | <9         | 25         | <9         | <9         | <9         | 14   |
| Selenio                          | Se     | µg/mtra    | <55        | <55        | <55        | <55        | <55        | <55  |
| Silicio                          | Si     | µg/mtra    | 2507       | 3412       | 2546       | 2302       | 2053       | 2541 |
| Estaño                           | Sn     | µg/mtra    | <15        | <15        | <15        | <15        | <15        | <15  |
| Estroncio                        | Sr     | µg/mtra    | 17,6       | 28,7       | 18,6       | 21         | 18,9       | 22,5 |
| Titanio                          | Ti     | µg/mtra    | 52         | 85         | 48         | 62         | 43         | 73   |
| Talio                            | Tl     | µg/mtra    | <60        | <60        | <60        | <60        | <60        | <60  |
| Vanadio                          | V      | µg/mtra    | 78,1       | 62,2       | 84,1       | 52,1       | 70,2       | 40,7 |
| Zinc                             | Zn     | µg/mtra    | 202        | 415        | 301        | 230        | 193        | 446  |

<: Debajo del límite de detección

Fuente: Informe de Ensayo N° ABR1065.R19 del laboratorio Certimin S.A.

| CONCENTRACIÓN DE METALES                |        |                   |                |                |                |                |                |       |
|---|--------|-------------------|----------------|----------------|----------------|----------------|----------------|-------|
| Metal medido en PM <sub>10</sub>        | Unidad | CA-VMP-1          |                |                |                |                |                |       |
|   |        | 04/03/2019        | 07/03/2019     | 13/03/2019     | 16/03/2019     | 19/03/2019     | 29/03/2019     |       |
| <b>Volumen estándar (m<sup>3</sup>)</b> |        | <b>1562,39</b>    | <b>1520,76</b> | <b>1527,91</b> | <b>1561,99</b> | <b>1597,70</b> | <b>1564,89</b> |       |
| Plata                                   | Ag     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |       |
| Aluminio                                | Al     | µg/m <sup>3</sup> | 0,74           | 1,23           | 0,72           | 0,89           | 0,65           | 1,03  |
| Arsenico                                | As     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Bario                                   | Ba     | µg/m <sup>3</sup> | 0,015          | 0,028          | 0,015          | 0,017          | 0,014          | 0,022 |
| Berilio                                 | Be     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Bismuto                                 | Bi     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Boro                                    | B      | µg/m <sup>3</sup> | 0,022          | 0,020          | 0,036          | 0,030          | 0,008          | 0,061 |
| Calcio                                  | Ca     | µg/m <sup>3</sup> | 2,41           | 4,11           | 2,41           | 2,72           | 2,35           | 3,04  |
| Cadmio                                  | Cd     | µg/m <sup>3</sup> | 0,002          | 0,004          | 0,002          | 0,002          | 0,002          | 0,008 |
| Cobalto                                 | Co     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Cromo                                   | Cr     | µg/m <sup>3</sup> | 0,030          | 0,020          | 0,026          | 0,022          | 0,019          | 0,027 |
| Cobre                                   | Cu     | µg/m <sup>3</sup> | 0,182          | 0,340          | 0,197          | 0,180          | 0,203          | 0,253 |
| Hierro                                  | Fe     | µg/m <sup>3</sup> | 1,33           | 2,16           | 1,31           | 1,47           | 1,17           | 1,78  |
| Potasio                                 | K      | µg/m <sup>3</sup> | 0,399          | 0,646          | 0,437          | 0,520          | 0,420          | 0,605 |
| Mercurio                                | Hg     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Litio                                   | Li     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Magnesio                                | Mg     | µg/m <sup>3</sup> | 0,85           | 1,31           | 0,95           | 1,10           | 0,97           | 1,04  |
| Manganeso                               | Mn     | µg/m <sup>3</sup> | 0,028          | 0,052          | 0,028          | 0,031          | 0,028          | 0,036 |
| Molibdeno                               | Mo     | µg/m <sup>3</sup> | 0,062          | 0,103          | 0,011          | 0,003          | 0,003          | 0,022 |
| Sodio                                   | Na     | µg/m <sup>3</sup> | 3,91           | 5,95           | 5,09           | 6,06           | 5,51           | 5,29  |
| Niquel                                  | Ni     | µg/m <sup>3</sup> | 0,008          | 0,013          | 0,012          | N.D.           | 0,011          | 0,007 |
| Fosforo                                 | P      | µg/m <sup>3</sup> | 0,154          | 0,266          | 0,160          | 0,175          | 0,095          | 0,204 |
| Plomo                                   | Pb     | µg/m <sup>3</sup> | 0,217          | 0,673          | 0,300          | 0,286          | 0,471          | 0,782 |
| Antimonio                               | Sb     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | 0,009 |
| Selenio                                 | Se     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Silicio                                 | Si     | µg/m <sup>3</sup> | 1,60           | 2,24           | 1,67           | 1,47           | 1,28           | 1,62  |
| Estaño                                  | Sn     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Estroncio                               | Sr     | µg/m <sup>3</sup> | 0,011          | 0,019          | 0,012          | 0,013          | 0,012          | 0,014 |
| Titanio                                 | Ti     | µg/m <sup>3</sup> | 0,033          | 0,056          | 0,031          | 0,040          | 0,027          | 0,047 |
| Talio                                   | Tl     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.  |
| Vanadio                                 | V      | µg/m <sup>3</sup> | 0,050          | 0,041          | 0,055          | 0,033          | 0,044          | 0,026 |
| Zinc                                    | Zn     | µg/m <sup>3</sup> | 0,129          | 0,273          | 0,197          | 0,147          | 0,121          | 0,285 |

**Observación:** Concentración de metales calculados a T=10 °C ó 283,15 °K

**N.D.:** No detectable



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## MONITOREO DE LA CALIDAD DEL AIRE RESUMEN DE LOS DATOS DE METEOROLOGÍA

### DATOS GENERALES

|         |                        |                        |               |                 |             |
|---------|------------------------|------------------------|---------------|-----------------|-------------|
| CUC N°: | 0001-3-2019-401        | ESTACIÓN DE MONITOREO: | CA-VMP-2      | DÍAS EVALUADOS: | 6           |
| EQUIPO: | ESTACIÓN METEOROLÓGICA |                        |               |                 |             |
| MARCA:  | Davis                  | MODELO:                | Vantage Pro 2 | SERIE:          | BB180411015 |

### MEDICIONES PROMEDIO (DATOS DIÁRIOS)

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 1 | INICIO: | 04/03/2019 15:28 | FINAL: | 05/03/2019 14:58 | PERIODO : | 23:30 horas | 1410 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 25,7 | Presión (mm Hg):          | 753,1 | Humedad (%):                | 72  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 1,0 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 2 | INICIO: | 07/03/2019 11:48 | FINAL: | 08/03/2019 11:18 | PERIODO : | 23:30 horas | 1410 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 26,3 | Presión (mm Hg):          | 751,3 | Humedad (%):                | 70  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 1,0 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 3 | INICIO: | 13/03/2019 15:47 | FINAL: | 14/03/2019 14:47 | PERIODO : | 23:00 horas | 1380 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 24,5 | Presión (mm Hg):          | 755,0 | Humedad (%):                | 74  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 1,0 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 4 | INICIO: | 16/03/2019 11:53 | FINAL: | 17/03/2019 11:25 | PERIODO : | 23:32 horas | 1412 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 23,7 | Presión (mm Hg):          | 755,2 | Humedad (%):                | 77  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 1,1 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 5 | INICIO: | 19/03/2019 11:44 | FINAL: | 20/03/2019 11:44 | PERIODO : | 24:00 horas | 1440 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 23,2 | Presión (mm Hg):          | 756,4 | Humedad (%):                | 71  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 1,1 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 6 | INICIO: | 29/03/2019 13:36 | FINAL: | 30/03/2019 13:06 | PERIODO : | 23:30 horas | 1410 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 24,0 | Presión (mm Hg):          | 756,3 | Humedad (%):                | 70  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 1,0 |



## MONITOREO DE LA CALIDAD DEL AIRE

### HOJA DE CÁLCULO PARA ESTIMAR LAS CONCENTRACIONES DE MATERIAL PARTICULADO ALTO VOLUMEN

**ESTACIÓN DE MONITOREO:** CA-VMP-2      **PROCEDENCIA:** CALLAO

**UBICACIÓN:**      **ESTE:** 268576      **NORTE:** 8688063      **ZONA:** 18 L      **ALTITUD:** 80      **PRECISIÓN GPS:** ± 3

**DESCRIPCIÓN:** Ubicado en la I.E.P. Arturo Padilla Espinoza, Av. Revolución N° 2494, distrito de Ventanilla

**PARÁMETROS:** PM-10 y Metales en PM-10

| N° | Parámetro        | N° Filtro | Fecha Inicio     | Fecha Final      | Periodo (minutos) | Temperatura ambiental (°C) | Presión ambiental (mm Hg) | Po/Pa | Flujo de muestreo (m <sup>3</sup> /min) | Volumen muestreado real (m <sup>3</sup> ) | Volumen muestreado estándar (m <sup>3</sup> ) | ΔPeso (μg) * | Concentración de partículas (μg/m <sup>3</sup> ) |
|----|------------------|-----------|------------------|------------------|-------------------|----------------------------|---------------------------|-------|---|---|---|--------------|--|
| 1  | PM-10            | 0031A.R19 | 04/03/2019 15:28 | 05/03/2019 14:58 | 1410              | 25,7                       | 753,1                     | 0,964 | 1,181                                   | 1665,77                                   | 1646,78                                       | 129600       | <b>78,70</b>                                     |
| 2  |                  | 0064A.R19 | 07/03/2019 11:48 | 08/03/2019 11:18 | 1410              | 26,3                       | 751,3                     | 0,964 | 1,183                                   | 1667,47                                   | 1641,22                                       | 181600       | <b>110,65</b>                                    |
| 3  |                  | 0070A.R19 | 13/03/2019 15:47 | 14/03/2019 14:47 | 1380              | 24,5                       | 755,0                     | 0,964 | 1,179                                   | 1627,02                                   | 1619,03                                       | 166100       | <b>102,59</b>                                    |
| 4  |                  | 0074A.R19 | 16/03/2019 11:53 | 17/03/2019 11:25 | 1412              | 23,7                       | 755,2                     | 0,965 | 1,179                                   | 1665,31                                   | 1662,04                                       | 173500       | <b>104,39</b>                                    |
| 5  |                  | 0078A.R19 | 19/03/2019 11:44 | 20/03/2019 11:44 | 1440              | 23,2                       | 756,4                     | 0,969 | 1,183                                   | 1704,10                                   | 1706,33                                       | 192800       | <b>112,99</b>                                    |
| 6  |                  | 0082A.R19 | 29/03/2019 13:36 | 30/03/2019 13:06 | 1410              | 24,0                       | 756,3                     | 0,966 | 1,181                                   | 1665,21                                   | 1662,68                                       | 199400       | <b>119,93</b>                                    |
| 1  | Metales en PM 10 | 0031A.R19 | 04/03/2019 15:28 | 05/03/2019 14:58 | 1410              | 25,7                       | 753,1                     | 0,964 | 1,181                                   | 1665,77                                   | 1646,78                                       | -            | -  |
| 2  |                  | 0064A.R19 | 07/03/2019 11:48 | 08/03/2019 11:18 | 1410              | 26,3                       | 751,3                     | 0,964 | 1,183                                   | 1667,47                                   | 1641,22                                       | -            | -  |
| 3  |                  | 0070A.R19 | 13/03/2019 15:47 | 14/03/2019 14:47 | 1380              | 24,5                       | 755,0                     | 0,964 | 1,179                                   | 1627,02                                   | 1619,03                                       | -            | -  |
| 4  |                  | 0074A.R19 | 16/03/2019 11:53 | 17/03/2019 11:25 | 1412              | 23,7                       | 755,2                     | 0,965 | 1,179                                   | 1665,31                                   | 1662,04                                       | -            | -  |
| 5  |                  | 0078A.R19 | 19/03/2019 11:44 | 20/03/2019 11:44 | 1440              | 23,2                       | 756,4                     | 0,969 | 1,183                                   | 1704,10                                   | 1706,33                                       | -            | -  |
| 6  |                  | 0082A.R19 | 29/03/2019 13:36 | 30/03/2019 13:06 | 1410              | 24,0                       | 756,3                     | 0,966 | 1,181                                   | 1665,21                                   | 1662,68                                       | -            | -  |

#### OBSERVACIONES:

(1) El cálculo de volumen estándar para material particulado, se realizó en base a las condiciones de temperatura estándar (T= 25°C ó 298,15 °K) y presión estándar (760 mmHg ó 1013,25 mBar), establecidas en el Protocolo de Monitoreo de la Calidad del aire y Gestión de los datos de la DIGESA (2005).

(2) El cálculo de volumen estándar para metales en PM<sub>10</sub> se realizó en base a las condiciones de temperatura estándar (T= 25°C ó 298,15 °K) y presión estándar (760 mmHg ó 1013,25 mBar).

(\*) Fuente: Informe de Ensayo N° ABR1065.R19 del laboratorio Certimin S.A.

"-" : No aplica.

## MONITOREO DE LA CALIDAD DEL AIRE

### HOJA DE CÁLCULO PARA ESTIMAR LAS CONCENTRACIONES DE MATERIAL PARTICULADO BAJO VOLUMEN

**ESTACIÓN DE MONITOREO:** CA-VMP-2      **PROCEDENCIA:** CALLAO

**UBICACIÓN:**      **ESTE:** 268576      **NORTE:** 8688063      **ZONA:** 18 L      **ALTITUD:** 80      **PRECISIÓN GPS:** ± 3

**DESCRIPCIÓN:** Ubicado en la I.E.P. Arturo Padilla Espinoza, Av. Revolución N° 2494, distrito de Ventanilla

**PARÁMETROS:** PM-2,5

| N° | Parámetro | N° Filtro | Fecha Inicio     | Fecha Final      | Periodo (minutos) | Temperatura ambiental (°C) | Presión ambiental (mm Hg) | Po/Pa | Flujo de muestreo (m <sup>3</sup> /min) | Volumen muestreado real (m <sup>3</sup> ) | Volumen muestreado estándar (m <sup>3</sup> ) | ΔPeso (μg) * | Concentración de partículas (μg/m <sup>3</sup> ) |
|----|-----------|-----------|------------------|------------------|-------------------|----------------------------|---------------------------|-------|---|---|---|--------------|--|
| 1  | PM-2,5    | 0039T.R19 | 04/03/2019 15:28 | 05/03/2019 14:58 | 1410              | 24,3                       | 754                       | -     | -                                       | 23,52                                     | -   | 588          | 25,00  |
| 2  |           | 0040T.R19 | 07/03/2019 11:48 | 08/03/2019 11:18 | 1410              | 24,8                       | 753                       | -     | -                                       | 23,52                                     | -   | 773          | 32,87  |
| 3  |           | 0041T.R19 | 13/03/2019 15:47 | 14/03/2019 14:47 | 1380              | 24,0                       | 754                       | -     | -                                       | 23,02                                     | -   | 642          | 27,89  |
| 4  |           | 0042T.R19 | 16/03/2019 11:53 | 17/03/2019 11:23 | 1410              | 23,4                       | 754                       | -     | -                                       | 23,40                                     | -   | 583          | 24,91  |
| 5  |           | 0043T.R19 | 19/03/2019 11:44 | 20/03/2019 11:44 | 1440              | 23,7                       | 755                       | -     | -                                       | 24,03                                     | -   | 634          | 26,38  |
| 6  |           | 0044T.R19 | 29/03/2019 13:36 | 30/03/2019 13:06 | 1410              | 23,5                       | 755                       | -     | -                                       | 23,51                                     | -   | 814          | 34,62  |

#### OBSERVACIONES:

(1) El volumen muestreado real para material particulado PM<sub>2,5</sub> es arrojado por el equipo muestreador de bajo volumen.

(\*) Fuente: Informe de Ensayo N° ABR1067.R19 del laboratorio Certimin S.A.

"-" : No aplica.

**NOMBRE DEL PROYECTO:**

VIGILANCIA AMBIENTAL DE LA CALIDAD DEL AIRE EN EL ÁMBITO DE INFLUENCIA DE LA ZONA INDUSTRIAL DE VENTANILLA-MI PERÚ, UBICADO EN LOS DISTRITOS DE VENTANILLA Y MI PERÚ, PROVINCIA CONSTITUCIONAL DEL CALLAO, DURANTE EL MES DE MARZO 2019

| RESULTADOS DE LABORATORIO        |        |            |            |            |            |            |            |      |
|----------------------------------|--------|------------|------------|------------|------------|------------|------------|------|
| Metal medido en PM <sub>10</sub> | Unidad | CA-VMP-2   |            |            |            |            |            |      |
|                                  |        | 04/03/2019 | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |      |
| Plata                            | Ag     | µg/mtra    | <1         | 1          | <1         | <1         | <1         | 2    |
| Aluminio                         | Al     | µg/mtra    | 720        | 1626       | 1967       | 1635       | 2274       | 1601 |
| Arsenico                         | As     | µg/mtra    | <9         | <9         | <9         | <9         | <9         | 20   |
| Bario                            | Ba     | µg/mtra    | 20         | 44         | 36         | 31         | 36         | 46   |
| Berilio                          | Be     | µg/mtra    | <1         | <1         | <1         | <1         | <1         | <1   |
| Bismuto                          | Bi     | µg/mtra    | <350       | <350       | <350       | <350       | <350       | <350 |
| Boro                             | B      | µg/mtra    | <10        | 18         | 39         | 25         | 13         | 36   |
| Calcio                           | Ca     | µg/mtra    | 2493       | 5873       | 5358       | 4524       | 5207       | 5898 |
| Cadmio                           | Cd     | µg/mtra    | 13         | 13         | 18         | 10         | 19         | 12   |
| Cobalto                          | Co     | µg/mtra    | <6         | <6         | <6         | <6         | <6         | <6   |
| Cromo                            | Cr     | µg/mtra    | 29         | 28         | 34         | 68         | 37         | 68   |
| Cobre                            | Cu     | µg/mtra    | 172        | 1183       | 341        | 226        | 234        | 410  |
| Hierro                           | Fe     | µg/mtra    | 1329       | 2897       | 3237       | 2901       | 3598       | 3110 |
| Potasio                          | K      | µg/mtra    | 405        | 870        | 864        | 829        | 887        | 926  |
| Mercurio                         | Hg     | µg/mtra    | <20        | <20        | <20        | <20        | <20        | <20  |
| Litio                            | Li     | µg/mtra    | <2         | <2         | <2         | <2         | <2         | <2   |
| Magnesio                         | Mg     | µg/mtra    | 857        | 1833       | 1918       | 1835       | 2110       | 1828 |
| Manganeso                        | Mn     | µg/mtra    | 29         | 71         | 64         | 59         | 72         | 65   |
| Molibdeno                        | Mo     | µg/mtra    | 99         | 30         | 7          | <3         | <3         | 23   |
| Sodio                            | Na     | µg/mtra    | 3627       | 7994       | 7920       | 8385       | 7624       | 8327 |
| Niquel                           | Ni     | µg/mtra    | <5         | 8          | 18         | <5         | 19         | 14   |
| Fosforo                          | P      | µg/mtra    | 115        | 380        | 245        | 221        | 189        | 363  |
| Plomo                            | Pb     | µg/mtra    | 148        | 654        | 309        | 319        | 205        | 723  |
| Antimonio                        | Sb     | µg/mtra    | <9         | 14         | <9         | <9         | <9         | 17   |
| Selenio                          | Se     | µg/mtra    | <55        | <55        | <55        | <55        | <55        | <55  |
| Silicio                          | Si     | µg/mtra    | 1450       | 2831       | 3871       | 2939       | 3619       | 2239 |
| Estaño                           | Sn     | µg/mtra    | <15        | <15        | <15        | <15        | <15        | <15  |
| Estroncio                        | Sr     | µg/mtra    | 11,7       | 26,4       | 25,6       | 22,2       | 24,6       | 26,1 |
| Titanio                          | Ti     | µg/mtra    | 31         | 68         | 95         | 69         | 99         | 64   |
| Talio                            | Tl     | µg/mtra    | <60        | <60        | <60        | <60        | <60        | <60  |
| Vanadio                          | V      | µg/mtra    | 41,9       | 59,6       | 85         | 42,8       | 61,6       | 38,8 |
| Zinc                             | Zn     | µg/mtra    | 136        | 437        | 335        | 198        | 186        | 481  |

<: Debajo del límite de detección

Fuente: Informe de Ensayo N° ABR1065.R19 del laboratorio Certimin S.A.

| CONCENTRACIÓN DE METALES           |        |                   |            |            |            |            |            |       |
|------------------------------------|--------|-------------------|------------|------------|------------|------------|------------|-------|
| Metal medido en PM <sub>10</sub>   | Unidad | CA-VMP-2          |            |            |            |            |            |       |
|                                    |        | 04/03/2019        | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |       |
| Volumen estándar (m <sup>3</sup> ) |        | 1646,78           | 1641,22    | 1619,03    | 1662,04    | 1706,33    | 1662,68    |       |
| Plata                              | Ag     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | 0,001 |
| Aluminio                           | Al     | µg/m <sup>3</sup> | 0,44       | 0,99       | 1,21       | 0,98       | 1,33       | 0,96  |
| Arsenico                           | As     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Bario                              | Ba     | µg/m <sup>3</sup> | 0,012      | 0,027      | 0,022      | 0,019      | 0,021      | 0,028 |
| Berilio                            | Be     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Bismuto                            | Bi     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Boro                               | B      | µg/m <sup>3</sup> | N.D.       | 0,011      | 0,024      | N.D.       | 0,008      | 0,022 |
| Calcio                             | Ca     | µg/m <sup>3</sup> | 1,51       | 3,58       | 3,31       | 2,72       | 3,05       | 3,55  |
| Cadmio                             | Cd     | µg/m <sup>3</sup> | 0,008      | 0,008      | 0,011      | 0,006      | 0,011      | 0,007 |
| Cobalto                            | Co     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Cromo                              | Cr     | µg/m <sup>3</sup> | 0,018      | 0,017      | 0,021      | 0,041      | 0,022      | 0,041 |
| Cobre                              | Cu     | µg/m <sup>3</sup> | 0,104      | 0,721      | 0,211      | 0,136      | 0,137      | 0,247 |
| Hierro                             | Fe     | µg/m <sup>3</sup> | 0,81       | 1,77       | 2,00       | 1,75       | 2,11       | 1,87  |
| Potasio                            | K      | µg/m <sup>3</sup> | 0,246      | 0,530      | 0,534      | 0,499      | 0,520      | 0,557 |
| Mercurio                           | Hg     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Litio                              | Li     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Magnesio                           | Mg     | µg/m <sup>3</sup> | 0,52       | 1,12       | 1,18       | 1,10       | 1,24       | 1,10  |
| Manganeso                          | Mn     | µg/m <sup>3</sup> | 0,018      | 0,043      | 0,040      | 0,035      | 0,042      | 0,039 |
| Molibdeno                          | Mo     | µg/m <sup>3</sup> | 0,060      | N.D.       | N.D.       | N.D.       | N.D.       | 0,014 |
| Sodio                              | Na     | µg/m <sup>3</sup> | 2,20       | 4,87       | 4,89       | 5,04       | 4,47       | 5,01  |
| Niquel                             | Ni     | µg/m <sup>3</sup> | N.D.       | 0,005      | 0,011      | N.D.       | 0,011      | 0,008 |
| Fosforo                            | P      | µg/m <sup>3</sup> | 0,070      | 0,232      | 0,151      | 0,133      | 0,111      | 0,218 |
| Plomo                              | Pb     | µg/m <sup>3</sup> | 0,090      | 0,398      | 0,191      | 0,192      | 0,120      | 0,435 |
| Antimonio                          | Sb     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Selenio                            | Se     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Silicio                            | Si     | µg/m <sup>3</sup> | 0,88       | 1,72       | 2,39       | 1,77       | 2,12       | 1,35  |
| Estaño                             | Sn     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Estroncio                          | Sr     | µg/m <sup>3</sup> | 0,007      | 0,016      | 0,016      | 0,013      | 0,014      | 0,016 |
| Titanio                            | Ti     | µg/m <sup>3</sup> | 0,019      | 0,041      | 0,059      | 0,042      | 0,058      | 0,038 |
| Talio                              | Tl     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Vanadio                            | V      | µg/m <sup>3</sup> | 0,025      | 0,036      | 0,053      | 0,026      | 0,036      | 0,023 |
| Zinc                               | Zn     | µg/m <sup>3</sup> | 0,083      | 0,266      | 0,207      | 0,119      | 0,109      | 0,289 |

**Observación:** Concentración de metales calculados a T=25 °C ó 298,15 °K

N.D.: No detectable

## MONITOREO DE LA CALIDAD DEL AIRE HOJA DE CÁLCULO PARA ESTIMAR EL VOLUMEN ESTÁNDAR PARA METALES (10°C)

|                               |              |  |               |                     |              |        |                 |    |                       |     |
|-------------------------------|--------------|--|---------------|---------------------|--------------|--------|-----------------|----|-----------------------|-----|
| <b>ESTACIÓN DE MONITOREO:</b> |              | CA-VMP-2   |               | <b>PROCEDENCIA:</b> |              | CALLAO |                 |    |                       |     |
| <b>UBICACIÓN:</b>             | <b>ESTE:</b> | 268576   | <b>NORTE:</b> | 8688063             | <b>ZONA:</b> | 18 L   | <b>ALTITUD:</b> | 80 | <b>PRECISIÓN GPS:</b> | ± 3 |
| <b>DESCRIPCIÓN:</b>           |              | Ubicado en la I.E.P. Arturo Padilla Espinoza, Av. Revolución N° 2494, distrito de Ventanilla |               |                     |              |        |                 |    |                       |     |
| <b>PARÁMETROS:</b>            |              | Metales en PM-10   |               |                     |              |        |                 |    |                       |     |

| N° | Parámetro     | N° Filtro | Fecha Inicio     | Fecha Final      | Periodo (minutos) | Temperatura ambiental (°C) | Presión ambiental (mm Hg) | Po/Pa | Flujo de muestreo (m <sup>3</sup> /min) | Volumen muestreado real (m <sup>3</sup> ) | Volumen muestreado estándar (m <sup>3</sup> ) |
|----|---------------|-----------|------------------|------------------|-------------------|----------------------------|---------------------------|-------|---|---|---|
| 1  | Metales PM 10 | 0031A.R19 | 04/03/2019 15:28 | 05/03/2019 14:58 | 1410              | 25,7                       | 753,1                     | 0,964 | 1,181                                   | 1665,77                                   | 1563,93                                       |
| 2  |               | 0064A.R19 | 07/03/2019 11:48 | 08/03/2019 11:18 | 1410              | 26,3                       | 751,3                     | 0,964 | 1,183                                   | 1667,47                                   | 1558,65                                       |
| 3  |               | 0070A.R19 | 13/03/2019 15:47 | 14/03/2019 14:47 | 1380              | 24,5                       | 755,0                     | 0,964 | 1,179                                   | 1627,02                                   | 1537,58                                       |
| 4  |               | 0074A.R19 | 16/03/2019 11:53 | 17/03/2019 11:25 | 1412              | 23,7                       | 755,2                     | 0,965 | 1,179                                   | 1665,31                                   | 1578,42                                       |
| 5  |               | 0078A.R19 | 19/03/2019 11:44 | 20/03/2019 11:44 | 1440              | 23,2                       | 756,4                     | 0,969 | 1,183                                   | 1704,10                                   | 1620,48                                       |
| 6  |               | 0082A.R19 | 29/03/2019 13:36 | 30/03/2019 13:06 | 1410              | 24,0                       | 756,3                     | 0,966 | 1,181                                   | 1665,21                                   | 1579,03                                       |

### OBSERVACIONES:

(1) El cálculo de volumen estándar para metales en PM<sub>10</sub>, se realizó en base a las condiciones de temperatura estándar (T= 10°C ó 283.15 °K) y presión estándar (760 mmHg ó 1013,25 mBar).  
 "-" : No aplica.

**NOMBRE DEL PROYECTO:**

VIGILANCIA AMBIENTAL DE LA CALIDAD DEL AIRE EN EL ÁMBITO DE INFLUENCIA DE LA ZONA INDUSTRIAL DE VENTANILLA-MI PERÚ, UBICADO EN LOS DISTRITOS DE VENTANILLA Y MI PERÚ, PROVINCIA CONSTITUCIONAL DEL CALLAO, DURANTE EL MES DE MARZO 2019

| Metal medido en PM <sub>10</sub> |    | Unidad  | RESULTADOS DE LABORATORIO |            |            |            |            |            |
|----------------------------------|----|---------|---------------------------|------------|------------|------------|------------|------------|
|                                  |    |         | CA-VMP-2                  |            |            |            |            |            |
|                                  |    |         | 04/03/2019                | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| Plata                            | Ag | µg/mtra | <1                        | 1          | <1         | <1         | <1         | 2          |
| Aluminio                         | Al | µg/mtra | 720                       | 1626       | 1967       | 1635       | 2274       | 1601       |
| Arsenico                         | As | µg/mtra | <9                        | <9         | <9         | <9         | <9         | 20         |
| Bario                            | Ba | µg/mtra | 20                        | 44         | 36         | 31         | 36         | 46         |
| Berilio                          | Be | µg/mtra | <1                        | <1         | <1         | <1         | <1         | <1         |
| Bismuto                          | Bi | µg/mtra | <350                      | <350       | <350       | <350       | <350       | <350       |
| Boro                             | B  | µg/mtra | <10                       | 18         | 39         | 25         | 13         | 36         |
| Calcio                           | Ca | µg/mtra | 2493                      | 5873       | 5358       | 4524       | 5207       | 5898       |
| Cadmio                           | Cd | µg/mtra | 13                        | 13         | 18         | 10         | 19         | 12         |
| Cobalto                          | Co | µg/mtra | <6                        | <6         | <6         | <6         | <6         | <6         |
| Cromo                            | Cr | µg/mtra | 29                        | 28         | 34         | 68         | 37         | 68         |
| Cobre                            | Cu | µg/mtra | 172                       | 1183       | 341        | 226        | 234        | 410        |
| Hierro                           | Fe | µg/mtra | 1329                      | 2897       | 3237       | 2901       | 3598       | 3110       |
| Potasio                          | K  | µg/mtra | 405                       | 870        | 864        | 829        | 887        | 926        |
| Mercurio                         | Hg | µg/mtra | <20                       | <20        | <20        | <20        | <20        | <20        |
| Litio                            | Li | µg/mtra | <2                        | <2         | <2         | <2         | <2         | <2         |
| Magnesio                         | Mg | µg/mtra | 857                       | 1833       | 1918       | 1835       | 2110       | 1828       |
| Manganeso                        | Mn | µg/mtra | 29                        | 71         | 64         | 59         | 72         | 65         |
| Molibdeno                        | Mo | µg/mtra | 99                        | 30         | 7          | <3         | <3         | 23         |
| Sodio                            | Na | µg/mtra | 3627                      | 7994       | 7920       | 8385       | 7624       | 8327       |
| Niquel                           | Ni | µg/mtra | <5                        | 8          | 18         | <5         | 19         | 14         |
| Fosforo                          | P  | µg/mtra | 115                       | 380        | 245        | 221        | 189        | 363        |
| Plomo                            | Pb | µg/mtra | 148                       | 654        | 309        | 319        | 205        | 723        |
| Antimonio                        | Sb | µg/mtra | <9                        | 14         | <9         | <9         | <9         | 17         |
| Selenio                          | Se | µg/mtra | <55                       | <55        | <55        | <55        | <55        | <55        |
| Silicio                          | Si | µg/mtra | 1450                      | 2831       | 3871       | 2939       | 3619       | 2239       |
| Estaño                           | Sn | µg/mtra | <15                       | <15        | <15        | <15        | <15        | <15        |
| Estroncio                        | Sr | µg/mtra | 11,7                      | 26,4       | 25,6       | 22,2       | 24,6       | 26,1       |
| Titanio                          | Ti | µg/mtra | 31                        | 68         | 95         | 69         | 99         | 64         |
| Talio                            | Tl | µg/mtra | <60                       | <60        | <60        | <60        | <60        | <60        |
| Vanadio                          | V  | µg/mtra | 41,9                      | 59,6       | 85         | 42,8       | 61,6       | 38,8       |
| Zinc                             | Zn | µg/mtra | 136                       | 437        | 335        | 198        | 186        | 481        |

<: Debajo del límite de detección

Fuente: Informe de Ensayo N° ABR1065.R19 del laboratorio Certimin S.A.

| Metal medido en PM <sub>10</sub>   |    | Unidad            | CONCENTRACIÓN DE METALES |            |            |            |            |            |
|------------------------------------|----|-------------------|--------------------------|------------|------------|------------|------------|------------|
|                                    |    |                   | CA-VMP-2                 |            |            |            |            |            |
|                                    |    |                   | 04/03/2019               | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| Volumen estándar (m <sup>3</sup> ) |    |                   | 1563,93                  | 1558,65    | 1537,58    | 1578,42    | 1620,48    | 1579,03    |
| Plata                              | Ag | µg/m <sup>3</sup> | N.D.                     | N.D.       | N.D.       | N.D.       | N.D.       | 0,001      |
| Aluminio                           | Al | µg/m <sup>3</sup> | 0,46                     | 1,04       | 1,28       | 1,04       | 1,40       | 1,01       |
| Arsenico                           | As | µg/m <sup>3</sup> | N.D.                     | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Bario                              | Ba | µg/m <sup>3</sup> | 0,013                    | 0,028      | 0,023      | 0,020      | 0,022      | 0,029      |
| Berilio                            | Be | µg/m <sup>3</sup> | N.D.                     | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Bismuto                            | Bi | µg/m <sup>3</sup> | N.D.                     | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Boro                               | B  | µg/m <sup>3</sup> | N.D.                     | 0,012      | 0,025      | N.D.       | 0,008      | 0,023      |
| Calcio                             | Ca | µg/m <sup>3</sup> | 1,59                     | 3,77       | 3,48       | 2,87       | 3,21       | 3,74       |
| Cadmio                             | Cd | µg/m <sup>3</sup> | 0,008                    | 0,008      | 0,012      | 0,006      | 0,012      | 0,008      |
| Cobalto                            | Co | µg/m <sup>3</sup> | N.D.                     | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Cromo                              | Cr | µg/m <sup>3</sup> | 0,019                    | 0,018      | 0,022      | 0,043      | 0,023      | 0,043      |
| Cobre                              | Cu | µg/m <sup>3</sup> | 0,110                    | 0,759      | 0,222      | 0,143      | 0,144      | 0,260      |
| Hierro                             | Fe | µg/m <sup>3</sup> | 0,85                     | 1,86       | 2,11       | 1,84       | 2,22       | 1,97       |
| Potasio                            | K  | µg/m <sup>3</sup> | 0,259                    | 0,558      | 0,562      | 0,525      | 0,547      | 0,586      |
| Mercurio                           | Hg | µg/m <sup>3</sup> | N.D.                     | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Litio                              | Li | µg/m <sup>3</sup> | N.D.                     | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Magnesio                           | Mg | µg/m <sup>3</sup> | 0,55                     | 1,18       | 1,25       | 1,16       | 1,30       | 1,16       |
| Manganeso                          | Mn | µg/m <sup>3</sup> | 0,019                    | 0,046      | 0,042      | 0,037      | 0,044      | 0,041      |
| Molibdeno                          | Mo | µg/m <sup>3</sup> | 0,063                    | N.D.       | N.D.       | N.D.       | N.D.       | 0,015      |
| Sodio                              | Na | µg/m <sup>3</sup> | 2,32                     | 5,13       | 5,15       | 5,31       | 4,70       | 5,27       |
| Niquel                             | Ni | µg/m <sup>3</sup> | N.D.                     | 0,005      | 0,012      | N.D.       | 0,012      | 0,009      |
| Fosforo                            | P  | µg/m <sup>3</sup> | 0,074                    | 0,244      | 0,159      | 0,140      | 0,117      | 0,230      |
| Plomo                              | Pb | µg/m <sup>3</sup> | 0,095                    | 0,420      | 0,201      | 0,202      | 0,127      | 0,458      |
| Antimonio                          | Sb | µg/m <sup>3</sup> | N.D.                     | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Selenio                            | Se | µg/m <sup>3</sup> | N.D.                     | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Silicio                            | Si | µg/m <sup>3</sup> | 0,93                     | 1,82       | 2,52       | 1,86       | 2,23       | 1,42       |
| Estaño                             | Sn | µg/m <sup>3</sup> | N.D.                     | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Estroncio                          | Sr | µg/m <sup>3</sup> | 0,007                    | 0,017      | 0,017      | 0,014      | 0,015      | 0,017      |
| Titanio                            | Ti | µg/m <sup>3</sup> | 0,020                    | 0,044      | 0,062      | 0,044      | 0,061      | 0,041      |
| Talio                              | Tl | µg/m <sup>3</sup> | N.D.                     | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Vanadio                            | V  | µg/m <sup>3</sup> | 0,027                    | 0,038      | 0,055      | 0,027      | 0,038      | 0,025      |
| Zinc                               | Zn | µg/m <sup>3</sup> | 0,087                    | 0,280      | 0,218      | 0,125      | 0,115      | 0,305      |

Observación: Concentración de metales calculados a T=10 °C ó 283,15 °K

N.D.: No detectable



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## MONITOREO DE LA CALIDAD DEL AIRE RESUMEN DE LOS DATOS DE METEOROLOGÍA

### DATOS GENERALES

|         |                        |                        |               |                 |             |
|---------|------------------------|------------------------|---------------|-----------------|-------------|
| CUC N°: | 0001-3-2019-401        | ESTACIÓN DE MONITOREO: | CA-VMP-6      | DÍAS EVALUADOS: | 6           |
| EQUIPO: | ESTACIÓN METEOROLÓGICA |                        |               |                 |             |
| MARCA:  | Davis                  | MODELO:                | Vantage Pro 2 | SERIE:          | BB180411015 |

### MEDICIONES PROMEDIO (DATOS DIÁRIOS)

|                             |         |                           |        |                             |           |             |          |
|-----------------------------|---------|---------------------------|--------|-----------------------------|-----------|-------------|----------|
| DÍA 1                       | INICIO: | 04/03/2019 14:03          | FINAL: | 05/03/2019 14:03            | PERIODO : | 24:00 horas | 1440 min |
| Datos horarios registrados: |         | 24                        | horas  |                             |           |             |          |
| Temperatura (°C):           | 25,5    | Presión (mm Hg):          | 753,4  | Humedad (%):                | 72        |             |          |
| Precipitación (mm):         | 0       | Dirección del viento (°): | -      | Velocidad del Viento (m/s): | 0,9       |             |          |
| DÍA 2                       | INICIO: | 07/03/2019 11:25          | FINAL: | 08/03/2019 11:09            | PERIODO : | 23:44 horas | 1424 min |
| Datos horarios registrados: |         | 24                        | horas  |                             |           |             |          |
| Temperatura (°C):           | 26,3    | Presión (mm Hg):          | 751,3  | Humedad (%):                | 70        |             |          |
| Precipitación (mm):         | 0       | Dirección del viento (°): | -      | Velocidad del Viento (m/s): | 1,0       |             |          |
| DÍA 3                       | INICIO: | 13/03/2019 14:56          | FINAL: | 14/03/2019 14:07            | PERIODO : | 23:11 horas | 1391 min |
| Datos horarios registrados: |         | 23                        | horas  |                             |           |             |          |
| Temperatura (°C):           | 24,5    | Presión (mm Hg):          | 755,0  | Humedad (%):                | 75        |             |          |
| Precipitación (mm):         | 0       | Dirección del viento (°): | -      | Velocidad del Viento (m/s): | 1,0       |             |          |
| DÍA 4                       | INICIO: | 16/03/2019 10:20          | FINAL: | 17/03/2019 10:43            | PERIODO : | 24:23 horas | 1463 min |
| Datos horarios registrados: |         | 24                        | horas  |                             |           |             |          |
| Temperatura (°C):           | 23,7    | Presión (mm Hg):          | 755,3  | Humedad (%):                | 77        |             |          |
| Precipitación (mm):         | 0       | Dirección del viento (°): | -      | Velocidad del Viento (m/s): | 1,1       |             |          |
| DÍA 5                       | INICIO: | 19/03/2019 11:00          | FINAL: | 20/03/2019 11:00            | PERIODO : | 24:00 horas | 1440 min |
| Datos horarios registrados: |         | 24                        | horas  |                             |           |             |          |
| Temperatura (°C):           | 23,2    | Presión (mm Hg):          | 756,4  | Humedad (%):                | 71        |             |          |
| Precipitación (mm):         | 0       | Dirección del viento (°): | -      | Velocidad del Viento (m/s): | 1,1       |             |          |
| DÍA 6                       | INICIO: | 29/03/2019 11:30          | FINAL: | 30/03/2019 11:30            | PERIODO : | 24:00 horas | 1440 min |
| Datos horarios registrados: |         | 24                        | horas  |                             |           |             |          |
| Temperatura (°C):           | 24,1    | Presión (mm Hg):          | 756,3  | Humedad (%):                | 70        |             |          |
| Precipitación (mm):         | 0       | Dirección del viento (°): | -      | Velocidad del Viento (m/s): | 1,0       |             |          |

**DATOS GENERALES**

CUC N°: 0001-3-2019-401      ESTACIÓN DE MONITOREO: CA-VMP-6      DÍAS EVALUADOS: 6

PARÁMETROS: PM-10 y Metales en PM-10

**DATOS DE LOS EQUIPOS**

| Barómetro      | MARCA:  | -                 | MODELO: | - | SERIE: | - |
|----------------|---------|-------------------|---------|---|--------|---|
| Venturi PM-10  | MARCA:  | THERMO SCIENTIFIC |         |   |        |   |
|                | MODELO: | HI VOL            |         |   |        |   |
|                | SERIE:  | P9328X            |         |   |        |   |
| Venturi PM-2,5 | MARCA:  | -                 |         |   |        |   |
|                | MODELO: | -                 |         |   |        |   |
|                | SERIE:  | -                 |         |   |        |   |

**CÁLCULOS**

| PM-10                      |                        |                                |                                |                     |                 |                               |                                  |                            |      |      |       |       |
|----------------------------|------------------------|--------------------------------|--------------------------------|---------------------|-----------------|-------------------------------|----------------------------------|----------------------------|------|------|-------|-------|
| DÍA 1                      |                        | Fecha Inicio: 04/03/2019 14:03 |                                |                     |                 | Fecha Final: 05/03/2019 14:03 |                                  |                            |      |      |       |       |
| Presión inicial:           |                        | 13,7 pulg H <sub>2</sub> O     |                                |                     |                 | Presión final:                |                                  | 14,5 pulg H <sub>2</sub> O |      |      |       |       |
| PRESIÓN BAROMÉTRICA        |                        |                                |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior               | Flujo prom (m <sup>3</sup> /min) | Flujo prom (l/min)         |      |      |       |       |
| Δh (pulg H <sub>2</sub> O) | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)         | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                               |                                  |                            | 14,1 | 26,3 | 753,4 | 0,965 |

| PM-2,5                     |                        |                         |                                |                     |                 |                 |                             |                         |   |   |   |
|----------------------------|------------------------|-------------------------|--------------------------------|---------------------|-----------------|-----------------|-----------------------------|-------------------------|---|---|---|
| DÍA 1                      |                        | Fecha Inicio: -         |                                |                     |                 | Fecha Final: -  |                             |                         |   |   |   |
| Presión inicial:           |                        | - pulg H <sub>2</sub> O |                                |                     |                 | Presión final:  |                             | - pulg H <sub>2</sub> O |   |   |   |
| PRESIÓN BAROMÉTRICA        |                        |                         |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior | Flujo (m <sup>3</sup> /min) | Flujo prom (l/min)      |   |   |   |
| Δh (pulg H <sub>2</sub> O) | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)  | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                 |                             |                         | - | - | - |

| DÍA 2                          |                        |                               |                                |                     |                 |                 |                             |                            |      |      |       |       |
|--------------------------------|------------------------|-------------------------------|--------------------------------|---------------------|-----------------|-----------------|-----------------------------|----------------------------|------|------|-------|-------|
| Fecha Inicio: 07/03/2019 11:25 |                        | Fecha Final: 08/03/2019 11:09 |                                |                     |                 |                 |                             |                            |      |      |       |       |
| Presión inicial:               |                        | 15,0 pulg H <sub>2</sub> O    |                                |                     |                 | Presión final:  |                             | 15,7 pulg H <sub>2</sub> O |      |      |       |       |
| PRESIÓN BAROMÉTRICA            |                        |                               |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior | Flujo (m <sup>3</sup> /min) | Flujo prom (l/min)         |      |      |       |       |
| Δh (pulg H <sub>2</sub> O)     | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)        | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                 |                             |                            | 15,4 | 28,6 | 751,3 | 0,962 |

| DÍA 2                      |                        |                         |                                |                     |                 |                 |                             |                         |   |   |   |
|----------------------------|------------------------|-------------------------|--------------------------------|---------------------|-----------------|-----------------|-----------------------------|-------------------------|---|---|---|
| Fecha Inicio: -            |                        | Fecha Final: -          |                                |                     |                 |                 |                             |                         |   |   |   |
| Presión inicial:           |                        | - pulg H <sub>2</sub> O |                                |                     |                 | Presión final:  |                             | - pulg H <sub>2</sub> O |   |   |   |
| PRESIÓN BAROMÉTRICA        |                        |                         |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior | Flujo (m <sup>3</sup> /min) | Flujo prom (l/min)      |   |   |   |
| Δh (pulg H <sub>2</sub> O) | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)  | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                 |                             |                         | - | - | - |

| DÍA 3                          |                        |                               |                                |                     |                 |                 |                             |                            |      |      |       |       |
|--------------------------------|------------------------|-------------------------------|--------------------------------|---------------------|-----------------|-----------------|-----------------------------|----------------------------|------|------|-------|-------|
| Fecha Inicio: 13/03/2019 14:56 |                        | Fecha Final: 14/03/2019 14:07 |                                |                     |                 |                 |                             |                            |      |      |       |       |
| Presión inicial:               |                        | 15,0 pulg H <sub>2</sub> O    |                                |                     |                 | Presión final:  |                             | 15,6 pulg H <sub>2</sub> O |      |      |       |       |
| PRESIÓN BAROMÉTRICA            |                        |                               |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior | Flujo (m <sup>3</sup> /min) | Flujo prom (l/min)         |      |      |       |       |
| Δh (pulg H <sub>2</sub> O)     | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)        | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                 |                             |                            | 15,3 | 28,6 | 755,0 | 0,962 |

| DÍA 3                      |                        |                         |                                |                     |                 |                 |                             |                         |   |   |   |
|----------------------------|------------------------|-------------------------|--------------------------------|---------------------|-----------------|-----------------|-----------------------------|-------------------------|---|---|---|
| Fecha Inicio: -            |                        | Fecha Final: -          |                                |                     |                 |                 |                             |                         |   |   |   |
| Presión inicial:           |                        | - pulg H <sub>2</sub> O |                                |                     |                 | Presión final:  |                             | - pulg H <sub>2</sub> O |   |   |   |
| PRESIÓN BAROMÉTRICA        |                        |                         |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior | Flujo (m <sup>3</sup> /min) | Flujo prom (l/min)      |   |   |   |
| Δh (pulg H <sub>2</sub> O) | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)  | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                 |                             |                         | - | - | - |

| DÍA 4                          |                        |                               |                                |                     |                 |                 |                             |                            |      |      |       |       |
|--------------------------------|------------------------|-------------------------------|--------------------------------|---------------------|-----------------|-----------------|-----------------------------|----------------------------|------|------|-------|-------|
| Fecha Inicio: 16/03/2019 10:20 |                        | Fecha Final: 17/03/2019 10:43 |                                |                     |                 |                 |                             |                            |      |      |       |       |
| Presión inicial:               |                        | 15,0 pulg H <sub>2</sub> O    |                                |                     |                 | Presión final:  |                             | 15,6 pulg H <sub>2</sub> O |      |      |       |       |
| PRESIÓN BAROMÉTRICA            |                        |                               |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior | Flujo (m <sup>3</sup> /min) | Flujo prom (l/min)         |      |      |       |       |
| Δh (pulg H <sub>2</sub> O)     | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)        | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                 |                             |                            | 15,3 | 28,6 | 755,3 | 0,962 |

| DÍA 4                      |                        |                         |                                |                     |                 |                 |                             |                         |   |   |   |
|----------------------------|------------------------|-------------------------|--------------------------------|---------------------|-----------------|-----------------|-----------------------------|-------------------------|---|---|---|
| Fecha Inicio: -            |                        | Fecha Final: -          |                                |                     |                 |                 |                             |                         |   |   |   |
| Presión inicial:           |                        | - pulg H <sub>2</sub> O |                                |                     |                 | Presión final:  |                             | - pulg H <sub>2</sub> O |   |   |   |
| PRESIÓN BAROMÉTRICA        |                        |                         |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior | Flujo (m <sup>3</sup> /min) | Flujo prom (l/min)      |   |   |   |
| Δh (pulg H <sub>2</sub> O) | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)  | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                 |                             |                         | - | - | - |

| DÍA 5                          |                        |                               |                                |                     |                 |                 |                             |                            |      |      |       |       |
|--------------------------------|------------------------|-------------------------------|--------------------------------|---------------------|-----------------|-----------------|-----------------------------|----------------------------|------|------|-------|-------|
| Fecha Inicio: 19/03/2019 11:00 |                        | Fecha Final: 20/03/2019 11:00 |                                |                     |                 |                 |                             |                            |      |      |       |       |
| Presión inicial:               |                        | 15,7 pulg H <sub>2</sub> O    |                                |                     |                 | Presión final:  |                             | 16,5 pulg H <sub>2</sub> O |      |      |       |       |
| PRESIÓN BAROMÉTRICA            |                        |                               |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior | Flujo (m <sup>3</sup> /min) | Flujo prom (l/min)         |      |      |       |       |
| Δh (pulg H <sub>2</sub> O)     | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)        | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                 |                             |                            | 16,1 | 30,0 | 756,4 | 0,960 |

| DÍA 5                      |                        |                         |                                |                     |                 |                 |                             |                         |   |   |   |
|----------------------------|------------------------|-------------------------|--------------------------------|---------------------|-----------------|-----------------|-----------------------------|-------------------------|---|---|---|
| Fecha Inicio: -            |                        | Fecha Final: -          |                                |                     |                 |                 |                             |                         |   |   |   |
| Presión inicial:           |                        | - pulg H <sub>2</sub> O |                                |                     |                 | Presión final:  |                             | - pulg H <sub>2</sub> O |   |   |   |
| PRESIÓN BAROMÉTRICA        |                        |                         |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior | Flujo (m <sup>3</sup> /min) | Flujo prom (l/min)      |   |   |   |
| Δh (pulg H <sub>2</sub> O) | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)  | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                 |                             |                         | - | - | - |

| DÍA 6                          |                        |                               |                                |                     |                 |                 |                                  |                            |      |      |       |       |
|--------------------------------|------------------------|-------------------------------|--------------------------------|---------------------|-----------------|-----------------|----------------------------------|----------------------------|------|------|-------|-------|
| Fecha Inicio: 29/03/2019 11:30 |                        | Fecha Final: 30/03/2019 11:30 |                                |                     |                 |                 |                                  |                            |      |      |       |       |
| Presión inicial:               |                        | 14,9 pulg H <sub>2</sub> O    |                                |                     |                 | Presión final:  |                                  | 15,1 pulg H <sub>2</sub> O |      |      |       |       |
| PRESIÓN BAROMÉTRICA            |                        |                               |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior | Flujo prom (m <sup>3</sup> /min) | Flujo prom (l/min)         |      |      |       |       |
| Δh (pulg H <sub>2</sub> O)     | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)        | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                 |                                  |                            | 15,0 | 28,0 | 756,3 | 0,963 |

| DÍA 6                      |                        |                         |                                |                     |                 |                 |                             |                         |   |   |   |
|----------------------------|------------------------|-------------------------|--------------------------------|---------------------|-----------------|-----------------|-----------------------------|-------------------------|---|---|---|
| Fecha Inicio: -            |                        | Fecha Final: -          |                                |                     |                 |                 |                             |                         |   |   |   |
| Presión inicial:           |                        | - pulg H <sub>2</sub> O |                                |                     |                 | Presión final:  |                             | - pulg H <sub>2</sub> O |   |   |   |
| PRESIÓN BAROMÉTRICA        |                        |                         |                                | T <sub>a</sub> (°C) | T (°C) inferior | T (°C) superior | Flujo (m <sup>3</sup> /min) | Flujo prom (l/min)      |   |   |   |
| Δh (pulg H <sub>2</sub> O) | P <sub>i</sub> (mm Hg) | P <sub>s</sub> (mm Hg)  | P <sub>j</sub> /P <sub>s</sub> |                     |                 |                 |                             |                         | - | - | - |

## MONITOREO DE LA CALIDAD DEL AIRE

### HOJA DE CÁLCULO PARA ESTIMAR LAS CONCENTRACIONES DE MATERIAL PARTICULADO ALTO VOLUMEN

**ESTACIÓN DE MONITOREO:** CA-VMP-6 **PROCEDENCIA:** CALLAO

**UBICACIÓN:** ESTE: 268428 NORTE: 8686638 ZONA: 18 L ALTITUD: 50 PRECISIÓN GPS: ± 3

**DESCRIPCIÓN:** Ubicado en la azotea del Hospital de Ventanilla, Av. Pedro Beltrán s/n Urb. Satélite, distrito de Ventanilla

**PARÁMETROS:** PM-10 y Metales en PM-10

| N° | Parámetro        | N° Filtro | Fecha Inicio     | Fecha Final      | Periodo (minutos) | Temperatura ambiental (°C) | Presión ambiental (mm Hg) | Po/Pa | Flujo de muestreo (m <sup>3</sup> /min) | Volumen muestreado real (m <sup>3</sup> ) | Volumen muestreado estándar (m <sup>3</sup> ) | ΔPeso (μg) * | Concentración de partículas (μg/m <sup>3</sup> ) |
|----|------------------|-----------|------------------|------------------|-------------------|----------------------------|---------------------------|-------|---|---|---|--------------|--|
| 1  | PM-10            | 0027A.R19 | 04/03/2019 14:03 | 05/03/2019 14:03 | 1440              | 25,5                       | 753,4                     | 0,965 | 1,187                                   | 1709,28                                   | 1691,60                                       | 96300        | 56,93  |
| 2  |                  | 0063A.R19 | 07/03/2019 11:25 | 08/03/2019 11:09 | 1424              | 26,3                       | 751,3                     | 0,962 | 1,185                                   | 1686,87                                   | 1660,32                                       | 154400       | 92,99  |
| 3  |                  | 0067A.R19 | 13/03/2019 14:56 | 14/03/2019 14:07 | 1391              | 24,5                       | 755,0                     | 0,962 | 1,182                                   | 1643,81                                   | 1635,74                                       | 116100       | 70,98  |
| 4  |                  | 0071A.R19 | 16/03/2019 10:20 | 17/03/2019 10:43 | 1463              | 23,7                       | 755,3                     | 0,962 | 1,180                                   | 1726,93                                   | 1723,76                                       | 136600       | 79,25  |
| 5  |                  | 0075A.R19 | 19/03/2019 11:00 | 20/03/2019 11:00 | 1440              | 23,2                       | 756,4                     | 0,960 | 1,176                                   | 1694,02                                   | 1696,23                                       | 138400       | 81,59  |
| 6  |                  | 0079A.R19 | 29/03/2019 11:30 | 30/03/2019 11:30 | 1440              | 24,1                       | 756,3                     | 0,963 | 1,182                                   | 1702,30                                   | 1699,14                                       | 168700       | 99,29  |
| 1  | Metales en PM 10 | 0027A.R19 | 04/03/2019 14:03 | 05/03/2019 14:03 | 1440              | 25,5                       | 753,4                     | 0,965 | 1,187                                   | 1709,28                                   | 1691,60                                       | -            | -  |
| 2  |                  | 0063A.R19 | 07/03/2019 11:25 | 08/03/2019 11:09 | 1424              | 26,3                       | 751,3                     | 0,962 | 1,185                                   | 1686,87                                   | 1660,32                                       | -            | -  |
| 3  |                  | 0067A.R19 | 13/03/2019 14:56 | 14/03/2019 14:07 | 1391              | 24,5                       | 755,0                     | 0,962 | 1,182                                   | 1643,81                                   | 1635,74                                       | -            | -  |
| 4  |                  | 0071A.R19 | 16/03/2019 10:20 | 17/03/2019 10:43 | 1463              | 23,7                       | 755,3                     | 0,962 | 1,180                                   | 1726,93                                   | 1723,76                                       | -            | -  |
| 5  |                  | 0075A.R19 | 19/03/2019 11:00 | 20/03/2019 11:00 | 1440              | 23,2                       | 756,4                     | 0,960 | 1,176                                   | 1694,02                                   | 1696,23                                       | -            | -  |
| 6  |                  | 0079A.R19 | 29/03/2019 11:30 | 30/03/2019 11:30 | 1440              | 24,1                       | 756,3                     | 0,963 | 1,182                                   | 1702,30                                   | 1699,14                                       | -            | -  |

#### OBSERVACIONES:

(1) El cálculo de volumen estándar para material particulado, se realizó en base a las condiciones de temperatura estándar (T= 25°C ó 298,15 °K) y presión estándar (760 mmHg ó 1013,25 mBar), establecidas en el Protocolo de Monitoreo de la Calidad del aire y Gestión de los datos de la DIGESA (2005).

(2) El cálculo de volumen estándar para metales en PM<sub>10</sub> se realizó en base a las condiciones de temperatura estándar (T= 25°C ó 298,15 °K) y presión estándar (760 mmHg ó 1013,25 mBar).

(\*) Fuente: Informe de Ensayo N° ABR1066.R19 del laboratorio Certimin S.A.

"-" : No aplica.

**NOMBRE DEL PROYECTO:**

VIGILANCIA AMBIENTAL DE LA CALIDAD DEL AIRE EN EL ÁMBITO DE INFLUENCIA DE LA ZONA INDUSTRIAL DE VENTANILLA-MI PERÚ, UBICADO EN LOS DISTRITOS DE VENTANILLA Y MI PERÚ, PROVINCIA CONSTITUCIONAL DEL CALLAO, DURANTE EL MES DE MARZO 2019

| RESULTADOS DE LABORATORIO        |        |            |            |            |            |            |            |
|----------------------------------|--------|------------|------------|------------|------------|------------|------------|
| Metal medido en PM <sub>10</sub> | Unidad | CA-VMP-6   |            |            |            |            |            |
|                                  |        | 04/03/2019 | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| Plata                            | Ag     | µg/mtra    | <1         | <1         | <1         | <1         | <1         |
| Aluminio                         | Al     | µg/mtra    | 443        | 1011       | 763        | 665        | 631        |
| Arsenico                         | As     | µg/mtra    | 10         | <9         | <9         | <9         | 13         |
| Bario                            | Ba     | µg/mtra    | 15         | 30         | 20         | 19         | 39         |
| Berilio                          | Be     | µg/mtra    | <1         | <1         | <1         | <1         | <1         |
| Bismuto                          | Bi     | µg/mtra    | <350       | <350       | <350       | <350       | <350       |
| Boro                             | B      | µg/mtra    | 15         | 47         | 28         | 22         | 46         |
| Calcio                           | Ca     | µg/mtra    | 2131       | 4609       | 3069       | 3236       | 3574       |
| Cadmio                           | Cd     | µg/mtra    | <2         | 2          | <2         | <2         | <2         |
| Cobalto                          | Co     | µg/mtra    | <6         | <6         | <6         | <6         | <6         |
| Cromo                            | Cr     | µg/mtra    | 57         | 53         | 25         | 25         | 26         |
| Cobre                            | Cu     | µg/mtra    | 41         | 89         | 94         | 61         | 71         |
| Hierro                           | Fe     | µg/mtra    | 1084       | 2114       | 1485       | 1282       | 1237       |
| Potasio                          | K      | µg/mtra    | 429        | 827        | 636        | 703        | 679        |
| Mercurio                         | Hg     | µg/mtra    | <20        | <20        | <20        | <20        | <20        |
| Litio                            | Li     | µg/mtra    | <2         | <2         | <2         | <2         | <2         |
| Magnesio                         | Mg     | µg/mtra    | 877        | 1627       | 1378       | 1606       | 1543       |
| Manganeso                        | Mn     | µg/mtra    | 22         | 53         | 34         | 32         | 31         |
| Molibdeno                        | Mo     | µg/mtra    | 19         | <3         | 153        | <3         | <3         |
| Sodio                            | Na     | µg/mtra    | 5002       | 8846       | 8236       | 10312      | 10065      |
| Niquel                           | Ni     | µg/mtra    | 6          | <5         | 13         | <5         | 15         |
| Fosforo                          | P      | µg/mtra    | 128        | 254        | 152        | 222        | 135        |
| Plomo                            | Pb     | µg/mtra    | 53         | 150        | 108        | 114        | 64         |
| Antimonio                        | Sb     | µg/mtra    | <9         | <9         | <9         | <9         | <9         |
| Selenio                          | Se     | µg/mtra    | <55        | <55        | <55        | <55        | <55        |
| Silicio                          | Si     | µg/mtra    | 967        | 1904       | 1813       | 1355       | 1289       |
| Estaño                           | Sn     | µg/mtra    | 52         | 16         | <15        | <15        | <15        |
| Estroncio                        | Sr     | µg/mtra    | 11,1       | 22,2       | 17         | 18,5       | 19,3       |
| Titanio                          | Ti     | µg/mtra    | 19         | 42         | 32         | 28         | 25         |
| Talio                            | Tl     | µg/mtra    | <60        | <60        | <60        | <60        | <60        |
| Vanadio                          | V      | µg/mtra    | 51,4       | 39,1       | 70         | 37,7       | 66,1       |
| Zinc                             | Zn     | µg/mtra    | 113        | 244        | 290        | 178        | 182        |

<: Debajo del límite de detección

Fuente: Informe de Ensayo N° ABR1066.R19 del laboratorio Certimin S.A.

| CONCENTRACIÓN DE METALES           |        |                   |            |            |            |            |            |
|------------------------------------|--------|-------------------|------------|------------|------------|------------|------------|
| Metal medido en PM <sub>10</sub>   | Unidad | CA-VMP-6          |            |            |            |            |            |
|                                    |        | 04/03/2019        | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| Volumen estándar (m <sup>3</sup> ) |        | 1691,60           | 1660,32    | 1635,74    | 1723,76    | 1696,23    | 1699,14    |
| Plata                              | Ag     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Aluminio                           | Al     | µg/m <sup>3</sup> | 0,26       | 0,61       | 0,47       | 0,39       | 0,80       |
| Arsenico                           | As     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Bario                              | Ba     | µg/m <sup>3</sup> | 0,009      | 0,018      | 0,012      | 0,011      | 0,023      |
| Berilio                            | Be     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Bismuto                            | Bi     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Boro                               | B      | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Calcio                             | Ca     | µg/m <sup>3</sup> | 1,26       | 2,78       | 1,88       | 1,88       | 2,11       |
| Cadmio                             | Cd     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Cobalto                            | Co     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Cromo                              | Cr     | µg/m <sup>3</sup> | 0,034      | 0,032      | 0,015      | 0,015      | 0,015      |
| Cobre                              | Cu     | µg/m <sup>3</sup> | 0,024      | 0,054      | 0,057      | 0,035      | 0,042      |
| Hierro                             | Fe     | µg/m <sup>3</sup> | 0,64       | 1,27       | 0,91       | 0,74       | 0,73       |
| Potasio                            | K      | µg/m <sup>3</sup> | 0,254      | 0,498      | 0,389      | 0,408      | 0,400      |
| Mercurio                           | Hg     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Litio                              | Li     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Magnesio                           | Mg     | µg/m <sup>3</sup> | 0,52       | 0,98       | 0,84       | 0,93       | 0,91       |
| Manganeso                          | Mn     | µg/m <sup>3</sup> | 0,013      | 0,032      | 0,021      | 0,019      | 0,018      |
| Molibdeno                          | Mo     | µg/m <sup>3</sup> | 0,011      | N.D.       | N.D.       | N.D.       | N.D.       |
| Sodio                              | Na     | µg/m <sup>3</sup> | 2,96       | 5,33       | 5,04       | 5,98       | 5,93       |
| Niquel                             | Ni     | µg/m <sup>3</sup> | 0,004      | N.D.       | 0,008      | N.D.       | 0,009      |
| Fosforo                            | P      | µg/m <sup>3</sup> | 0,076      | 0,153      | 0,093      | 0,129      | 0,080      |
| Plomo                              | Pb     | µg/m <sup>3</sup> | 0,031      | 0,090      | 0,066      | 0,066      | 0,038      |
| Antimonio                          | Sb     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Selenio                            | Se     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Silicio                            | Si     | µg/m <sup>3</sup> | 0,57       | 1,15       | 1,11       | 0,79       | 0,76       |
| Estaño                             | Sn     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Estroncio                          | Sr     | µg/m <sup>3</sup> | 0,007      | 0,013      | 0,010      | 0,011      | 0,011      |
| Titanio                            | Ti     | µg/m <sup>3</sup> | 0,011      | 0,025      | 0,020      | 0,016      | 0,015      |
| Talio                              | Tl     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       |
| Vanadio                            | V      | µg/m <sup>3</sup> | 0,030      | 0,024      | 0,043      | 0,022      | 0,039      |
| Zinc                               | Zn     | µg/m <sup>3</sup> | 0,067      | 0,147      | 0,177      | 0,103      | 0,107      |

Observación: Concentración de metales calculados a T=25 °C ó 298,15 °K

N.D.: No detectable

## MONITOREO DE LA CALIDAD DEL AIRE HOJA DE CÁLCULO PARA ESTIMAR EL VOLUMEN ESTÁNDAR PARA METALES (10°C)

|                               |              |  |               |                     |              |        |                 |    |                       |     |
|-------------------------------|--------------|--|---------------|---------------------|--------------|--------|-----------------|----|-----------------------|-----|
| <b>ESTACIÓN DE MONITOREO:</b> |              | CA-VMP-6   |               | <b>PROCEDENCIA:</b> |              | CALLAO |                 |    |                       |     |
| <b>UBICACIÓN:</b>             | <b>ESTE:</b> | 268428   | <b>NORTE:</b> | 8686638             | <b>ZONA:</b> | 18 L   | <b>ALTITUD:</b> | 50 | <b>PRECISIÓN GPS:</b> | ± 3 |
| <b>DESCRIPCIÓN:</b>           |              | Ubicado en la azotea del Hospital de Ventanilla, Av. Pedro Beltrán s/n Urb. Satélite, distrito de Ventanilla |               |                     |              |        |                 |    |                       |     |
| <b>PARÁMETROS:</b>            |              | Metales en PM-10   |               |                     |              |        |                 |    |                       |     |

| N° | Parámetro        | N° Filtro | Fecha Inicio     | Fecha Final      | Periodo (minutos) | Temperatura ambiental (°C) | Presión ambiental (mm Hg) | Po/Pa | Flujo de muestreo (m <sup>3</sup> /min) | Volumen muestreado real (m <sup>3</sup> ) | Volumen muestreado estándar (m <sup>3</sup> ) |
|----|------------------|-----------|------------------|------------------|-------------------|----------------------------|---------------------------|-------|---|---|---|
| 1  | Metales PM<br>10 | 0027A.R19 | 04/03/2019 14:03 | 05/03/2019 14:03 | 1440              | 25,5                       | 753,4                     | 0,965 | 1,187                                   | 1709,28                                   | 1606,49                                       |
| 2  |                  | 0063A.R19 | 07/03/2019 11:25 | 08/03/2019 11:09 | 1424              | 26,3                       | 751,3                     | 0,962 | 1,185                                   | 1686,87                                   | 1576,79                                       |
| 3  |                  | 0067A.R19 | 13/03/2019 14:56 | 14/03/2019 14:07 | 1391              | 24,5                       | 755,0                     | 0,962 | 1,182                                   | 1643,81                                   | 1553,45                                       |
| 4  |                  | 0071A.R19 | 16/03/2019 10:20 | 17/03/2019 10:43 | 1463              | 23,7                       | 755,3                     | 0,962 | 1,180                                   | 1726,93                                   | 1637,04                                       |
| 5  |                  | 0075A.R19 | 19/03/2019 11:00 | 20/03/2019 11:00 | 1440              | 23,2                       | 756,4                     | 0,960 | 1,176                                   | 1694,02                                   | 1610,89                                       |
| 6  |                  | 0079A.R19 | 29/03/2019 11:30 | 30/03/2019 11:30 | 1440              | 24,1                       | 756,3                     | 0,963 | 1,182                                   | 1702,30                                   | 1613,65                                       |

### OBSERVACIONES:

(1) El cálculo de volumen estándar para metales en PM<sub>10</sub>, se realizó en base a las condiciones de temperatura estándar (T= 10°C ó 283.15 °K) y presión estándar (760 mmHg ó 1013,25 mBar).  
 "-" : No aplica.

**NOMBRE DEL PROYECTO:**

VIGILANCIA AMBIENTAL DE LA CALIDAD DEL AIRE EN EL ÁMBITO DE INFLUENCIA DE LA ZONA INDUSTRIAL DE VENTANILLA-MI PERÚ, UBICADO EN LOS DISTRITOS DE VENTANILLA Y MI PERÚ, PROVINCIA CONSTITUCIONAL DEL CALLAO, DURANTE EL MES DE MARZO 2019

| RESULTADOS DE LABORATORIO        |        |            |            |            |            |            |            |
|----------------------------------|--------|------------|------------|------------|------------|------------|------------|
| Metal medido en PM <sub>10</sub> | Unidad | CA-VMP-6   |            |            |            |            |            |
|                                  |        | 04/03/2019 | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| Plata                            | Ag     | µg/mtra    | <1         | <1         | <1         | <1         | <1         |
| Aluminio                         | Al     | µg/mtra    | 443        | 1011       | 763        | 665        | 631        |
| Arsenico                         | As     | µg/mtra    | 10         | <9         | <9         | <9         | 13         |
| Bario                            | Ba     | µg/mtra    | 15         | 30         | 20         | 19         | 39         |
| Berilio                          | Be     | µg/mtra    | <1         | <1         | <1         | <1         | <1         |
| Bismuto                          | Bi     | µg/mtra    | <350       | <350       | <350       | <350       | <350       |
| Boro                             | B      | µg/mtra    | 15         | 47         | 28         | 22         | <10        |
| Calcio                           | Ca     | µg/mtra    | 2131       | 4609       | 3069       | 3236       | 4905       |
| Cadmio                           | Cd     | µg/mtra    | <2         | 2          | <2         | <2         | <2         |
| Cobalto                          | Co     | µg/mtra    | <6         | <6         | <6         | <6         | <6         |
| Cromo                            | Cr     | µg/mtra    | 57         | 53         | 25         | 25         | 16         |
| Cobre                            | Cu     | µg/mtra    | 41         | 89         | 94         | 61         | 71         |
| Hierro                           | Fe     | µg/mtra    | 1084       | 2114       | 1485       | 1282       | 1237       |
| Potasio                          | K      | µg/mtra    | 429        | 827        | 636        | 703        | 679        |
| Mercurio                         | Hg     | µg/mtra    | <20        | <20        | <20        | <20        | <20        |
| Litio                            | Li     | µg/mtra    | <2         | <2         | <2         | <2         | <2         |
| Magnesio                         | Mg     | µg/mtra    | 877        | 1627       | 1378       | 1606       | 1543       |
| Manganeso                        | Mn     | µg/mtra    | 22         | 53         | 34         | 32         | 31         |
| Molibdeno                        | Mo     | µg/mtra    | 19         | <3         | 153        | <3         | 3          |
| Sodio                            | Na     | µg/mtra    | 5002       | 8846       | 8236       | 10312      | 10065      |
| Niquel                           | Ni     | µg/mtra    | 6          | <5         | 13         | <5         | 15         |
| Fosforo                          | P      | µg/mtra    | 128        | 254        | 152        | 222        | 135        |
| Plomo                            | Pb     | µg/mtra    | 53         | 150        | 108        | 114        | 64         |
| Antimonio                        | Sb     | µg/mtra    | <9         | <9         | <9         | <9         | <9         |
| Selenio                          | Se     | µg/mtra    | <55        | <55        | <55        | <55        | <55        |
| Silicio                          | Si     | µg/mtra    | 967        | 1904       | 1813       | 1355       | 1289       |
| Estaño                           | Sn     | µg/mtra    | 52         | 16         | <15        | <15        | <15        |
| Estroncio                        | Sr     | µg/mtra    | 11,1       | 22,2       | 17         | 18,5       | 19,3       |
| Titanio                          | Ti     | µg/mtra    | 19         | 42         | 32         | 28         | 25         |
| Talio                            | Tl     | µg/mtra    | <60        | <60        | <60        | <60        | <60        |
| Vanadio                          | V      | µg/mtra    | 51,4       | 39,1       | 70         | 37,7       | 66,1       |
| Zinc                             | Zn     | µg/mtra    | 113        | 244        | 290        | 178        | 182        |

&lt;: Debajo del límite de detección

Fuente: Informe de Ensayo N° ABR1066.R19 del laboratorio Certimin S.A.

| CONCENTRACIÓN DE METALES                |        |                   |                |                |                |                |                |
|---|--------|-------------------|----------------|----------------|----------------|----------------|----------------|
| Metal medido en PM <sub>10</sub>        | Unidad | CA-VMP-6          |                |                |                |                |                |
|   |        | 04/03/2019        | 07/03/2019     | 13/03/2019     | 16/03/2019     | 19/03/2019     | 29/03/2019     |
| <b>Volumen estándar (m<sup>3</sup>)</b> |        | <b>1606,49</b>    | <b>1576,79</b> | <b>1553,45</b> | <b>1637,04</b> | <b>1610,89</b> | <b>1613,65</b> |
| Plata                                   | Ag     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Aluminio                                | Al     | µg/m <sup>3</sup> | 0,28           | 0,64           | 0,49           | 0,41           | 0,39           |
| Arsenico                                | As     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Bario                                   | Ba     | µg/m <sup>3</sup> | 0,009          | 0,019          | 0,013          | 0,012          | 0,012          |
| Berilio                                 | Be     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Bismuto                                 | Bi     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Boro                                    | B      | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Calcio                                  | Ca     | µg/m <sup>3</sup> | 1,33           | 2,92           | 1,98           | 1,98           | 2,22           |
| Cadmio                                  | Cd     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Cobalto                                 | Co     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Cromo                                   | Cr     | µg/m <sup>3</sup> | 0,035          | 0,034          | 0,016          | 0,015          | 0,016          |
| Cobre                                   | Cu     | µg/m <sup>3</sup> | 0,026          | 0,056          | 0,061          | 0,037          | 0,044          |
| Hierro                                  | Fe     | µg/m <sup>3</sup> | 0,67           | 1,34           | 0,96           | 0,78           | 0,77           |
| Potasio                                 | K      | µg/m <sup>3</sup> | 0,267          | 0,524          | 0,409          | 0,429          | 0,422          |
| Mercurio                                | Hg     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Litio                                   | Li     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Magnesio                                | Mg     | µg/m <sup>3</sup> | 0,55           | 1,03           | 0,89           | 0,98           | 0,96           |
| Manganeso                               | Mn     | µg/m <sup>3</sup> | 0,014          | 0,034          | 0,022          | 0,020          | 0,019          |
| Molibdeno                               | Mo     | µg/m <sup>3</sup> | 0,012          | N.D.           | N.D.           | N.D.           | 0,002          |
| Sodio                                   | Na     | µg/m <sup>3</sup> | 3,11           | 5,61           | 5,30           | 6,30           | 6,25           |
| Niquel                                  | Ni     | µg/m <sup>3</sup> | 0,004          | N.D.           | 0,008          | N.D.           | 0,009          |
| Fosforo                                 | P      | µg/m <sup>3</sup> | 0,080          | 0,161          | 0,098          | 0,136          | 0,084          |
| Plomo                                   | Pb     | µg/m <sup>3</sup> | 0,033          | 0,095          | 0,070          | 0,070          | 0,040          |
| Antimonio                               | Sb     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Selenio                                 | Se     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Silicio                                 | Si     | µg/m <sup>3</sup> | 0,60           | 1,21           | 1,17           | 0,83           | 0,80           |
| Estaño                                  | Sn     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Estroncio                               | Sr     | µg/m <sup>3</sup> | 0,007          | 0,014          | 0,011          | 0,011          | 0,012          |
| Titanio                                 | Ti     | µg/m <sup>3</sup> | 0,012          | 0,027          | 0,021          | 0,017          | 0,016          |
| Talio                                   | Tl     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           |
| Vanadio                                 | V      | µg/m <sup>3</sup> | 0,032          | 0,025          | 0,045          | 0,023          | 0,041          |
| Zinc                                    | Zn     | µg/m <sup>3</sup> | 0,070          | 0,155          | 0,187          | 0,109          | 0,113          |

**Observación:** Concentración de metales calculados a T=10 °C ó 283,15 °K

N.D.: No detectable



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## MONITOREO DE LA CALIDAD DEL AIRE RESUMEN DE LOS DATOS DE METEOROLOGÍA

### DATOS GENERALES

|         |                        |                        |               |                 |             |
|---------|------------------------|------------------------|---------------|-----------------|-------------|
| CUC N°: | 0001-3-2019-401        | ESTACIÓN DE MONITOREO: | CA-VMP-7      | DÍAS EVALUADOS: | 6           |
| EQUIPO: | ESTACIÓN METEOROLÓGICA |                        |               |                 |             |
| MARCA:  | Davis                  | MODELO:                | Vantage Pro 2 | SERIE:          | BB171204036 |

### MEDICIONES PROMEDIO (DATOS DIÁRIOS)

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 1 | INICIO: | 04/03/2019 16:23 | FINAL: | 05/03/2019 15:53 | PERIODO : | 23:30 horas | 1410 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 26,1 | Presión (mm Hg):          | 752,1 | Humedad (%):                | 72  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 0,9 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 2 | INICIO: | 07/03/2019 12:35 | FINAL: | 08/03/2019 11:35 | PERIODO : | 23:00 horas | 1380 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 23 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 26,1 | Presión (mm Hg):          | 751,3 | Humedad (%):                | 71  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 1,0 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 3 | INICIO: | 13/03/2019 15:17 | FINAL: | 14/03/2019 14:17 | PERIODO : | 23:00 horas | 1380 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 23 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 25,5 | Presión (mm Hg):          | 751,5 | Humedad (%):                | 73  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 0,9 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 4 | INICIO: | 16/03/2019 10:45 | FINAL: | 17/03/2019 10:15 | PERIODO : | 23:30 horas | 1410 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 24,7 | Presión (mm Hg):          | 751,7 | Humedad (%):                | 73  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 0,9 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 5 | INICIO: | 19/03/2019 11:21 | FINAL: | 20/03/2019 11:21 | PERIODO : | 24:00 horas | 1440 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 24,2 | Presión (mm Hg):          | 752,8 | Humedad (%):                | 71  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 0,9 |

|       |         |                  |        |                  |           |             |          |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|
| DÍA 6 | INICIO: | 29/03/2019 12:10 | FINAL: | 30/03/2019 12:00 | PERIODO : | 23:50 horas | 1430 min |
|-------|---------|------------------|--------|------------------|-----------|-------------|----------|

Datos horarios registrados: 24 horas

|                     |      |                           |       |                             |     |
|---------------------|------|---------------------------|-------|-----------------------------|-----|
| Temperatura (°C):   | 24,5 | Presión (mm Hg):          | 752,6 | Humedad (%):                | 72  |
| Precipitación (mm): | 0    | Dirección del viento (°): | -     | Velocidad del Viento (m/s): | 1,0 |



## MONITOREO DE LA CALIDAD DEL AIRE

### HOJA DE CÁLCULO PARA ESTIMAR LAS CONCENTRACIONES DE MATERIAL PARTICULADO ALTO VOLUMEN

**ESTACIÓN DE MONITOREO:** CA-VMP-7 **PROCEDENCIA:** CALLAO

**UBICACIÓN:** ESTE: 268736 NORTE: 8687699 **ZONA:** 18 L **ALTITUD:** 86 **PRECISIÓN GPS:** ± 3

**DESCRIPCIÓN:** Ubicado en la azotea de la vivienda del asentamiento humano - A.H. Virgen de Guadalupe - 2da etapa, Mz. Y Lt. 28, aproximadamente a 80 m del A.H. Las Casuarinas, distrito Mi Perú

**PARÁMETROS:** PM-10 y Metales en PM-10

| N° | Parámetro        | N° Filtro | Fecha Inicio     | Fecha Final      | Periodo (minutos) | Temperatura ambiental (°C) | Presión ambiental (mm Hg) | Po/Pa | Flujo de muestreo (m <sup>3</sup> /min) | Volumen muestreado real (m <sup>3</sup> ) | Volumen muestreado estándar (m <sup>3</sup> ) | ΔPeso (μg) * | Concentración de partículas (μg/m <sup>3</sup> ) |
|----|------------------|-----------|------------------|------------------|-------------------|----------------------------|---------------------------|-------|---|---|---|--------------|--|
| 1  | PM-10            | 0033A.R19 | 04/03/2019 16:23 | 05/03/2019 15:53 | 1410              | 26,1                       | 752,1                     | 0,963 | 1,188                                   | 1675,36                                   | 1651,85                                       | 113800       | <b>68,89</b>                                     |
| 2  |                  | 0065A.R19 | 07/03/2019 12:35 | 08/03/2019 11:35 | 1380              | 26,1                       | 751,3                     | 0,962 | 1,187                                   | 1638,27                                   | 1613,56                                       | 185000       | <b>114,65</b>                                    |
| 3  |                  | 0068A.R19 | 13/03/2019 15:17 | 14/03/2019 14:17 | 1380              | 25,5                       | 751,5                     | 0,962 | 1,186                                   | 1636,68                                   | 1615,67                                       | 140400       | <b>86,90</b>                                     |
| 4  |                  | 0072A.R19 | 16/03/2019 10:45 | 17/03/2019 10:15 | 1410              | 24,7                       | 751,7                     | 0,962 | 1,184                                   | 1670,00                                   | 1653,43                                       | 169700       | <b>102,64</b>                                    |
| 5  |                  | 0076A.R19 | 19/03/2019 11:21 | 20/03/2019 11:21 | 1440              | 24,2                       | 752,8                     | 0,961 | 1,182                                   | 1702,66                                   | 1691,06                                       | 164500       | <b>97,28</b>                                     |
| 6  |                  | 0080A.R19 | 29/03/2019 12:10 | 30/03/2019 12:00 | 1430              | 24,5                       | 752,6                     | 0,963 | 1,186                                   | 1695,62                                   | 1681,93                                       | 189700       | <b>112,79</b>                                    |
| 1  | Metales en PM 10 | 0033A.R19 | 04/03/2019 16:23 | 05/03/2019 15:53 | 1410              | 26,1                       | 752,1                     | 0,963 | 1,188                                   | 1675,36                                   | 1651,85                                       | -            | -  |
| 2  |                  | 0065A.R19 | 07/03/2019 12:35 | 08/03/2019 11:35 | 1380              | 26,1                       | 751,3                     | 0,962 | 1,187                                   | 1638,27                                   | 1613,56                                       | -            | -  |
| 3  |                  | 0068A.R19 | 13/03/2019 15:17 | 14/03/2019 14:17 | 1380              | 25,5                       | 751,5                     | 0,962 | 1,186                                   | 1636,68                                   | 1615,67                                       | -            | -  |
| 4  |                  | 0072A.R19 | 16/03/2019 10:45 | 17/03/2019 10:15 | 1410              | 24,7                       | 751,7                     | 0,962 | 1,184                                   | 1670,00                                   | 1653,43                                       | -            | -  |
| 5  |                  | 0076A.R19 | 19/03/2019 11:21 | 20/03/2019 11:21 | 1440              | 24,2                       | 752,8                     | 0,961 | 1,182                                   | 1702,66                                   | 1691,06                                       | -            | -  |
| 6  |                  | 0080A.R19 | 29/03/2019 12:10 | 30/03/2019 12:00 | 1430              | 24,5                       | 752,6                     | 0,963 | 1,186                                   | 1695,62                                   | 1681,93                                       | -            | -  |

#### OBSERVACIONES:

(1) El cálculo de volumen estándar para material particulado, se realizó en base a las condiciones de temperatura estándar (T= 25°C ó 298,15 °K) y presión estándar (760 mmHg ó 1013,25 mBar), establecidas en el Protocolo de Monitoreo de la Calidad del aire y Gestión de los datos de la DIGESA (2005).

(2) El cálculo de volumen estándar para metales en PM<sub>10</sub> se realizó en base a las condiciones de temperatura estándar (T= 25°C ó 298,15 °K) y presión estándar (760 mmHg ó 1013,25 mBar).

(\*) Fuente: Informe de Ensayo N° ABR1066.R19 del laboratorio Certimin S.A.

"-" : No aplica.

**NOMBRE DEL PROYECTO:**

VIGILANCIA AMBIENTAL DE LA CALIDAD DEL AIRE EN EL ÁMBITO DE INFLUENCIA DE LA ZONA INDUSTRIAL DE VENTANILLA-MI PERÚ, UBICADO EN LOS DISTRITOS DE VENTANILLA Y MI PERÚ, PROVINCIA CONSTITUCIONAL DEL CALLAO, DURANTE EL MES DE MARZO 2019

| RESULTADOS DE LABORATORIO        |        |            |            |            |            |            |            |      |
|----------------------------------|--------|------------|------------|------------|------------|------------|------------|------|
| Metal medido en PM <sub>10</sub> | Unidad | CA-VMP-7   |            |            |            |            |            |      |
|                                  |        | 04/03/2019 | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |      |
| Plata                            | Ag     | µg/mtra    | <1         | 1          | <1         | <1         | <1         | 1    |
| Aluminio                         | Al     | µg/mtra    | 1065       | 1471       | 1002       | 1114       | 1083       | 1478 |
| Arsenico                         | As     | µg/mtra    | <9         | <9         | 17         | <9         | <9         | <9   |
| Bario                            | Ba     | µg/mtra    | 22         | 40         | 27         | 28         | 24         | 38   |
| Berilio                          | Be     | µg/mtra    | <1         | <1         | <1         | <1         | <1         | <1   |
| Bismuto                          | Bi     | µg/mtra    | <350       | <350       | <350       | <350       | <350       | <350 |
| Boro                             | B      | µg/mtra    | <10        | <10        | 11         | <10        | 129        | 11   |
| Calcio                           | Ca     | µg/mtra    | 3088       | 5859       | 3865       | 4217       | 3784       | 5328 |
| Cadmio                           | Cd     | µg/mtra    | 2          | 4          | 2          | 3          | 3          | 5    |
| Cobalto                          | Co     | µg/mtra    | <6         | <6         | <6         | <6         | <6         | <6   |
| Cromo                            | Cr     | µg/mtra    | 35         | 31         | 35         | 26         | 49         | 55   |
| Cobre                            | Cu     | µg/mtra    | 88         | 231        | 172        | 108        | 168        | 280  |
| Hierro                           | Fe     | µg/mtra    | 1854       | 2865       | 1915       | 2159       | 2109       | 2907 |
| Potasio                          | K      | µg/mtra    | 588        | 831        | 618        | 782        | 663        | 875  |
| Mercurio                         | Hg     | µg/mtra    | <20        | <20        | <20        | <20        | <20        | <20  |
| Litio                            | Li     | µg/mtra    | <2         | <2         | <2         | <2         | <2         | <2   |
| Magnesio                         | Mg     | µg/mtra    | 1216       | 1886       | 1464       | 1856       | 1575       | 1780 |
| Manganeso                        | Mn     | µg/mtra    | 43         | 79         | 44         | 55         | 55         | 66   |
| Molibdeno                        | Mo     | µg/mtra    | 71         | 102        | 15         | <3         | <3         | 32   |
| Sodio                            | Na     | µg/mtra    | 5752       | 8519       | 7747       | 10346      | 8841       | 8625 |
| Niquel                           | Ni     | µg/mtra    | 26         | 7          | 23         | 17         | 13         | <5   |
| Fosforo                          | P      | µg/mtra    | 193        | 402        | 276        | 274        | 185        | 441  |
| Plomo                            | Pb     | µg/mtra    | 75         | 313        | 218        | 168        | 151        | 521  |
| Antimonio                        | Sb     | µg/mtra    | <9         | <9         | <9         | <9         | <9         | <9   |
| Selenio                          | Se     | µg/mtra    | <55        | <55        | <55        | <55        | <55        | <55  |
| Silicio                          | Si     | µg/mtra    | 2526       | 2568       | 2089       | 2198       | 2330       | 2944 |
| Estaño                           | Sn     | µg/mtra    | 23         | 37         | <15        | <15        | 25         | 25   |
| Estroncio                        | Sr     | µg/mtra    | 14,8       | 25         | 18,6       | 20,6       | 18,5       | 23,3 |
| Titanio                          | Ti     | µg/mtra    | 54         | 58         | 42         | 46         | 49         | 66   |
| Talio                            | Tl     | µg/mtra    | <60        | <60        | <60        | <60        | <60        | <60  |
| Vanadio                          | V      | µg/mtra    | 69,6       | 63,2       | 85,8       | 50,8       | 68,5       | 48,2 |
| Zinc                             | Zn     | µg/mtra    | 168        | 394        | 327        | 225        | 191        | 496  |

<: Debajo del límite de detección

Fuente: Informe de Ensayo N° ABR1066.R19 del laboratorio Certimin S.A.

| CONCENTRACIÓN DE METALES                |        |                   |                |                |                |                |                |          |
|---|--------|-------------------|----------------|----------------|----------------|----------------|----------------|----------|
| Metal medido en PM <sub>10</sub>        | Unidad | CA-VMP-7          |                |                |                |                |                |          |
|   |        | 04/03/2019        | 07/03/2019     | 13/03/2019     | 16/03/2019     | 19/03/2019     | 29/03/2019     |          |
| <b>Volumen estándar (m<sup>3</sup>)</b> |        | <b>1651,85</b>    | <b>1613,56</b> | <b>1615,67</b> | <b>1653,43</b> | <b>1691,06</b> | <b>1681,93</b> |          |
| Plata                                   | Ag     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Aluminio                                | Al     | µg/m <sup>3</sup> | 0,64           | 0,91           | 0,62           | 0,67           | 0,64           | 0,88     |
| Arsenico                                | As     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Bario                                   | Ba     | µg/m <sup>3</sup> | 0,013          | 0,025          | 0,017          | 0,017          | 0,014          | 0,023    |
| Berilio                                 | Be     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Bismuto                                 | Bi     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Boro                                    | B      | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Calcio                                  | Ca     | µg/m <sup>3</sup> | 1,87           | 3,63           | 2,39           | 2,55           | 2,24           | 3,17     |
| Cadmio                                  | Cd     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | 0,002          | N.D.     |
| Cobalto                                 | Co     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Cromo                                   | Cr     | µg/m <sup>3</sup> | 0,021          | 0,019          | 0,022          | 0,016          | 0,029          | 0,033    |
| Cobre                                   | Cu     | µg/m <sup>3</sup> | 0,053          | 0,143          | 0,106          | 0,065          | 0,099          | 0,166    |
| Hierro                                  | Fe     | µg/m <sup>3</sup> | 1,12           | 1,78           | 1,19           | 1,31           | 1,25           | 1,73     |
| Potasio                                 | K      | µg/m <sup>3</sup> | 0,356          | 0,515          | 0,383          | 0,473          | 0,392          | 0,520    |
| Mercurio                                | Hg     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Litio                                   | Li     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Magnesio                                | Mg     | µg/m <sup>3</sup> | 0,74           | 1,17           | 0,91           | 1,12           | 0,93           | 1,06     |
| Manganeso                               | Mn     | µg/m <sup>3</sup> | 0,026          | 0,049          | 0,027          | 0,033          | 0,033          | 0,039    |
| Molibdeno                               | Mo     | µg/m <sup>3</sup> | 0,043          | N.D.           | N.D.           | N.D.           | N.D.           | 0,019    |
| Sodio                                   | Na     | µg/m <sup>3</sup> | 3,48           | 5,28           | 4,79           | 6,26           | 5,23           | 5,13     |
| Niquel                                  | Ni     | µg/m <sup>3</sup> | 0,016          | 0,004          | 0,014          | 0,010          | 0,008          | #iVALOR! |
| Fosforo                                 | P      | µg/m <sup>3</sup> | 0,117          | 0,249          | 0,171          | 0,166          | 0,109          | 0,262    |
| Plomo                                   | Pb     | µg/m <sup>3</sup> | 0,045          | 0,194          | 0,135          | 0,102          | 0,089          | 0,310    |
| Antimonio                               | Sb     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Selenio                                 | Se     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Silicio                                 | Si     | µg/m <sup>3</sup> | 1,53           | 1,59           | 1,29           | 1,33           | 1,38           | 1,75     |
| Estaño                                  | Sn     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Estroncio                               | Sr     | µg/m <sup>3</sup> | 0,009          | 0,015          | 0,012          | 0,012          | 0,011          | 0,014    |
| Titanio                                 | Ti     | µg/m <sup>3</sup> | 0,033          | 0,036          | 0,026          | 0,028          | 0,029          | 0,039    |
| Talio                                   | Tl     | µg/m <sup>3</sup> | N.D.           | N.D.           | N.D.           | N.D.           | N.D.           | N.D.     |
| Vanadio                                 | V      | µg/m <sup>3</sup> | 0,042          | 0,039          | 0,053          | 0,031          | 0,041          | 0,029    |
| Zinc                                    | Zn     | µg/m <sup>3</sup> | 0,102          | 0,244          | 0,202          | 0,136          | 0,113          | 0,295    |

**Observación:** Concentración de metales calculados a T=25 °C ó 298,15 °K

**N.D.:** No detectable

## MONITOREO DE LA CALIDAD DEL AIRE

### HOJA DE CÁLCULO PARA ESTIMAR EL VOLUMEN ESTÁNDAR PARA METALES (10°C)

**ESTACIÓN DE MONITOREO:** CA-VMP-7 **PROCEDENCIA:** CALLAO

**UBICACIÓN:** **ESTE:** 268736 **NORTE:** 8687699 **ZONA:** 18 L **ALTITUD:** 86 **PRECISIÓN GPS:** ± 3

**DESCRIPCIÓN:** Ubicado en la azotea de la vivienda del asentamiento humano - A.H. Virgen de Guadalupe - 2da etapa, Mz. Y Lt. 28, aproximadamente a 80 m del A.H. Las Casuarinas, distrito Mi Perú

**PARÁMETROS:** Metales en PM-10

| N° | Parámetro     | N° Filtro | Fecha Inicio     | Fecha Final      | Periodo (minutos) | Temperatura ambiental (°C) | Presión ambiental (mm Hg) | Po/Pa | Flujo de muestreo (m <sup>3</sup> /min) | Volumen muestreado real (m <sup>3</sup> ) | Volumen muestreado estándar (m <sup>3</sup> ) |
|----|---------------|-----------|------------------|------------------|-------------------|----------------------------|---------------------------|-------|---|---|---|
| 1  | Metales PM 10 | 0033A.R19 | 04/03/2019 16:23 | 05/03/2019 15:53 | 1410              | 26,1                       | 752,1                     | 0,963 | 1,188                                   | 1675,36                                   | 1568,75                                       |
| 2  |               | 0065A.R19 | 07/03/2019 12:35 | 08/03/2019 11:35 | 1380              | 26,1                       | 751,3                     | 0,962 | 1,187                                   | 1638,27                                   | 1532,38                                       |
| 3  |               | 0068A.R19 | 13/03/2019 15:17 | 14/03/2019 14:17 | 1380              | 25,5                       | 751,5                     | 0,962 | 1,186                                   | 1636,68                                   | 1534,38                                       |
| 4  |               | 0072A.R19 | 16/03/2019 10:45 | 17/03/2019 10:15 | 1410              | 24,7                       | 751,7                     | 0,962 | 1,184                                   | 1670,00                                   | 1570,25                                       |
| 5  |               | 0076A.R19 | 19/03/2019 11:21 | 20/03/2019 11:21 | 1440              | 24,2                       | 752,8                     | 0,961 | 1,182                                   | 1702,66                                   | 1605,99                                       |
| 6  |               | 0080A.R19 | 29/03/2019 12:10 | 30/03/2019 12:00 | 1430              | 24,5                       | 752,6                     | 0,963 | 1,186                                   | 1695,62                                   | 1597,31                                       |

#### OBSERVACIONES:

(1) El cálculo de volumen estándar para metales en PM<sub>10</sub>, se realizó en base a las condiciones de temperatura estándar (T= 10°C ó 283.15 °K) y presión estándar (760 mmHg ó 1013,25 mBar).  
 "-" : No aplica.

**NOMBRE DEL PROYECTO:**

VIGILANCIA AMBIENTAL DE LA CALIDAD DEL AIRE EN EL ÁMBITO DE INFLUENCIA DE LA ZONA INDUSTRIAL DE VENTANILLA-MI PERÚ, UBICADO EN LOS DISTRITOS DE VENTANILLA Y MI PERÚ, PROVINCIA CONSTITUCIONAL DEL CALLAO, DURANTE EL MES DE MARZO 2019

| RESULTADOS DE LABORATORIO        |        |            |            |            |            |            |            |      |
|----------------------------------|--------|------------|------------|------------|------------|------------|------------|------|
| Metal medido en PM <sub>10</sub> | Unidad | CA-VMP-7   |            |            |            |            |            |      |
|                                  |        | 04/03/2019 | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |      |
| Plata                            | Ag     | µg/mtra    | <1         | 1          | <1         | <1         | <1         | 1    |
| Aluminio                         | Al     | µg/mtra    | 1065       | 1471       | 1002       | 1114       | 1083       | 1478 |
| Arsenico                         | As     | µg/mtra    | <9         | <9         | 17         | <9         | <9         | <9   |
| Bario                            | Ba     | µg/mtra    | 22         | 40         | 27         | 28         | 24         | 38   |
| Berilio                          | Be     | µg/mtra    | <1         | <1         | <1         | <1         | <1         | <1   |
| Bismuto                          | Bi     | µg/mtra    | <350       | <350       | <350       | <350       | <350       | <350 |
| Boro                             | B      | µg/mtra    | <10        | <10        | 11         | <10        | 129        | 11   |
| Calcio                           | Ca     | µg/mtra    | 3088       | 5859       | 3865       | 4217       | 3784       | 5328 |
| Cadmio                           | Cd     | µg/mtra    | 2          | 4          | 2          | 3          | 3          | 5    |
| Cobalto                          | Co     | µg/mtra    | <6         | <6         | <6         | <6         | <6         | <6   |
| Cromo                            | Cr     | µg/mtra    | 35         | 31         | 35         | 26         | 49         | 55   |
| Cobre                            | Cu     | µg/mtra    | 88         | 231        | 172        | 108        | 168        | 280  |
| Hierro                           | Fe     | µg/mtra    | 1854       | 2865       | 1915       | 2159       | 2109       | 2907 |
| Potasio                          | K      | µg/mtra    | 588        | 831        | 618        | 782        | 663        | 875  |
| Mercurio                         | Hg     | µg/mtra    | <20        | <20        | <20        | <20        | <20        | <20  |
| Litio                            | Li     | µg/mtra    | <2         | <2         | <2         | <2         | <2         | <2   |
| Magnesio                         | Mg     | µg/mtra    | 1216       | 1886       | 1464       | 1856       | 1575       | 1780 |
| Manganeso                        | Mn     | µg/mtra    | 43         | 79         | 44         | 55         | 55         | 66   |
| Molibdeno                        | Mo     | µg/mtra    | 71         | 102        | 15         | <3         | <3         | 32   |
| Sodio                            | Na     | µg/mtra    | 5752       | 8519       | 7747       | 10346      | 8841       | 8625 |
| Niquel                           | Ni     | µg/mtra    | 26         | 7          | 23         | 17         | 13         | <5   |
| Fosforo                          | P      | µg/mtra    | 193        | 402        | 276        | 274        | 185        | 441  |
| Plomo                            | Pb     | µg/mtra    | 75         | 313        | 218        | 168        | 151        | 521  |
| Antimonio                        | Sb     | µg/mtra    | <9         | <9         | <9         | <9         | <9         | <9   |
| Selenio                          | Se     | µg/mtra    | <55        | <55        | <55        | <55        | <55        | <55  |
| Silicio                          | Si     | µg/mtra    | 2526       | 2568       | 2089       | 2198       | 2330       | 2944 |
| Estaño                           | Sn     | µg/mtra    | 23         | 37         | <15        | <15        | 25         | 25   |
| Estroncio                        | Sr     | µg/mtra    | 14,8       | 25         | 18,6       | 20,6       | 18,5       | 23,3 |
| Titanio                          | Ti     | µg/mtra    | 54         | 58         | 42         | 46         | 49         | 66   |
| Talio                            | Tl     | µg/mtra    | <60        | <60        | <60        | <60        | <60        | <60  |
| Vanadio                          | V      | µg/mtra    | 69,6       | 63,2       | 85,8       | 50,8       | 68,5       | 48,2 |
| Zinc                             | Zn     | µg/mtra    | 168        | 394        | 327        | 225        | 191        | 496  |

&lt;: Debajo del límite de detección

Fuente: Informe de Ensayo N° ABR1066.R19 del laboratorio Certimin S.A.

| CONCENTRACIÓN DE METALES           |        |                   |            |            |            |            |            |       |
|------------------------------------|--------|-------------------|------------|------------|------------|------------|------------|-------|
| Metal medido en PM <sub>10</sub>   | Unidad | CA-VMP-7          |            |            |            |            |            |       |
|                                    |        | 04/03/2019        | 07/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |       |
| Volumen estándar (m <sup>3</sup> ) |        | 1568,75           | 1532,38    | 1534,38    | 1570,25    | 1605,99    | 1597,31    |       |
| Plata                              | Ag     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Aluminio                           | Al     | µg/m <sup>3</sup> | 0,68       | 0,96       | 0,65       | 0,71       | 0,67       | 0,93  |
| Arsenico                           | As     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Bario                              | Ba     | µg/m <sup>3</sup> | 0,014      | 0,026      | 0,018      | 0,018      | 0,015      | 0,024 |
| Berilio                            | Be     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Bismuto                            | Bi     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Boro                               | B      | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Calcio                             | Ca     | µg/m <sup>3</sup> | 1,97       | 3,82       | 2,52       | 2,69       | 2,36       | 3,34  |
| Cadmio                             | Cd     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | 0,002      | N.D.  |
| Cobalto                            | Co     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Cromo                              | Cr     | µg/m <sup>3</sup> | 0,022      | 0,020      | 0,023      | 0,017      | 0,031      | 0,034 |
| Cobre                              | Cu     | µg/m <sup>3</sup> | 0,056      | 0,151      | 0,112      | 0,069      | 0,105      | 0,175 |
| Hierro                             | Fe     | µg/m <sup>3</sup> | 1,18       | 1,87       | 1,25       | 1,37       | 1,31       | 1,82  |
| Potasio                            | K      | µg/m <sup>3</sup> | 0,375      | 0,542      | 0,403      | 0,498      | 0,413      | 0,548 |
| Mercurio                           | Hg     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Litio                              | Li     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Magnesio                           | Mg     | µg/m <sup>3</sup> | 0,78       | 1,23       | 0,95       | 1,18       | 0,98       | 1,11  |
| Manganeso                          | Mn     | µg/m <sup>3</sup> | 0,027      | 0,052      | 0,029      | 0,035      | 0,034      | 0,041 |
| Molibdeno                          | Mo     | µg/m <sup>3</sup> | 0,045      | N.D.       | N.D.       | N.D.       | N.D.       | 0,020 |
| Sodio                              | Na     | µg/m <sup>3</sup> | 3,67       | 5,56       | 5,05       | 6,59       | 5,51       | 5,40  |
| Niquel                             | Ni     | µg/m <sup>3</sup> | 0,017      | 0,005      | 0,015      | 0,011      | 0,008      | N.D.  |
| Fosforo                            | P      | µg/m <sup>3</sup> | 0,123      | 0,262      | 0,180      | 0,174      | 0,115      | 0,276 |
| Plomo                              | Pb     | µg/m <sup>3</sup> | 0,048      | 0,204      | 0,142      | 0,107      | 0,094      | 0,326 |
| Antimonio                          | Sb     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Selenio                            | Se     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Silicio                            | Si     | µg/m <sup>3</sup> | 1,61       | 1,68       | 1,36       | 1,40       | 1,45       | 1,84  |
| Estaño                             | Sn     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Estroncio                          | Sr     | µg/m <sup>3</sup> | 0,009      | 0,016      | 0,012      | 0,013      | 0,012      | 0,015 |
| Titanio                            | Ti     | µg/m <sup>3</sup> | 0,034      | 0,038      | 0,027      | 0,029      | 0,031      | 0,041 |
| Talio                              | Tl     | µg/m <sup>3</sup> | N.D.       | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Vanadio                            | V      | µg/m <sup>3</sup> | 0,044      | 0,041      | 0,056      | 0,032      | 0,043      | 0,030 |
| Zinc                               | Zn     | µg/m <sup>3</sup> | 0,107      | 0,257      | 0,213      | 0,143      | 0,119      | 0,311 |

**Observación:** Concentración de metales calculados a T=10 °C ó 283,15 °K

N.D.: No detectable

date  
01/03/2019 00:00  
01/03/2019 01:00  
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03/03/2019 21:00  
03/03/2019 22:00

| Fecha  | Horas | SO2_ugm3 | ECA SO2 - 24 horas (250 µg/m <sup>3</sup> ) |
|--------|-------|----------|---|
| 01-Mar | 00:00 | 65,8     | 250   |
|        | 01:00 | 16,8     | 250   |
|        | 02:00 | 12,3     | 250   |
|        | 03:00 | 103,5    | 250   |
|        | 04:00 | 69,2     | 250   |
|        | 05:00 | 29,1     | 250   |
|        | 06:00 | 118,9    | 250   |
|        | 07:00 | 61,0     | 250   |
|        | 08:00 | 27,0     | 250   |
|        | 09:00 | 113,2    | 250   |
|        | 10:00 | 20,2     | 250   |
|        | 11:00 | 9,2      | 250   |
|        | 12:00 | 8,6      | 250   |
|        | 13:00 | 8,1      | 250   |
|        | 14:00 | 8,6      | 250   |
|        | 15:00 | 9,7      | 250   |
|        | 16:00 | 8,6      | 250   |
|        | 17:00 | 9,2      | 250   |
|        | 18:00 | 10,5     | 250   |
|        | 19:00 | 9,2      | 250   |
|        | 20:00 | 9,7      | 250   |
|        | 21:00 | 15,2     | 250   |
|        | 22:00 | 9,7      | 250   |
|        | 23:00 | 10,0     | 250   |
| 02-Mar | 00:00 | 17,8     | 250   |
|        | 01:00 | 9,7      | 250   |
|        | 02:00 | 12,1     | 250   |
|        | 03:00 | 16,5     | 250   |
|        | 04:00 | 13,6     | 250   |
|        | 05:00 | 10,2     | 250   |
|        | 06:00 | 10,7     | 250   |
|        | 07:00 | 35,1     | 250   |
|        | 08:00 | 36,7     | 250   |
|        | 09:00 | 11,0     | 250   |
|        | 10:00 | 7,3      | 250   |
|        | 11:00 | 9,7      | 250   |
|        | 12:00 | 4,7      | 250   |
|        | 13:00 | 3,1      | 250   |
|        | 14:00 | 3,7      | 250   |
|        | 15:00 | 46,4     | 250   |
|        | 16:00 | 13,6     | 250   |
|        | 17:00 | 13,9     | 250   |
|        | 18:00 | 287,4    | 250   |
|        | 19:00 | 86,2     | 250   |
|        | 20:00 | 9,7      | 250   |
|        | 21:00 | 318,9    | 250   |
|        | 22:00 | 62,4     | 250   |
|        | 23:00 | 22,0     | 250   |
| 03-Mar | 00:00 | 9,7      | 250   |
|        | 01:00 | 6,8      | 250   |
|        | 02:00 | 13,1     | 250   |
|        | 03:00 | 31,2     | 250   |
|        | 04:00 | 11,5     | 250   |
|        | 05:00 | 10,5     | 250   |
|        | 06:00 | 25,7     | 250   |
|        | 07:00 | 12,6     | 250   |
|        | 08:00 | 9,7      | 250   |
|        | 09:00 | 13,4     | 250   |
|        | 10:00 | 6,0      | 250   |
|        | 11:00 | 5,0      | 250   |
|        | 12:00 | 6,6      | 250   |
|        | 13:00 | 5,0      | 250   |
|        | 14:00 | 5,5      | 250   |
|        | 15:00 | 5,5      | 250   |
|        | 16:00 | 6,3      | 250   |
|        | 17:00 | 8,4      | 250   |
|        | 18:00 | 8,9      | 250   |
|        | 19:00 | 8,6      | 250   |
|        | 20:00 | 7,3      | 250   |
|        | 21:00 | 7,1      | 250   |
|        | 22:00 | 8,6      | 250   |

|                  |        |       |       |     |
|------------------|--------|-------|-------|-----|
| 03/03/2019 23:00 |        | 23:00 | 8,1   | 250 |
| 04/03/2019 00:00 | 04-Mar | 00:00 | 7,1   | 250 |
| 04/03/2019 01:00 |        | 01:00 | 8,6   | 250 |
| 04/03/2019 02:00 |        | 02:00 | 42,2  | 250 |
| 04/03/2019 03:00 |        | 03:00 | 24,6  | 250 |
| 04/03/2019 04:00 |        | 04:00 | 9,7   | 250 |
| 04/03/2019 05:00 |        | 05:00 | 10,2  | 250 |
| 04/03/2019 06:00 |        | 06:00 | 9,2   | 250 |
| 04/03/2019 07:00 |        | 07:00 | 9,4   | 250 |
| 04/03/2019 08:00 |        | 08:00 | 9,7   | 250 |
| 04/03/2019 09:00 |        | 09:00 | 49,8  | 250 |
| 04/03/2019 10:00 |        | 10:00 | 8,9   | 250 |
| 04/03/2019 11:00 |        | 11:00 | 7,3   | 250 |
| 04/03/2019 12:00 |        | 12:00 | 6,8   | 250 |
| 04/03/2019 13:00 |        | 13:00 | 6,8   | 250 |
| 04/03/2019 14:00 |        | 14:00 | 6,6   | 250 |
| 04/03/2019 15:00 |        | 15:00 | 6,0   | 250 |
| 04/03/2019 16:00 |        | 16:00 | 7,3   | 250 |
| 04/03/2019 17:00 |        | 17:00 | 6,3   | 250 |
| 04/03/2019 18:00 |        | 18:00 | 5,8   | 250 |
| 04/03/2019 19:00 |        | 19:00 | 5,2   | 250 |
| 04/03/2019 20:00 |        | 20:00 | 8,1   | 250 |
| 04/03/2019 21:00 |        | 21:00 | 23,8  | 250 |
| 04/03/2019 22:00 |        | 22:00 | 10,0  | 250 |
| 04/03/2019 23:00 | 23:00  | 8,6   | 250   |     |
| 05/03/2019 00:00 | 05-Mar | 00:00 | 6,8   | 250 |
| 05/03/2019 01:00 |        | 01:00 | 6,8   | 250 |
| 05/03/2019 02:00 |        | 02:00 | 4,5   | 250 |
| 05/03/2019 03:00 |        | 03:00 | 15,5  | 250 |
| 05/03/2019 04:00 |        | 04:00 | 22,3  | 250 |
| 05/03/2019 05:00 |        | 05:00 | 21,7  | 250 |
| 05/03/2019 06:00 |        | 06:00 | 19,1  | 250 |
| 05/03/2019 07:00 |        | 07:00 | 51,1  | 250 |
| 05/03/2019 08:00 |        | 08:00 | 119,2 | 250 |
| 05/03/2019 09:00 |        | 09:00 | 82,0  | 250 |
| 05/03/2019 10:00 |        | 10:00 | 32,5  | 250 |
| 05/03/2019 11:00 |        | 11:00 | 13,4  | 250 |
| 05/03/2019 12:00 |        | 12:00 | 10,0  | 250 |
| 05/03/2019 13:00 |        | 13:00 | 8,4   | 250 |
| 05/03/2019 14:00 |        | 14:00 | 7,3   | 250 |
| 05/03/2019 15:00 |        | 15:00 | 6,8   | 250 |
| 05/03/2019 16:00 |        | 16:00 | 7,1   | 250 |
| 05/03/2019 17:00 |        | 17:00 | 9,2   | 250 |
| 05/03/2019 18:00 |        | 18:00 | 9,7   | 250 |
| 05/03/2019 19:00 |        | 19:00 | 9,4   | 250 |
| 05/03/2019 20:00 |        | 20:00 | 9,4   | 250 |
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| 05/03/2019 22:00 |        | 22:00 | 8,9   | 250 |
| 05/03/2019 23:00 | 23:00  | 9,2   | 250   |     |
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| 06/03/2019 05:00 |        | 05:00 | 13,6  | 250 |
| 06/03/2019 06:00 |        | 06:00 | 11,5  | 250 |
| 06/03/2019 07:00 |        | 07:00 | 10,0  | 250 |
| 06/03/2019 08:00 |        | 08:00 | 16,5  | 250 |
| 06/03/2019 09:00 |        | 09:00 | 44,5  | 250 |
| 06/03/2019 10:00 |        | 10:00 | 82,8  | 250 |
| 06/03/2019 11:00 |        | 11:00 | 31,7  | 250 |
| 06/03/2019 12:00 |        | 12:00 | 17,3  | 250 |
| 06/03/2019 13:00 |        | 13:00 | 10,2  | 250 |
| 06/03/2019 14:00 |        | 14:00 | 8,9   | 250 |
| 06/03/2019 15:00 |        | 15:00 | 9,4   | 250 |
| 06/03/2019 16:00 |        | 16:00 | 7,9   | 250 |
| 06/03/2019 17:00 |        | 17:00 | 7,3   | 250 |
| 06/03/2019 18:00 |        | 18:00 | 6,6   | 250 |
| 06/03/2019 19:00 |        | 19:00 | 8,6   | 250 |
| 06/03/2019 20:00 |        | 20:00 | 12,3  | 250 |
| 06/03/2019 21:00 |        | 21:00 | 14,4  | 250 |
| 06/03/2019 22:00 |        | 22:00 | 13,4  | 250 |
| 06/03/2019 23:00 | 23:00  | 26,2  | 250   |     |

|                  |        |       |       |     |
|------------------|--------|-------|-------|-----|
| 07/03/2019 00:00 | 07-Mar | 00:00 | 63,7  | 250 |
| 07/03/2019 01:00 |        | 01:00 | 19,1  | 250 |
| 07/03/2019 02:00 |        | 02:00 | 30,4  | 250 |
| 07/03/2019 03:00 |        | 03:00 | 181,6 | 250 |
| 07/03/2019 04:00 |        | 04:00 | 79,9  | 250 |
| 07/03/2019 05:00 |        | 05:00 | 28,3  | 250 |
| 07/03/2019 06:00 |        | 06:00 | 120,5 | 250 |
| 07/03/2019 07:00 |        | 07:00 | 24,4  | 250 |
| 07/03/2019 08:00 |        | 08:00 | 65,5  | 250 |
| 07/03/2019 09:00 |        | 09:00 | 31,7  | 250 |
| 07/03/2019 10:00 |        | 10:00 | 20,4  | 250 |
| 07/03/2019 11:00 |        | 11:00 | 20,4  | 250 |
| 07/03/2019 12:00 |        | 12:00 | 17,8  | 250 |
| 07/03/2019 13:00 |        | 13:00 | 12,8  | 250 |
| 07/03/2019 14:00 |        | 14:00 | 10,0  | 250 |
| 07/03/2019 15:00 |        | 15:00 | 7,9   | 250 |
| 07/03/2019 16:00 |        | 16:00 | 9,4   | 250 |
| 07/03/2019 17:00 |        | 17:00 | 17,6  | 250 |
| 07/03/2019 18:00 |        | 18:00 | 38,0  | 250 |
| 07/03/2019 19:00 |        | 19:00 | 11,5  | 250 |
| 07/03/2019 20:00 |        | 20:00 | 10,0  | 250 |
| 07/03/2019 21:00 |        | 21:00 | 10,5  | 250 |
| 07/03/2019 22:00 |        | 22:00 | 7,6   | 250 |
| 07/03/2019 23:00 |        | 23:00 | 49,0  | 250 |
| 08/03/2019 00:00 | 08-Mar | 00:00 | 77,3  | 250 |
| 08/03/2019 01:00 |        | 01:00 | 23,8  | 250 |
| 08/03/2019 02:00 |        | 02:00 | 23,3  | 250 |
| 08/03/2019 03:00 |        | 03:00 | 6,8   | 250 |
| 08/03/2019 04:00 |        | 04:00 | 10,5  | 250 |
| 08/03/2019 05:00 |        | 05:00 | 40,3  | 250 |
| 08/03/2019 06:00 |        | 06:00 | 46,4  | 250 |
| 08/03/2019 07:00 |        | 07:00 | 18,9  | 250 |
| 08/03/2019 08:00 |        | 08:00 | 47,7  | 250 |
| 08/03/2019 09:00 |        | 09:00 | 80,2  | 250 |
| 08/03/2019 10:00 |        | 10:00 | 32,5  | 250 |
| 08/03/2019 11:00 |        | 11:00 | 21,2  | 250 |
| 08/03/2019 12:00 |        | 12:00 | 11,3  | 250 |
| 08/03/2019 13:00 |        | 13:00 | 11,5  | 250 |
| 08/03/2019 14:00 |        | 14:00 | 6,3   | 250 |
| 08/03/2019 15:00 |        | 15:00 | 6,6   | 250 |
| 08/03/2019 16:00 |        | 16:00 | 7,3   | 250 |
| 08/03/2019 17:00 |        | 17:00 | 7,9   | 250 |
| 08/03/2019 18:00 |        | 18:00 | 8,6   | 250 |
| 08/03/2019 19:00 |        | 19:00 | 4,2   | 250 |
| 08/03/2019 20:00 |        | 20:00 | 5,2   | 250 |
| 08/03/2019 21:00 |        | 21:00 | 8,6   | 250 |
| 08/03/2019 22:00 |        | 22:00 | 8,6   | 250 |
| 08/03/2019 23:00 |        | 23:00 | 111,6 | 250 |
| 09/03/2019 00:00 | 09-Mar | 00:00 | 6,6   | 250 |
| 09/03/2019 01:00 |        | 01:00 | 7,6   | 250 |
| 09/03/2019 02:00 |        | 02:00 | 114,0 | 250 |
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| 09/03/2019 04:00 |        | 04:00 | 7,1   | 250 |
| 09/03/2019 05:00 |        | 05:00 | 183,1 | 250 |
| 09/03/2019 06:00 |        | 06:00 | 137,0 | 250 |
| 09/03/2019 07:00 |        | 07:00 | 137,3 | 250 |
| 09/03/2019 08:00 |        | 08:00 | 103,2 | 250 |
| 09/03/2019 09:00 |        | 09:00 | 96,9  | 250 |
| 09/03/2019 10:00 |        | 10:00 | 17,0  | 250 |
| 09/03/2019 11:00 |        | 11:00 | 7,3   | 250 |
| 09/03/2019 12:00 |        | 12:00 | 5,0   | 250 |
| 09/03/2019 13:00 |        | 13:00 | 5,8   | 250 |
| 09/03/2019 14:00 |        | 14:00 | 2,9   | 250 |
| 09/03/2019 15:00 |        | 15:00 | 4,5   | 250 |
| 09/03/2019 16:00 |        | 16:00 | 4,5   | 250 |
| 09/03/2019 17:00 |        | 17:00 | 4,5   | 250 |
| 09/03/2019 18:00 |        | 18:00 | 16,8  | 250 |
| 09/03/2019 19:00 |        | 19:00 | 6,0   | 250 |
| 09/03/2019 20:00 |        | 20:00 | 5,2   | 250 |
| 09/03/2019 21:00 |        | 21:00 | 83,3  | 250 |
| 09/03/2019 22:00 |        | 22:00 | 97,7  | 250 |
| 09/03/2019 23:00 |        | 23:00 | 111,9 | 250 |
| 10/03/2019 00:00 |        | 00:00 | 115,8 | 250 |

|                  |        |       |       |     |
|------------------|--------|-------|-------|-----|
| 10/03/2019 01:00 |        | 01:00 | 9,2   | 250 |
| 10/03/2019 02:00 |        | 02:00 | 44,0  | 250 |
| 10/03/2019 03:00 |        | 03:00 | 22,8  | 250 |
| 10/03/2019 04:00 |        | 04:00 | 46,9  | 250 |
| 10/03/2019 05:00 |        | 05:00 | 14,4  | 250 |
| 10/03/2019 06:00 |        | 06:00 | 149,6 | 250 |
| 10/03/2019 07:00 |        | 07:00 | 56,3  | 250 |
| 10/03/2019 08:00 |        | 08:00 | 97,7  | 250 |
| 10/03/2019 09:00 |        | 09:00 | 30,4  | 250 |
| 10/03/2019 10:00 |        | 10:00 | 15,2  | 250 |
| 10/03/2019 11:00 |        | 11:00 | 11,0  | 250 |
| 10/03/2019 12:00 | 10-Mar | 12:00 | 7,3   | 250 |
| 10/03/2019 13:00 |        | 13:00 | 7,9   | 250 |
| 10/03/2019 14:00 |        | 14:00 | 7,1   | 250 |
| 10/03/2019 15:00 |        | 15:00 | 5,8   | 250 |
| 10/03/2019 16:00 |        | 16:00 | 6,8   | 250 |
| 10/03/2019 17:00 |        | 17:00 | 8,4   | 250 |
| 10/03/2019 18:00 |        | 18:00 | 8,1   | 250 |
| 10/03/2019 19:00 |        | 19:00 | 7,9   | 250 |
| 10/03/2019 20:00 |        | 20:00 | 17,0  | 250 |
| 10/03/2019 21:00 |        | 21:00 | 8,1   | 250 |
| 10/03/2019 22:00 |        | 22:00 | 203,6 | 250 |
| 10/03/2019 23:00 |        | 23:00 | 9,2   | 250 |
| 11/03/2019 00:00 |        | 00:00 | 11,0  | 250 |
| 11/03/2019 01:00 |        | 01:00 | 37,5  | 250 |
| 11/03/2019 02:00 |        | 02:00 | 127,3 | 250 |
| 11/03/2019 03:00 |        | 03:00 | 20,2  | 250 |
| 11/03/2019 04:00 |        | 04:00 | 53,7  | 250 |
| 11/03/2019 05:00 |        | 05:00 | 25,7  | 250 |
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| 11/03/2019 07:00 |        | 07:00 | 39,8  | 250 |
| 11/03/2019 08:00 |        | 08:00 | 74,7  | 250 |
| 11/03/2019 09:00 |        | 09:00 | 32,2  | 250 |
| 11/03/2019 10:00 |        | 10:00 | 21,2  | 250 |
| 11/03/2019 11:00 |        | 11:00 | 10,5  | 250 |
| 11/03/2019 12:00 | 11-Mar | 12:00 | 7,6   | 250 |
| 11/03/2019 13:00 |        | 13:00 | 7,3   | 250 |
| 11/03/2019 14:00 |        | 14:00 | 6,3   | 250 |
| 11/03/2019 15:00 |        | 15:00 | 5,8   | 250 |
| 11/03/2019 16:00 |        | 16:00 | 6,0   | 250 |
| 11/03/2019 17:00 |        | 17:00 | 7,9   | 250 |
| 11/03/2019 18:00 |        | 18:00 | 8,4   | 250 |
| 11/03/2019 19:00 |        | 19:00 | 6,8   | 250 |
| 11/03/2019 20:00 |        | 20:00 | 7,6   | 250 |
| 11/03/2019 21:00 |        | 21:00 | 10,2  | 250 |
| 11/03/2019 22:00 |        | 22:00 | 9,4   | 250 |
| 11/03/2019 23:00 |        | 23:00 | 61,0  | 250 |
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| 12/03/2019 01:00 |        | 01:00 | 17,8  | 250 |
| 12/03/2019 02:00 |        | 02:00 | 15,5  | 250 |
| 12/03/2019 03:00 |        | 03:00 | 25,4  | 250 |
| 12/03/2019 04:00 |        | 04:00 | 13,9  | 250 |
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| 12/03/2019 06:00 |        | 06:00 | 11,3  | 250 |
| 12/03/2019 07:00 |        | 07:00 | 15,7  | 250 |
| 12/03/2019 08:00 |        | 08:00 | 14,4  | 250 |
| 12/03/2019 09:00 |        | 09:00 | 93,5  | 250 |
| 12/03/2019 10:00 |        | 10:00 | 29,9  | 250 |
| 12/03/2019 11:00 |        | 11:00 | 9,7   | 250 |
| 12/03/2019 12:00 | 12-Mar | 12:00 | 8,6   | 250 |
| 12/03/2019 13:00 |        | 13:00 | 9,4   | 250 |
| 12/03/2019 14:00 |        | 14:00 | 7,6   | 250 |
| 12/03/2019 15:00 |        | 15:00 | 7,6   | 250 |
| 12/03/2019 16:00 |        | 16:00 | 8,1   | 250 |
| 12/03/2019 17:00 |        | 17:00 | 8,4   | 250 |
| 12/03/2019 18:00 |        | 18:00 | 8,4   | 250 |
| 12/03/2019 19:00 |        | 19:00 | 7,1   | 250 |
| 12/03/2019 20:00 |        | 20:00 | 8,4   | 250 |
| 12/03/2019 21:00 |        | 21:00 | 9,4   | 250 |
| 12/03/2019 22:00 |        | 22:00 | 22,3  | 250 |
| 12/03/2019 23:00 |        | 23:00 | 10,7  | 250 |
| 13/03/2019 00:00 |        | 00:00 | 10,5  | 250 |
| 13/03/2019 01:00 |        | 01:00 | 10,7  | 250 |

|                  |        |       |       |     |
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| 13/03/2019 02:00 |        | 02:00 | 12,6  | 250 |
| 13/03/2019 03:00 |        | 03:00 | 18,3  | 250 |
| 13/03/2019 04:00 |        | 04:00 | 20,4  | 250 |
| 13/03/2019 05:00 |        | 05:00 | 13,4  | 250 |
| 13/03/2019 06:00 |        | 06:00 | 12,6  | 250 |
| 13/03/2019 07:00 |        | 07:00 | 17,8  | 250 |
| 13/03/2019 08:00 |        | 08:00 | 92,0  | 250 |
| 13/03/2019 09:00 |        | 09:00 | 106,1 | 250 |
| 13/03/2019 10:00 |        | 10:00 | 9,7   | 250 |
| 13/03/2019 11:00 | 13-Mar | 11:00 | 8,6   | 250 |
| 13/03/2019 12:00 |        | 12:00 | 10,7  | 250 |
| 13/03/2019 13:00 |        | 13:00 | 6,6   | 250 |
| 13/03/2019 14:00 |        | 14:00 | 6,8   | 250 |
| 13/03/2019 15:00 |        | 15:00 | 7,6   | 250 |
| 13/03/2019 16:00 |        | 16:00 | 7,6   | 250 |
| 13/03/2019 17:00 |        | 17:00 | 8,9   | 250 |
| 13/03/2019 18:00 |        | 18:00 | 9,4   | 250 |
| 13/03/2019 19:00 |        | 19:00 | 8,1   | 250 |
| 13/03/2019 20:00 |        | 20:00 | 8,9   | 250 |
| 13/03/2019 21:00 |        | 21:00 | 8,6   | 250 |
| 13/03/2019 22:00 |        | 22:00 | 8,1   | 250 |
| 13/03/2019 23:00 |        | 23:00 | 7,3   | 250 |
| 14/03/2019 00:00 | 14-Mar | 00:00 | 6,6   | 250 |
| 14/03/2019 01:00 |        | 01:00 | 8,1   | 250 |
| 14/03/2019 02:00 |        | 02:00 | 16,5  | 250 |
| 14/03/2019 03:00 |        | 03:00 | 54,0  | 250 |
| 14/03/2019 04:00 |        | 04:00 | 12,3  | 250 |
| 14/03/2019 05:00 |        | 05:00 | 10,7  | 250 |
| 14/03/2019 06:00 |        | 06:00 | 10,7  | 250 |
| 14/03/2019 07:00 |        | 07:00 | 7,9   | 250 |
| 14/03/2019 08:00 |        | 08:00 | 12,1  | 250 |
| 14/03/2019 09:00 |        | 09:00 | 13,4  | 250 |
| 14/03/2019 10:00 |        | 10:00 | 12,3  | 250 |
| 14/03/2019 11:00 |        | 11:00 | 11,0  | 250 |
| 14/03/2019 12:00 |        | 12:00 | 10,5  | 250 |
| 14/03/2019 13:00 |        | 13:00 | 8,9   | 250 |
| 14/03/2019 14:00 |        | 14:00 | 7,6   | 250 |
| 14/03/2019 15:00 |        | 15:00 | 6,8   | 250 |
| 14/03/2019 16:00 |        | 16:00 | 7,3   | 250 |
| 14/03/2019 17:00 |        | 17:00 | 6,6   | 250 |
| 14/03/2019 18:00 |        | 18:00 | 6,0   | 250 |
| 14/03/2019 19:00 |        | 19:00 | 7,1   | 250 |
| 14/03/2019 20:00 |        | 20:00 | 8,1   | 250 |
| 14/03/2019 21:00 |        | 21:00 | 8,9   | 250 |
| 14/03/2019 22:00 |        | 22:00 | 8,1   | 250 |
| 14/03/2019 23:00 | 23:00  | 8,1   | 250   |     |
| 15/03/2019 00:00 | 15-Mar | 00:00 | 7,9   | 250 |
| 15/03/2019 01:00 |        | 01:00 | 8,1   | 250 |
| 15/03/2019 02:00 |        | 02:00 | 7,1   | 250 |
| 15/03/2019 03:00 |        | 03:00 | 8,9   | 250 |
| 15/03/2019 04:00 |        | 04:00 | 9,7   | 250 |
| 15/03/2019 05:00 |        | 05:00 | 22,0  | 250 |
| 15/03/2019 06:00 |        | 06:00 | 43,5  | 250 |
| 15/03/2019 07:00 |        | 07:00 | 18,9  | 250 |
| 15/03/2019 08:00 |        | 08:00 | 12,3  | 250 |
| 15/03/2019 09:00 |        | 09:00 | 9,2   | 250 |
| 15/03/2019 10:00 |        | 10:00 | 6,8   | 250 |
| 15/03/2019 11:00 |        | 11:00 | 7,1   | 250 |
| 15/03/2019 12:00 |        | 12:00 | 6,8   | 250 |
| 15/03/2019 13:00 |        | 13:00 | 7,1   | 250 |
| 15/03/2019 14:00 |        | 14:00 | 7,1   | 250 |
| 15/03/2019 15:00 |        | 15:00 | 6,8   | 250 |
| 15/03/2019 16:00 |        | 16:00 | 6,8   | 250 |
| 15/03/2019 17:00 |        | 17:00 | 7,6   | 250 |
| 15/03/2019 18:00 |        | 18:00 | 8,6   | 250 |
| 15/03/2019 19:00 |        | 19:00 | 8,1   | 250 |
| 15/03/2019 20:00 |        | 20:00 | 15,2  | 250 |
| 15/03/2019 21:00 |        | 21:00 | 61,6  | 250 |
| 15/03/2019 22:00 |        | 22:00 | 19,7  | 250 |
| 15/03/2019 23:00 | 23:00  | 8,6   | 250   |     |
| 16/03/2019 00:00 | 16-Mar | 00:00 | 74,4  | 250 |
| 16/03/2019 01:00 |        | 01:00 | 20,4  | 250 |
| 16/03/2019 02:00 |        | 02:00 | 19,4  | 250 |

|                  |        |        |       |      |     |
|------------------|--------|--------|-------|------|-----|
| 16/03/2019 03:00 | 16-Mar | 03:00  | 35,9  | 250  |     |
| 16/03/2019 04:00 |        | 04:00  | 22,3  | 250  |     |
| 16/03/2019 05:00 |        | 05:00  | 8,4   | 250  |     |
| 16/03/2019 06:00 |        | 06:00  | 40,6  | 250  |     |
| 16/03/2019 07:00 |        | 07:00  | 20,2  | 250  |     |
| 16/03/2019 08:00 |        | 08:00  | 12,6  | 250  |     |
| 16/03/2019 09:00 |        | 09:00  | 11,0  | 250  |     |
| 16/03/2019 10:00 |        | 10:00  | 11,3  | 250  |     |
| 16/03/2019 11:00 |        | 11:00  | 11,0  | 250  |     |
| 16/03/2019 12:00 |        | 12:00  | 9,2   | 250  |     |
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| 16/03/2019 14:00 |        | 14:00  | 8,4   | 250  |     |
| 16/03/2019 15:00 |        | 15:00  | 9,4   | 250  |     |
| 16/03/2019 16:00 |        | 16:00  | 9,7   | 250  |     |
| 16/03/2019 17:00 |        | 17:00  | 10,2  | 250  |     |
| 16/03/2019 18:00 |        | 18:00  | 8,6   | 250  |     |
| 16/03/2019 19:00 |        | 19:00  | 8,6   | 250  |     |
| 16/03/2019 20:00 |        | 20:00  | 8,1   | 250  |     |
| 16/03/2019 21:00 |        | 21:00  | 7,9   | 250  |     |
| 16/03/2019 22:00 |        | 22:00  | 7,9   | 250  |     |
| 16/03/2019 23:00 |        | 23:00  | 6,6   | 250  |     |
| 17/03/2019 00:00 |        | 17-Mar | 00:00 | 96,9 | 250 |
| 17/03/2019 01:00 |        |        | 01:00 | 10,7 | 250 |
| 17/03/2019 02:00 | 02:00  |        | 8,6   | 250  |     |
| 17/03/2019 03:00 | 03:00  |        | 80,7  | 250  |     |
| 17/03/2019 04:00 | 04:00  |        | 13,9  | 250  |     |
| 17/03/2019 05:00 | 05:00  |        | 7,9   | 250  |     |
| 17/03/2019 06:00 | 06:00  |        | 8,4   | 250  |     |
| 17/03/2019 07:00 | 07:00  |        | 8,9   | 250  |     |
| 17/03/2019 08:00 | 08:00  |        | 7,6   | 250  |     |
| 17/03/2019 09:00 | 09:00  |        | 7,3   | 250  |     |
| 17/03/2019 10:00 | 10:00  |        | 5,5   | 250  |     |
| 17/03/2019 11:00 | 11:00  |        | 5,5   | 250  |     |
| 17/03/2019 12:00 | 12:00  |        | 6,3   | 250  |     |
| 17/03/2019 13:00 | 13:00  |        | 6,0   | 250  |     |
| 17/03/2019 14:00 | 14:00  |        | 6,6   | 250  |     |
| 17/03/2019 15:00 | 15:00  |        | 5,8   | 250  |     |
| 17/03/2019 16:00 | 16:00  |        | 5,2   | 250  |     |
| 17/03/2019 17:00 | 17:00  |        | 7,3   | 250  |     |
| 17/03/2019 18:00 | 18:00  |        | 7,6   | 250  |     |
| 17/03/2019 19:00 | 19:00  |        | 6,8   | 250  |     |
| 17/03/2019 20:00 | 20:00  |        | 5,5   | 250  |     |
| 17/03/2019 21:00 | 21:00  |        | 6,8   | 250  |     |
| 17/03/2019 22:00 | 22:00  |        | 4,5   | 250  |     |
| 17/03/2019 23:00 | 23:00  | 5,2    | 250   |      |     |
| 18/03/2019 00:00 | 18-Mar | 00:00  | 7,1   | 250  |     |
| 18/03/2019 01:00 |        | 01:00  | 6,6   | 250  |     |
| 18/03/2019 02:00 |        | 02:00  | 5,5   | 250  |     |
| 18/03/2019 03:00 |        | 03:00  | 6,0   | 250  |     |
| 18/03/2019 04:00 |        | 04:00  | 11,0  | 250  |     |
| 18/03/2019 05:00 |        | 05:00  | 10,0  | 250  |     |
| 18/03/2019 06:00 |        | 06:00  | 5,5   | 250  |     |
| 18/03/2019 07:00 |        | 07:00  | 7,3   | 250  |     |
| 18/03/2019 08:00 |        | 08:00  | 8,1   | 250  |     |
| 18/03/2019 09:00 |        | 09:00  | 8,1   | 250  |     |
| 18/03/2019 10:00 |        | 10:00  | 5,8   | 250  |     |
| 18/03/2019 11:00 |        | 11:00  | 6,8   | 250  |     |
| 18/03/2019 12:00 |        | 12:00  | 6,3   | 250  |     |
| 18/03/2019 13:00 |        | 13:00  | 7,9   | 250  |     |
| 18/03/2019 14:00 |        | 14:00  | 7,3   | 250  |     |
| 18/03/2019 15:00 |        | 15:00  | 6,3   | 250  |     |
| 18/03/2019 16:00 |        | 16:00  | 7,1   | 250  |     |
| 18/03/2019 17:00 |        | 17:00  | 8,9   | 250  |     |
| 18/03/2019 18:00 |        | 18:00  | 8,4   | 250  |     |
| 18/03/2019 19:00 |        | 19:00  | 6,3   | 250  |     |
| 18/03/2019 20:00 |        | 20:00  | 7,9   | 250  |     |
| 18/03/2019 21:00 |        | 21:00  | 8,6   | 250  |     |
| 18/03/2019 22:00 |        | 22:00  | 5,5   | 250  |     |
| 18/03/2019 23:00 | 23:00  | 6,6    | 250   |      |     |
| 19/03/2019 00:00 |        | 00:00  | 7,6   | 250  |     |
| 19/03/2019 01:00 |        | 01:00  | 7,3   | 250  |     |
| 19/03/2019 02:00 |        | 02:00  | 9,4   | 250  |     |
| 19/03/2019 03:00 |        | 03:00  | 13,6  | 250  |     |

|                  |        |        |       |      |     |
|------------------|--------|--------|-------|------|-----|
| 19/03/2019 04:00 | 19-Mar | 04:00  | 16,5  | 250  |     |
| 19/03/2019 05:00 |        | 05:00  | 7,1   | 250  |     |
| 19/03/2019 06:00 |        | 06:00  | 5,5   | 250  |     |
| 19/03/2019 07:00 |        | 07:00  | 8,1   | 250  |     |
| 19/03/2019 08:00 |        | 08:00  | 10,7  | 250  |     |
| 19/03/2019 09:00 |        | 09:00  | 20,4  | 250  |     |
| 19/03/2019 10:00 |        | 10:00  | 7,9   | 250  |     |
| 19/03/2019 11:00 |        | 11:00  | 6,8   | 250  |     |
| 19/03/2019 12:00 |        | 12:00  | 6,3   | 250  |     |
| 19/03/2019 13:00 |        | 13:00  | 5,0   | 250  |     |
| 19/03/2019 14:00 |        | 14:00  | 6,3   | 250  |     |
| 19/03/2019 15:00 |        | 15:00  | 6,8   | 250  |     |
| 19/03/2019 16:00 |        | 16:00  | 7,9   | 250  |     |
| 19/03/2019 17:00 |        | 17:00  | 5,5   | 250  |     |
| 19/03/2019 18:00 |        | 18:00  | 6,8   | 250  |     |
| 19/03/2019 19:00 |        | 19:00  | 6,0   | 250  |     |
| 19/03/2019 20:00 |        | 20:00  | 9,4   | 250  |     |
| 19/03/2019 21:00 |        | 21:00  | 8,4   | 250  |     |
| 19/03/2019 22:00 |        | 22:00  | 4,2   | 250  |     |
| 19/03/2019 23:00 |        | 23:00  | 3,1   | 250  |     |
| 20/03/2019 00:00 |        | 20-Mar | 00:00 | 4,7  | 250 |
| 20/03/2019 01:00 |        |        | 01:00 | 16,5 | 250 |
| 20/03/2019 02:00 |        |        | 02:00 | 10,7 | 250 |
| 20/03/2019 03:00 | 03:00  |        | 7,6   | 250  |     |
| 20/03/2019 04:00 | 04:00  |        | 7,3   | 250  |     |
| 20/03/2019 05:00 | 05:00  |        | 11,5  | 250  |     |
| 20/03/2019 06:00 | 06:00  |        | 9,4   | 250  |     |
| 20/03/2019 07:00 | 07:00  |        | 12,8  | 250  |     |
| 20/03/2019 08:00 | 08:00  |        | 17,3  | 250  |     |
| 20/03/2019 09:00 | 09:00  |        | 9,4   | 250  |     |
| 20/03/2019 10:00 | 10:00  |        | 7,1   | 250  |     |
| 20/03/2019 11:00 | 11:00  |        | 7,1   | 250  |     |
| 20/03/2019 12:00 | 12:00  |        | 7,9   | 250  |     |
| 20/03/2019 13:00 | 13:00  |        | 7,3   | 250  |     |
| 20/03/2019 14:00 | 14:00  |        | 8,4   | 250  |     |
| 20/03/2019 15:00 | 15:00  |        | 6,0   | 250  |     |
| 20/03/2019 16:00 | 16:00  |        | 5,8   | 250  |     |
| 20/03/2019 17:00 | 17:00  |        | 4,2   | 250  |     |
| 20/03/2019 18:00 | 18:00  |        | 4,2   | 250  |     |
| 20/03/2019 19:00 | 19:00  |        | 4,7   | 250  |     |
| 20/03/2019 20:00 | 20:00  |        | 6,3   | 250  |     |
| 20/03/2019 21:00 | 21:00  |        | 5,0   | 250  |     |
| 20/03/2019 22:00 | 22:00  |        | 5,8   | 250  |     |
| 20/03/2019 23:00 | 23:00  | 5,5    | 250   |      |     |
| 21/03/2019 00:00 | 21-Mar | 00:00  | 6,3   | 250  |     |
| 21/03/2019 01:00 |        | 01:00  | 7,1   | 250  |     |
| 21/03/2019 02:00 |        | 02:00  | 7,1   | 250  |     |
| 21/03/2019 03:00 |        | 03:00  | 15,5  | 250  |     |
| 21/03/2019 04:00 |        | 04:00  | 9,7   | 250  |     |
| 21/03/2019 05:00 |        | 05:00  | 29,6  | 250  |     |
| 21/03/2019 06:00 |        | 06:00  | 23,8  | 250  |     |
| 21/03/2019 07:00 |        | 07:00  | 38,5  | 250  |     |
| 21/03/2019 08:00 |        | 08:00  | 13,1  | 250  |     |
| 21/03/2019 09:00 |        | 09:00  | 12,6  | 250  |     |
| 21/03/2019 10:00 |        | 10:00  | 8,4   | 250  |     |
| 21/03/2019 11:00 |        | 11:00  | 6,3   | 250  |     |
| 21/03/2019 12:00 |        | 12:00  | 5,8   | 250  |     |
| 21/03/2019 13:00 |        | 13:00  | 7,1   | 250  |     |
| 21/03/2019 14:00 |        | 14:00  | 6,6   | 250  |     |
| 21/03/2019 15:00 |        | 15:00  | 5,0   | 250  |     |
| 21/03/2019 16:00 |        | 16:00  | 7,1   | 250  |     |
| 21/03/2019 17:00 |        | 17:00  | 6,0   | 250  |     |
| 21/03/2019 18:00 |        | 18:00  | 8,4   | 250  |     |
| 21/03/2019 19:00 |        | 19:00  | 16,5  | 250  |     |
| 21/03/2019 20:00 |        | 20:00  | 8,9   | 250  |     |
| 21/03/2019 21:00 |        | 21:00  | 5,5   | 250  |     |
| 21/03/2019 22:00 |        | 22:00  | 5,5   | 250  |     |
| 21/03/2019 23:00 | 23:00  | 4,5    | 250   |      |     |
| 22/03/2019 00:00 | 22-Mar | 00:00  | 4,7   | 250  |     |
| 22/03/2019 01:00 |        | 01:00  | 5,2   | 250  |     |
| 22/03/2019 02:00 |        | 02:00  | 8,4   | 250  |     |
| 22/03/2019 03:00 |        | 03:00  | 29,9  | 250  |     |
| 22/03/2019 04:00 | 04:00  | 7,3    | 250   |      |     |



|      |
|------|
| date |
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01/03/2019 00:00  
01/03/2019 01:00  
01/03/2019 02:00  
01/03/2019 03:00  
01/03/2019 04:00  
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03/03/2019 18:00  
03/03/2019 19:00  
03/03/2019 20:00  
03/03/2019 21:00  
03/03/2019 22:00

| Fecha  | Horas | H2S_ugm3 | ECA H2S - 24 horas (250 µg/m³) |
|--------|-------|----------|--------------------------------|
| 01-Mar | 00:00 | 89,9     | 150                            |
|        | 01:00 | 93,5     | 150                            |
|        | 02:00 | 19,5     | 150                            |
|        | 03:00 | 73,8     | 150                            |
|        | 04:00 | 68,4     | 150                            |
|        | 05:00 | 60,0     | 150                            |
|        | 06:00 | 47,0     | 150                            |
|        | 07:00 | 36,6     | 150                            |
|        | 08:00 | 57,3     | 150                            |
|        | 09:00 | 12,1     | 150                            |
|        | 10:00 | 22,4     | 150                            |
|        | 11:00 | 12,4     | 150                            |
|        | 12:00 | 12,4     | 150                            |
|        | 13:00 | 17,0     | 150                            |
|        | 14:00 | 26,0     | 150                            |
|        | 15:00 | 24,6     | 150                            |
|        | 16:00 | 14,5     | 150                            |
|        | 17:00 | 18,9     | 150                            |
|        | 18:00 | 30,9     | 150                            |
|        | 19:00 | 22,0     | 150                            |
|        | 20:00 | 32,5     | 150                            |
|        | 21:00 | 32,7     | 150                            |
|        | 22:00 | 14,0     | 150                            |
|        | 23:00 | 29,1     | 150                            |
| 02-Mar | 00:00 | 53,4     | 150                            |
|        | 01:00 | 17,7     | 150                            |
|        | 02:00 | 16,5     | 150                            |
|        | 03:00 | 79,8     | 150                            |
|        | 04:00 | 34,6     | 150                            |
|        | 05:00 | 42,3     | 150                            |
|        | 06:00 | 45,2     | 150                            |
|        | 07:00 | 49,2     | 150                            |
|        | 08:00 | 93,5     | 150                            |
|        | 09:00 | 46,1     | 150                            |
|        | 10:00 | 31,4     | 150                            |
|        | 11:00 | 20,7     | 150                            |
|        | 12:00 | 15,7     | 150                            |
|        | 13:00 | 12,1     | 150                            |
|        | 14:00 | 12,9     | 150                            |
|        | 15:00 | 13,9     | 150                            |
|        | 16:00 | 14,9     | 150                            |
|        | 17:00 | 13,6     | 150                            |
|        | 18:00 | 3,8      | 150                            |
|        | 19:00 | 2,4      | 150                            |
|        | 20:00 | 8,5      | 150                            |
|        | 21:00 | 41,1     | 150                            |
|        | 22:00 | 14,0     | 150                            |
|        | 23:00 | 17,7     | 150                            |
| 03-Mar | 00:00 | 11,4     | 150                            |
|        | 01:00 | 14,7     | 150                            |
|        | 02:00 | 16,1     | 150                            |
|        | 03:00 | 31,1     | 150                            |
|        | 04:00 | 23,9     | 150                            |
|        | 05:00 | 17,0     | 150                            |
|        | 06:00 | 22,7     | 150                            |
|        | 07:00 | 33,4     | 150                            |
|        | 08:00 | 12,2     | 150                            |
|        | 09:00 | 29,9     | 150                            |
|        | 10:00 | 15,2     | 150                            |
|        | 11:00 | 11,5     | 150                            |
|        | 12:00 | 11,5     | 150                            |
|        | 13:00 | 11,3     | 150                            |
|        | 14:00 | 11,4     | 150                            |
|        | 15:00 | 12,1     | 150                            |
|        | 16:00 | 12,9     | 150                            |
|        | 17:00 | 12,5     | 150                            |
|        | 18:00 | 12,1     | 150                            |
|        | 19:00 | 20,2     | 150                            |
|        | 20:00 | 17,8     | 150                            |
|        | 21:00 | 12,2     | 150                            |
|        | 22:00 | 31,0     | 150                            |

|                  |        |       |       |     |
|------------------|--------|-------|-------|-----|
| 03/03/2019 23:00 |        | 23:00 | 13,9  | 150 |
| 04/03/2019 00:00 | 04-Mar | 00:00 | 12,4  | 150 |
| 04/03/2019 01:00 |        | 01:00 | 34,9  | 150 |
| 04/03/2019 02:00 |        | 02:00 | 47,5  | 150 |
| 04/03/2019 03:00 |        | 03:00 | 54,8  | 150 |
| 04/03/2019 04:00 |        | 04:00 | 16,3  | 150 |
| 04/03/2019 05:00 |        | 05:00 | 67,3  | 150 |
| 04/03/2019 06:00 |        | 06:00 | 53,4  | 150 |
| 04/03/2019 07:00 |        | 07:00 | 25,7  | 150 |
| 04/03/2019 08:00 |        | 08:00 | 28,2  | 150 |
| 04/03/2019 09:00 |        | 09:00 | 44,8  | 150 |
| 04/03/2019 10:00 |        | 10:00 | 22,0  | 150 |
| 04/03/2019 11:00 |        | 11:00 | 17,2  | 150 |
| 04/03/2019 12:00 |        | 12:00 | 20,7  | 150 |
| 04/03/2019 13:00 |        | 13:00 | 16,8  | 150 |
| 04/03/2019 14:00 |        | 14:00 | 17,1  | 150 |
| 04/03/2019 15:00 |        | 15:00 | 14,7  | 150 |
| 04/03/2019 16:00 |        | 16:00 | 16,4  | 150 |
| 04/03/2019 17:00 |        | 17:00 | 17,2  | 150 |
| 04/03/2019 18:00 |        | 18:00 | 20,4  | 150 |
| 04/03/2019 19:00 |        | 19:00 | 12,2  | 150 |
| 04/03/2019 20:00 |        | 20:00 | 31,7  | 150 |
| 04/03/2019 21:00 |        | 21:00 | 48,0  | 150 |
| 04/03/2019 22:00 |        | 22:00 | 20,3  | 150 |
| 04/03/2019 23:00 |        | 23:00 | 57,4  | 150 |
| 05/03/2019 00:00 | 05-Mar | 00:00 | 35,9  | 150 |
| 05/03/2019 01:00 |        | 01:00 | 17,4  | 150 |
| 05/03/2019 02:00 |        | 02:00 | 20,2  | 150 |
| 05/03/2019 03:00 |        | 03:00 | 20,4  | 150 |
| 05/03/2019 04:00 |        | 04:00 | 36,4  | 150 |
| 05/03/2019 05:00 |        | 05:00 | 60,3  | 150 |
| 05/03/2019 06:00 |        | 06:00 | 57,4  | 150 |
| 05/03/2019 07:00 |        | 07:00 | 42,4  | 150 |
| 05/03/2019 08:00 |        | 08:00 | 78,4  | 150 |
| 05/03/2019 09:00 |        | 09:00 | 34,1  | 150 |
| 05/03/2019 10:00 |        | 10:00 | 23,5  | 150 |
| 05/03/2019 11:00 |        | 11:00 | 14,3  | 150 |
| 05/03/2019 12:00 |        | 12:00 | 25,6  | 150 |
| 05/03/2019 13:00 |        | 13:00 | 33,8  | 150 |
| 05/03/2019 14:00 |        | 14:00 | 23,5  | 150 |
| 05/03/2019 15:00 |        | 15:00 | 19,3  | 150 |
| 05/03/2019 16:00 |        | 16:00 | 28,8  | 150 |
| 05/03/2019 17:00 |        | 17:00 | 27,2  | 150 |
| 05/03/2019 18:00 |        | 18:00 | 34,1  | 150 |
| 05/03/2019 19:00 |        | 19:00 | 21,7  | 150 |
| 05/03/2019 20:00 |        | 20:00 | 12,6  | 150 |
| 05/03/2019 21:00 |        | 21:00 | 12,9  | 150 |
| 05/03/2019 22:00 |        | 22:00 | 12,2  | 150 |
| 05/03/2019 23:00 |        | 23:00 | 37,7  | 150 |
| 06/03/2019 00:00 | 06-Mar | 00:00 | 11,3  | 150 |
| 06/03/2019 01:00 |        | 01:00 | 17,8  | 150 |
| 06/03/2019 02:00 |        | 02:00 | 58,1  | 150 |
| 06/03/2019 03:00 |        | 03:00 | 46,4  | 150 |
| 06/03/2019 04:00 |        | 04:00 | 108,7 | 150 |
| 06/03/2019 05:00 |        | 05:00 | 34,8  | 150 |
| 06/03/2019 06:00 |        | 06:00 | 15,8  | 150 |
| 06/03/2019 07:00 |        | 07:00 | 13,5  | 150 |
| 06/03/2019 08:00 |        | 08:00 | 57,0  | 150 |
| 06/03/2019 09:00 |        | 09:00 | 63,0  | 150 |
| 06/03/2019 10:00 |        | 10:00 | 57,8  | 150 |
| 06/03/2019 11:00 |        | 11:00 | 23,2  | 150 |
| 06/03/2019 12:00 |        | 12:00 | 16,8  | 150 |
| 06/03/2019 13:00 |        | 13:00 | 13,5  | 150 |
| 06/03/2019 14:00 |        | 14:00 | 16,1  | 150 |
| 06/03/2019 15:00 |        | 15:00 | 13,3  | 150 |
| 06/03/2019 16:00 |        | 16:00 | 10,8  | 150 |
| 06/03/2019 17:00 |        | 17:00 | 16,7  | 150 |
| 06/03/2019 18:00 |        | 18:00 | 18,5  | 150 |
| 06/03/2019 19:00 |        | 19:00 | 10,8  | 150 |
| 06/03/2019 20:00 |        | 20:00 | 26,0  | 150 |
| 06/03/2019 21:00 |        | 21:00 | 22,1  | 150 |
| 06/03/2019 22:00 |        | 22:00 | 12,4  | 150 |
| 06/03/2019 23:00 |        | 23:00 | 32,7  | 150 |

|                  |        |       |       |     |
|------------------|--------|-------|-------|-----|
| 07/03/2019 00:00 |        | 00:00 | 35,9  | 150 |
| 07/03/2019 01:00 |        | 01:00 | 23,4  | 150 |
| 07/03/2019 02:00 |        | 02:00 | 41,3  | 150 |
| 07/03/2019 03:00 |        | 03:00 | 24,3  | 150 |
| 07/03/2019 04:00 |        | 04:00 | 13,9  | 150 |
| 07/03/2019 05:00 |        | 05:00 | 65,1  | 150 |
| 07/03/2019 06:00 |        | 06:00 | 51,3  | 150 |
| 07/03/2019 07:00 |        | 07:00 | 18,1  | 150 |
| 07/03/2019 08:00 |        | 08:00 | 20,2  | 150 |
| 07/03/2019 09:00 |        | 09:00 | 15,3  | 150 |
| 07/03/2019 10:00 |        | 10:00 | 12,0  | 150 |
| 07/03/2019 11:00 |        | 11:00 | 20,3  | 150 |
| 07/03/2019 12:00 | 07-Mar | 12:00 | 21,5  | 150 |
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| 07/03/2019 14:00 |        | 14:00 | 12,6  | 150 |
| 07/03/2019 15:00 |        | 15:00 | 13,1  | 150 |
| 07/03/2019 16:00 |        | 16:00 | 12,2  | 150 |
| 07/03/2019 17:00 |        | 17:00 | 14,0  | 150 |
| 07/03/2019 18:00 |        | 18:00 | 18,6  | 150 |
| 07/03/2019 19:00 |        | 19:00 | 17,4  | 150 |
| 07/03/2019 20:00 |        | 20:00 | 15,8  | 150 |
| 07/03/2019 21:00 |        | 21:00 | 16,8  | 150 |
| 07/03/2019 22:00 |        | 22:00 | 16,8  | 150 |
| 07/03/2019 23:00 |        | 23:00 | 22,9  | 150 |
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| 08/03/2019 03:00 |        | 03:00 | 12,6  | 150 |
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| 08/03/2019 05:00 |        | 05:00 | 43,2  | 150 |
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| 08/03/2019 17:00 |        | 17:00 | 23,9  | 150 |
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| 08/03/2019 19:00 |        | 19:00 | 23,9  | 150 |
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| 09/03/2019 23:00 |        | 23:00 | 29,9  | 150 |
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| 10/03/2019 02:00 |        | 02:00 | 36,6  | 150 |
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| 10/03/2019 19:00 |        | 19:00 | 26,0  | 150 |
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| 16/03/2019 01:00 |        | 01:00  | 43,9  | 150  |
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| 19/03/2019 03:00 | 03:00  | 22,5   | 150   |      |     |

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| 19/03/2019 22:00 |        | 22:00  | 17,0  | 150  |     |
| 19/03/2019 23:00 |        | 23:00  | 14,6  | 150  |     |
| 20/03/2019 00:00 |        | 20-Mar | 00:00 | 10,6 | 150 |
| 20/03/2019 01:00 |        |        | 01:00 | 25,4 | 150 |
| 20/03/2019 02:00 |        |        | 02:00 | 34,8 | 150 |
| 20/03/2019 03:00 | 03:00  |        | 18,2  | 150  |     |
| 20/03/2019 04:00 | 04:00  |        | 12,5  | 150  |     |
| 20/03/2019 05:00 | 05:00  |        | 12,5  | 150  |     |
| 20/03/2019 06:00 | 06:00  |        | 8,6   | 150  |     |
| 20/03/2019 07:00 | 07:00  |        | 12,4  | 150  |     |
| 20/03/2019 08:00 | 08:00  |        | 23,4  | 150  |     |
| 20/03/2019 09:00 | 09:00  |        | 13,6  | 150  |     |
| 20/03/2019 10:00 | 10:00  |        | 14,9  | 150  |     |
| 20/03/2019 11:00 | 11:00  |        | 11,7  | 150  |     |
| 20/03/2019 12:00 | 12:00  |        | 12,1  | 150  |     |
| 20/03/2019 13:00 | 13:00  |        | 25,6  | 150  |     |
| 20/03/2019 14:00 | 14:00  |        | 29,2  | 150  |     |
| 20/03/2019 15:00 | 15:00  |        | 15,8  | 150  |     |
| 20/03/2019 16:00 | 16:00  |        | 14,3  | 150  |     |
| 20/03/2019 17:00 | 17:00  |        | 12,0  | 150  |     |
| 20/03/2019 18:00 | 18:00  |        | 10,6  | 150  |     |
| 20/03/2019 19:00 | 19:00  |        | 19,3  | 150  |     |
| 20/03/2019 20:00 | 20:00  |        | 16,1  | 150  |     |
| 20/03/2019 21:00 | 21:00  |        | 12,1  | 150  |     |
| 20/03/2019 22:00 | 22:00  |        | 14,3  | 150  |     |
| 20/03/2019 23:00 | 23:00  | 19,7   | 150   |      |     |
| 21/03/2019 00:00 | 21-Mar | 00:00  | 11,3  | 150  |     |
| 21/03/2019 01:00 |        | 01:00  | 10,4  | 150  |     |
| 21/03/2019 02:00 |        | 02:00  | 14,9  | 150  |     |
| 21/03/2019 03:00 |        | 03:00  | 26,8  | 150  |     |
| 21/03/2019 04:00 |        | 04:00  | 13,3  | 150  |     |
| 21/03/2019 05:00 |        | 05:00  | 16,5  | 150  |     |
| 21/03/2019 06:00 |        | 06:00  | 58,1  | 150  |     |
| 21/03/2019 07:00 |        | 07:00  | 79,9  | 150  |     |
| 21/03/2019 08:00 |        | 08:00  | 59,4  | 150  |     |
| 21/03/2019 09:00 |        | 09:00  | 27,9  | 150  |     |
| 21/03/2019 10:00 |        | 10:00  | 13,1  | 150  |     |
| 21/03/2019 11:00 |        | 11:00  | 15,6  | 150  |     |
| 21/03/2019 12:00 |        | 12:00  | 12,1  | 150  |     |
| 21/03/2019 13:00 |        | 13:00  | 12,6  | 150  |     |
| 21/03/2019 14:00 |        | 14:00  | 12,8  | 150  |     |
| 21/03/2019 15:00 |        | 15:00  | 13,5  | 150  |     |
| 21/03/2019 16:00 |        | 16:00  | 13,5  | 150  |     |
| 21/03/2019 17:00 |        | 17:00  | 18,6  | 150  |     |
| 21/03/2019 18:00 |        | 18:00  | 22,8  | 150  |     |
| 21/03/2019 19:00 |        | 19:00  | 22,7  | 150  |     |
| 21/03/2019 20:00 |        | 20:00  | 22,1  | 150  |     |
| 21/03/2019 21:00 |        | 21:00  | 16,5  | 150  |     |
| 21/03/2019 22:00 |        | 22:00  | 18,9  | 150  |     |
| 21/03/2019 23:00 | 23:00  | 15,0   | 150   |      |     |
| 22/03/2019 00:00 | 22-Mar | 00:00  | 15,3  | 150  |     |
| 22/03/2019 01:00 |        | 01:00  | 19,6  | 150  |     |
| 22/03/2019 02:00 |        | 02:00  | 12,5  | 150  |     |
| 22/03/2019 03:00 |        | 03:00  | 73,5  | 150  |     |
| 22/03/2019 04:00 |        | 04:00  | 19,3  | 150  |     |



29-0006

**Thermo Scientific**

**Flow Look-Up Table for PM10 VFC**

**High Volume Air Sampler**

**Serial # P9308 X**

**Calibrated with Rootsmeter serial # 0438320**

**Date Calibrated: 05/08/15**

## USE OF LOOK-UP-TABLE FOR DETERMINATION OF FLOW RATE PM10 VFC High Volume Air Sampler

1. Determine and record atmospheric properties.
2. Operate sampler and allow to warm up. Perform leak test and make sure all gaskets are in place and that there are no leaks.
3. Read the differential pressure across the filter ( $P_f$ ), inches of H<sub>2</sub>O that has to be converted to mm Hg. Reading is taken with a manometer where one side is open to atmosphere and the other is connected to pressure tap on side of filter holder. Filter should be in place for this measurement.
4. Calculate pressure ratio,  $P_o / P_a$   $P_o / P_a = 1 - (P_f / P_a)$   
 $P_f$  and  $P_a$  should be in mm Hg
5. Look up flow rate in look up table. The first 4 pages are in Celsius and actual m<sup>3</sup>/min the last 4 pages are in Fahrenheit and actual cubic feet.

### Example

(NOTE: Individual Look Up Tables will vary.)

1. Suppose the ambient conditions are:

Temperature:  $T_a = 24\text{ }^\circ\text{C}$

Barometric Pressure:  $P_a = 762\text{ mm Hg}$  (this must be station pressure which is not corrected to sea level)

2. Assume system is allowed to warm up for stable operation.
3. Measure filter pressure differential,  $P_f$ . This reading is the set-up reading plus pick-up reading divided by 2 for an average reading. This is taken with a differential manometer with one side of the manometer connected to the stagnation tap on the filter holder (or the Bulkhead Fitting) and the other side open to the atmosphere. Filter must be in place during this measurement.

Assume that:

Set-up Reading:  $P_f = 18.60\text{ in H}_2\text{O}$

Pick-up Reading:  $P_f = 19.80\text{ in H}_2\text{O}$

$P_f = (18.60 + 19.80)/2 = 19.20\text{ in H}_2\text{O}$ .

4. Convert  $P_f =$  to same units as barometric pressure.

$$P_f = 19.20 \text{ in H}_2\text{O} / 13.61 \times 25.4 = 35.83 \text{ mm Hg}$$

$$P_f = 35.83 \text{ mm Hg}$$

5. Calculate pressure ratio.

$$P_o/P_a = 1 - (P_f/P_a)$$

NOTE:  $P_f$  and  $P_a$  MUST HAVE CONSISTENT UNITS

$$P_o/P_a = 1 - (35.83 / 762) \quad P_o/P_a = .953$$

6. Look up Flow Rate from table.

Table 1 (pages 1 – 4) is set up with temperature in  $^{\circ}\text{C}$  and the Flow Rate is read in units of  $\text{m}^3/\text{min}$  (actual, ACMM). In table 2 (pages 5 – 8) the temperature is in  $^{\circ}\text{F}$  and Flow Rate is read in  $\text{ft}^3/\text{min}$  (actual, ACFM).

- a) For the example we will use Table 1.

Locate the temperature and pressure ratio entries nearest the conditions of:

$$T_a = 24^{\circ}\text{C}$$

$$P_o/P_a = .953$$

Example: Look-Up Table for Actual Flow Rate in Units of  $\text{m}^3/\text{min}$

|           | Temperature $^{\circ}\text{C}$ |              |       |       |       |
|-----------|--------------------------------|--------------|-------|-------|-------|
| $P_o/P_a$ | 22                             | 24           | 26    | 28    | 30    |
| 0.950     | 1.142                          | 1.146        | 1.149 | 1.153 | 1.156 |
| 0.951     | 1.144                          | 1.147        | 1.150 | 1.154 | 1.157 |
| 0.952     | 1.145                          | 1.148        | 1.152 | 1.155 | 1.159 |
| 0.953     | 1.146                          | <b>1.150</b> | 1.153 | 1.156 | 1.160 |
| 0.954     | 1.147                          | 1.151        | 1.154 | 1.158 | 1.161 |
| 0.955     | 1.149                          | 1.152        | 1.156 | 1.159 | 1.162 |

- b) The reading of flow rate is:  $Q_a = 1.150 \text{ m}^3/\text{min}$  (actual)

If your  $P_o/P_a$  number is not in look up table ie;  $>.979$  then interpolate.

7. Determine flow rate in terms of standard air.

$$Q_{\text{std}} = 1.150 \text{ m}^3 / \text{min} \left( \frac{762 \text{ mm Hg}}{760 \text{ mm Hg}} \right) \left( \frac{298\text{K}}{(273 + 24) \text{K}} \right)$$

$$Q_{\text{std}} = 1.157 \text{ std m}^3/\text{min}$$

It is always a good idea to contact the lab that you are dealing with to determine what information that they need including actual or standard air with respect to flow rate.

| Po/Pa | TEMPERATURE °C Flow rate m3/min (actual) |       |       |       |       |       |       |       |       |       |       |       | Po/Pa |       |
|-------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|       | -32                                      | -30   | -28   | -26   | -24   | -22   | -20   | -18   | -16   | -14   | -12   | -10   |       | -8    |
| 0.930 | 1.041                                    | 1.045 | 1.048 | 1.052 | 1.056 | 1.060 | 1.063 | 1.067 | 1.071 | 1.074 | 1.078 | 1.082 | 1.085 | 0.930 |
| 0.931 | 1.042                                    | 1.046 | 1.050 | 1.053 | 1.057 | 1.061 | 1.065 | 1.068 | 1.072 | 1.076 | 1.079 | 1.083 | 1.087 | 0.931 |
| 0.932 | 1.043                                    | 1.047 | 1.051 | 1.054 | 1.058 | 1.062 | 1.066 | 1.069 | 1.073 | 1.077 | 1.081 | 1.084 | 1.088 | 0.932 |
| 0.933 | 1.044                                    | 1.048 | 1.052 | 1.056 | 1.059 | 1.063 | 1.067 | 1.071 | 1.074 | 1.078 | 1.082 | 1.085 | 1.089 | 0.933 |
| 0.934 | 1.045                                    | 1.049 | 1.053 | 1.057 | 1.061 | 1.064 | 1.068 | 1.072 | 1.076 | 1.079 | 1.083 | 1.087 | 1.090 | 0.934 |
| 0.935 | 1.047                                    | 1.050 | 1.054 | 1.058 | 1.062 | 1.066 | 1.069 | 1.073 | 1.077 | 1.081 | 1.084 | 1.088 | 1.092 | 0.935 |
| 0.936 | 1.048                                    | 1.052 | 1.055 | 1.059 | 1.063 | 1.067 | 1.071 | 1.074 | 1.078 | 1.082 | 1.085 | 1.089 | 1.093 | 0.936 |
| 0.937 | 1.049                                    | 1.053 | 1.057 | 1.060 | 1.064 | 1.068 | 1.072 | 1.076 | 1.079 | 1.083 | 1.087 | 1.090 | 1.094 | 0.937 |
| 0.938 | 1.050                                    | 1.054 | 1.058 | 1.062 | 1.065 | 1.069 | 1.073 | 1.077 | 1.080 | 1.084 | 1.088 | 1.092 | 1.095 | 0.938 |
| 0.939 | 1.051                                    | 1.055 | 1.059 | 1.063 | 1.067 | 1.070 | 1.074 | 1.078 | 1.082 | 1.085 | 1.089 | 1.093 | 1.096 | 0.939 |
| 0.940 | 1.053                                    | 1.056 | 1.060 | 1.064 | 1.068 | 1.072 | 1.075 | 1.079 | 1.083 | 1.087 | 1.090 | 1.094 | 1.098 | 0.940 |
| 0.941 | 1.054                                    | 1.058 | 1.061 | 1.065 | 1.069 | 1.073 | 1.077 | 1.080 | 1.084 | 1.088 | 1.092 | 1.095 | 1.099 | 0.941 |
| 0.942 | 1.055                                    | 1.059 | 1.063 | 1.066 | 1.070 | 1.074 | 1.078 | 1.082 | 1.085 | 1.089 | 1.093 | 1.096 | 1.100 | 0.942 |
| 0.943 | 1.056                                    | 1.060 | 1.064 | 1.068 | 1.071 | 1.075 | 1.079 | 1.083 | 1.087 | 1.090 | 1.094 | 1.098 | 1.101 | 0.943 |
| 0.944 | 1.057                                    | 1.061 | 1.065 | 1.069 | 1.073 | 1.076 | 1.080 | 1.084 | 1.088 | 1.091 | 1.095 | 1.099 | 1.103 | 0.944 |
| 0.945 | 1.058                                    | 1.062 | 1.066 | 1.070 | 1.074 | 1.078 | 1.081 | 1.085 | 1.089 | 1.093 | 1.096 | 1.100 | 1.104 | 0.945 |
| 0.946 | 1.060                                    | 1.063 | 1.067 | 1.071 | 1.075 | 1.079 | 1.083 | 1.086 | 1.090 | 1.094 | 1.098 | 1.101 | 1.105 | 0.946 |
| 0.947 | 1.061                                    | 1.065 | 1.069 | 1.072 | 1.076 | 1.080 | 1.084 | 1.088 | 1.091 | 1.095 | 1.099 | 1.103 | 1.106 | 0.947 |
| 0.948 | 1.062                                    | 1.066 | 1.070 | 1.074 | 1.077 | 1.081 | 1.085 | 1.089 | 1.093 | 1.096 | 1.100 | 1.104 | 1.108 | 0.948 |
| 0.949 | 1.063                                    | 1.067 | 1.071 | 1.075 | 1.079 | 1.082 | 1.086 | 1.090 | 1.094 | 1.098 | 1.101 | 1.105 | 1.109 | 0.949 |
| 0.950 | 1.064                                    | 1.068 | 1.072 | 1.076 | 1.080 | 1.084 | 1.087 | 1.091 | 1.095 | 1.099 | 1.103 | 1.106 | 1.110 | 0.950 |
| 0.951 | 1.065                                    | 1.069 | 1.073 | 1.077 | 1.081 | 1.085 | 1.089 | 1.092 | 1.096 | 1.100 | 1.104 | 1.108 | 1.111 | 0.951 |
| 0.952 | 1.067                                    | 1.071 | 1.074 | 1.078 | 1.082 | 1.086 | 1.090 | 1.094 | 1.097 | 1.101 | 1.105 | 1.109 | 1.112 | 0.952 |
| 0.953 | 1.068                                    | 1.072 | 1.076 | 1.080 | 1.083 | 1.087 | 1.091 | 1.095 | 1.099 | 1.102 | 1.106 | 1.110 | 1.114 | 0.953 |
| 0.954 | 1.069                                    | 1.073 | 1.077 | 1.081 | 1.085 | 1.088 | 1.092 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 1.115 | 0.954 |
| 0.955 | 1.070                                    | 1.074 | 1.078 | 1.082 | 1.086 | 1.090 | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 0.955 |
| 0.956 | 1.071                                    | 1.075 | 1.079 | 1.083 | 1.087 | 1.091 | 1.095 | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.117 | 0.956 |
| 0.957 | 1.073                                    | 1.076 | 1.080 | 1.084 | 1.088 | 1.092 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 1.115 | 1.119 | 0.957 |
| 0.958 | 1.074                                    | 1.078 | 1.082 | 1.085 | 1.089 | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 1.120 | 0.958 |
| 0.959 | 1.075                                    | 1.079 | 1.083 | 1.087 | 1.091 | 1.094 | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.117 | 1.121 | 0.959 |
| 0.960 | 1.076                                    | 1.080 | 1.084 | 1.088 | 1.092 | 1.096 | 1.099 | 1.103 | 1.107 | 1.111 | 1.115 | 1.119 | 1.122 | 0.960 |
| 0.961 | 1.077                                    | 1.081 | 1.085 | 1.089 | 1.093 | 1.097 | 1.101 | 1.105 | 1.108 | 1.112 | 1.116 | 1.120 | 1.124 | 0.961 |
| 0.962 | 1.078                                    | 1.082 | 1.086 | 1.090 | 1.094 | 1.098 | 1.102 | 1.106 | 1.110 | 1.113 | 1.117 | 1.121 | 1.125 | 0.962 |
| 0.963 | 1.080                                    | 1.084 | 1.088 | 1.091 | 1.095 | 1.099 | 1.103 | 1.107 | 1.111 | 1.115 | 1.118 | 1.122 | 1.126 | 0.963 |
| 0.964 | 1.081                                    | 1.085 | 1.089 | 1.093 | 1.097 | 1.100 | 1.104 | 1.108 | 1.112 | 1.116 | 1.120 | 1.123 | 1.127 | 0.964 |
| 0.965 | 1.082                                    | 1.086 | 1.090 | 1.094 | 1.098 | 1.102 | 1.106 | 1.109 | 1.113 | 1.117 | 1.121 | 1.125 | 1.128 | 0.965 |
| 0.966 | 1.083                                    | 1.087 | 1.091 | 1.095 | 1.099 | 1.103 | 1.107 | 1.111 | 1.114 | 1.118 | 1.122 | 1.126 | 1.130 | 0.966 |
| 0.967 | 1.084                                    | 1.088 | 1.092 | 1.096 | 1.100 | 1.104 | 1.108 | 1.112 | 1.116 | 1.119 | 1.123 | 1.127 | 1.131 | 0.967 |
| 0.968 | 1.086                                    | 1.090 | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.113 | 1.117 | 1.121 | 1.125 | 1.128 | 1.132 | 0.968 |
| 0.969 | 1.087                                    | 1.091 | 1.095 | 1.099 | 1.103 | 1.106 | 1.110 | 1.114 | 1.118 | 1.122 | 1.126 | 1.130 | 1.133 | 0.969 |
| 0.970 | 1.088                                    | 1.092 | 1.096 | 1.100 | 1.104 | 1.108 | 1.112 | 1.115 | 1.119 | 1.123 | 1.127 | 1.131 | 1.135 | 0.970 |
| 0.971 | 1.089                                    | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.113 | 1.117 | 1.121 | 1.124 | 1.128 | 1.132 | 1.136 | 0.971 |
| 0.972 | 1.090                                    | 1.094 | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.118 | 1.122 | 1.126 | 1.129 | 1.133 | 1.137 | 0.972 |
| 0.973 | 1.091                                    | 1.095 | 1.099 | 1.103 | 1.107 | 1.111 | 1.115 | 1.119 | 1.123 | 1.127 | 1.131 | 1.134 | 1.138 | 0.973 |
| 0.974 | 1.093                                    | 1.097 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 1.120 | 1.124 | 1.128 | 1.132 | 1.136 | 1.140 | 0.974 |
| 0.975 | 1.094                                    | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.118 | 1.121 | 1.125 | 1.129 | 1.133 | 1.137 | 1.141 | 0.975 |
| 0.976 | 1.095                                    | 1.099 | 1.103 | 1.107 | 1.111 | 1.115 | 1.119 | 1.123 | 1.127 | 1.130 | 1.134 | 1.138 | 1.142 | 0.976 |
| 0.977 | 1.096                                    | 1.100 | 1.104 | 1.108 | 1.112 | 1.116 | 1.120 | 1.124 | 1.128 | 1.132 | 1.136 | 1.139 | 1.143 | 0.977 |
| 0.978 | 1.097                                    | 1.101 | 1.105 | 1.109 | 1.113 | 1.117 | 1.121 | 1.125 | 1.129 | 1.133 | 1.137 | 1.141 | 1.144 | 0.978 |
| 0.979 | 1.099                                    | 1.103 | 1.107 | 1.111 | 1.115 | 1.118 | 1.122 | 1.126 | 1.130 | 1.134 | 1.138 | 1.142 | 1.146 | 0.979 |

## TEMPERATURE °C Flow rate m3/min (actual)

| Po/Pa | -6    | -4    | -2    | 0     | 2     | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 18    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 1.089 | 1.093 | 1.096 | 1.100 | 1.103 | 1.107 | 1.111 | 1.114 | 1.118 | 1.121 | 1.125 | 1.128 | 1.132 | 0.930 |
| 0.931 | 1.090 | 1.094 | 1.098 | 1.101 | 1.105 | 1.108 | 1.112 | 1.115 | 1.119 | 1.122 | 1.126 | 1.129 | 1.133 | 0.931 |
| 0.932 | 1.092 | 1.095 | 1.099 | 1.102 | 1.106 | 1.110 | 1.113 | 1.117 | 1.120 | 1.124 | 1.127 | 1.131 | 1.134 | 0.932 |
| 0.933 | 1.093 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 1.114 | 1.118 | 1.121 | 1.125 | 1.128 | 1.132 | 1.135 | 0.933 |
| 0.934 | 1.094 | 1.098 | 1.101 | 1.105 | 1.108 | 1.112 | 1.116 | 1.119 | 1.123 | 1.126 | 1.130 | 1.133 | 1.137 | 0.934 |
| 0.935 | 1.095 | 1.099 | 1.102 | 1.106 | 1.110 | 1.113 | 1.117 | 1.120 | 1.124 | 1.127 | 1.131 | 1.135 | 1.138 | 0.935 |
| 0.936 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 1.115 | 1.118 | 1.122 | 1.125 | 1.129 | 1.132 | 1.136 | 1.139 | 0.936 |
| 0.937 | 1.098 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 1.119 | 1.123 | 1.126 | 1.130 | 1.134 | 1.137 | 1.141 | 0.937 |
| 0.938 | 1.099 | 1.103 | 1.106 | 1.110 | 1.113 | 1.117 | 1.121 | 1.124 | 1.128 | 1.131 | 1.135 | 1.138 | 1.142 | 0.938 |
| 0.939 | 1.100 | 1.104 | 1.107 | 1.111 | 1.115 | 1.118 | 1.122 | 1.125 | 1.129 | 1.133 | 1.136 | 1.140 | 1.143 | 0.939 |
| 0.940 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 1.120 | 1.123 | 1.127 | 1.130 | 1.134 | 1.137 | 1.141 | 1.144 | 0.940 |
| 0.941 | 1.103 | 1.106 | 1.110 | 1.114 | 1.117 | 1.121 | 1.124 | 1.128 | 1.132 | 1.135 | 1.139 | 1.142 | 1.146 | 0.941 |
| 0.942 | 1.104 | 1.108 | 1.111 | 1.115 | 1.118 | 1.122 | 1.126 | 1.129 | 1.133 | 1.136 | 1.140 | 1.143 | 1.147 | 0.942 |
| 0.943 | 1.105 | 1.109 | 1.112 | 1.116 | 1.120 | 1.123 | 1.127 | 1.130 | 1.134 | 1.138 | 1.141 | 1.145 | 1.148 | 0.943 |
| 0.944 | 1.106 | 1.110 | 1.114 | 1.117 | 1.121 | 1.125 | 1.128 | 1.132 | 1.135 | 1.139 | 1.142 | 1.146 | 1.150 | 0.944 |
| 0.945 | 1.108 | 1.111 | 1.115 | 1.119 | 1.122 | 1.126 | 1.129 | 1.133 | 1.137 | 1.140 | 1.144 | 1.147 | 1.151 | 0.945 |
| 0.946 | 1.109 | 1.112 | 1.116 | 1.120 | 1.123 | 1.127 | 1.131 | 1.134 | 1.138 | 1.141 | 1.145 | 1.149 | 1.152 | 0.946 |
| 0.947 | 1.110 | 1.114 | 1.117 | 1.121 | 1.125 | 1.128 | 1.132 | 1.136 | 1.139 | 1.143 | 1.146 | 1.150 | 1.153 | 0.947 |
| 0.948 | 1.111 | 1.115 | 1.119 | 1.122 | 1.126 | 1.130 | 1.133 | 1.137 | 1.140 | 1.144 | 1.148 | 1.151 | 1.155 | 0.948 |
| 0.949 | 1.112 | 1.116 | 1.120 | 1.124 | 1.127 | 1.131 | 1.134 | 1.138 | 1.142 | 1.145 | 1.149 | 1.152 | 1.156 | 0.949 |
| 0.950 | 1.114 | 1.117 | 1.121 | 1.125 | 1.128 | 1.132 | 1.136 | 1.139 | 1.143 | 1.147 | 1.150 | 1.154 | 1.157 | 0.950 |
| 0.951 | 1.115 | 1.119 | 1.122 | 1.126 | 1.130 | 1.133 | 1.137 | 1.141 | 1.144 | 1.148 | 1.151 | 1.155 | 1.159 | 0.951 |
| 0.952 | 1.116 | 1.120 | 1.124 | 1.127 | 1.131 | 1.135 | 1.138 | 1.142 | 1.145 | 1.149 | 1.153 | 1.156 | 1.160 | 0.952 |
| 0.953 | 1.117 | 1.121 | 1.125 | 1.129 | 1.132 | 1.136 | 1.139 | 1.143 | 1.147 | 1.150 | 1.154 | 1.158 | 1.161 | 0.953 |
| 0.954 | 1.119 | 1.122 | 1.126 | 1.130 | 1.133 | 1.137 | 1.141 | 1.144 | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 0.954 |
| 0.955 | 1.120 | 1.124 | 1.127 | 1.131 | 1.135 | 1.138 | 1.142 | 1.146 | 1.149 | 1.153 | 1.156 | 1.160 | 1.164 | 0.955 |
| 0.956 | 1.121 | 1.125 | 1.129 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 0.956 |
| 0.957 | 1.122 | 1.126 | 1.130 | 1.134 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.155 | 1.159 | 1.163 | 1.166 | 0.957 |
| 0.958 | 1.124 | 1.127 | 1.131 | 1.135 | 1.138 | 1.142 | 1.146 | 1.149 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 0.958 |
| 0.959 | 1.125 | 1.129 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.154 | 1.158 | 1.162 | 1.165 | 1.169 | 0.959 |
| 0.960 | 1.126 | 1.130 | 1.134 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.159 | 1.163 | 1.166 | 1.170 | 0.960 |
| 0.961 | 1.127 | 1.131 | 1.135 | 1.138 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 0.961 |
| 0.962 | 1.129 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.154 | 1.158 | 1.162 | 1.165 | 1.169 | 1.173 | 0.962 |
| 0.963 | 1.130 | 1.134 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.159 | 1.163 | 1.167 | 1.170 | 1.174 | 0.963 |
| 0.964 | 1.131 | 1.135 | 1.139 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.164 | 1.168 | 1.172 | 1.175 | 0.964 |
| 0.965 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 0.965 |
| 0.966 | 1.133 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.171 | 1.174 | 1.178 | 0.966 |
| 0.967 | 1.135 | 1.138 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.164 | 1.168 | 1.172 | 1.175 | 1.179 | 0.967 |
| 0.968 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.169 | 1.173 | 1.177 | 1.180 | 0.968 |
| 0.969 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.171 | 1.174 | 1.178 | 1.182 | 0.969 |
| 0.970 | 1.138 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.165 | 1.168 | 1.172 | 1.176 | 1.179 | 1.183 | 0.970 |
| 0.971 | 1.140 | 1.143 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.170 | 1.173 | 1.177 | 1.181 | 1.184 | 0.971 |
| 0.972 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.171 | 1.174 | 1.178 | 1.182 | 1.185 | 0.972 |
| 0.973 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.165 | 1.168 | 1.172 | 1.176 | 1.179 | 1.183 | 1.187 | 0.973 |
| 0.974 | 1.143 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.170 | 1.173 | 1.177 | 1.181 | 1.184 | 1.188 | 0.974 |
| 0.975 | 1.145 | 1.148 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.171 | 1.175 | 1.178 | 1.182 | 1.186 | 1.189 | 0.975 |
| 0.976 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.165 | 1.168 | 1.172 | 1.176 | 1.180 | 1.183 | 1.187 | 1.191 | 0.976 |
| 0.977 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.170 | 1.173 | 1.177 | 1.181 | 1.185 | 1.188 | 1.192 | 0.977 |
| 0.978 | 1.148 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.171 | 1.175 | 1.178 | 1.182 | 1.186 | 1.189 | 1.193 | 0.978 |
| 0.979 | 1.150 | 1.153 | 1.157 | 1.161 | 1.165 | 1.168 | 1.172 | 1.176 | 1.180 | 1.183 | 1.187 | 1.191 | 1.194 | 0.979 |

## TEMPERATURE °C Flow rate m3/min (actual)

| Po/Pa | 16    | 18    | 20    | 22    | 24    | 26    | 28    | 30    | 32    | 34    | 36    | 38    | 40    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 1.128 | 1.132 | 1.135 | 1.139 | 1.142 | 1.145 | 1.149 | 1.152 | 1.156 | 1.159 | 1.162 | 1.166 | 1.169 | 0.930 |
| 0.931 | 1.129 | 1.133 | 1.136 | 1.140 | 1.143 | 1.147 | 1.150 | 1.154 | 1.157 | 1.160 | 1.164 | 1.167 | 1.170 | 0.931 |
| 0.932 | 1.131 | 1.134 | 1.138 | 1.141 | 1.145 | 1.148 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.168 | 1.172 | 0.932 |
| 0.933 | 1.132 | 1.135 | 1.139 | 1.142 | 1.146 | 1.149 | 1.153 | 1.156 | 1.160 | 1.163 | 1.166 | 1.170 | 1.173 | 0.933 |
| 0.934 | 1.133 | 1.137 | 1.140 | 1.144 | 1.147 | 1.151 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.174 | 0.934 |
| 0.935 | 1.135 | 1.138 | 1.141 | 1.145 | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 1.166 | 1.169 | 1.172 | 1.176 | 0.935 |
| 0.936 | 1.136 | 1.139 | 1.143 | 1.146 | 1.150 | 1.153 | 1.157 | 1.160 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 0.936 |
| 0.937 | 1.137 | 1.141 | 1.144 | 1.148 | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.178 | 0.937 |
| 0.938 | 1.138 | 1.142 | 1.145 | 1.149 | 1.152 | 1.156 | 1.159 | 1.163 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 0.938 |
| 0.939 | 1.140 | 1.143 | 1.147 | 1.150 | 1.154 | 1.157 | 1.161 | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 0.939 |
| 0.940 | 1.141 | 1.144 | 1.148 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 0.940 |
| 0.941 | 1.142 | 1.146 | 1.149 | 1.153 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 0.941 |
| 0.942 | 1.143 | 1.147 | 1.150 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 0.942 |
| 0.943 | 1.145 | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.179 | 1.183 | 1.186 | 0.943 |
| 0.944 | 1.146 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 0.944 |
| 0.945 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 0.945 |
| 0.946 | 1.149 | 1.152 | 1.156 | 1.159 | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.183 | 1.187 | 1.190 | 0.946 |
| 0.947 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 0.947 |
| 0.948 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.189 | 1.193 | 0.948 |
| 0.949 | 1.152 | 1.156 | 1.159 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 0.949 |
| 0.950 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 0.950 |
| 0.951 | 1.155 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.193 | 1.197 | 0.951 |
| 0.952 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 0.952 |
| 0.953 | 1.158 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 0.953 |
| 0.954 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 0.954 |
| 0.955 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 0.955 |
| 0.956 | 1.161 | 1.165 | 1.168 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 0.956 |
| 0.957 | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 0.957 |
| 0.958 | 1.164 | 1.167 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 0.958 |
| 0.959 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.207 | 0.959 |
| 0.960 | 1.166 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 0.960 |
| 0.961 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 0.961 |
| 0.962 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 0.962 |
| 0.963 | 1.170 | 1.174 | 1.177 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 0.963 |
| 0.964 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 0.964 |
| 0.965 | 1.173 | 1.176 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 0.965 |
| 0.966 | 1.174 | 1.178 | 1.181 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 0.966 |
| 0.967 | 1.175 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 0.967 |
| 0.968 | 1.177 | 1.180 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 0.968 |
| 0.969 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 0.969 |
| 0.970 | 1.179 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 0.970 |
| 0.971 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 0.971 |
| 0.972 | 1.182 | 1.185 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 0.972 |
| 0.973 | 1.183 | 1.187 | 1.190 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.223 | 1.226 | 0.973 |
| 0.974 | 1.184 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.210 | 1.213 | 1.217 | 1.220 | 1.224 | 1.227 | 0.974 |
| 0.975 | 1.186 | 1.189 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.215 | 1.218 | 1.222 | 1.225 | 1.229 | 0.975 |
| 0.976 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226 | 1.230 | 0.976 |
| 0.977 | 1.188 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.214 | 1.217 | 1.221 | 1.224 | 1.228 | 1.231 | 0.977 |
| 0.978 | 1.189 | 1.193 | 1.197 | 1.200 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 1.222 | 1.226 | 1.229 | 1.233 | 0.978 |
| 0.979 | 1.191 | 1.194 | 1.198 | 1.202 | 1.205 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 1.227 | 1.230 | 1.234 | 0.979 |

TEMPERATURE °C Flow rate m3/min (actual)

| Po/Pa | 26    | 28    | 30    | 32    | 34    | 36    | 38    | 40    | 42    | 44    | 46    | 48    | 50    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 1.145 | 1.149 | 1.152 | 1.156 | 1.159 | 1.162 | 1.166 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 1.186 | 0.930 |
| 0.931 | 1.147 | 1.150 | 1.154 | 1.157 | 1.160 | 1.164 | 1.167 | 1.170 | 1.174 | 1.177 | 1.180 | 1.184 | 1.187 | 0.931 |
| 0.932 | 1.148 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.168 | 1.172 | 1.175 | 1.178 | 1.182 | 1.185 | 1.188 | 0.932 |
| 0.933 | 1.149 | 1.153 | 1.156 | 1.160 | 1.163 | 1.166 | 1.170 | 1.173 | 1.176 | 1.180 | 1.183 | 1.186 | 1.190 | 0.933 |
| 0.934 | 1.151 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.174 | 1.178 | 1.181 | 1.184 | 1.188 | 1.191 | 0.934 |
| 0.935 | 1.152 | 1.155 | 1.159 | 1.162 | 1.166 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 1.186 | 1.189 | 1.192 | 0.935 |
| 0.936 | 1.153 | 1.157 | 1.160 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 1.180 | 1.184 | 1.187 | 1.190 | 1.194 | 0.936 |
| 0.937 | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.178 | 1.182 | 1.185 | 1.188 | 1.192 | 1.195 | 0.937 |
| 0.938 | 1.156 | 1.159 | 1.163 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.186 | 1.190 | 1.193 | 1.196 | 0.938 |
| 0.939 | 1.157 | 1.161 | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.184 | 1.188 | 1.191 | 1.194 | 1.198 | 0.939 |
| 0.940 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 1.186 | 1.189 | 1.192 | 1.196 | 1.199 | 0.940 |
| 0.941 | 1.160 | 1.163 | 1.167 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.190 | 1.194 | 1.197 | 1.200 | 0.941 |
| 0.942 | 1.161 | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.188 | 1.192 | 1.195 | 1.198 | 1.202 | 0.942 |
| 0.943 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.196 | 1.200 | 1.203 | 0.943 |
| 0.944 | 1.164 | 1.167 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.194 | 1.198 | 1.201 | 1.204 | 0.944 |
| 0.945 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.192 | 1.196 | 1.199 | 1.202 | 1.206 | 0.945 |
| 0.946 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.200 | 1.204 | 1.207 | 0.946 |
| 0.947 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 0.947 |
| 0.948 | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.206 | 1.210 | 0.948 |
| 0.949 | 1.170 | 1.174 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.204 | 1.208 | 1.211 | 0.949 |
| 0.950 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 0.950 |
| 0.951 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.210 | 1.214 | 0.951 |
| 0.952 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.208 | 1.212 | 1.215 | 0.952 |
| 0.953 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 0.953 |
| 0.954 | 1.177 | 1.180 | 1.184 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 0.954 |
| 0.955 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.212 | 1.216 | 1.219 | 0.955 |
| 0.956 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 0.956 |
| 0.957 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 0.957 |
| 0.958 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.216 | 1.220 | 1.223 | 0.958 |
| 0.959 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 0.959 |
| 0.960 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226 | 0.960 |
| 0.961 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.220 | 1.224 | 1.227 | 0.961 |
| 0.962 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 1.222 | 1.225 | 1.229 | 0.962 |
| 0.963 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 1.227 | 1.230 | 0.963 |
| 0.964 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.224 | 1.228 | 1.231 | 0.964 |
| 0.965 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 1.226 | 1.229 | 1.233 | 0.965 |
| 0.966 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 1.220 | 1.224 | 1.227 | 1.231 | 1.234 | 0.966 |
| 0.967 | 1.193 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 1.222 | 1.225 | 1.228 | 1.232 | 1.235 | 0.967 |
| 0.968 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226 | 1.230 | 1.233 | 1.237 | 0.968 |
| 0.969 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 1.224 | 1.228 | 1.231 | 1.235 | 1.238 | 0.969 |
| 0.970 | 1.197 | 1.201 | 1.204 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 1.226 | 1.229 | 1.233 | 1.236 | 1.239 | 0.970 |
| 0.971 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 1.227 | 1.230 | 1.234 | 1.237 | 1.241 | 0.971 |
| 0.972 | 1.200 | 1.203 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 1.228 | 1.232 | 1.235 | 1.239 | 1.242 | 0.972 |
| 0.973 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.223 | 1.226 | 1.230 | 1.233 | 1.237 | 1.240 | 1.243 | 0.973 |
| 0.974 | 1.202 | 1.206 | 1.210 | 1.213 | 1.217 | 1.220 | 1.224 | 1.227 | 1.231 | 1.234 | 1.238 | 1.241 | 1.245 | 0.974 |
| 0.975 | 1.204 | 1.207 | 1.211 | 1.215 | 1.218 | 1.222 | 1.225 | 1.229 | 1.232 | 1.236 | 1.239 | 1.243 | 1.246 | 0.975 |
| 0.976 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226 | 1.230 | 1.234 | 1.237 | 1.241 | 1.244 | 1.247 | 0.976 |
| 0.977 | 1.206 | 1.210 | 1.214 | 1.217 | 1.221 | 1.224 | 1.228 | 1.231 | 1.235 | 1.238 | 1.242 | 1.245 | 1.249 | 0.977 |
| 0.978 | 1.208 | 1.211 | 1.215 | 1.218 | 1.222 | 1.226 | 1.229 | 1.233 | 1.236 | 1.240 | 1.243 | 1.247 | 1.250 | 0.978 |
| 0.979 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 1.227 | 1.230 | 1.234 | 1.238 | 1.241 | 1.245 | 1.248 | 1.252 | 0.979 |

TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | -12   | -8    | -4    | 0     | 4     | 8     | 12    | 16    | 20    | 24    | 28    | 32    | 36    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 37.26 | 37.41 | 37.55 | 37.70 | 37.84 | 37.99 | 38.13 | 38.27 | 38.42 | 38.56 | 38.70 | 38.84 | 38.98 | 0.930 |
| 0.931 | 37.30 | 37.45 | 37.59 | 37.74 | 37.89 | 38.03 | 38.17 | 38.32 | 38.46 | 38.60 | 38.74 | 38.89 | 39.03 | 0.931 |
| 0.932 | 37.34 | 37.49 | 37.64 | 37.78 | 37.93 | 38.07 | 38.22 | 38.36 | 38.50 | 38.65 | 38.79 | 38.93 | 39.07 | 0.932 |
| 0.933 | 37.38 | 37.53 | 37.68 | 37.83 | 37.97 | 38.12 | 38.26 | 38.40 | 38.55 | 38.69 | 38.83 | 38.97 | 39.11 | 0.933 |
| 0.934 | 37.43 | 37.57 | 37.72 | 37.87 | 38.01 | 38.16 | 38.30 | 38.45 | 38.59 | 38.73 | 38.88 | 39.02 | 39.16 | 0.934 |
| 0.935 | 37.47 | 37.62 | 37.76 | 37.91 | 38.06 | 38.20 | 38.35 | 38.49 | 38.63 | 38.78 | 38.92 | 39.06 | 39.20 | 0.935 |
| 0.936 | 37.51 | 37.66 | 37.81 | 37.95 | 38.10 | 38.25 | 38.39 | 38.53 | 38.68 | 38.82 | 38.96 | 39.11 | 39.25 | 0.936 |
| 0.937 | 37.55 | 37.70 | 37.85 | 38.00 | 38.14 | 38.29 | 38.43 | 38.58 | 38.72 | 38.86 | 39.01 | 39.15 | 39.29 | 0.937 |
| 0.938 | 37.60 | 37.74 | 37.89 | 38.04 | 38.19 | 38.33 | 38.48 | 38.62 | 38.76 | 38.91 | 39.05 | 39.19 | 39.33 | 0.938 |
| 0.939 | 37.64 | 37.79 | 37.93 | 38.08 | 38.23 | 38.37 | 38.52 | 38.66 | 38.81 | 38.95 | 39.09 | 39.24 | 39.38 | 0.939 |
| 0.940 | 37.68 | 37.83 | 37.98 | 38.12 | 38.27 | 38.42 | 38.56 | 38.71 | 38.85 | 39.00 | 39.14 | 39.28 | 39.42 | 0.940 |
| 0.941 | 37.72 | 37.87 | 38.02 | 38.17 | 38.31 | 38.46 | 38.61 | 38.75 | 38.90 | 39.04 | 39.18 | 39.32 | 39.47 | 0.941 |
| 0.942 | 37.76 | 37.91 | 38.06 | 38.21 | 38.36 | 38.50 | 38.65 | 38.79 | 38.94 | 39.08 | 39.23 | 39.37 | 39.51 | 0.942 |
| 0.943 | 37.81 | 37.96 | 38.10 | 38.25 | 38.40 | 38.55 | 38.69 | 38.84 | 38.98 | 39.13 | 39.27 | 39.41 | 39.56 | 0.943 |
| 0.944 | 37.85 | 38.00 | 38.15 | 38.30 | 38.44 | 38.59 | 38.74 | 38.88 | 39.03 | 39.17 | 39.31 | 39.46 | 39.60 | 0.944 |
| 0.945 | 37.89 | 38.04 | 38.19 | 38.34 | 38.49 | 38.63 | 38.78 | 38.92 | 39.07 | 39.21 | 39.36 | 39.50 | 39.64 | 0.945 |
| 0.946 | 37.93 | 38.08 | 38.23 | 38.38 | 38.53 | 38.68 | 38.82 | 38.97 | 39.11 | 39.26 | 39.40 | 39.54 | 39.69 | 0.946 |
| 0.947 | 37.98 | 38.13 | 38.27 | 38.42 | 38.57 | 38.72 | 38.87 | 39.01 | 39.16 | 39.30 | 39.45 | 39.59 | 39.73 | 0.947 |
| 0.948 | 38.02 | 38.17 | 38.32 | 38.47 | 38.61 | 38.76 | 38.91 | 39.05 | 39.20 | 39.34 | 39.49 | 39.63 | 39.78 | 0.948 |
| 0.949 | 38.06 | 38.21 | 38.36 | 38.51 | 38.66 | 38.80 | 38.95 | 39.10 | 39.24 | 39.39 | 39.53 | 39.68 | 39.82 | 0.949 |
| 0.950 | 38.10 | 38.25 | 38.40 | 38.55 | 38.70 | 38.85 | 38.99 | 39.14 | 39.29 | 39.43 | 39.58 | 39.72 | 39.86 | 0.950 |
| 0.951 | 38.14 | 38.29 | 38.44 | 38.59 | 38.74 | 38.89 | 39.04 | 39.18 | 39.33 | 39.48 | 39.62 | 39.77 | 39.91 | 0.951 |
| 0.952 | 38.19 | 38.34 | 38.49 | 38.64 | 38.79 | 38.93 | 39.08 | 39.23 | 39.37 | 39.52 | 39.66 | 39.81 | 39.95 | 0.952 |
| 0.953 | 38.23 | 38.38 | 38.53 | 38.68 | 38.83 | 38.98 | 39.12 | 39.27 | 39.42 | 39.56 | 39.71 | 39.85 | 40.00 | 0.953 |
| 0.954 | 38.27 | 38.42 | 38.57 | 38.72 | 38.87 | 39.02 | 39.17 | 39.31 | 39.46 | 39.61 | 39.75 | 39.90 | 40.04 | 0.954 |
| 0.955 | 38.31 | 38.46 | 38.62 | 38.76 | 38.91 | 39.06 | 39.21 | 39.36 | 39.50 | 39.65 | 39.80 | 39.94 | 40.09 | 0.955 |
| 0.956 | 38.36 | 38.51 | 38.66 | 38.81 | 38.96 | 39.11 | 39.25 | 39.40 | 39.55 | 39.69 | 39.84 | 39.99 | 40.13 | 0.956 |
| 0.957 | 38.40 | 38.55 | 38.70 | 38.85 | 39.00 | 39.15 | 39.30 | 39.44 | 39.59 | 39.74 | 39.88 | 40.03 | 40.17 | 0.957 |
| 0.958 | 38.44 | 38.59 | 38.74 | 38.89 | 39.04 | 39.19 | 39.34 | 39.49 | 39.64 | 39.78 | 39.93 | 40.07 | 40.22 | 0.958 |
| 0.959 | 38.48 | 38.63 | 38.79 | 38.94 | 39.09 | 39.24 | 39.38 | 39.53 | 39.68 | 39.83 | 39.97 | 40.12 | 40.26 | 0.959 |
| 0.960 | 38.52 | 38.68 | 38.83 | 38.98 | 39.13 | 39.28 | 39.43 | 39.57 | 39.72 | 39.87 | 40.02 | 40.16 | 40.31 | 0.960 |
| 0.961 | 38.57 | 38.72 | 38.87 | 39.02 | 39.17 | 39.32 | 39.47 | 39.62 | 39.77 | 39.91 | 40.06 | 40.21 | 40.35 | 0.961 |
| 0.962 | 38.61 | 38.76 | 38.91 | 39.06 | 39.21 | 39.36 | 39.51 | 39.66 | 39.81 | 39.96 | 40.10 | 40.25 | 40.39 | 0.962 |
| 0.963 | 38.65 | 38.80 | 38.96 | 39.11 | 39.26 | 39.41 | 39.56 | 39.71 | 39.85 | 40.00 | 40.15 | 40.29 | 40.44 | 0.963 |
| 0.964 | 38.69 | 38.85 | 39.00 | 39.15 | 39.30 | 39.45 | 39.60 | 39.75 | 39.90 | 40.04 | 40.19 | 40.34 | 40.48 | 0.964 |
| 0.965 | 38.74 | 38.89 | 39.04 | 39.19 | 39.34 | 39.49 | 39.64 | 39.79 | 39.94 | 40.09 | 40.24 | 40.38 | 40.53 | 0.965 |
| 0.966 | 38.78 | 38.93 | 39.08 | 39.24 | 39.39 | 39.54 | 39.69 | 39.84 | 39.98 | 40.13 | 40.28 | 40.43 | 40.57 | 0.966 |
| 0.967 | 38.82 | 38.97 | 39.13 | 39.28 | 39.43 | 39.58 | 39.73 | 39.88 | 40.03 | 40.18 | 40.32 | 40.47 | 40.62 | 0.967 |
| 0.968 | 38.86 | 39.02 | 39.17 | 39.32 | 39.47 | 39.62 | 39.77 | 39.92 | 40.07 | 40.22 | 40.37 | 40.51 | 40.66 | 0.968 |
| 0.969 | 38.90 | 39.06 | 39.21 | 39.36 | 39.51 | 39.67 | 39.82 | 39.97 | 40.11 | 40.26 | 40.41 | 40.56 | 40.70 | 0.969 |
| 0.970 | 38.95 | 39.10 | 39.25 | 39.41 | 39.56 | 39.71 | 39.86 | 40.01 | 40.16 | 40.31 | 40.45 | 40.60 | 40.75 | 0.970 |
| 0.971 | 38.99 | 39.14 | 39.30 | 39.45 | 39.60 | 39.75 | 39.90 | 40.05 | 40.20 | 40.35 | 40.50 | 40.65 | 40.79 | 0.971 |
| 0.972 | 39.03 | 39.19 | 39.34 | 39.49 | 39.64 | 39.80 | 39.95 | 40.10 | 40.25 | 40.39 | 40.54 | 40.69 | 40.84 | 0.972 |
| 0.973 | 39.07 | 39.23 | 39.38 | 39.53 | 39.69 | 39.84 | 39.99 | 40.14 | 40.29 | 40.44 | 40.59 | 40.73 | 40.88 | 0.973 |
| 0.974 | 39.12 | 39.27 | 39.42 | 39.58 | 39.73 | 39.88 | 40.03 | 40.18 | 40.33 | 40.48 | 40.63 | 40.78 | 40.93 | 0.974 |
| 0.975 | 39.16 | 39.31 | 39.47 | 39.62 | 39.77 | 39.92 | 40.08 | 40.23 | 40.38 | 40.53 | 40.67 | 40.82 | 40.97 | 0.975 |
| 0.976 | 39.20 | 39.36 | 39.51 | 39.66 | 39.82 | 39.97 | 40.12 | 40.27 | 40.42 | 40.57 | 40.72 | 40.87 | 41.01 | 0.976 |
| 0.977 | 39.24 | 39.40 | 39.55 | 39.71 | 39.86 | 40.01 | 40.16 | 40.31 | 40.46 | 40.61 | 40.76 | 40.91 | 41.06 | 0.977 |
| 0.978 | 39.29 | 39.44 | 39.59 | 39.75 | 39.90 | 40.05 | 40.21 | 40.36 | 40.51 | 40.66 | 40.81 | 40.95 | 41.10 | 0.978 |
| 0.979 | 39.33 | 39.48 | 39.64 | 39.79 | 39.94 | 40.10 | 40.25 | 40.40 | 40.55 | 40.70 | 40.85 | 41.00 | 41.15 | 0.979 |

TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | 18    | 22    | 26    | 30    | 34    | 38    | 42    | 46    | 50    | 54    | 58    | 62    | 66    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 38.35 | 38.49 | 38.63 | 38.77 | 38.91 | 39.05 | 39.19 | 39.33 | 39.47 | 39.61 | 39.74 | 39.88 | 40.02 | 0.930 |
| 0.931 | 38.39 | 38.53 | 38.67 | 38.81 | 38.96 | 39.10 | 39.24 | 39.37 | 39.51 | 39.65 | 39.79 | 39.93 | 40.06 | 0.931 |
| 0.932 | 38.43 | 38.58 | 38.72 | 38.86 | 39.00 | 39.14 | 39.28 | 39.42 | 39.56 | 39.70 | 39.83 | 39.97 | 40.11 | 0.932 |
| 0.933 | 38.48 | 38.62 | 38.76 | 38.90 | 39.04 | 39.18 | 39.32 | 39.46 | 39.60 | 39.74 | 39.88 | 40.02 | 40.15 | 0.933 |
| 0.934 | 38.52 | 38.66 | 38.80 | 38.95 | 39.09 | 39.23 | 39.37 | 39.51 | 39.65 | 39.79 | 39.92 | 40.06 | 40.20 | 0.934 |
| 0.935 | 38.56 | 38.71 | 38.85 | 38.99 | 39.13 | 39.27 | 39.41 | 39.55 | 39.69 | 39.83 | 39.97 | 40.11 | 40.24 | 0.935 |
| 0.936 | 38.61 | 38.75 | 38.89 | 39.03 | 39.18 | 39.32 | 39.46 | 39.60 | 39.74 | 39.87 | 40.01 | 40.15 | 40.29 | 0.936 |
| 0.937 | 38.65 | 38.79 | 38.94 | 39.08 | 39.22 | 39.36 | 39.50 | 39.64 | 39.78 | 39.92 | 40.06 | 40.20 | 40.33 | 0.937 |
| 0.938 | 38.69 | 38.84 | 38.98 | 39.12 | 39.26 | 39.41 | 39.55 | 39.69 | 39.83 | 39.96 | 40.10 | 40.24 | 40.38 | 0.938 |
| 0.939 | 38.74 | 38.88 | 39.02 | 39.17 | 39.31 | 39.45 | 39.59 | 39.73 | 39.87 | 40.01 | 40.15 | 40.29 | 40.42 | 0.939 |
| 0.940 | 38.78 | 38.92 | 39.07 | 39.21 | 39.35 | 39.49 | 39.63 | 39.78 | 39.92 | 40.05 | 40.19 | 40.33 | 40.47 | 0.940 |
| 0.941 | 38.82 | 38.97 | 39.11 | 39.25 | 39.40 | 39.54 | 39.68 | 39.82 | 39.96 | 40.10 | 40.24 | 40.38 | 40.51 | 0.941 |
| 0.942 | 38.87 | 39.01 | 39.15 | 39.30 | 39.44 | 39.58 | 39.72 | 39.86 | 40.00 | 40.14 | 40.28 | 40.42 | 40.56 | 0.942 |
| 0.943 | 38.91 | 39.05 | 39.20 | 39.34 | 39.48 | 39.63 | 39.77 | 39.91 | 40.05 | 40.19 | 40.33 | 40.47 | 40.61 | 0.943 |
| 0.944 | 38.95 | 39.10 | 39.24 | 39.39 | 39.53 | 39.67 | 39.81 | 39.95 | 40.09 | 40.23 | 40.37 | 40.51 | 40.65 | 0.944 |
| 0.945 | 39.00 | 39.14 | 39.29 | 39.43 | 39.57 | 39.71 | 39.86 | 40.00 | 40.14 | 40.28 | 40.42 | 40.56 | 40.70 | 0.945 |
| 0.946 | 39.04 | 39.19 | 39.33 | 39.47 | 39.62 | 39.76 | 39.90 | 40.04 | 40.18 | 40.32 | 40.46 | 40.60 | 40.74 | 0.946 |
| 0.947 | 39.08 | 39.23 | 39.37 | 39.52 | 39.66 | 39.80 | 39.95 | 40.09 | 40.23 | 40.37 | 40.51 | 40.65 | 40.79 | 0.947 |
| 0.948 | 39.13 | 39.27 | 39.42 | 39.56 | 39.70 | 39.85 | 39.99 | 40.13 | 40.27 | 40.41 | 40.55 | 40.69 | 40.83 | 0.948 |
| 0.949 | 39.17 | 39.32 | 39.46 | 39.61 | 39.75 | 39.89 | 40.03 | 40.18 | 40.32 | 40.46 | 40.60 | 40.74 | 40.88 | 0.949 |
| 0.950 | 39.21 | 39.36 | 39.50 | 39.65 | 39.79 | 39.94 | 40.08 | 40.22 | 40.36 | 40.50 | 40.64 | 40.78 | 40.92 | 0.950 |
| 0.951 | 39.26 | 39.40 | 39.55 | 39.69 | 39.84 | 39.98 | 40.12 | 40.27 | 40.41 | 40.55 | 40.69 | 40.83 | 40.97 | 0.951 |
| 0.952 | 39.30 | 39.45 | 39.59 | 39.74 | 39.88 | 40.02 | 40.17 | 40.31 | 40.45 | 40.59 | 40.73 | 40.87 | 41.01 | 0.952 |
| 0.953 | 39.34 | 39.49 | 39.64 | 39.78 | 39.93 | 40.07 | 40.21 | 40.35 | 40.50 | 40.64 | 40.78 | 40.92 | 41.06 | 0.953 |
| 0.954 | 39.39 | 39.53 | 39.68 | 39.82 | 39.97 | 40.11 | 40.26 | 40.40 | 40.54 | 40.68 | 40.82 | 40.96 | 41.10 | 0.954 |
| 0.955 | 39.43 | 39.58 | 39.72 | 39.87 | 40.01 | 40.16 | 40.30 | 40.44 | 40.59 | 40.73 | 40.87 | 41.01 | 41.15 | 0.955 |
| 0.956 | 39.47 | 39.62 | 39.77 | 39.91 | 40.06 | 40.20 | 40.35 | 40.49 | 40.63 | 40.77 | 40.91 | 41.05 | 41.19 | 0.956 |
| 0.957 | 39.52 | 39.67 | 39.81 | 39.96 | 40.10 | 40.25 | 40.39 | 40.53 | 40.68 | 40.82 | 40.96 | 41.10 | 41.24 | 0.957 |
| 0.958 | 39.56 | 39.71 | 39.85 | 40.00 | 40.15 | 40.29 | 40.43 | 40.58 | 40.72 | 40.86 | 41.00 | 41.14 | 41.29 | 0.958 |
| 0.959 | 39.61 | 39.75 | 39.90 | 40.04 | 40.19 | 40.33 | 40.48 | 40.62 | 40.76 | 40.91 | 41.05 | 41.19 | 41.33 | 0.959 |
| 0.960 | 39.65 | 39.80 | 39.94 | 40.09 | 40.23 | 40.38 | 40.52 | 40.67 | 40.81 | 40.95 | 41.09 | 41.24 | 41.38 | 0.960 |
| 0.961 | 39.69 | 39.84 | 39.99 | 40.13 | 40.28 | 40.42 | 40.57 | 40.71 | 40.85 | 41.00 | 41.14 | 41.28 | 41.42 | 0.961 |
| 0.962 | 39.74 | 39.88 | 40.03 | 40.18 | 40.32 | 40.47 | 40.61 | 40.76 | 40.90 | 41.04 | 41.18 | 41.33 | 41.47 | 0.962 |
| 0.963 | 39.78 | 39.93 | 40.07 | 40.22 | 40.37 | 40.51 | 40.66 | 40.80 | 40.94 | 41.09 | 41.23 | 41.37 | 41.51 | 0.963 |
| 0.964 | 39.82 | 39.97 | 40.12 | 40.26 | 40.41 | 40.56 | 40.70 | 40.84 | 40.99 | 41.13 | 41.27 | 41.42 | 41.56 | 0.964 |
| 0.965 | 39.87 | 40.01 | 40.16 | 40.31 | 40.45 | 40.60 | 40.75 | 40.89 | 41.03 | 41.18 | 41.32 | 41.46 | 41.60 | 0.965 |
| 0.966 | 39.91 | 40.06 | 40.21 | 40.35 | 40.50 | 40.64 | 40.79 | 40.93 | 41.08 | 41.22 | 41.36 | 41.51 | 41.65 | 0.966 |
| 0.967 | 39.95 | 40.10 | 40.25 | 40.40 | 40.54 | 40.69 | 40.83 | 40.98 | 41.12 | 41.27 | 41.41 | 41.55 | 41.69 | 0.967 |
| 0.968 | 40.00 | 40.15 | 40.29 | 40.44 | 40.59 | 40.73 | 40.88 | 41.02 | 41.17 | 41.31 | 41.45 | 41.60 | 41.74 | 0.968 |
| 0.969 | 40.04 | 40.19 | 40.34 | 40.48 | 40.63 | 40.78 | 40.92 | 41.07 | 41.21 | 41.36 | 41.50 | 41.64 | 41.78 | 0.969 |
| 0.970 | 40.08 | 40.23 | 40.38 | 40.53 | 40.68 | 40.82 | 40.97 | 41.11 | 41.26 | 41.40 | 41.54 | 41.69 | 41.83 | 0.970 |
| 0.971 | 40.13 | 40.28 | 40.42 | 40.57 | 40.72 | 40.87 | 41.01 | 41.16 | 41.30 | 41.45 | 41.59 | 41.73 | 41.88 | 0.971 |
| 0.972 | 40.17 | 40.32 | 40.47 | 40.62 | 40.76 | 40.91 | 41.06 | 41.20 | 41.35 | 41.49 | 41.63 | 41.78 | 41.92 | 0.972 |
| 0.973 | 40.21 | 40.36 | 40.51 | 40.66 | 40.81 | 40.95 | 41.10 | 41.25 | 41.39 | 41.54 | 41.68 | 41.82 | 41.97 | 0.973 |
| 0.974 | 40.26 | 40.41 | 40.56 | 40.70 | 40.85 | 41.00 | 41.15 | 41.29 | 41.44 | 41.58 | 41.73 | 41.87 | 42.01 | 0.974 |
| 0.975 | 40.30 | 40.45 | 40.60 | 40.75 | 40.90 | 41.04 | 41.19 | 41.34 | 41.48 | 41.63 | 41.77 | 41.91 | 42.06 | 0.975 |
| 0.976 | 40.34 | 40.49 | 40.64 | 40.79 | 40.94 | 41.09 | 41.23 | 41.38 | 41.53 | 41.67 | 41.82 | 41.96 | 42.10 | 0.976 |
| 0.977 | 40.39 | 40.54 | 40.69 | 40.84 | 40.98 | 41.13 | 41.28 | 41.42 | 41.57 | 41.72 | 41.86 | 42.00 | 42.15 | 0.977 |
| 0.978 | 40.43 | 40.58 | 40.73 | 40.88 | 41.03 | 41.18 | 41.32 | 41.47 | 41.62 | 41.76 | 41.91 | 42.05 | 42.19 | 0.978 |
| 0.979 | 40.48 | 40.63 | 40.78 | 40.92 | 41.07 | 41.22 | 41.37 | 41.51 | 41.66 | 41.81 | 41.95 | 42.09 | 42.24 | 0.979 |

## TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | 48    | 52    | 56    | 60    | 64    | 68    | 72    | 76    | 80    | 84    | 88    | 92    | 96    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 39.40 | 39.54 | 39.67 | 39.81 | 39.95 | 40.08 | 40.22 | 40.35 | 40.49 | 40.62 | 40.76 | 40.89 | 41.02 | 0.930 |
| 0.931 | 39.44 | 39.58 | 39.72 | 39.86 | 39.99 | 40.13 | 40.27 | 40.40 | 40.53 | 40.67 | 40.80 | 40.94 | 41.07 | 0.931 |
| 0.932 | 39.49 | 39.63 | 39.76 | 39.90 | 40.04 | 40.17 | 40.31 | 40.45 | 40.58 | 40.71 | 40.85 | 40.98 | 41.11 | 0.932 |
| 0.933 | 39.53 | 39.67 | 39.81 | 39.95 | 40.08 | 40.22 | 40.36 | 40.49 | 40.63 | 40.76 | 40.89 | 41.03 | 41.16 | 0.933 |
| 0.934 | 39.58 | 39.72 | 39.85 | 39.99 | 40.13 | 40.27 | 40.40 | 40.54 | 40.67 | 40.81 | 40.94 | 41.07 | 41.21 | 0.934 |
| 0.935 | 39.62 | 39.76 | 39.90 | 40.04 | 40.17 | 40.31 | 40.45 | 40.58 | 40.72 | 40.85 | 40.99 | 41.12 | 41.25 | 0.935 |
| 0.936 | 39.67 | 39.81 | 39.94 | 40.08 | 40.22 | 40.36 | 40.49 | 40.63 | 40.76 | 40.90 | 41.03 | 41.17 | 41.30 | 0.936 |
| 0.937 | 39.71 | 39.85 | 39.99 | 40.13 | 40.26 | 40.40 | 40.54 | 40.67 | 40.81 | 40.94 | 41.08 | 41.21 | 41.35 | 0.937 |
| 0.938 | 39.76 | 39.90 | 40.03 | 40.17 | 40.31 | 40.45 | 40.58 | 40.72 | 40.86 | 40.99 | 41.13 | 41.26 | 41.39 | 0.938 |
| 0.939 | 39.80 | 39.94 | 40.08 | 40.22 | 40.36 | 40.49 | 40.63 | 40.77 | 40.90 | 41.04 | 41.17 | 41.31 | 41.44 | 0.939 |
| 0.940 | 39.85 | 39.98 | 40.12 | 40.26 | 40.40 | 40.54 | 40.67 | 40.81 | 40.95 | 41.08 | 41.22 | 41.35 | 41.49 | 0.940 |
| 0.941 | 39.89 | 40.03 | 40.17 | 40.31 | 40.45 | 40.58 | 40.72 | 40.86 | 40.99 | 41.13 | 41.26 | 41.40 | 41.53 | 0.941 |
| 0.942 | 39.93 | 40.07 | 40.21 | 40.35 | 40.49 | 40.63 | 40.77 | 40.90 | 41.04 | 41.17 | 41.31 | 41.44 | 41.58 | 0.942 |
| 0.943 | 39.98 | 40.12 | 40.26 | 40.40 | 40.54 | 40.67 | 40.81 | 40.95 | 41.08 | 41.22 | 41.36 | 41.49 | 41.63 | 0.943 |
| 0.944 | 40.02 | 40.16 | 40.30 | 40.44 | 40.58 | 40.72 | 40.86 | 40.99 | 41.13 | 41.27 | 41.40 | 41.54 | 41.67 | 0.944 |
| 0.945 | 40.07 | 40.21 | 40.35 | 40.49 | 40.63 | 40.76 | 40.90 | 41.04 | 41.18 | 41.31 | 41.45 | 41.58 | 41.72 | 0.945 |
| 0.946 | 40.11 | 40.25 | 40.39 | 40.53 | 40.67 | 40.81 | 40.95 | 41.09 | 41.22 | 41.36 | 41.49 | 41.63 | 41.77 | 0.946 |
| 0.947 | 40.16 | 40.30 | 40.44 | 40.58 | 40.72 | 40.86 | 40.99 | 41.13 | 41.27 | 41.40 | 41.54 | 41.68 | 41.81 | 0.947 |
| 0.948 | 40.20 | 40.34 | 40.48 | 40.62 | 40.76 | 40.90 | 41.04 | 41.18 | 41.31 | 41.45 | 41.59 | 41.72 | 41.86 | 0.948 |
| 0.949 | 40.25 | 40.39 | 40.53 | 40.67 | 40.81 | 40.95 | 41.09 | 41.22 | 41.36 | 41.50 | 41.63 | 41.77 | 41.90 | 0.949 |
| 0.950 | 40.29 | 40.43 | 40.57 | 40.71 | 40.85 | 40.99 | 41.13 | 41.27 | 41.41 | 41.54 | 41.68 | 41.82 | 41.95 | 0.950 |
| 0.951 | 40.34 | 40.48 | 40.62 | 40.76 | 40.90 | 41.04 | 41.18 | 41.31 | 41.45 | 41.59 | 41.73 | 41.86 | 42.00 | 0.951 |
| 0.952 | 40.38 | 40.52 | 40.66 | 40.80 | 40.94 | 41.08 | 41.22 | 41.36 | 41.50 | 41.64 | 41.77 | 41.91 | 42.04 | 0.952 |
| 0.953 | 40.43 | 40.57 | 40.71 | 40.85 | 40.99 | 41.13 | 41.27 | 41.41 | 41.54 | 41.68 | 41.82 | 41.95 | 42.09 | 0.953 |
| 0.954 | 40.47 | 40.61 | 40.75 | 40.89 | 41.03 | 41.17 | 41.31 | 41.45 | 41.59 | 41.73 | 41.86 | 42.00 | 42.14 | 0.954 |
| 0.955 | 40.51 | 40.66 | 40.80 | 40.94 | 41.08 | 41.22 | 41.36 | 41.50 | 41.64 | 41.77 | 41.91 | 42.05 | 42.18 | 0.955 |
| 0.956 | 40.56 | 40.70 | 40.84 | 40.98 | 41.12 | 41.26 | 41.40 | 41.54 | 41.68 | 41.82 | 41.96 | 42.09 | 42.23 | 0.956 |
| 0.957 | 40.60 | 40.75 | 40.89 | 41.03 | 41.17 | 41.31 | 41.45 | 41.59 | 41.73 | 41.87 | 42.00 | 42.14 | 42.28 | 0.957 |
| 0.958 | 40.65 | 40.79 | 40.93 | 41.07 | 41.22 | 41.36 | 41.50 | 41.63 | 41.77 | 41.91 | 42.05 | 42.19 | 42.32 | 0.958 |
| 0.959 | 40.69 | 40.84 | 40.98 | 41.12 | 41.26 | 41.40 | 41.54 | 41.68 | 41.82 | 41.96 | 42.10 | 42.23 | 42.37 | 0.959 |
| 0.960 | 40.74 | 40.88 | 41.02 | 41.16 | 41.31 | 41.45 | 41.59 | 41.73 | 41.87 | 42.00 | 42.14 | 42.28 | 42.42 | 0.960 |
| 0.961 | 40.78 | 40.93 | 41.07 | 41.21 | 41.35 | 41.49 | 41.63 | 41.77 | 41.91 | 42.05 | 42.19 | 42.33 | 42.46 | 0.961 |
| 0.962 | 40.83 | 40.97 | 41.11 | 41.26 | 41.40 | 41.54 | 41.68 | 41.82 | 41.96 | 42.10 | 42.23 | 42.37 | 42.51 | 0.962 |
| 0.963 | 40.87 | 41.02 | 41.16 | 41.30 | 41.44 | 41.58 | 41.72 | 41.86 | 42.00 | 42.14 | 42.28 | 42.42 | 42.56 | 0.963 |
| 0.964 | 40.92 | 41.06 | 41.20 | 41.35 | 41.49 | 41.63 | 41.77 | 41.91 | 42.05 | 42.19 | 42.33 | 42.46 | 42.60 | 0.964 |
| 0.965 | 40.96 | 41.11 | 41.25 | 41.39 | 41.53 | 41.67 | 41.81 | 41.95 | 42.09 | 42.23 | 42.37 | 42.51 | 42.65 | 0.965 |
| 0.966 | 41.01 | 41.15 | 41.29 | 41.44 | 41.58 | 41.72 | 41.86 | 42.00 | 42.14 | 42.28 | 42.42 | 42.56 | 42.70 | 0.966 |
| 0.967 | 41.05 | 41.19 | 41.34 | 41.48 | 41.62 | 41.76 | 41.91 | 42.05 | 42.19 | 42.33 | 42.47 | 42.60 | 42.74 | 0.967 |
| 0.968 | 41.10 | 41.24 | 41.38 | 41.53 | 41.67 | 41.81 | 41.95 | 42.09 | 42.23 | 42.37 | 42.51 | 42.65 | 42.79 | 0.968 |
| 0.969 | 41.14 | 41.28 | 41.43 | 41.57 | 41.71 | 41.86 | 42.00 | 42.14 | 42.28 | 42.42 | 42.56 | 42.70 | 42.83 | 0.969 |
| 0.970 | 41.18 | 41.33 | 41.47 | 41.62 | 41.76 | 41.90 | 42.04 | 42.18 | 42.32 | 42.46 | 42.60 | 42.74 | 42.88 | 0.970 |
| 0.971 | 41.23 | 41.37 | 41.52 | 41.66 | 41.80 | 41.95 | 42.09 | 42.23 | 42.37 | 42.51 | 42.65 | 42.79 | 42.93 | 0.971 |
| 0.972 | 41.27 | 41.42 | 41.56 | 41.71 | 41.85 | 41.99 | 42.13 | 42.28 | 42.42 | 42.56 | 42.70 | 42.84 | 42.97 | 0.972 |
| 0.973 | 41.32 | 41.46 | 41.61 | 41.75 | 41.89 | 42.04 | 42.18 | 42.32 | 42.46 | 42.60 | 42.74 | 42.88 | 43.02 | 0.973 |
| 0.974 | 41.36 | 41.51 | 41.65 | 41.80 | 41.94 | 42.08 | 42.23 | 42.37 | 42.51 | 42.65 | 42.79 | 42.93 | 43.07 | 0.974 |
| 0.975 | 41.41 | 41.55 | 41.70 | 41.84 | 41.99 | 42.13 | 42.27 | 42.41 | 42.55 | 42.69 | 42.83 | 42.97 | 43.11 | 0.975 |
| 0.976 | 41.45 | 41.60 | 41.74 | 41.89 | 42.03 | 42.17 | 42.32 | 42.46 | 42.60 | 42.74 | 42.88 | 43.02 | 43.16 | 0.976 |
| 0.977 | 41.50 | 41.64 | 41.79 | 41.93 | 42.08 | 42.22 | 42.36 | 42.50 | 42.65 | 42.79 | 42.93 | 43.07 | 43.21 | 0.977 |
| 0.978 | 41.54 | 41.69 | 41.83 | 41.98 | 42.12 | 42.26 | 42.41 | 42.55 | 42.69 | 42.83 | 42.97 | 43.11 | 43.25 | 0.978 |
| 0.979 | 41.59 | 41.73 | 41.88 | 42.02 | 42.17 | 42.31 | 42.45 | 42.60 | 42.74 | 42.88 | 43.02 | 43.16 | 43.30 | 0.979 |

| TEMPERATURE °F Flow rate ft3/min (actual) |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Po/Pa                                     | 76    | 80    | 84    | 88    | 92    | 96    | 100   | 104   | 108   | 112   | 116   | 120   | 124   | Po/Pa |
| 0.930                                     | 40.35 | 40.49 | 40.62 | 40.76 | 40.89 | 41.02 | 41.15 | 41.29 | 41.42 | 41.55 | 41.68 | 41.81 | 41.94 | 0.930 |
| 0.931                                     | 40.40 | 40.53 | 40.67 | 40.80 | 40.94 | 41.07 | 41.20 | 41.33 | 41.46 | 41.59 | 41.72 | 41.85 | 41.98 | 0.931 |
| 0.932                                     | 40.45 | 40.58 | 40.71 | 40.85 | 40.98 | 41.11 | 41.25 | 41.38 | 41.51 | 41.64 | 41.77 | 41.90 | 42.03 | 0.932 |
| 0.933                                     | 40.49 | 40.63 | 40.76 | 40.89 | 41.03 | 41.16 | 41.29 | 41.43 | 41.56 | 41.69 | 41.82 | 41.95 | 42.08 | 0.933 |
| 0.934                                     | 40.54 | 40.67 | 40.81 | 40.94 | 41.07 | 41.21 | 41.34 | 41.47 | 41.60 | 41.74 | 41.87 | 42.00 | 42.13 | 0.934 |
| 0.935                                     | 40.58 | 40.72 | 40.85 | 40.99 | 41.12 | 41.25 | 41.39 | 41.52 | 41.65 | 41.78 | 41.91 | 42.04 | 42.17 | 0.935 |
| 0.936                                     | 40.63 | 40.76 | 40.90 | 41.03 | 41.17 | 41.30 | 41.43 | 41.57 | 41.70 | 41.83 | 41.96 | 42.09 | 42.22 | 0.936 |
| 0.937                                     | 40.67 | 40.81 | 40.94 | 41.08 | 41.21 | 41.35 | 41.48 | 41.61 | 41.74 | 41.88 | 42.01 | 42.14 | 42.27 | 0.937 |
| 0.938                                     | 40.72 | 40.86 | 40.99 | 41.13 | 41.26 | 41.39 | 41.53 | 41.66 | 41.79 | 41.92 | 42.05 | 42.19 | 42.32 | 0.938 |
| 0.939                                     | 40.77 | 40.90 | 41.04 | 41.17 | 41.31 | 41.44 | 41.57 | 41.71 | 41.84 | 41.97 | 42.10 | 42.23 | 42.36 | 0.939 |
| 0.940                                     | 40.81 | 40.95 | 41.08 | 41.22 | 41.35 | 41.49 | 41.62 | 41.75 | 41.89 | 42.02 | 42.15 | 42.28 | 42.41 | 0.940 |
| 0.941                                     | 40.86 | 40.99 | 41.13 | 41.26 | 41.40 | 41.53 | 41.67 | 41.80 | 41.93 | 42.06 | 42.20 | 42.33 | 42.46 | 0.941 |
| 0.942                                     | 40.90 | 41.04 | 41.17 | 41.31 | 41.44 | 41.58 | 41.71 | 41.85 | 41.98 | 42.11 | 42.24 | 42.38 | 42.51 | 0.942 |
| 0.943                                     | 40.95 | 41.08 | 41.22 | 41.36 | 41.49 | 41.63 | 41.76 | 41.89 | 42.03 | 42.16 | 42.29 | 42.42 | 42.55 | 0.943 |
| 0.944                                     | 40.99 | 41.13 | 41.27 | 41.40 | 41.54 | 41.67 | 41.81 | 41.94 | 42.07 | 42.21 | 42.34 | 42.47 | 42.60 | 0.944 |
| 0.945                                     | 41.04 | 41.18 | 41.31 | 41.45 | 41.58 | 41.72 | 41.85 | 41.99 | 42.12 | 42.25 | 42.39 | 42.52 | 42.65 | 0.945 |
| 0.946                                     | 41.09 | 41.22 | 41.36 | 41.49 | 41.63 | 41.77 | 41.90 | 42.03 | 42.17 | 42.30 | 42.43 | 42.56 | 42.70 | 0.946 |
| 0.947                                     | 41.13 | 41.27 | 41.40 | 41.54 | 41.68 | 41.81 | 41.95 | 42.08 | 42.21 | 42.35 | 42.48 | 42.61 | 42.74 | 0.947 |
| 0.948                                     | 41.18 | 41.31 | 41.45 | 41.59 | 41.72 | 41.86 | 41.99 | 42.13 | 42.26 | 42.39 | 42.53 | 42.66 | 42.79 | 0.948 |
| 0.949                                     | 41.22 | 41.36 | 41.50 | 41.63 | 41.77 | 41.90 | 42.04 | 42.17 | 42.31 | 42.44 | 42.57 | 42.71 | 42.84 | 0.949 |
| 0.950                                     | 41.27 | 41.41 | 41.54 | 41.68 | 41.82 | 41.95 | 42.09 | 42.22 | 42.35 | 42.49 | 42.62 | 42.75 | 42.89 | 0.950 |
| 0.951                                     | 41.31 | 41.45 | 41.59 | 41.73 | 41.86 | 42.00 | 42.13 | 42.27 | 42.40 | 42.54 | 42.67 | 42.80 | 42.93 | 0.951 |
| 0.952                                     | 41.36 | 41.50 | 41.64 | 41.77 | 41.91 | 42.04 | 42.18 | 42.31 | 42.45 | 42.58 | 42.72 | 42.85 | 42.98 | 0.952 |
| 0.953                                     | 41.41 | 41.54 | 41.68 | 41.82 | 41.95 | 42.09 | 42.23 | 42.36 | 42.50 | 42.63 | 42.76 | 42.90 | 43.03 | 0.953 |
| 0.954                                     | 41.45 | 41.59 | 41.73 | 41.86 | 42.00 | 42.14 | 42.27 | 42.41 | 42.54 | 42.68 | 42.81 | 42.94 | 43.08 | 0.954 |
| 0.955                                     | 41.50 | 41.64 | 41.77 | 41.91 | 42.05 | 42.18 | 42.32 | 42.45 | 42.59 | 42.72 | 42.86 | 42.99 | 43.12 | 0.955 |
| 0.956                                     | 41.54 | 41.68 | 41.82 | 41.96 | 42.09 | 42.23 | 42.37 | 42.50 | 42.64 | 42.77 | 42.90 | 43.04 | 43.17 | 0.956 |
| 0.957                                     | 41.59 | 41.73 | 41.87 | 42.00 | 42.14 | 42.28 | 42.41 | 42.55 | 42.68 | 42.82 | 42.95 | 43.09 | 43.22 | 0.957 |
| 0.958                                     | 41.63 | 41.77 | 41.91 | 42.05 | 42.19 | 42.32 | 42.46 | 42.59 | 42.73 | 42.86 | 43.00 | 43.13 | 43.27 | 0.958 |
| 0.959                                     | 41.68 | 41.82 | 41.96 | 42.10 | 42.23 | 42.37 | 42.51 | 42.64 | 42.78 | 42.91 | 43.05 | 43.18 | 43.31 | 0.959 |
| 0.960                                     | 41.73 | 41.87 | 42.00 | 42.14 | 42.28 | 42.42 | 42.55 | 42.69 | 42.82 | 42.96 | 43.09 | 43.23 | 43.36 | 0.960 |
| 0.961                                     | 41.77 | 41.91 | 42.05 | 42.19 | 42.33 | 42.46 | 42.60 | 42.74 | 42.87 | 43.01 | 43.14 | 43.28 | 43.41 | 0.961 |
| 0.962                                     | 41.82 | 41.96 | 42.10 | 42.23 | 42.37 | 42.51 | 42.65 | 42.78 | 42.92 | 43.05 | 43.19 | 43.32 | 43.46 | 0.962 |
| 0.963                                     | 41.86 | 42.00 | 42.14 | 42.28 | 42.42 | 42.56 | 42.69 | 42.83 | 42.96 | 43.10 | 43.24 | 43.37 | 43.50 | 0.963 |
| 0.964                                     | 41.91 | 42.05 | 42.19 | 42.33 | 42.46 | 42.60 | 42.74 | 42.88 | 43.01 | 43.15 | 43.28 | 43.42 | 43.55 | 0.964 |
| 0.965                                     | 41.95 | 42.09 | 42.23 | 42.37 | 42.51 | 42.65 | 42.79 | 42.92 | 43.06 | 43.19 | 43.33 | 43.46 | 43.60 | 0.965 |
| 0.966                                     | 42.00 | 42.14 | 42.28 | 42.42 | 42.56 | 42.70 | 42.83 | 42.97 | 43.11 | 43.24 | 43.38 | 43.51 | 43.65 | 0.966 |
| 0.967                                     | 42.05 | 42.19 | 42.33 | 42.47 | 42.60 | 42.74 | 42.88 | 43.02 | 43.15 | 43.29 | 43.42 | 43.56 | 43.69 | 0.967 |
| 0.968                                     | 42.09 | 42.23 | 42.37 | 42.51 | 42.65 | 42.79 | 42.93 | 43.06 | 43.20 | 43.34 | 43.47 | 43.61 | 43.74 | 0.968 |
| 0.969                                     | 42.14 | 42.28 | 42.42 | 42.56 | 42.70 | 42.83 | 42.97 | 43.11 | 43.25 | 43.38 | 43.52 | 43.65 | 43.79 | 0.969 |
| 0.970                                     | 42.18 | 42.32 | 42.46 | 42.60 | 42.74 | 42.88 | 43.02 | 43.16 | 43.29 | 43.43 | 43.57 | 43.70 | 43.84 | 0.970 |
| 0.971                                     | 42.23 | 42.37 | 42.51 | 42.65 | 42.79 | 42.93 | 43.07 | 43.20 | 43.34 | 43.48 | 43.61 | 43.75 | 43.88 | 0.971 |
| 0.972                                     | 42.28 | 42.42 | 42.56 | 42.70 | 42.84 | 42.97 | 43.11 | 43.25 | 43.39 | 43.52 | 43.66 | 43.80 | 43.93 | 0.972 |
| 0.973                                     | 42.32 | 42.46 | 42.60 | 42.74 | 42.88 | 43.02 | 43.16 | 43.30 | 43.43 | 43.57 | 43.71 | 43.84 | 43.98 | 0.973 |
| 0.974                                     | 42.37 | 42.51 | 42.65 | 42.79 | 42.93 | 43.07 | 43.21 | 43.34 | 43.48 | 43.62 | 43.76 | 43.89 | 44.03 | 0.974 |
| 0.975                                     | 42.41 | 42.55 | 42.69 | 42.83 | 42.97 | 43.11 | 43.25 | 43.39 | 43.53 | 43.67 | 43.80 | 43.94 | 44.08 | 0.975 |
| 0.976                                     | 42.46 | 42.60 | 42.74 | 42.88 | 43.02 | 43.16 | 43.30 | 43.44 | 43.58 | 43.71 | 43.85 | 43.99 | 44.12 | 0.976 |
| 0.977                                     | 42.50 | 42.65 | 42.79 | 42.93 | 43.07 | 43.21 | 43.35 | 43.48 | 43.62 | 43.76 | 43.90 | 44.03 | 44.17 | 0.977 |
| 0.978                                     | 42.55 | 42.69 | 42.83 | 42.97 | 43.11 | 43.25 | 43.39 | 43.53 | 43.67 | 43.81 | 43.94 | 44.08 | 44.22 | 0.978 |
| 0.979                                     | 42.60 | 42.74 | 42.88 | 43.02 | 43.16 | 43.30 | 43.44 | 43.58 | 43.72 | 43.85 | 43.99 | 44.13 | 44.27 | 0.979 |

09-0007

**Thermo Scientific**  
**Flow Look-Up Table for PM10 VFC**  
**High Volume Air Sampler**

**Serial # P9307 X**

**Calibrated with Rootsmeter serial # 0438320**

**Date Calibrated: 05/08/15**

## USE OF LOOK-UP-TABLE FOR DETERMINATION OF FLOW RATE PM10 VFC High Volume Air Sampler

1. Determine and record atmospheric properties.
2. Operate sampler and allow to warm up. Perform leak test and make sure all gaskets are in place and that there are no leaks.
3. Read the differential pressure across the filter ( $P_f$ ), inches of H<sub>2</sub>O that has to be converted to mm Hg. Reading is taken with a manometer where one side is open to atmosphere and the other is connected to pressure tap on side of filter holder. Filter should be in place for this measurement.
4. Calculate pressure ratio,  $P_o / P_a$   $P_o / P_a = 1 - (P_f / P_a)$   
 $P_f$  and  $P_a$  should be in mm Hg
5. Look up flow rate in look up table. The first 4 pages are in Celsius and actual m<sup>3</sup>/min the last 4 pages are in Fahrenheit and actual cubic feet.

### Example

(NOTE: Individual Look Up Tables will vary.)

1. Suppose the ambient conditions are:

Temperature:  $T_a = 24^\circ\text{C}$

Barometric Pressure:  $P_a = 762$  mm Hg (this must be station pressure which is not corrected to sea level)

2. Assume system is allowed to warm up for stable operation.
3. Measure filter pressure differential,  $P_f$ . This reading is the set-up reading plus pick-up reading divided by 2 for an average reading. This is taken with a differential manometer with one side of the manometer connected to the stagnation tap on the filter holder (or the Bulkhead Fitting) and the other side open to the atmosphere. Filter must be in place during this measurement.

Assume that:

Set-up Reading:  $P_f = 18.60$  in H<sub>2</sub>O

Pick-up Reading:  $P_f = 19.80$  in H<sub>2</sub>O

$P_f = (18.60 + 19.80)/2 = 19.20$  in H<sub>2</sub>O.

4. Convert  $P_f =$  to same units as barometric pressure.

$$P_f = 19.20 \text{ in H}_2\text{O} / 13.61 \times 25.4 = 35.83 \text{ mm Hg}$$

$$P_f = 35.83 \text{ mm Hg}$$

5. Calculate pressure ratio.

$$P_o/P_a = 1 - (P_f/P_a)$$

NOTE:  $P_f$  and  $P_a$  MUST HAVE CONSISTENT UNITS

$$P_o/P_a = 1 - (35.83 / 762) \quad P_o/P_a = .953$$

6. Look up Flow Rate from table.

Table 1 (pages 1 – 4) is set up with temperature in °C and the Flow Rate is read in units of  $\text{m}^3/\text{min}$  (actual, ACMM). In table 2 (pages 5 – 8) the temperature is in °F and Flow Rate is read in  $\text{ft}^3/\text{min}$  (actual, ACFM).

a) For the example we will use Table 1.

Locate the temperature and pressure ratio entries nearest the conditions of:

$$T_a = 24^\circ\text{C}$$

$$P_o/P_a = .953$$

Example: Look-Up Table for Actual Flow Rate in Units of  $\text{m}^3/\text{min}$

|           | Temperature °C |              |       |       |       |
|-----------|----------------|--------------|-------|-------|-------|
| $P_o/P_a$ | 22             | 24           | 26    | 28    | 30    |
| 0.950     | 1.142          | 1.146        | 1.149 | 1.153 | 1.156 |
| 0.951     | 1.144          | 1.147        | 1.150 | 1.154 | 1.157 |
| 0.952     | 1.145          | 1.148        | 1.152 | 1.155 | 1.159 |
| 0.953     | 1.146          | <b>1.150</b> | 1.153 | 1.156 | 1.160 |
| 0.954     | 1.147          | 1.151        | 1.154 | 1.158 | 1.161 |
| 0.955     | 1.149          | 1.152        | 1.156 | 1.159 | 1.162 |

b) The reading of flow rate is:  $Q_a = 1.150 \text{ m}^3/\text{min}$  (actual)

If your  $P_o/P_a$  number is not in look up table ie;  $>.979$  then interpolate.

7. Determine flow rate in terms of standard air.

$$Q_{\text{std}} = 1.150 \text{ m}^3/\text{min} \left( \frac{762 \text{ mm Hg}}{760 \text{ mm Hg}} \right) \left( \frac{298\text{K}}{(273 + 24) \text{K}} \right)$$

$$Q_{\text{std}} = 1.157 \text{ std m}^3/\text{min}$$

It is always a good idea to contact the lab that you are dealing with to determine what information that they need including actual or standard air with respect to flow rate.

|       | TEMPERATURE °C Flow rate m3/min (actual) |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Po/Pa | -32                                      | -30   | -28   | -26   | -24   | -22   | -20   | -18   | -16   | -14   | -12   | -10   | -8    | Po/Pa |
| 0.930 | 1.034                                    | 1.038 | 1.042 | 1.045 | 1.049 | 1.053 | 1.057 | 1.060 | 1.064 | 1.068 | 1.071 | 1.075 | 1.078 | 0.930 |
| 0.931 | 1.035                                    | 1.039 | 1.043 | 1.047 | 1.050 | 1.054 | 1.058 | 1.061 | 1.065 | 1.069 | 1.072 | 1.076 | 1.080 | 0.931 |
| 0.932 | 1.036                                    | 1.040 | 1.044 | 1.048 | 1.052 | 1.055 | 1.059 | 1.063 | 1.066 | 1.070 | 1.074 | 1.077 | 1.081 | 0.932 |
| 0.933 | 1.038                                    | 1.041 | 1.045 | 1.049 | 1.053 | 1.056 | 1.060 | 1.064 | 1.068 | 1.071 | 1.075 | 1.078 | 1.082 | 0.933 |
| 0.934 | 1.039                                    | 1.043 | 1.046 | 1.050 | 1.054 | 1.058 | 1.061 | 1.065 | 1.069 | 1.072 | 1.076 | 1.080 | 1.083 | 0.934 |
| 0.935 | 1.040                                    | 1.044 | 1.048 | 1.051 | 1.055 | 1.059 | 1.063 | 1.066 | 1.070 | 1.074 | 1.077 | 1.081 | 1.085 | 0.935 |
| 0.936 | 1.041                                    | 1.045 | 1.049 | 1.052 | 1.056 | 1.060 | 1.064 | 1.067 | 1.071 | 1.075 | 1.078 | 1.082 | 1.086 | 0.936 |
| 0.937 | 1.042                                    | 1.046 | 1.050 | 1.054 | 1.057 | 1.061 | 1.065 | 1.069 | 1.072 | 1.076 | 1.080 | 1.083 | 1.087 | 0.937 |
| 0.938 | 1.043                                    | 1.047 | 1.051 | 1.055 | 1.059 | 1.062 | 1.066 | 1.070 | 1.074 | 1.077 | 1.081 | 1.085 | 1.088 | 0.938 |
| 0.939 | 1.045                                    | 1.048 | 1.052 | 1.056 | 1.060 | 1.064 | 1.067 | 1.071 | 1.075 | 1.078 | 1.082 | 1.086 | 1.089 | 0.939 |
| 0.940 | 1.046                                    | 1.050 | 1.053 | 1.057 | 1.061 | 1.065 | 1.069 | 1.072 | 1.076 | 1.080 | 1.083 | 1.087 | 1.091 | 0.940 |
| 0.941 | 1.047                                    | 1.051 | 1.055 | 1.058 | 1.062 | 1.066 | 1.070 | 1.073 | 1.077 | 1.081 | 1.085 | 1.088 | 1.092 | 0.941 |
| 0.942 | 1.048                                    | 1.052 | 1.056 | 1.060 | 1.063 | 1.067 | 1.071 | 1.075 | 1.078 | 1.082 | 1.086 | 1.089 | 1.093 | 0.942 |
| 0.943 | 1.049                                    | 1.053 | 1.057 | 1.061 | 1.065 | 1.068 | 1.072 | 1.076 | 1.080 | 1.083 | 1.087 | 1.091 | 1.094 | 0.943 |
| 0.944 | 1.051                                    | 1.054 | 1.058 | 1.062 | 1.066 | 1.070 | 1.073 | 1.077 | 1.081 | 1.084 | 1.088 | 1.092 | 1.096 | 0.944 |
| 0.945 | 1.052                                    | 1.056 | 1.059 | 1.063 | 1.067 | 1.071 | 1.074 | 1.078 | 1.082 | 1.086 | 1.089 | 1.093 | 1.097 | 0.945 |
| 0.946 | 1.053                                    | 1.057 | 1.061 | 1.064 | 1.068 | 1.072 | 1.076 | 1.079 | 1.083 | 1.087 | 1.091 | 1.094 | 1.098 | 0.946 |
| 0.947 | 1.054                                    | 1.058 | 1.062 | 1.066 | 1.069 | 1.073 | 1.077 | 1.081 | 1.084 | 1.088 | 1.092 | 1.096 | 1.099 | 0.947 |
| 0.948 | 1.055                                    | 1.059 | 1.063 | 1.067 | 1.071 | 1.074 | 1.078 | 1.082 | 1.086 | 1.089 | 1.093 | 1.097 | 1.100 | 0.948 |
| 0.949 | 1.056                                    | 1.060 | 1.064 | 1.068 | 1.072 | 1.076 | 1.079 | 1.083 | 1.087 | 1.091 | 1.094 | 1.098 | 1.102 | 0.949 |
| 0.950 | 1.058                                    | 1.061 | 1.065 | 1.069 | 1.073 | 1.077 | 1.080 | 1.084 | 1.088 | 1.092 | 1.095 | 1.099 | 1.103 | 0.950 |
| 0.951 | 1.059                                    | 1.063 | 1.066 | 1.070 | 1.074 | 1.078 | 1.082 | 1.085 | 1.089 | 1.093 | 1.097 | 1.100 | 1.104 | 0.951 |
| 0.952 | 1.060                                    | 1.064 | 1.068 | 1.071 | 1.075 | 1.079 | 1.083 | 1.087 | 1.090 | 1.094 | 1.098 | 1.102 | 1.105 | 0.952 |
| 0.953 | 1.061                                    | 1.065 | 1.069 | 1.073 | 1.076 | 1.080 | 1.084 | 1.088 | 1.092 | 1.095 | 1.099 | 1.103 | 1.107 | 0.953 |
| 0.954 | 1.062                                    | 1.066 | 1.070 | 1.074 | 1.078 | 1.081 | 1.085 | 1.089 | 1.093 | 1.097 | 1.100 | 1.104 | 1.108 | 0.954 |
| 0.955 | 1.063                                    | 1.067 | 1.071 | 1.075 | 1.079 | 1.083 | 1.086 | 1.090 | 1.094 | 1.098 | 1.102 | 1.105 | 1.109 | 0.955 |
| 0.956 | 1.065                                    | 1.068 | 1.072 | 1.076 | 1.080 | 1.084 | 1.088 | 1.091 | 1.095 | 1.099 | 1.103 | 1.107 | 1.110 | 0.956 |
| 0.957 | 1.066                                    | 1.070 | 1.074 | 1.077 | 1.081 | 1.085 | 1.089 | 1.093 | 1.096 | 1.100 | 1.104 | 1.108 | 1.111 | 0.957 |
| 0.958 | 1.067                                    | 1.071 | 1.075 | 1.079 | 1.082 | 1.086 | 1.090 | 1.094 | 1.098 | 1.101 | 1.105 | 1.109 | 1.113 | 0.958 |
| 0.959 | 1.068                                    | 1.072 | 1.076 | 1.080 | 1.084 | 1.087 | 1.091 | 1.095 | 1.099 | 1.103 | 1.106 | 1.110 | 1.114 | 0.959 |
| 0.960 | 1.069                                    | 1.073 | 1.077 | 1.081 | 1.085 | 1.089 | 1.092 | 1.096 | 1.100 | 1.104 | 1.108 | 1.111 | 1.115 | 0.960 |
| 0.961 | 1.070                                    | 1.074 | 1.078 | 1.082 | 1.086 | 1.090 | 1.094 | 1.097 | 1.101 | 1.105 | 1.109 | 1.113 | 1.116 | 0.961 |
| 0.962 | 1.072                                    | 1.076 | 1.079 | 1.083 | 1.087 | 1.091 | 1.095 | 1.099 | 1.102 | 1.106 | 1.110 | 1.114 | 1.118 | 0.962 |
| 0.963 | 1.073                                    | 1.077 | 1.081 | 1.084 | 1.088 | 1.092 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 1.115 | 1.119 | 0.963 |
| 0.964 | 1.074                                    | 1.078 | 1.082 | 1.086 | 1.090 | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 1.120 | 0.964 |
| 0.965 | 1.075                                    | 1.079 | 1.083 | 1.087 | 1.091 | 1.095 | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.117 | 1.121 | 0.965 |
| 0.966 | 1.076                                    | 1.080 | 1.084 | 1.088 | 1.092 | 1.096 | 1.100 | 1.103 | 1.107 | 1.111 | 1.115 | 1.119 | 1.122 | 0.966 |
| 0.967 | 1.077                                    | 1.081 | 1.085 | 1.089 | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 1.120 | 1.124 | 0.967 |
| 0.968 | 1.079                                    | 1.083 | 1.087 | 1.090 | 1.094 | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.117 | 1.121 | 1.125 | 0.968 |
| 0.969 | 1.080                                    | 1.084 | 1.088 | 1.092 | 1.096 | 1.099 | 1.103 | 1.107 | 1.111 | 1.115 | 1.119 | 1.122 | 1.126 | 0.969 |
| 0.970 | 1.081                                    | 1.085 | 1.089 | 1.093 | 1.097 | 1.101 | 1.104 | 1.108 | 1.112 | 1.116 | 1.120 | 1.124 | 1.127 | 0.970 |
| 0.971 | 1.082                                    | 1.086 | 1.090 | 1.094 | 1.098 | 1.102 | 1.106 | 1.110 | 1.113 | 1.117 | 1.121 | 1.125 | 1.129 | 0.971 |
| 0.972 | 1.083                                    | 1.087 | 1.091 | 1.095 | 1.099 | 1.103 | 1.107 | 1.111 | 1.115 | 1.118 | 1.122 | 1.126 | 1.130 | 0.972 |
| 0.973 | 1.085                                    | 1.088 | 1.092 | 1.096 | 1.100 | 1.104 | 1.108 | 1.112 | 1.116 | 1.120 | 1.123 | 1.127 | 1.131 | 0.973 |
| 0.974 | 1.086                                    | 1.090 | 1.094 | 1.098 | 1.101 | 1.105 | 1.109 | 1.113 | 1.117 | 1.121 | 1.125 | 1.128 | 1.132 | 0.974 |
| 0.975 | 1.087                                    | 1.091 | 1.095 | 1.099 | 1.103 | 1.107 | 1.110 | 1.114 | 1.118 | 1.122 | 1.126 | 1.130 | 1.133 | 0.975 |
| 0.976 | 1.088                                    | 1.092 | 1.096 | 1.100 | 1.104 | 1.108 | 1.112 | 1.116 | 1.119 | 1.123 | 1.127 | 1.131 | 1.135 | 0.976 |
| 0.977 | 1.089                                    | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.113 | 1.117 | 1.121 | 1.124 | 1.128 | 1.132 | 1.136 | 0.977 |
| 0.978 | 1.090                                    | 1.094 | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.118 | 1.122 | 1.126 | 1.130 | 1.133 | 1.137 | 0.978 |
| 0.979 | 1.092                                    | 1.096 | 1.100 | 1.103 | 1.107 | 1.111 | 1.115 | 1.119 | 1.123 | 1.127 | 1.131 | 1.135 | 1.138 | 0.979 |

TEMPERATURE °C Flow rate m3/min (actual)

| Po/Pa | -6    | -4    | -2    | 0     | 2     | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 18    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 1.082 | 1.086 | 1.089 | 1.093 | 1.096 | 1.100 | 1.103 | 1.107 | 1.110 | 1.114 | 1.117 | 1.121 | 1.124 | 0.930 |
| 0.931 | 1.083 | 1.087 | 1.090 | 1.094 | 1.098 | 1.101 | 1.105 | 1.108 | 1.112 | 1.115 | 1.119 | 1.122 | 1.126 | 0.931 |
| 0.932 | 1.085 | 1.088 | 1.092 | 1.095 | 1.099 | 1.102 | 1.106 | 1.109 | 1.113 | 1.116 | 1.120 | 1.123 | 1.127 | 0.932 |
| 0.933 | 1.086 | 1.089 | 1.093 | 1.097 | 1.100 | 1.104 | 1.107 | 1.111 | 1.114 | 1.118 | 1.121 | 1.125 | 1.128 | 0.933 |
| 0.934 | 1.087 | 1.091 | 1.094 | 1.098 | 1.101 | 1.105 | 1.108 | 1.112 | 1.115 | 1.119 | 1.122 | 1.126 | 1.129 | 0.934 |
| 0.935 | 1.088 | 1.092 | 1.095 | 1.099 | 1.103 | 1.106 | 1.110 | 1.113 | 1.117 | 1.120 | 1.124 | 1.127 | 1.131 | 0.935 |
| 0.936 | 1.089 | 1.093 | 1.097 | 1.100 | 1.104 | 1.107 | 1.111 | 1.114 | 1.118 | 1.121 | 1.125 | 1.128 | 1.132 | 0.936 |
| 0.937 | 1.091 | 1.094 | 1.098 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 1.119 | 1.123 | 1.126 | 1.130 | 1.133 | 0.937 |
| 0.938 | 1.092 | 1.095 | 1.099 | 1.103 | 1.106 | 1.110 | 1.113 | 1.117 | 1.120 | 1.124 | 1.127 | 1.131 | 1.134 | 0.938 |
| 0.939 | 1.093 | 1.097 | 1.100 | 1.104 | 1.108 | 1.111 | 1.115 | 1.118 | 1.122 | 1.125 | 1.129 | 1.132 | 1.136 | 0.939 |
| 0.940 | 1.094 | 1.098 | 1.102 | 1.105 | 1.109 | 1.112 | 1.116 | 1.119 | 1.123 | 1.127 | 1.130 | 1.134 | 1.137 | 0.940 |
| 0.941 | 1.096 | 1.099 | 1.103 | 1.106 | 1.110 | 1.114 | 1.117 | 1.121 | 1.124 | 1.128 | 1.131 | 1.135 | 1.138 | 0.941 |
| 0.942 | 1.097 | 1.100 | 1.104 | 1.108 | 1.111 | 1.115 | 1.118 | 1.122 | 1.126 | 1.129 | 1.133 | 1.136 | 1.140 | 0.942 |
| 0.943 | 1.098 | 1.102 | 1.105 | 1.109 | 1.112 | 1.116 | 1.120 | 1.123 | 1.127 | 1.130 | 1.134 | 1.137 | 1.141 | 0.943 |
| 0.944 | 1.099 | 1.103 | 1.107 | 1.110 | 1.114 | 1.117 | 1.121 | 1.124 | 1.128 | 1.132 | 1.135 | 1.139 | 1.142 | 0.944 |
| 0.945 | 1.100 | 1.104 | 1.108 | 1.111 | 1.115 | 1.119 | 1.122 | 1.126 | 1.129 | 1.133 | 1.136 | 1.140 | 1.143 | 0.945 |
| 0.946 | 1.102 | 1.105 | 1.109 | 1.113 | 1.116 | 1.120 | 1.123 | 1.127 | 1.131 | 1.134 | 1.138 | 1.141 | 1.145 | 0.946 |
| 0.947 | 1.103 | 1.107 | 1.110 | 1.114 | 1.117 | 1.121 | 1.125 | 1.128 | 1.132 | 1.135 | 1.139 | 1.142 | 1.146 | 0.947 |
| 0.948 | 1.104 | 1.108 | 1.111 | 1.115 | 1.119 | 1.122 | 1.126 | 1.129 | 1.133 | 1.137 | 1.140 | 1.144 | 1.147 | 0.948 |
| 0.949 | 1.105 | 1.109 | 1.113 | 1.116 | 1.120 | 1.124 | 1.127 | 1.131 | 1.134 | 1.138 | 1.141 | 1.145 | 1.148 | 0.949 |
| 0.950 | 1.107 | 1.110 | 1.114 | 1.118 | 1.121 | 1.125 | 1.128 | 1.132 | 1.136 | 1.139 | 1.143 | 1.146 | 1.150 | 0.950 |
| 0.951 | 1.108 | 1.111 | 1.115 | 1.119 | 1.122 | 1.126 | 1.130 | 1.133 | 1.137 | 1.140 | 1.144 | 1.148 | 1.151 | 0.951 |
| 0.952 | 1.109 | 1.113 | 1.116 | 1.120 | 1.124 | 1.127 | 1.131 | 1.135 | 1.138 | 1.142 | 1.145 | 1.149 | 1.152 | 0.952 |
| 0.953 | 1.110 | 1.114 | 1.118 | 1.121 | 1.125 | 1.129 | 1.132 | 1.136 | 1.139 | 1.143 | 1.146 | 1.150 | 1.154 | 0.953 |
| 0.954 | 1.111 | 1.115 | 1.119 | 1.123 | 1.126 | 1.130 | 1.133 | 1.137 | 1.141 | 1.144 | 1.148 | 1.151 | 1.155 | 0.954 |
| 0.955 | 1.113 | 1.116 | 1.120 | 1.124 | 1.127 | 1.131 | 1.135 | 1.138 | 1.142 | 1.145 | 1.149 | 1.153 | 1.156 | 0.955 |
| 0.956 | 1.114 | 1.118 | 1.121 | 1.125 | 1.129 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.150 | 1.154 | 1.157 | 0.956 |
| 0.957 | 1.115 | 1.119 | 1.123 | 1.126 | 1.130 | 1.134 | 1.137 | 1.141 | 1.144 | 1.148 | 1.152 | 1.155 | 1.159 | 0.957 |
| 0.958 | 1.116 | 1.120 | 1.124 | 1.127 | 1.131 | 1.135 | 1.138 | 1.142 | 1.146 | 1.149 | 1.153 | 1.156 | 1.160 | 0.958 |
| 0.959 | 1.118 | 1.121 | 1.125 | 1.129 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 0.959 |
| 0.960 | 1.119 | 1.123 | 1.126 | 1.130 | 1.134 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.155 | 1.159 | 1.163 | 0.960 |
| 0.961 | 1.120 | 1.124 | 1.127 | 1.131 | 1.135 | 1.139 | 1.142 | 1.146 | 1.149 | 1.153 | 1.157 | 1.160 | 1.164 | 0.961 |
| 0.962 | 1.121 | 1.125 | 1.129 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 0.962 |
| 0.963 | 1.123 | 1.126 | 1.130 | 1.134 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.159 | 1.163 | 1.166 | 0.963 |
| 0.964 | 1.124 | 1.127 | 1.131 | 1.135 | 1.139 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.168 | 0.964 |
| 0.965 | 1.125 | 1.129 | 1.132 | 1.136 | 1.140 | 1.144 | 1.147 | 1.151 | 1.154 | 1.158 | 1.162 | 1.165 | 1.169 | 0.965 |
| 0.966 | 1.126 | 1.130 | 1.134 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.159 | 1.163 | 1.167 | 1.170 | 0.966 |
| 0.967 | 1.127 | 1.131 | 1.135 | 1.139 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 0.967 |
| 0.968 | 1.129 | 1.132 | 1.136 | 1.140 | 1.144 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.169 | 1.173 | 0.968 |
| 0.969 | 1.130 | 1.134 | 1.137 | 1.141 | 1.145 | 1.149 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.174 | 0.969 |
| 0.970 | 1.131 | 1.135 | 1.139 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.164 | 1.168 | 1.172 | 1.175 | 0.970 |
| 0.971 | 1.132 | 1.136 | 1.140 | 1.144 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.169 | 1.173 | 1.177 | 0.971 |
| 0.972 | 1.134 | 1.137 | 1.141 | 1.145 | 1.149 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.171 | 1.174 | 1.178 | 0.972 |
| 0.973 | 1.135 | 1.139 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 0.973 |
| 0.974 | 1.136 | 1.140 | 1.144 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.169 | 1.173 | 1.177 | 1.180 | 0.974 |
| 0.975 | 1.137 | 1.141 | 1.145 | 1.149 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.171 | 1.174 | 1.178 | 1.182 | 0.975 |
| 0.976 | 1.138 | 1.142 | 1.146 | 1.150 | 1.154 | 1.157 | 1.161 | 1.165 | 1.168 | 1.172 | 1.176 | 1.179 | 1.183 | 0.976 |
| 0.977 | 1.140 | 1.144 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.170 | 1.173 | 1.177 | 1.181 | 1.184 | 0.977 |
| 0.978 | 1.141 | 1.145 | 1.149 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 0.978 |
| 0.979 | 1.142 | 1.146 | 1.150 | 1.154 | 1.157 | 1.161 | 1.165 | 1.168 | 1.172 | 1.176 | 1.179 | 1.183 | 1.187 | 0.979 |

| TEMPERATURE °C Flow rate m3/min (actual) |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Po/Pa                                    | 16    | 18    | 20    | 22    | 24    | 26    | 28    | 30    | 32    | 34    | 36    | 38    | 40    | Po/Pa |
| 0.930                                    | 1.121 | 1.124 | 1.128 | 1.131 | 1.135 | 1.138 | 1.141 | 1.145 | 1.148 | 1.151 | 1.155 | 1.158 | 1.161 | 0.930 |
| 0.931                                    | 1.122 | 1.126 | 1.129 | 1.132 | 1.136 | 1.139 | 1.143 | 1.146 | 1.149 | 1.153 | 1.156 | 1.159 | 1.163 | 0.931 |
| 0.932                                    | 1.123 | 1.127 | 1.130 | 1.134 | 1.137 | 1.141 | 1.144 | 1.147 | 1.151 | 1.154 | 1.157 | 1.161 | 1.164 | 0.932 |
| 0.933                                    | 1.125 | 1.128 | 1.132 | 1.135 | 1.138 | 1.142 | 1.145 | 1.149 | 1.152 | 1.155 | 1.159 | 1.162 | 1.165 | 0.933 |
| 0.934                                    | 1.126 | 1.129 | 1.133 | 1.136 | 1.140 | 1.143 | 1.147 | 1.150 | 1.153 | 1.157 | 1.160 | 1.163 | 1.167 | 0.934 |
| 0.935                                    | 1.127 | 1.131 | 1.134 | 1.138 | 1.141 | 1.144 | 1.148 | 1.151 | 1.155 | 1.158 | 1.161 | 1.165 | 1.168 | 0.935 |
| 0.936                                    | 1.128 | 1.132 | 1.135 | 1.139 | 1.142 | 1.146 | 1.149 | 1.153 | 1.156 | 1.159 | 1.163 | 1.166 | 1.169 | 0.936 |
| 0.937                                    | 1.130 | 1.133 | 1.137 | 1.140 | 1.144 | 1.147 | 1.150 | 1.154 | 1.157 | 1.161 | 1.164 | 1.167 | 1.171 | 0.937 |
| 0.938                                    | 1.131 | 1.134 | 1.138 | 1.141 | 1.145 | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 1.165 | 1.169 | 1.172 | 0.938 |
| 0.939                                    | 1.132 | 1.136 | 1.139 | 1.143 | 1.146 | 1.150 | 1.153 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.173 | 0.939 |
| 0.940                                    | 1.134 | 1.137 | 1.140 | 1.144 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.171 | 1.175 | 0.940 |
| 0.941                                    | 1.135 | 1.138 | 1.142 | 1.145 | 1.149 | 1.152 | 1.156 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 0.941 |
| 0.942                                    | 1.136 | 1.140 | 1.143 | 1.147 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.177 | 0.942 |
| 0.943                                    | 1.137 | 1.141 | 1.144 | 1.148 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 0.943 |
| 0.944                                    | 1.139 | 1.142 | 1.146 | 1.149 | 1.153 | 1.156 | 1.159 | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 0.944 |
| 0.945                                    | 1.140 | 1.143 | 1.147 | 1.150 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.174 | 1.178 | 1.181 | 0.945 |
| 0.946                                    | 1.141 | 1.145 | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 0.946 |
| 0.947                                    | 1.142 | 1.146 | 1.149 | 1.153 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 1.180 | 1.184 | 0.947 |
| 0.948                                    | 1.144 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.178 | 1.182 | 1.185 | 0.948 |
| 0.949                                    | 1.145 | 1.148 | 1.152 | 1.156 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.186 | 0.949 |
| 0.950                                    | 1.146 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.184 | 1.188 | 0.950 |
| 0.951                                    | 1.148 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 0.951 |
| 0.952                                    | 1.149 | 1.152 | 1.156 | 1.159 | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.190 | 0.952 |
| 0.953                                    | 1.150 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 0.953 |
| 0.954                                    | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 0.954 |
| 0.955                                    | 1.153 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.194 | 0.955 |
| 0.956                                    | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 0.956 |
| 0.957                                    | 1.155 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 0.957 |
| 0.958                                    | 1.156 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.191 | 1.195 | 1.198 | 0.958 |
| 0.959                                    | 1.158 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 0.959 |
| 0.960                                    | 1.159 | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 0.960 |
| 0.961                                    | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 0.961 |
| 0.962                                    | 1.161 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 0.962 |
| 0.963                                    | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.201 | 1.205 | 0.963 |
| 0.964                                    | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 0.964 |
| 0.965                                    | 1.165 | 1.169 | 1.172 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 0.965 |
| 0.966                                    | 1.167 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 0.966 |
| 0.967                                    | 1.168 | 1.171 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 0.967 |
| 0.968                                    | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 0.968 |
| 0.969                                    | 1.170 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 0.969 |
| 0.970                                    | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 0.970 |
| 0.971                                    | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 0.971 |
| 0.972                                    | 1.174 | 1.178 | 1.181 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 0.972 |
| 0.973                                    | 1.175 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 0.973 |
| 0.974                                    | 1.177 | 1.180 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 0.974 |
| 0.975                                    | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 0.975 |
| 0.976                                    | 1.179 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 0.976 |
| 0.977                                    | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 0.977 |
| 0.978                                    | 1.182 | 1.185 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 0.978 |
| 0.979                                    | 1.183 | 1.187 | 1.190 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.223 | 1.226 | 0.979 |

| Po/Pa | TEMPERATURE °C Flow rate m3/min (actual) |       |       |       |       |       |       |       |       |       |       |       |       | Po/Pa |
|-------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|       | 26                                       | 28    | 30    | 32    | 34    | 36    | 38    | 40    | 42    | 44    | 46    | 48    | 50    |       |
| 0.930 | 1.138                                    | 1.141 | 1.145 | 1.148 | 1.151 | 1.155 | 1.158 | 1.161 | 1.165 | 1.168 | 1.171 | 1.175 | 1.178 | 0.930 |
| 0.931 | 1.139                                    | 1.143 | 1.146 | 1.149 | 1.153 | 1.156 | 1.159 | 1.163 | 1.166 | 1.169 | 1.173 | 1.176 | 1.179 | 0.931 |
| 0.932 | 1.141                                    | 1.144 | 1.147 | 1.151 | 1.154 | 1.157 | 1.161 | 1.164 | 1.167 | 1.171 | 1.174 | 1.177 | 1.181 | 0.932 |
| 0.933 | 1.142                                    | 1.145 | 1.149 | 1.152 | 1.155 | 1.159 | 1.162 | 1.165 | 1.169 | 1.172 | 1.175 | 1.179 | 1.182 | 0.933 |
| 0.934 | 1.143                                    | 1.147 | 1.150 | 1.153 | 1.157 | 1.160 | 1.163 | 1.167 | 1.170 | 1.173 | 1.177 | 1.180 | 1.183 | 0.934 |
| 0.935 | 1.144                                    | 1.148 | 1.151 | 1.155 | 1.158 | 1.161 | 1.165 | 1.168 | 1.171 | 1.175 | 1.178 | 1.181 | 1.185 | 0.935 |
| 0.936 | 1.146                                    | 1.149 | 1.153 | 1.156 | 1.159 | 1.163 | 1.166 | 1.169 | 1.173 | 1.176 | 1.179 | 1.183 | 1.186 | 0.936 |
| 0.937 | 1.147                                    | 1.150 | 1.154 | 1.157 | 1.161 | 1.164 | 1.167 | 1.171 | 1.174 | 1.177 | 1.181 | 1.184 | 1.187 | 0.937 |
| 0.938 | 1.148                                    | 1.152 | 1.155 | 1.159 | 1.162 | 1.165 | 1.169 | 1.172 | 1.175 | 1.179 | 1.182 | 1.185 | 1.189 | 0.938 |
| 0.939 | 1.150                                    | 1.153 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.173 | 1.177 | 1.180 | 1.183 | 1.187 | 1.190 | 0.939 |
| 0.940 | 1.151                                    | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.171 | 1.175 | 1.178 | 1.181 | 1.185 | 1.188 | 1.191 | 0.940 |
| 0.941 | 1.152                                    | 1.156 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.179 | 1.183 | 1.186 | 1.189 | 1.193 | 0.941 |
| 0.942 | 1.153                                    | 1.157 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.177 | 1.181 | 1.184 | 1.187 | 1.191 | 1.194 | 0.942 |
| 0.943 | 1.155                                    | 1.158 | 1.162 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.185 | 1.189 | 1.192 | 1.195 | 0.943 |
| 0.944 | 1.156                                    | 1.159 | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.183 | 1.187 | 1.190 | 1.193 | 1.197 | 0.944 |
| 0.945 | 1.157                                    | 1.161 | 1.164 | 1.168 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.191 | 1.195 | 1.198 | 0.945 |
| 0.946 | 1.159                                    | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.189 | 1.193 | 1.196 | 1.199 | 0.946 |
| 0.947 | 1.160                                    | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.197 | 1.201 | 0.947 |
| 0.948 | 1.161                                    | 1.165 | 1.168 | 1.172 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.195 | 1.199 | 1.202 | 0.948 |
| 0.949 | 1.162                                    | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.203 | 0.949 |
| 0.950 | 1.164                                    | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.201 | 1.205 | 0.950 |
| 0.951 | 1.165                                    | 1.169 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.199 | 1.203 | 1.206 | 0.951 |
| 0.952 | 1.166                                    | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.207 | 0.952 |
| 0.953 | 1.168                                    | 1.171 | 1.175 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.205 | 1.209 | 0.953 |
| 0.954 | 1.169                                    | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 0.954 |
| 0.955 | 1.170                                    | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.211 | 0.955 |
| 0.956 | 1.171                                    | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.209 | 1.213 | 0.956 |
| 0.957 | 1.173                                    | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 0.957 |
| 0.958 | 1.174                                    | 1.178 | 1.181 | 1.185 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.215 | 0.958 |
| 0.959 | 1.175                                    | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 0.959 |
| 0.960 | 1.177                                    | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 0.960 |
| 0.961 | 1.178                                    | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.219 | 0.961 |
| 0.962 | 1.179                                    | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 0.962 |
| 0.963 | 1.181                                    | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 0.963 |
| 0.964 | 1.182                                    | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 1.220 | 1.223 | 0.964 |
| 0.965 | 1.183                                    | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 0.965 |
| 0.966 | 1.184                                    | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226 | 0.966 |
| 0.967 | 1.186                                    | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 1.224 | 1.227 | 0.967 |
| 0.968 | 1.187                                    | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.218 | 1.222 | 1.225 | 1.229 | 0.968 |
| 0.969 | 1.188                                    | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 1.227 | 1.230 | 0.969 |
| 0.970 | 1.190                                    | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 1.228 | 1.231 | 0.970 |
| 0.971 | 1.191                                    | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 1.226 | 1.229 | 1.233 | 0.971 |
| 0.972 | 1.192                                    | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 1.220 | 1.224 | 1.227 | 1.231 | 1.234 | 0.972 |
| 0.973 | 1.193                                    | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 1.222 | 1.225 | 1.229 | 1.232 | 1.235 | 0.973 |
| 0.974 | 1.195                                    | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226 | 1.230 | 1.233 | 1.237 | 0.974 |
| 0.975 | 1.196                                    | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 1.224 | 1.228 | 1.231 | 1.235 | 1.238 | 0.975 |
| 0.976 | 1.197                                    | 1.201 | 1.204 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 1.226 | 1.229 | 1.233 | 1.236 | 1.239 | 0.976 |
| 0.977 | 1.199                                    | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 1.227 | 1.230 | 1.234 | 1.237 | 1.241 | 0.977 |
| 0.978 | 1.200                                    | 1.203 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 1.228 | 1.232 | 1.235 | 1.239 | 1.242 | 0.978 |
| 0.979 | 1.201                                    | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.223 | 1.226 | 1.230 | 1.233 | 1.236 | 1.240 | 1.243 | 0.979 |

## TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | -12   | -8    | -4    | 0     | 4     | 8     | 12    | 16    | 20    | 24    | 28    | 32    | 36    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 37.02 | 37.17 | 37.31 | 37.46 | 37.60 | 37.74 | 37.89 | 38.03 | 38.17 | 38.31 | 38.45 | 38.59 | 38.73 | 0.930 |
| 0.931 | 37.06 | 37.21 | 37.35 | 37.50 | 37.64 | 37.79 | 37.93 | 38.07 | 38.21 | 38.35 | 38.50 | 38.64 | 38.77 | 0.931 |
| 0.932 | 37.10 | 37.25 | 37.40 | 37.54 | 37.69 | 37.83 | 37.97 | 38.11 | 38.26 | 38.40 | 38.54 | 38.68 | 38.82 | 0.932 |
| 0.933 | 37.15 | 37.29 | 37.44 | 37.58 | 37.73 | 37.87 | 38.02 | 38.16 | 38.30 | 38.44 | 38.58 | 38.72 | 38.86 | 0.933 |
| 0.934 | 37.19 | 37.33 | 37.48 | 37.63 | 37.77 | 37.91 | 38.06 | 38.20 | 38.34 | 38.48 | 38.63 | 38.77 | 38.91 | 0.934 |
| 0.935 | 37.23 | 37.38 | 37.52 | 37.67 | 37.81 | 37.96 | 38.10 | 38.24 | 38.39 | 38.53 | 38.67 | 38.81 | 38.95 | 0.935 |
| 0.936 | 37.27 | 37.42 | 37.57 | 37.71 | 37.86 | 38.00 | 38.14 | 38.29 | 38.43 | 38.57 | 38.71 | 38.85 | 38.99 | 0.936 |
| 0.937 | 37.31 | 37.46 | 37.61 | 37.75 | 37.90 | 38.04 | 38.19 | 38.33 | 38.47 | 38.62 | 38.76 | 38.90 | 39.04 | 0.937 |
| 0.938 | 37.36 | 37.50 | 37.65 | 37.80 | 37.94 | 38.09 | 38.23 | 38.37 | 38.52 | 38.66 | 38.80 | 38.94 | 39.08 | 0.938 |
| 0.939 | 37.40 | 37.55 | 37.69 | 37.84 | 37.98 | 38.13 | 38.27 | 38.42 | 38.56 | 38.70 | 38.84 | 38.98 | 39.13 | 0.939 |
| 0.940 | 37.44 | 37.59 | 37.73 | 37.88 | 38.03 | 38.17 | 38.32 | 38.46 | 38.60 | 38.75 | 38.89 | 39.03 | 39.17 | 0.940 |
| 0.941 | 37.48 | 37.63 | 37.78 | 37.92 | 38.07 | 38.21 | 38.36 | 38.50 | 38.65 | 38.79 | 38.93 | 39.07 | 39.21 | 0.941 |
| 0.942 | 37.52 | 37.67 | 37.82 | 37.97 | 38.11 | 38.26 | 38.40 | 38.55 | 38.69 | 38.83 | 38.97 | 39.12 | 39.26 | 0.942 |
| 0.943 | 37.57 | 37.71 | 37.86 | 38.01 | 38.15 | 38.30 | 38.44 | 38.59 | 38.73 | 38.88 | 39.02 | 39.16 | 39.30 | 0.943 |
| 0.944 | 37.61 | 37.76 | 37.90 | 38.05 | 38.20 | 38.34 | 38.49 | 38.63 | 38.78 | 38.92 | 39.06 | 39.20 | 39.35 | 0.944 |
| 0.945 | 37.65 | 37.80 | 37.95 | 38.09 | 38.24 | 38.39 | 38.53 | 38.67 | 38.82 | 38.96 | 39.11 | 39.25 | 39.39 | 0.945 |
| 0.946 | 37.69 | 37.84 | 37.99 | 38.14 | 38.28 | 38.43 | 38.57 | 38.72 | 38.86 | 39.01 | 39.15 | 39.29 | 39.43 | 0.946 |
| 0.947 | 37.73 | 37.88 | 38.03 | 38.18 | 38.32 | 38.47 | 38.62 | 38.76 | 38.91 | 39.05 | 39.19 | 39.33 | 39.48 | 0.947 |
| 0.948 | 37.78 | 37.92 | 38.07 | 38.22 | 38.37 | 38.51 | 38.66 | 38.80 | 38.95 | 39.09 | 39.24 | 39.38 | 39.52 | 0.948 |
| 0.949 | 37.82 | 37.97 | 38.11 | 38.26 | 38.41 | 38.56 | 38.70 | 38.85 | 38.99 | 39.14 | 39.28 | 39.42 | 39.56 | 0.949 |
| 0.950 | 37.86 | 38.01 | 38.16 | 38.30 | 38.45 | 38.60 | 38.75 | 38.89 | 39.04 | 39.18 | 39.32 | 39.47 | 39.61 | 0.950 |
| 0.951 | 37.90 | 38.05 | 38.20 | 38.35 | 38.49 | 38.64 | 38.79 | 38.93 | 39.08 | 39.22 | 39.37 | 39.51 | 39.65 | 0.951 |
| 0.952 | 37.94 | 38.09 | 38.24 | 38.39 | 38.54 | 38.68 | 38.83 | 38.98 | 39.12 | 39.27 | 39.41 | 39.55 | 39.70 | 0.952 |
| 0.953 | 37.99 | 38.13 | 38.28 | 38.43 | 38.58 | 38.73 | 38.87 | 39.02 | 39.17 | 39.31 | 39.45 | 39.60 | 39.74 | 0.953 |
| 0.954 | 38.03 | 38.18 | 38.33 | 38.47 | 38.62 | 38.77 | 38.92 | 39.06 | 39.21 | 39.35 | 39.50 | 39.64 | 39.78 | 0.954 |
| 0.955 | 38.07 | 38.22 | 38.37 | 38.52 | 38.67 | 38.81 | 38.96 | 39.11 | 39.25 | 39.40 | 39.54 | 39.68 | 39.83 | 0.955 |
| 0.956 | 38.11 | 38.26 | 38.41 | 38.56 | 38.71 | 38.86 | 39.00 | 39.15 | 39.29 | 39.44 | 39.58 | 39.73 | 39.87 | 0.956 |
| 0.957 | 38.15 | 38.30 | 38.45 | 38.60 | 38.75 | 38.90 | 39.05 | 39.19 | 39.34 | 39.48 | 39.63 | 39.77 | 39.92 | 0.957 |
| 0.958 | 38.19 | 38.35 | 38.50 | 38.64 | 38.79 | 38.94 | 39.09 | 39.24 | 39.38 | 39.53 | 39.67 | 39.82 | 39.96 | 0.958 |
| 0.959 | 38.24 | 38.39 | 38.54 | 38.69 | 38.84 | 38.98 | 39.13 | 39.28 | 39.42 | 39.57 | 39.72 | 39.86 | 40.00 | 0.959 |
| 0.960 | 38.28 | 38.43 | 38.58 | 38.73 | 38.88 | 39.03 | 39.17 | 39.32 | 39.47 | 39.61 | 39.76 | 39.90 | 40.05 | 0.960 |
| 0.961 | 38.32 | 38.47 | 38.62 | 38.77 | 38.92 | 39.07 | 39.22 | 39.36 | 39.51 | 39.66 | 39.80 | 39.95 | 40.09 | 0.961 |
| 0.962 | 38.36 | 38.51 | 38.66 | 38.81 | 38.96 | 39.11 | 39.26 | 39.41 | 39.55 | 39.70 | 39.85 | 39.99 | 40.14 | 0.962 |
| 0.963 | 38.40 | 38.56 | 38.71 | 38.86 | 39.01 | 39.16 | 39.30 | 39.45 | 39.60 | 39.74 | 39.89 | 40.03 | 40.18 | 0.963 |
| 0.964 | 38.45 | 38.60 | 38.75 | 38.90 | 39.05 | 39.20 | 39.35 | 39.49 | 39.64 | 39.79 | 39.93 | 40.08 | 40.22 | 0.964 |
| 0.965 | 38.49 | 38.64 | 38.79 | 38.94 | 39.09 | 39.24 | 39.39 | 39.54 | 39.68 | 39.83 | 39.98 | 40.12 | 40.27 | 0.965 |
| 0.966 | 38.53 | 38.68 | 38.83 | 38.98 | 39.13 | 39.28 | 39.43 | 39.58 | 39.73 | 39.87 | 40.02 | 40.17 | 40.31 | 0.966 |
| 0.967 | 38.57 | 38.73 | 38.88 | 39.03 | 39.18 | 39.33 | 39.48 | 39.62 | 39.77 | 39.92 | 40.06 | 40.21 | 40.36 | 0.967 |
| 0.968 | 38.61 | 38.77 | 38.92 | 39.07 | 39.22 | 39.37 | 39.52 | 39.67 | 39.81 | 39.96 | 40.11 | 40.25 | 40.40 | 0.968 |
| 0.969 | 38.66 | 38.81 | 38.96 | 39.11 | 39.26 | 39.41 | 39.56 | 39.71 | 39.86 | 40.01 | 40.15 | 40.30 | 40.44 | 0.969 |
| 0.970 | 38.70 | 38.85 | 39.00 | 39.15 | 39.31 | 39.46 | 39.60 | 39.75 | 39.90 | 40.05 | 40.20 | 40.34 | 40.49 | 0.970 |
| 0.971 | 38.74 | 38.89 | 39.05 | 39.20 | 39.35 | 39.50 | 39.65 | 39.80 | 39.94 | 40.09 | 40.24 | 40.39 | 40.53 | 0.971 |
| 0.972 | 38.78 | 38.94 | 39.09 | 39.24 | 39.39 | 39.54 | 39.69 | 39.84 | 39.99 | 40.14 | 40.28 | 40.43 | 40.57 | 0.972 |
| 0.973 | 38.82 | 38.98 | 39.13 | 39.28 | 39.43 | 39.58 | 39.73 | 39.88 | 40.03 | 40.18 | 40.33 | 40.47 | 40.62 | 0.973 |
| 0.974 | 38.87 | 39.02 | 39.17 | 39.32 | 39.48 | 39.63 | 39.78 | 39.93 | 40.07 | 40.22 | 40.37 | 40.52 | 40.66 | 0.974 |
| 0.975 | 38.91 | 39.06 | 39.22 | 39.37 | 39.52 | 39.67 | 39.82 | 39.97 | 40.12 | 40.27 | 40.41 | 40.56 | 40.71 | 0.975 |
| 0.976 | 38.95 | 39.10 | 39.26 | 39.41 | 39.56 | 39.71 | 39.86 | 40.01 | 40.16 | 40.31 | 40.46 | 40.60 | 40.75 | 0.976 |
| 0.977 | 38.99 | 39.15 | 39.30 | 39.45 | 39.60 | 39.76 | 39.91 | 40.06 | 40.20 | 40.35 | 40.50 | 40.65 | 40.79 | 0.977 |
| 0.978 | 39.04 | 39.19 | 39.34 | 39.49 | 39.65 | 39.80 | 39.95 | 40.10 | 40.25 | 40.40 | 40.54 | 40.69 | 40.84 | 0.978 |
| 0.979 | 39.08 | 39.23 | 39.38 | 39.54 | 39.69 | 39.84 | 39.99 | 40.14 | 40.29 | 40.44 | 40.59 | 40.74 | 40.88 | 0.979 |

TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | 18    | 22    | 26    | 30    | 34    | 38    | 42    | 46    | 50    | 54    | 58    | 62    | 66    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 38.10 | 38.24 | 38.38 | 38.52 | 38.66 | 38.80 | 38.94 | 39.08 | 39.21 | 39.35 | 39.49 | 39.62 | 39.76 | 0.930 |
| 0.931 | 38.14 | 38.28 | 38.43 | 38.57 | 38.71 | 38.84 | 38.98 | 39.12 | 39.26 | 39.40 | 39.53 | 39.67 | 39.80 | 0.931 |
| 0.932 | 38.19 | 38.33 | 38.47 | 38.61 | 38.75 | 38.89 | 39.03 | 39.17 | 39.30 | 39.44 | 39.58 | 39.71 | 39.85 | 0.932 |
| 0.933 | 38.23 | 38.37 | 38.51 | 38.65 | 38.79 | 38.93 | 39.07 | 39.21 | 39.35 | 39.48 | 39.62 | 39.76 | 39.89 | 0.933 |
| 0.934 | 38.27 | 38.41 | 38.56 | 38.70 | 38.84 | 38.98 | 39.12 | 39.25 | 39.39 | 39.53 | 39.67 | 39.80 | 39.94 | 0.934 |
| 0.935 | 38.32 | 38.46 | 38.60 | 38.74 | 38.88 | 39.02 | 39.16 | 39.30 | 39.44 | 39.57 | 39.71 | 39.85 | 39.98 | 0.935 |
| 0.936 | 38.36 | 38.50 | 38.64 | 38.78 | 38.92 | 39.06 | 39.20 | 39.34 | 39.48 | 39.62 | 39.76 | 39.89 | 40.03 | 0.936 |
| 0.937 | 38.40 | 38.54 | 38.69 | 38.83 | 38.97 | 39.11 | 39.25 | 39.39 | 39.52 | 39.66 | 39.80 | 39.94 | 40.07 | 0.937 |
| 0.938 | 38.44 | 38.59 | 38.73 | 38.87 | 39.01 | 39.15 | 39.29 | 39.43 | 39.57 | 39.71 | 39.84 | 39.98 | 40.12 | 0.938 |
| 0.939 | 38.49 | 38.63 | 38.77 | 38.91 | 39.06 | 39.20 | 39.34 | 39.47 | 39.61 | 39.75 | 39.89 | 40.03 | 40.16 | 0.939 |
| 0.940 | 38.53 | 38.67 | 38.82 | 38.96 | 39.10 | 39.24 | 39.38 | 39.52 | 39.66 | 39.80 | 39.93 | 40.07 | 40.21 | 0.940 |
| 0.941 | 38.57 | 38.72 | 38.86 | 39.00 | 39.14 | 39.28 | 39.42 | 39.56 | 39.70 | 39.84 | 39.98 | 40.12 | 40.25 | 0.941 |
| 0.942 | 38.62 | 38.76 | 38.90 | 39.05 | 39.19 | 39.33 | 39.47 | 39.61 | 39.75 | 39.89 | 40.02 | 40.16 | 40.30 | 0.942 |
| 0.943 | 38.66 | 38.80 | 38.95 | 39.09 | 39.23 | 39.37 | 39.51 | 39.65 | 39.79 | 39.93 | 40.07 | 40.21 | 40.34 | 0.943 |
| 0.944 | 38.70 | 38.85 | 38.99 | 39.13 | 39.27 | 39.42 | 39.56 | 39.70 | 39.84 | 39.97 | 40.11 | 40.25 | 40.39 | 0.944 |
| 0.945 | 38.75 | 38.89 | 39.03 | 39.18 | 39.32 | 39.46 | 39.60 | 39.74 | 39.88 | 40.02 | 40.16 | 40.30 | 40.43 | 0.945 |
| 0.946 | 38.79 | 38.93 | 39.08 | 39.22 | 39.36 | 39.50 | 39.64 | 39.78 | 39.92 | 40.06 | 40.20 | 40.34 | 40.48 | 0.946 |
| 0.947 | 38.83 | 38.98 | 39.12 | 39.26 | 39.41 | 39.55 | 39.69 | 39.83 | 39.97 | 40.11 | 40.25 | 40.39 | 40.52 | 0.947 |
| 0.948 | 38.88 | 39.02 | 39.16 | 39.31 | 39.45 | 39.59 | 39.73 | 39.87 | 40.01 | 40.15 | 40.29 | 40.43 | 40.57 | 0.948 |
| 0.949 | 38.92 | 39.06 | 39.21 | 39.35 | 39.49 | 39.64 | 39.78 | 39.92 | 40.06 | 40.20 | 40.34 | 40.48 | 40.61 | 0.949 |
| 0.950 | 38.96 | 39.11 | 39.25 | 39.39 | 39.54 | 39.68 | 39.82 | 39.96 | 40.10 | 40.24 | 40.38 | 40.52 | 40.66 | 0.950 |
| 0.951 | 39.01 | 39.15 | 39.29 | 39.44 | 39.58 | 39.72 | 39.87 | 40.01 | 40.15 | 40.29 | 40.43 | 40.57 | 40.70 | 0.951 |
| 0.952 | 39.05 | 39.19 | 39.34 | 39.48 | 39.62 | 39.77 | 39.91 | 40.05 | 40.19 | 40.33 | 40.47 | 40.61 | 40.75 | 0.952 |
| 0.953 | 39.09 | 39.24 | 39.38 | 39.53 | 39.67 | 39.81 | 39.95 | 40.09 | 40.24 | 40.38 | 40.52 | 40.66 | 40.79 | 0.953 |
| 0.954 | 39.14 | 39.28 | 39.43 | 39.57 | 39.71 | 39.86 | 40.00 | 40.14 | 40.28 | 40.42 | 40.56 | 40.70 | 40.84 | 0.954 |
| 0.955 | 39.18 | 39.32 | 39.47 | 39.61 | 39.76 | 39.90 | 40.04 | 40.18 | 40.32 | 40.47 | 40.61 | 40.75 | 40.88 | 0.955 |
| 0.956 | 39.22 | 39.37 | 39.51 | 39.66 | 39.80 | 39.94 | 40.09 | 40.23 | 40.37 | 40.51 | 40.65 | 40.79 | 40.93 | 0.956 |
| 0.957 | 39.27 | 39.41 | 39.56 | 39.70 | 39.84 | 39.99 | 40.13 | 40.27 | 40.41 | 40.55 | 40.70 | 40.83 | 40.97 | 0.957 |
| 0.958 | 39.31 | 39.45 | 39.60 | 39.74 | 39.89 | 40.03 | 40.17 | 40.32 | 40.46 | 40.60 | 40.74 | 40.88 | 41.02 | 0.958 |
| 0.959 | 39.35 | 39.50 | 39.64 | 39.79 | 39.93 | 40.08 | 40.22 | 40.36 | 40.50 | 40.64 | 40.78 | 40.92 | 41.06 | 0.959 |
| 0.960 | 39.39 | 39.54 | 39.69 | 39.83 | 39.98 | 40.12 | 40.26 | 40.41 | 40.55 | 40.69 | 40.83 | 40.97 | 41.11 | 0.960 |
| 0.961 | 39.44 | 39.58 | 39.73 | 39.88 | 40.02 | 40.16 | 40.31 | 40.45 | 40.59 | 40.73 | 40.87 | 41.01 | 41.15 | 0.961 |
| 0.962 | 39.48 | 39.63 | 39.77 | 39.92 | 40.06 | 40.21 | 40.35 | 40.49 | 40.64 | 40.78 | 40.92 | 41.06 | 41.20 | 0.962 |
| 0.963 | 39.52 | 39.67 | 39.82 | 39.96 | 40.11 | 40.25 | 40.40 | 40.54 | 40.68 | 40.82 | 40.96 | 41.10 | 41.24 | 0.963 |
| 0.964 | 39.57 | 39.71 | 39.86 | 40.01 | 40.15 | 40.30 | 40.44 | 40.58 | 40.73 | 40.87 | 41.01 | 41.15 | 41.29 | 0.964 |
| 0.965 | 39.61 | 39.76 | 39.90 | 40.05 | 40.19 | 40.34 | 40.48 | 40.63 | 40.77 | 40.91 | 41.05 | 41.19 | 41.34 | 0.965 |
| 0.966 | 39.65 | 39.80 | 39.95 | 40.09 | 40.24 | 40.38 | 40.53 | 40.67 | 40.81 | 40.96 | 41.10 | 41.24 | 41.38 | 0.966 |
| 0.967 | 39.70 | 39.84 | 39.99 | 40.14 | 40.28 | 40.43 | 40.57 | 40.72 | 40.86 | 41.00 | 41.14 | 41.28 | 41.43 | 0.967 |
| 0.968 | 39.74 | 39.89 | 40.03 | 40.18 | 40.33 | 40.47 | 40.62 | 40.76 | 40.90 | 41.05 | 41.19 | 41.33 | 41.47 | 0.968 |
| 0.969 | 39.78 | 39.93 | 40.08 | 40.22 | 40.37 | 40.52 | 40.66 | 40.80 | 40.95 | 41.09 | 41.23 | 41.37 | 41.52 | 0.969 |
| 0.970 | 39.83 | 39.97 | 40.12 | 40.27 | 40.41 | 40.56 | 40.70 | 40.85 | 40.99 | 41.13 | 41.28 | 41.42 | 41.56 | 0.970 |
| 0.971 | 39.87 | 40.02 | 40.17 | 40.31 | 40.46 | 40.60 | 40.75 | 40.89 | 41.04 | 41.18 | 41.32 | 41.46 | 41.61 | 0.971 |
| 0.972 | 39.91 | 40.06 | 40.21 | 40.36 | 40.50 | 40.65 | 40.79 | 40.94 | 41.08 | 41.22 | 41.37 | 41.51 | 41.65 | 0.972 |
| 0.973 | 39.96 | 40.11 | 40.25 | 40.40 | 40.55 | 40.69 | 40.84 | 40.98 | 41.13 | 41.27 | 41.41 | 41.55 | 41.70 | 0.973 |
| 0.974 | 40.00 | 40.15 | 40.30 | 40.44 | 40.59 | 40.74 | 40.88 | 41.03 | 41.17 | 41.31 | 41.46 | 41.60 | 41.74 | 0.974 |
| 0.975 | 40.04 | 40.19 | 40.34 | 40.49 | 40.63 | 40.78 | 40.93 | 41.07 | 41.21 | 41.36 | 41.50 | 41.64 | 41.79 | 0.975 |
| 0.976 | 40.09 | 40.24 | 40.38 | 40.53 | 40.68 | 40.82 | 40.97 | 41.11 | 41.26 | 41.40 | 41.55 | 41.69 | 41.83 | 0.976 |
| 0.977 | 40.13 | 40.28 | 40.43 | 40.57 | 40.72 | 40.87 | 41.01 | 41.16 | 41.30 | 41.45 | 41.59 | 41.73 | 41.88 | 0.977 |
| 0.978 | 40.17 | 40.32 | 40.47 | 40.62 | 40.77 | 40.91 | 41.06 | 41.20 | 41.35 | 41.49 | 41.64 | 41.78 | 41.92 | 0.978 |
| 0.979 | 40.22 | 40.37 | 40.51 | 40.66 | 40.81 | 40.96 | 41.10 | 41.25 | 41.39 | 41.54 | 41.68 | 41.82 | 41.97 | 0.979 |

TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | 48    | 52    | 56    | 60    | 64    | 68    | 72    | 76    | 80    | 84    | 88    | 92    | 96    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 39.15 | 39.28 | 39.42 | 39.55 | 39.69 | 39.83 | 39.96 | 40.09 | 40.23 | 40.36 | 40.49 | 40.62 | 40.76 | 0.930 |
| 0.931 | 39.19 | 39.33 | 39.46 | 39.60 | 39.74 | 39.87 | 40.00 | 40.14 | 40.27 | 40.41 | 40.54 | 40.67 | 40.80 | 0.931 |
| 0.932 | 39.23 | 39.37 | 39.51 | 39.64 | 39.78 | 39.92 | 40.05 | 40.18 | 40.32 | 40.45 | 40.58 | 40.72 | 40.85 | 0.932 |
| 0.933 | 39.28 | 39.42 | 39.55 | 39.69 | 39.83 | 39.96 | 40.10 | 40.23 | 40.36 | 40.50 | 40.63 | 40.76 | 40.89 | 0.933 |
| 0.934 | 39.32 | 39.46 | 39.60 | 39.73 | 39.87 | 40.01 | 40.14 | 40.28 | 40.41 | 40.54 | 40.68 | 40.81 | 40.94 | 0.934 |
| 0.935 | 39.37 | 39.50 | 39.64 | 39.78 | 39.92 | 40.05 | 40.19 | 40.32 | 40.45 | 40.59 | 40.72 | 40.85 | 40.99 | 0.935 |
| 0.936 | 39.41 | 39.55 | 39.69 | 39.82 | 39.96 | 40.10 | 40.23 | 40.37 | 40.50 | 40.63 | 40.77 | 40.90 | 41.03 | 0.936 |
| 0.937 | 39.46 | 39.59 | 39.73 | 39.87 | 40.00 | 40.14 | 40.28 | 40.41 | 40.55 | 40.68 | 40.81 | 40.95 | 41.08 | 0.937 |
| 0.938 | 39.50 | 39.64 | 39.78 | 39.91 | 40.05 | 40.19 | 40.32 | 40.46 | 40.59 | 40.73 | 40.86 | 40.99 | 41.13 | 0.938 |
| 0.939 | 39.54 | 39.68 | 39.82 | 39.96 | 40.09 | 40.23 | 40.37 | 40.50 | 40.64 | 40.77 | 40.91 | 41.04 | 41.17 | 0.939 |
| 0.940 | 39.59 | 39.73 | 39.87 | 40.00 | 40.14 | 40.28 | 40.41 | 40.55 | 40.68 | 40.82 | 40.95 | 41.08 | 41.22 | 0.940 |
| 0.941 | 39.63 | 39.77 | 39.91 | 40.05 | 40.18 | 40.32 | 40.46 | 40.59 | 40.73 | 40.86 | 41.00 | 41.13 | 41.26 | 0.941 |
| 0.942 | 39.68 | 39.82 | 39.95 | 40.09 | 40.23 | 40.37 | 40.50 | 40.64 | 40.77 | 40.91 | 41.04 | 41.18 | 41.31 | 0.942 |
| 0.943 | 39.72 | 39.86 | 40.00 | 40.14 | 40.27 | 40.41 | 40.55 | 40.68 | 40.82 | 40.95 | 41.09 | 41.22 | 41.36 | 0.943 |
| 0.944 | 39.77 | 39.91 | 40.04 | 40.18 | 40.32 | 40.46 | 40.59 | 40.73 | 40.87 | 41.00 | 41.13 | 41.27 | 41.40 | 0.944 |
| 0.945 | 39.81 | 39.95 | 40.09 | 40.23 | 40.36 | 40.50 | 40.64 | 40.77 | 40.91 | 41.05 | 41.18 | 41.31 | 41.45 | 0.945 |
| 0.946 | 39.85 | 39.99 | 40.13 | 40.27 | 40.41 | 40.55 | 40.68 | 40.82 | 40.96 | 41.09 | 41.23 | 41.36 | 41.49 | 0.946 |
| 0.947 | 39.90 | 40.04 | 40.18 | 40.32 | 40.45 | 40.59 | 40.73 | 40.87 | 41.00 | 41.14 | 41.27 | 41.41 | 41.54 | 0.947 |
| 0.948 | 39.94 | 40.08 | 40.22 | 40.36 | 40.50 | 40.64 | 40.77 | 40.91 | 41.05 | 41.18 | 41.32 | 41.45 | 41.59 | 0.948 |
| 0.949 | 39.99 | 40.13 | 40.27 | 40.41 | 40.54 | 40.68 | 40.82 | 40.96 | 41.09 | 41.23 | 41.36 | 41.50 | 41.63 | 0.949 |
| 0.950 | 40.03 | 40.17 | 40.31 | 40.45 | 40.59 | 40.73 | 40.87 | 41.00 | 41.14 | 41.27 | 41.41 | 41.54 | 41.68 | 0.950 |
| 0.951 | 40.08 | 40.22 | 40.36 | 40.50 | 40.63 | 40.77 | 40.91 | 41.05 | 41.18 | 41.32 | 41.46 | 41.59 | 41.73 | 0.951 |
| 0.952 | 40.12 | 40.26 | 40.40 | 40.54 | 40.68 | 40.82 | 40.96 | 41.09 | 41.23 | 41.37 | 41.50 | 41.64 | 41.77 | 0.952 |
| 0.953 | 40.17 | 40.31 | 40.45 | 40.59 | 40.72 | 40.86 | 41.00 | 41.14 | 41.28 | 41.41 | 41.55 | 41.68 | 41.82 | 0.953 |
| 0.954 | 40.21 | 40.35 | 40.49 | 40.63 | 40.77 | 40.91 | 41.05 | 41.18 | 41.32 | 41.46 | 41.59 | 41.73 | 41.86 | 0.954 |
| 0.955 | 40.25 | 40.40 | 40.54 | 40.68 | 40.81 | 40.95 | 41.09 | 41.23 | 41.37 | 41.50 | 41.64 | 41.78 | 41.91 | 0.955 |
| 0.956 | 40.30 | 40.44 | 40.58 | 40.72 | 40.86 | 41.00 | 41.14 | 41.27 | 41.41 | 41.55 | 41.69 | 41.82 | 41.96 | 0.956 |
| 0.957 | 40.34 | 40.48 | 40.62 | 40.77 | 40.90 | 41.04 | 41.18 | 41.32 | 41.46 | 41.59 | 41.73 | 41.87 | 42.00 | 0.957 |
| 0.958 | 40.39 | 40.53 | 40.67 | 40.81 | 40.95 | 41.09 | 41.23 | 41.37 | 41.50 | 41.64 | 41.78 | 41.91 | 42.05 | 0.958 |
| 0.959 | 40.43 | 40.57 | 40.71 | 40.85 | 40.99 | 41.13 | 41.27 | 41.41 | 41.55 | 41.69 | 41.82 | 41.96 | 42.10 | 0.959 |
| 0.960 | 40.48 | 40.62 | 40.76 | 40.90 | 41.04 | 41.18 | 41.32 | 41.46 | 41.59 | 41.73 | 41.87 | 42.01 | 42.14 | 0.960 |
| 0.961 | 40.52 | 40.66 | 40.80 | 40.94 | 41.08 | 41.22 | 41.36 | 41.50 | 41.64 | 41.78 | 41.92 | 42.05 | 42.19 | 0.961 |
| 0.962 | 40.56 | 40.71 | 40.85 | 40.99 | 41.13 | 41.27 | 41.41 | 41.55 | 41.69 | 41.82 | 41.96 | 42.10 | 42.23 | 0.962 |
| 0.963 | 40.61 | 40.75 | 40.89 | 41.03 | 41.17 | 41.31 | 41.45 | 41.59 | 41.73 | 41.87 | 42.01 | 42.14 | 42.28 | 0.963 |
| 0.964 | 40.65 | 40.80 | 40.94 | 41.08 | 41.22 | 41.36 | 41.50 | 41.64 | 41.78 | 41.92 | 42.05 | 42.19 | 42.33 | 0.964 |
| 0.965 | 40.70 | 40.84 | 40.98 | 41.12 | 41.26 | 41.41 | 41.54 | 41.68 | 41.82 | 41.96 | 42.10 | 42.24 | 42.37 | 0.965 |
| 0.966 | 40.74 | 40.89 | 41.03 | 41.17 | 41.31 | 41.45 | 41.59 | 41.73 | 41.87 | 42.01 | 42.14 | 42.28 | 42.42 | 0.966 |
| 0.967 | 40.79 | 40.93 | 41.07 | 41.21 | 41.35 | 41.50 | 41.64 | 41.78 | 41.91 | 42.05 | 42.19 | 42.33 | 42.47 | 0.967 |
| 0.968 | 40.83 | 40.97 | 41.12 | 41.26 | 41.40 | 41.54 | 41.68 | 41.82 | 41.96 | 42.10 | 42.24 | 42.37 | 42.51 | 0.968 |
| 0.969 | 40.88 | 41.02 | 41.16 | 41.30 | 41.44 | 41.59 | 41.73 | 41.87 | 42.01 | 42.14 | 42.28 | 42.42 | 42.56 | 0.969 |
| 0.970 | 40.92 | 41.06 | 41.21 | 41.35 | 41.49 | 41.63 | 41.77 | 41.91 | 42.05 | 42.19 | 42.33 | 42.47 | 42.60 | 0.970 |
| 0.971 | 40.96 | 41.11 | 41.25 | 41.39 | 41.54 | 41.68 | 41.82 | 41.96 | 42.10 | 42.24 | 42.37 | 42.51 | 42.65 | 0.971 |
| 0.972 | 41.01 | 41.15 | 41.30 | 41.44 | 41.58 | 41.72 | 41.86 | 42.00 | 42.14 | 42.28 | 42.42 | 42.56 | 42.70 | 0.972 |
| 0.973 | 41.05 | 41.20 | 41.34 | 41.48 | 41.63 | 41.77 | 41.91 | 42.05 | 42.19 | 42.33 | 42.47 | 42.60 | 42.74 | 0.973 |
| 0.974 | 41.10 | 41.24 | 41.39 | 41.53 | 41.67 | 41.81 | 41.95 | 42.09 | 42.23 | 42.37 | 42.51 | 42.65 | 42.79 | 0.974 |
| 0.975 | 41.14 | 41.29 | 41.43 | 41.57 | 41.72 | 41.86 | 42.00 | 42.14 | 42.28 | 42.42 | 42.56 | 42.70 | 42.84 | 0.975 |
| 0.976 | 41.19 | 41.33 | 41.47 | 41.62 | 41.76 | 41.90 | 42.04 | 42.18 | 42.33 | 42.46 | 42.60 | 42.74 | 42.88 | 0.976 |
| 0.977 | 41.23 | 41.38 | 41.52 | 41.66 | 41.81 | 41.95 | 42.09 | 42.23 | 42.37 | 42.51 | 42.65 | 42.79 | 42.93 | 0.977 |
| 0.978 | 41.28 | 41.42 | 41.56 | 41.71 | 41.85 | 41.99 | 42.13 | 42.28 | 42.42 | 42.56 | 42.70 | 42.84 | 42.97 | 0.978 |
| 0.979 | 41.32 | 41.46 | 41.61 | 41.75 | 41.90 | 42.04 | 42.18 | 42.32 | 42.46 | 42.60 | 42.74 | 42.88 | 43.02 | 0.979 |

## TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | 76    | 80    | 84    | 88    | 92    | 96    | 100   | 104   | 108   | 112   | 116   | 120   | 124   | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 40.09 | 40.23 | 40.36 | 40.49 | 40.62 | 40.76 | 40.89 | 41.02 | 41.15 | 41.28 | 41.41 | 41.54 | 41.66 | 0.930 |
| 0.931 | 40.14 | 40.27 | 40.41 | 40.54 | 40.67 | 40.80 | 40.93 | 41.06 | 41.19 | 41.32 | 41.45 | 41.58 | 41.71 | 0.931 |
| 0.932 | 40.18 | 40.32 | 40.45 | 40.58 | 40.72 | 40.85 | 40.98 | 41.11 | 41.24 | 41.37 | 41.50 | 41.63 | 41.76 | 0.932 |
| 0.933 | 40.23 | 40.36 | 40.50 | 40.63 | 40.76 | 40.89 | 41.03 | 41.16 | 41.29 | 41.42 | 41.55 | 41.68 | 41.81 | 0.933 |
| 0.934 | 40.28 | 40.41 | 40.54 | 40.68 | 40.81 | 40.94 | 41.07 | 41.20 | 41.33 | 41.46 | 41.59 | 41.72 | 41.85 | 0.934 |
| 0.935 | 40.32 | 40.45 | 40.59 | 40.72 | 40.85 | 40.99 | 41.12 | 41.25 | 41.38 | 41.51 | 41.64 | 41.77 | 41.90 | 0.935 |
| 0.936 | 40.37 | 40.50 | 40.63 | 40.77 | 40.90 | 41.03 | 41.16 | 41.30 | 41.43 | 41.56 | 41.69 | 41.82 | 41.95 | 0.936 |
| 0.937 | 40.41 | 40.55 | 40.68 | 40.81 | 40.95 | 41.08 | 41.21 | 41.34 | 41.47 | 41.60 | 41.73 | 41.86 | 41.99 | 0.937 |
| 0.938 | 40.46 | 40.59 | 40.73 | 40.86 | 40.99 | 41.13 | 41.26 | 41.39 | 41.52 | 41.65 | 41.78 | 41.91 | 42.04 | 0.938 |
| 0.939 | 40.50 | 40.64 | 40.77 | 40.91 | 41.04 | 41.17 | 41.30 | 41.44 | 41.57 | 41.70 | 41.83 | 41.96 | 42.09 | 0.939 |
| 0.940 | 40.55 | 40.68 | 40.82 | 40.95 | 41.08 | 41.22 | 41.35 | 41.48 | 41.61 | 41.74 | 41.88 | 42.01 | 42.14 | 0.940 |
| 0.941 | 40.59 | 40.73 | 40.86 | 41.00 | 41.13 | 41.26 | 41.40 | 41.53 | 41.66 | 41.79 | 41.92 | 42.05 | 42.18 | 0.941 |
| 0.942 | 40.64 | 40.77 | 40.91 | 41.04 | 41.18 | 41.31 | 41.44 | 41.58 | 41.71 | 41.84 | 41.97 | 42.10 | 42.23 | 0.942 |
| 0.943 | 40.68 | 40.82 | 40.95 | 41.09 | 41.22 | 41.36 | 41.49 | 41.62 | 41.75 | 41.89 | 42.02 | 42.15 | 42.28 | 0.943 |
| 0.944 | 40.73 | 40.87 | 41.00 | 41.13 | 41.27 | 41.40 | 41.54 | 41.67 | 41.80 | 41.93 | 42.06 | 42.19 | 42.32 | 0.944 |
| 0.945 | 40.77 | 40.91 | 41.05 | 41.18 | 41.31 | 41.45 | 41.58 | 41.71 | 41.85 | 41.98 | 42.11 | 42.24 | 42.37 | 0.945 |
| 0.946 | 40.82 | 40.96 | 41.09 | 41.23 | 41.36 | 41.49 | 41.63 | 41.76 | 41.89 | 42.03 | 42.16 | 42.29 | 42.42 | 0.946 |
| 0.947 | 40.87 | 41.00 | 41.14 | 41.27 | 41.41 | 41.54 | 41.67 | 41.81 | 41.94 | 42.07 | 42.20 | 42.34 | 42.47 | 0.947 |
| 0.948 | 40.91 | 41.05 | 41.18 | 41.32 | 41.45 | 41.59 | 41.72 | 41.85 | 41.99 | 42.12 | 42.25 | 42.38 | 42.51 | 0.948 |
| 0.949 | 40.96 | 41.09 | 41.23 | 41.36 | 41.50 | 41.63 | 41.77 | 41.90 | 42.03 | 42.17 | 42.30 | 42.43 | 42.56 | 0.949 |
| 0.950 | 41.00 | 41.14 | 41.27 | 41.41 | 41.54 | 41.68 | 41.81 | 41.95 | 42.08 | 42.21 | 42.34 | 42.48 | 42.61 | 0.950 |
| 0.951 | 41.05 | 41.18 | 41.32 | 41.46 | 41.59 | 41.73 | 41.86 | 41.99 | 42.13 | 42.26 | 42.39 | 42.52 | 42.65 | 0.951 |
| 0.952 | 41.09 | 41.23 | 41.37 | 41.50 | 41.64 | 41.77 | 41.91 | 42.04 | 42.17 | 42.31 | 42.44 | 42.57 | 42.70 | 0.952 |
| 0.953 | 41.14 | 41.28 | 41.41 | 41.55 | 41.68 | 41.82 | 41.95 | 42.09 | 42.22 | 42.35 | 42.49 | 42.62 | 42.75 | 0.953 |
| 0.954 | 41.18 | 41.32 | 41.46 | 41.59 | 41.73 | 41.86 | 42.00 | 42.13 | 42.27 | 42.40 | 42.53 | 42.66 | 42.80 | 0.954 |
| 0.955 | 41.23 | 41.37 | 41.50 | 41.64 | 41.78 | 41.91 | 42.05 | 42.18 | 42.31 | 42.45 | 42.58 | 42.71 | 42.84 | 0.955 |
| 0.956 | 41.27 | 41.41 | 41.55 | 41.69 | 41.82 | 41.96 | 42.09 | 42.23 | 42.36 | 42.49 | 42.63 | 42.76 | 42.89 | 0.956 |
| 0.957 | 41.32 | 41.46 | 41.59 | 41.73 | 41.87 | 42.00 | 42.14 | 42.27 | 42.41 | 42.54 | 42.67 | 42.81 | 42.94 | 0.957 |
| 0.958 | 41.37 | 41.50 | 41.64 | 41.78 | 41.91 | 42.05 | 42.18 | 42.32 | 42.45 | 42.59 | 42.72 | 42.85 | 42.99 | 0.958 |
| 0.959 | 41.41 | 41.55 | 41.69 | 41.82 | 41.96 | 42.10 | 42.23 | 42.37 | 42.50 | 42.63 | 42.77 | 42.90 | 43.03 | 0.959 |
| 0.960 | 41.46 | 41.59 | 41.73 | 41.87 | 42.01 | 42.14 | 42.28 | 42.41 | 42.55 | 42.68 | 42.81 | 42.95 | 43.08 | 0.960 |
| 0.961 | 41.50 | 41.64 | 41.78 | 41.92 | 42.05 | 42.19 | 42.32 | 42.46 | 42.59 | 42.73 | 42.86 | 42.99 | 43.13 | 0.961 |
| 0.962 | 41.55 | 41.69 | 41.82 | 41.96 | 42.10 | 42.23 | 42.37 | 42.51 | 42.64 | 42.77 | 42.91 | 43.04 | 43.17 | 0.962 |
| 0.963 | 41.59 | 41.73 | 41.87 | 42.01 | 42.14 | 42.28 | 42.42 | 42.55 | 42.69 | 42.82 | 42.96 | 43.09 | 43.22 | 0.963 |
| 0.964 | 41.64 | 41.78 | 41.92 | 42.05 | 42.19 | 42.33 | 42.46 | 42.60 | 42.73 | 42.87 | 43.00 | 43.14 | 43.27 | 0.964 |
| 0.965 | 41.68 | 41.82 | 41.96 | 42.10 | 42.24 | 42.37 | 42.51 | 42.64 | 42.78 | 42.91 | 43.05 | 43.18 | 43.32 | 0.965 |
| 0.966 | 41.73 | 41.87 | 42.01 | 42.14 | 42.28 | 42.42 | 42.56 | 42.69 | 42.83 | 42.96 | 43.10 | 43.23 | 43.36 | 0.966 |
| 0.967 | 41.78 | 41.91 | 42.05 | 42.19 | 42.33 | 42.47 | 42.60 | 42.74 | 42.87 | 43.01 | 43.14 | 43.28 | 43.41 | 0.967 |
| 0.968 | 41.82 | 41.96 | 42.10 | 42.24 | 42.37 | 42.51 | 42.65 | 42.78 | 42.92 | 43.06 | 43.19 | 43.32 | 43.46 | 0.968 |
| 0.969 | 41.87 | 42.01 | 42.14 | 42.28 | 42.42 | 42.56 | 42.69 | 42.83 | 42.97 | 43.10 | 43.24 | 43.37 | 43.51 | 0.969 |
| 0.970 | 41.91 | 42.05 | 42.19 | 42.33 | 42.47 | 42.60 | 42.74 | 42.88 | 43.01 | 43.15 | 43.28 | 43.42 | 43.55 | 0.970 |
| 0.971 | 41.96 | 42.10 | 42.24 | 42.37 | 42.51 | 42.65 | 42.79 | 42.92 | 43.06 | 43.20 | 43.33 | 43.47 | 43.60 | 0.971 |
| 0.972 | 42.00 | 42.14 | 42.28 | 42.42 | 42.56 | 42.70 | 42.83 | 42.97 | 43.11 | 43.24 | 43.38 | 43.51 | 43.65 | 0.972 |
| 0.973 | 42.05 | 42.19 | 42.33 | 42.47 | 42.60 | 42.74 | 42.88 | 43.02 | 43.15 | 43.29 | 43.43 | 43.56 | 43.69 | 0.973 |
| 0.974 | 42.09 | 42.23 | 42.37 | 42.51 | 42.65 | 42.79 | 42.93 | 43.06 | 43.20 | 43.34 | 43.47 | 43.61 | 43.74 | 0.974 |
| 0.975 | 42.14 | 42.28 | 42.42 | 42.56 | 42.70 | 42.84 | 42.97 | 43.11 | 43.25 | 43.38 | 43.52 | 43.65 | 43.79 | 0.975 |
| 0.976 | 42.18 | 42.33 | 42.46 | 42.60 | 42.74 | 42.88 | 43.02 | 43.16 | 43.29 | 43.43 | 43.57 | 43.70 | 43.84 | 0.976 |
| 0.977 | 42.23 | 42.37 | 42.51 | 42.65 | 42.79 | 42.93 | 43.07 | 43.20 | 43.34 | 43.48 | 43.61 | 43.75 | 43.88 | 0.977 |
| 0.978 | 42.28 | 42.42 | 42.56 | 42.70 | 42.84 | 42.97 | 43.11 | 43.25 | 43.39 | 43.52 | 43.66 | 43.80 | 43.93 | 0.978 |
| 0.979 | 42.32 | 42.46 | 42.60 | 42.74 | 42.88 | 43.02 | 43.16 | 43.30 | 43.43 | 43.57 | 43.71 | 43.84 | 43.98 | 0.979 |

09-0013

**Thermo Scientific**  
**Flow Look-Up Table for PM10 VFC**  
**High Volume Air Sampler**

**Serial # P9309 X**

**Calibrated with Rootsmeter serial # 0438320**

**Date Calibrated: 05/08/15**

## USE OF LOOK-UP-TABLE FOR DETERMINATION OF FLOW RATE PM10 VFC High Volume Air Sampler

1. Determine and record atmospheric properties.
2. Operate sampler and allow to warm up. Perform leak test and make sure all gaskets are in place and that there are no leaks.
3. Read the differential pressure across the filter ( $P_f$ ), inches of  $H_2O$  that has to be converted to mm Hg. Reading is taken with a manometer where one side is open to atmosphere and the other is connected to pressure tap on side of filter holder. Filter should be in place for this measurement.
4. Calculate pressure ratio,  $P_o / P_a$   $P_o / P_a = 1 - (P_f / P_a)$   
 $P_f$  and  $P_a$  should be in mm Hg
5. Look up flow rate in look up table. The first 4 pages are in Celsius and actual  $m^3/min$  the last 4 pages are in Fahrenheit and actual cubic feet.

### Example

(NOTE: Individual Look Up Tables will vary.)

1. Suppose the ambient conditions are:

Temperature:  $T_a = 24^\circ C$

Barometric Pressure:  $P_a = 762$  mm Hg (this must be station pressure which is not corrected to sea level)

2. Assume system is allowed to warm up for stable operation.
3. Measure filter pressure differential,  $P_f$ . This reading is the set-up reading plus pick-up reading divided by 2 for an average reading. This is taken with a differential manometer with one side of the manometer connected to the stagnation tap on the filter holder (or the Bulkhead Fitting) and the other side open to the atmosphere. Filter must be in place during this measurement.

Assume that:

Set-up Reading:  $P_f = 18.60$  in  $H_2O$

Pick-up Reading:  $P_f = 19.80$  in  $H_2O$

$P_f = (18.60 + 19.80)/2 = 19.20$  in  $H_2O$ .

4. Convert  $P_f =$  to same units as barometric pressure.

$$P_f = 19.20 \text{ in H}_2\text{O} / 13.61 \times 25.4 = 35.83 \text{ mm Hg}$$

$$P_f = 35.83 \text{ mm Hg}$$

5. Calculate pressure ratio.

$$P_o/P_a = 1 - (P_f/P_a)$$

NOTE:  $P_f$  and  $P_a$  MUST HAVE CONSISTENT UNITS

$$P_o/P_a = 1 - (35.83 / 762) \quad P_o/P_a = .953$$

6. Look up Flow Rate from table.

Table 1 (pages 1 – 4) is set up with temperature in °C and the Flow Rate is read in units of  $\text{m}^3/\text{min}$  (actual, ACMM). In table 2 (pages 5 – 8) the temperature is in °F and Flow Rate is read in  $\text{ft}^3/\text{min}$  (actual, ACFM).

a) For the example we will use Table 1.

Locate the temperature and pressure ratio entries nearest the conditions of:

$$T_a = 24^\circ\text{C}$$

$$P_o/P_a = .953$$

Example: Look-Up Table for Actual Flow Rate in Units of  $\text{m}^3/\text{min}$

|           | Temperature °C |              |       |       |       |
|-----------|----------------|--------------|-------|-------|-------|
| $P_o/P_a$ | 22             | 24           | 26    | 28    | 30    |
| 0.950     | 1.142          | 1.146        | 1.149 | 1.153 | 1.156 |
| 0.951     | 1.144          | 1.147        | 1.150 | 1.154 | 1.157 |
| 0.952     | 1.145          | 1.148        | 1.152 | 1.155 | 1.159 |
| 0.953     | 1.146          | <b>1.150</b> | 1.153 | 1.156 | 1.160 |
| 0.954     | 1.147          | 1.151        | 1.154 | 1.158 | 1.161 |
| 0.955     | 1.149          | 1.152        | 1.156 | 1.159 | 1.162 |

b) The reading of flow rate is:  $Q_a = 1.150 \text{ m}^3/\text{min}$  (actual)

If your  $P_o/P_a$  number is not in look up table ie;  $>.979$  then interpolate.

7. Determine flow rate in terms of standard air.

$$Q_{\text{std}} = 1.150 \text{ m}^3/\text{min} \left( \frac{762 \text{ mm Hg}}{760 \text{ mm Hg}} \right) \left( \frac{298\text{K}}{(273 + 24) \text{K}} \right)$$

$$Q_{\text{std}} = 1.157 \text{ std m}^3/\text{min}$$

It is always a good idea to contact the lab that you are dealing with to determine what information that they need including actual or standard air with respect to flow rate.

TEMPERATURE °C Flow rate m3/min (actual)

| Po/Pa | -32   | -30   | -28   | -26   | -24   | -22   | -20   | -18   | -16   | -14   | -12   | -10   | -8    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 1.034 | 1.038 | 1.042 | 1.046 | 1.049 | 1.053 | 1.057 | 1.060 | 1.064 | 1.068 | 1.071 | 1.075 | 1.079 | 0.930 |
| 0.931 | 1.035 | 1.039 | 1.043 | 1.047 | 1.050 | 1.054 | 1.058 | 1.062 | 1.065 | 1.069 | 1.073 | 1.076 | 1.080 | 0.931 |
| 0.932 | 1.037 | 1.040 | 1.044 | 1.048 | 1.052 | 1.055 | 1.059 | 1.063 | 1.066 | 1.070 | 1.074 | 1.077 | 1.081 | 0.932 |
| 0.933 | 1.038 | 1.042 | 1.045 | 1.049 | 1.053 | 1.057 | 1.060 | 1.064 | 1.068 | 1.071 | 1.075 | 1.079 | 1.082 | 0.933 |
| 0.934 | 1.039 | 1.043 | 1.047 | 1.050 | 1.054 | 1.058 | 1.061 | 1.065 | 1.069 | 1.073 | 1.076 | 1.080 | 1.083 | 0.934 |
| 0.935 | 1.040 | 1.044 | 1.048 | 1.051 | 1.055 | 1.059 | 1.063 | 1.066 | 1.070 | 1.074 | 1.077 | 1.081 | 1.085 | 0.935 |
| 0.936 | 1.041 | 1.045 | 1.049 | 1.053 | 1.056 | 1.060 | 1.064 | 1.068 | 1.071 | 1.075 | 1.079 | 1.082 | 1.086 | 0.936 |
| 0.937 | 1.042 | 1.046 | 1.050 | 1.054 | 1.058 | 1.061 | 1.065 | 1.069 | 1.072 | 1.076 | 1.080 | 1.084 | 1.087 | 0.937 |
| 0.938 | 1.044 | 1.047 | 1.051 | 1.055 | 1.059 | 1.063 | 1.066 | 1.070 | 1.074 | 1.077 | 1.081 | 1.085 | 1.088 | 0.938 |
| 0.939 | 1.045 | 1.049 | 1.052 | 1.056 | 1.060 | 1.064 | 1.067 | 1.071 | 1.075 | 1.079 | 1.082 | 1.086 | 1.090 | 0.939 |
| 0.940 | 1.046 | 1.050 | 1.054 | 1.057 | 1.061 | 1.065 | 1.069 | 1.072 | 1.076 | 1.080 | 1.083 | 1.087 | 1.091 | 0.940 |
| 0.941 | 1.047 | 1.051 | 1.055 | 1.059 | 1.062 | 1.066 | 1.070 | 1.074 | 1.077 | 1.081 | 1.085 | 1.088 | 1.092 | 0.941 |
| 0.942 | 1.048 | 1.052 | 1.056 | 1.060 | 1.064 | 1.067 | 1.071 | 1.075 | 1.079 | 1.082 | 1.086 | 1.090 | 1.093 | 0.942 |
| 0.943 | 1.049 | 1.053 | 1.057 | 1.061 | 1.065 | 1.069 | 1.072 | 1.076 | 1.080 | 1.083 | 1.087 | 1.091 | 1.094 | 0.943 |
| 0.944 | 1.051 | 1.054 | 1.058 | 1.062 | 1.066 | 1.070 | 1.073 | 1.077 | 1.081 | 1.085 | 1.088 | 1.092 | 1.096 | 0.944 |
| 0.945 | 1.052 | 1.056 | 1.059 | 1.063 | 1.067 | 1.071 | 1.075 | 1.078 | 1.082 | 1.086 | 1.090 | 1.093 | 1.097 | 0.945 |
| 0.946 | 1.053 | 1.057 | 1.061 | 1.064 | 1.068 | 1.072 | 1.076 | 1.080 | 1.083 | 1.087 | 1.091 | 1.094 | 1.098 | 0.946 |
| 0.947 | 1.054 | 1.058 | 1.062 | 1.066 | 1.069 | 1.073 | 1.077 | 1.081 | 1.085 | 1.088 | 1.092 | 1.096 | 1.099 | 0.947 |
| 0.948 | 1.055 | 1.059 | 1.063 | 1.067 | 1.071 | 1.074 | 1.078 | 1.082 | 1.086 | 1.089 | 1.093 | 1.097 | 1.101 | 0.948 |
| 0.949 | 1.057 | 1.060 | 1.064 | 1.068 | 1.072 | 1.076 | 1.079 | 1.083 | 1.087 | 1.091 | 1.094 | 1.098 | 1.102 | 0.949 |
| 0.950 | 1.058 | 1.062 | 1.065 | 1.069 | 1.073 | 1.077 | 1.081 | 1.084 | 1.088 | 1.092 | 1.096 | 1.099 | 1.103 | 0.950 |
| 0.951 | 1.059 | 1.063 | 1.067 | 1.070 | 1.074 | 1.078 | 1.082 | 1.086 | 1.089 | 1.093 | 1.097 | 1.101 | 1.104 | 0.951 |
| 0.952 | 1.060 | 1.064 | 1.068 | 1.072 | 1.075 | 1.079 | 1.083 | 1.087 | 1.091 | 1.094 | 1.098 | 1.102 | 1.106 | 0.952 |
| 0.953 | 1.061 | 1.065 | 1.069 | 1.073 | 1.077 | 1.080 | 1.084 | 1.088 | 1.092 | 1.096 | 1.099 | 1.103 | 1.107 | 0.953 |
| 0.954 | 1.062 | 1.066 | 1.070 | 1.074 | 1.078 | 1.082 | 1.085 | 1.089 | 1.093 | 1.097 | 1.101 | 1.104 | 1.108 | 0.954 |
| 0.955 | 1.064 | 1.067 | 1.071 | 1.075 | 1.079 | 1.083 | 1.087 | 1.090 | 1.094 | 1.098 | 1.102 | 1.105 | 1.109 | 0.955 |
| 0.956 | 1.065 | 1.069 | 1.072 | 1.076 | 1.080 | 1.084 | 1.088 | 1.092 | 1.095 | 1.099 | 1.103 | 1.107 | 1.110 | 0.956 |
| 0.957 | 1.066 | 1.070 | 1.074 | 1.078 | 1.081 | 1.085 | 1.089 | 1.093 | 1.097 | 1.100 | 1.104 | 1.108 | 1.112 | 0.957 |
| 0.958 | 1.067 | 1.071 | 1.075 | 1.079 | 1.083 | 1.086 | 1.090 | 1.094 | 1.098 | 1.102 | 1.105 | 1.109 | 1.113 | 0.958 |
| 0.959 | 1.068 | 1.072 | 1.076 | 1.080 | 1.084 | 1.088 | 1.091 | 1.095 | 1.099 | 1.103 | 1.107 | 1.110 | 1.114 | 0.959 |
| 0.960 | 1.069 | 1.073 | 1.077 | 1.081 | 1.085 | 1.089 | 1.093 | 1.096 | 1.100 | 1.104 | 1.108 | 1.112 | 1.115 | 0.960 |
| 0.961 | 1.071 | 1.074 | 1.078 | 1.082 | 1.086 | 1.090 | 1.094 | 1.098 | 1.101 | 1.105 | 1.109 | 1.113 | 1.117 | 0.961 |
| 0.962 | 1.072 | 1.076 | 1.080 | 1.083 | 1.087 | 1.091 | 1.095 | 1.099 | 1.103 | 1.106 | 1.110 | 1.114 | 1.118 | 0.962 |
| 0.963 | 1.073 | 1.077 | 1.081 | 1.085 | 1.089 | 1.092 | 1.096 | 1.100 | 1.104 | 1.108 | 1.111 | 1.115 | 1.119 | 0.963 |
| 0.964 | 1.074 | 1.078 | 1.082 | 1.086 | 1.090 | 1.094 | 1.097 | 1.101 | 1.105 | 1.109 | 1.113 | 1.116 | 1.120 | 0.964 |
| 0.965 | 1.075 | 1.079 | 1.083 | 1.087 | 1.091 | 1.095 | 1.099 | 1.102 | 1.106 | 1.110 | 1.114 | 1.118 | 1.121 | 0.965 |
| 0.966 | 1.076 | 1.080 | 1.084 | 1.088 | 1.092 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 1.115 | 1.119 | 1.123 | 0.966 |
| 0.967 | 1.078 | 1.082 | 1.085 | 1.089 | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 1.120 | 1.124 | 0.967 |
| 0.968 | 1.079 | 1.083 | 1.087 | 1.091 | 1.094 | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.118 | 1.121 | 1.125 | 0.968 |
| 0.969 | 1.080 | 1.084 | 1.088 | 1.092 | 1.096 | 1.100 | 1.103 | 1.107 | 1.111 | 1.115 | 1.119 | 1.123 | 1.126 | 0.969 |
| 0.970 | 1.081 | 1.085 | 1.089 | 1.093 | 1.097 | 1.101 | 1.105 | 1.108 | 1.112 | 1.116 | 1.120 | 1.124 | 1.128 | 0.970 |
| 0.971 | 1.082 | 1.086 | 1.090 | 1.094 | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.117 | 1.121 | 1.125 | 1.129 | 0.971 |
| 0.972 | 1.083 | 1.087 | 1.091 | 1.095 | 1.099 | 1.103 | 1.107 | 1.111 | 1.115 | 1.119 | 1.122 | 1.126 | 1.130 | 0.972 |
| 0.973 | 1.085 | 1.089 | 1.093 | 1.097 | 1.100 | 1.104 | 1.108 | 1.112 | 1.116 | 1.120 | 1.124 | 1.127 | 1.131 | 0.973 |
| 0.974 | 1.086 | 1.090 | 1.094 | 1.098 | 1.102 | 1.106 | 1.109 | 1.113 | 1.117 | 1.121 | 1.125 | 1.129 | 1.132 | 0.974 |
| 0.975 | 1.087 | 1.091 | 1.095 | 1.099 | 1.103 | 1.107 | 1.111 | 1.114 | 1.118 | 1.122 | 1.126 | 1.130 | 1.134 | 0.975 |
| 0.976 | 1.088 | 1.092 | 1.096 | 1.100 | 1.104 | 1.108 | 1.112 | 1.116 | 1.120 | 1.123 | 1.127 | 1.131 | 1.135 | 0.976 |
| 0.977 | 1.089 | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.113 | 1.117 | 1.121 | 1.125 | 1.128 | 1.132 | 1.136 | 0.977 |
| 0.978 | 1.091 | 1.095 | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.118 | 1.122 | 1.126 | 1.130 | 1.134 | 1.137 | 0.978 |
| 0.979 | 1.092 | 1.096 | 1.100 | 1.104 | 1.108 | 1.111 | 1.115 | 1.119 | 1.123 | 1.127 | 1.131 | 1.135 | 1.139 | 0.979 |

| Po/Pa | TEMPERATURE °C Flow rate m3/min (actual) |       |       |       |       |       |       |       |       |       |       |       | Po/Pa |       |
|-------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|       | -6                                       | -4    | -2    | 0     | 2     | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 18    |       |
| 0.930 | 1.082                                    | 1.086 | 1.089 | 1.093 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 1.114 | 1.118 | 1.121 | 1.124 | 0.930 |
| 0.931 | 1.083                                    | 1.087 | 1.091 | 1.094 | 1.098 | 1.101 | 1.105 | 1.108 | 1.112 | 1.115 | 1.119 | 1.122 | 1.126 | 0.931 |
| 0.932 | 1.085                                    | 1.088 | 1.092 | 1.095 | 1.099 | 1.103 | 1.106 | 1.110 | 1.113 | 1.117 | 1.120 | 1.124 | 1.127 | 0.932 |
| 0.933 | 1.086                                    | 1.089 | 1.093 | 1.097 | 1.100 | 1.104 | 1.107 | 1.111 | 1.114 | 1.118 | 1.121 | 1.125 | 1.128 | 0.933 |
| 0.934 | 1.087                                    | 1.091 | 1.094 | 1.098 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 1.119 | 1.123 | 1.126 | 1.130 | 0.934 |
| 0.935 | 1.088                                    | 1.092 | 1.096 | 1.099 | 1.103 | 1.106 | 1.110 | 1.113 | 1.117 | 1.120 | 1.124 | 1.127 | 1.131 | 0.935 |
| 0.936 | 1.090                                    | 1.093 | 1.097 | 1.100 | 1.104 | 1.108 | 1.111 | 1.115 | 1.118 | 1.122 | 1.125 | 1.129 | 1.132 | 0.936 |
| 0.937 | 1.091                                    | 1.094 | 1.098 | 1.102 | 1.105 | 1.109 | 1.112 | 1.116 | 1.119 | 1.123 | 1.126 | 1.130 | 1.133 | 0.937 |
| 0.938 | 1.092                                    | 1.096 | 1.099 | 1.103 | 1.106 | 1.110 | 1.114 | 1.117 | 1.121 | 1.124 | 1.128 | 1.131 | 1.135 | 0.938 |
| 0.939 | 1.093                                    | 1.097 | 1.100 | 1.104 | 1.108 | 1.111 | 1.115 | 1.118 | 1.122 | 1.125 | 1.129 | 1.132 | 1.136 | 0.939 |
| 0.940 | 1.094                                    | 1.098 | 1.102 | 1.105 | 1.109 | 1.112 | 1.116 | 1.120 | 1.123 | 1.127 | 1.130 | 1.134 | 1.137 | 0.940 |
| 0.941 | 1.096                                    | 1.099 | 1.103 | 1.107 | 1.110 | 1.114 | 1.117 | 1.121 | 1.124 | 1.128 | 1.131 | 1.135 | 1.138 | 0.941 |
| 0.942 | 1.097                                    | 1.101 | 1.104 | 1.108 | 1.111 | 1.115 | 1.119 | 1.122 | 1.126 | 1.129 | 1.133 | 1.136 | 1.140 | 0.942 |
| 0.943 | 1.098                                    | 1.102 | 1.105 | 1.109 | 1.113 | 1.116 | 1.120 | 1.123 | 1.127 | 1.130 | 1.134 | 1.138 | 1.141 | 0.943 |
| 0.944 | 1.099                                    | 1.103 | 1.107 | 1.110 | 1.114 | 1.117 | 1.121 | 1.125 | 1.128 | 1.132 | 1.135 | 1.139 | 1.142 | 0.944 |
| 0.945 | 1.101                                    | 1.104 | 1.108 | 1.112 | 1.115 | 1.119 | 1.122 | 1.126 | 1.129 | 1.133 | 1.137 | 1.140 | 1.144 | 0.945 |
| 0.946 | 1.102                                    | 1.105 | 1.109 | 1.113 | 1.116 | 1.120 | 1.124 | 1.127 | 1.131 | 1.134 | 1.138 | 1.141 | 1.145 | 0.946 |
| 0.947 | 1.103                                    | 1.107 | 1.110 | 1.114 | 1.118 | 1.121 | 1.125 | 1.128 | 1.132 | 1.136 | 1.139 | 1.143 | 1.146 | 0.947 |
| 0.948 | 1.104                                    | 1.108 | 1.112 | 1.115 | 1.119 | 1.122 | 1.126 | 1.130 | 1.133 | 1.137 | 1.140 | 1.144 | 1.147 | 0.948 |
| 0.949 | 1.106                                    | 1.109 | 1.113 | 1.116 | 1.120 | 1.124 | 1.127 | 1.131 | 1.134 | 1.138 | 1.142 | 1.145 | 1.149 | 0.949 |
| 0.950 | 1.107                                    | 1.110 | 1.114 | 1.118 | 1.121 | 1.125 | 1.129 | 1.132 | 1.136 | 1.139 | 1.143 | 1.146 | 1.150 | 0.950 |
| 0.951 | 1.108                                    | 1.112 | 1.115 | 1.119 | 1.123 | 1.126 | 1.130 | 1.133 | 1.137 | 1.141 | 1.144 | 1.148 | 1.151 | 0.951 |
| 0.952 | 1.109                                    | 1.113 | 1.117 | 1.120 | 1.124 | 1.127 | 1.131 | 1.135 | 1.138 | 1.142 | 1.145 | 1.149 | 1.152 | 0.952 |
| 0.953 | 1.110                                    | 1.114 | 1.118 | 1.121 | 1.125 | 1.129 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.150 | 1.154 | 0.953 |
| 0.954 | 1.112                                    | 1.115 | 1.119 | 1.123 | 1.126 | 1.130 | 1.134 | 1.137 | 1.141 | 1.144 | 1.148 | 1.151 | 1.155 | 0.954 |
| 0.955 | 1.113                                    | 1.117 | 1.120 | 1.124 | 1.128 | 1.131 | 1.135 | 1.138 | 1.142 | 1.146 | 1.149 | 1.153 | 1.156 | 0.955 |
| 0.956 | 1.114                                    | 1.118 | 1.121 | 1.125 | 1.129 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.150 | 1.154 | 1.158 | 0.956 |
| 0.957 | 1.115                                    | 1.119 | 1.123 | 1.126 | 1.130 | 1.134 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.155 | 1.159 | 0.957 |
| 0.958 | 1.117                                    | 1.120 | 1.124 | 1.128 | 1.131 | 1.135 | 1.139 | 1.142 | 1.146 | 1.149 | 1.153 | 1.157 | 1.160 | 0.958 |
| 0.959 | 1.118                                    | 1.121 | 1.125 | 1.129 | 1.133 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 0.959 |
| 0.960 | 1.119                                    | 1.123 | 1.126 | 1.130 | 1.134 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.159 | 1.163 | 0.960 |
| 0.961 | 1.120                                    | 1.124 | 1.128 | 1.131 | 1.135 | 1.139 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 0.961 |
| 0.962 | 1.121                                    | 1.125 | 1.129 | 1.133 | 1.136 | 1.140 | 1.144 | 1.147 | 1.151 | 1.154 | 1.158 | 1.162 | 1.165 | 0.962 |
| 0.963 | 1.123                                    | 1.126 | 1.130 | 1.134 | 1.138 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.159 | 1.163 | 1.167 | 0.963 |
| 0.964 | 1.124                                    | 1.128 | 1.131 | 1.135 | 1.139 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.164 | 1.168 | 0.964 |
| 0.965 | 1.125                                    | 1.129 | 1.133 | 1.136 | 1.140 | 1.144 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.169 | 0.965 |
| 0.966 | 1.126                                    | 1.130 | 1.134 | 1.138 | 1.141 | 1.145 | 1.149 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 0.966 |
| 0.967 | 1.128                                    | 1.131 | 1.135 | 1.139 | 1.142 | 1.146 | 1.150 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.172 | 0.967 |
| 0.968 | 1.129                                    | 1.133 | 1.136 | 1.140 | 1.144 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.169 | 1.173 | 0.968 |
| 0.969 | 1.130                                    | 1.134 | 1.138 | 1.141 | 1.145 | 1.149 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.171 | 1.174 | 0.969 |
| 0.970 | 1.131                                    | 1.135 | 1.139 | 1.143 | 1.146 | 1.150 | 1.154 | 1.157 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 0.970 |
| 0.971 | 1.133                                    | 1.136 | 1.140 | 1.144 | 1.147 | 1.151 | 1.155 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.177 | 0.971 |
| 0.972 | 1.134                                    | 1.138 | 1.141 | 1.145 | 1.149 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.171 | 1.174 | 1.178 | 0.972 |
| 0.973 | 1.135                                    | 1.139 | 1.142 | 1.146 | 1.150 | 1.154 | 1.157 | 1.161 | 1.165 | 1.168 | 1.172 | 1.176 | 1.179 | 0.973 |
| 0.974 | 1.136                                    | 1.140 | 1.144 | 1.147 | 1.151 | 1.155 | 1.159 | 1.162 | 1.166 | 1.170 | 1.173 | 1.177 | 1.181 | 0.974 |
| 0.975 | 1.137                                    | 1.141 | 1.145 | 1.149 | 1.152 | 1.156 | 1.160 | 1.164 | 1.167 | 1.171 | 1.175 | 1.178 | 1.182 | 0.975 |
| 0.976 | 1.139                                    | 1.142 | 1.146 | 1.150 | 1.154 | 1.157 | 1.161 | 1.165 | 1.168 | 1.172 | 1.176 | 1.179 | 1.183 | 0.976 |
| 0.977 | 1.140                                    | 1.144 | 1.147 | 1.151 | 1.155 | 1.159 | 1.162 | 1.166 | 1.170 | 1.173 | 1.177 | 1.181 | 1.184 | 0.977 |
| 0.978 | 1.141                                    | 1.145 | 1.149 | 1.152 | 1.156 | 1.160 | 1.164 | 1.167 | 1.171 | 1.175 | 1.178 | 1.182 | 1.186 | 0.978 |
| 0.979 | 1.142                                    | 1.146 | 1.150 | 1.154 | 1.157 | 1.161 | 1.165 | 1.169 | 1.172 | 1.176 | 1.180 | 1.183 | 1.187 | 0.979 |

|       |       | TEMPERATURE °C |       |       |       |       |       |       |       |       |       |       | Flow rate m3/min (actual) |       |
|-------|-------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------------------|-------|
| Po/Pa | 16    | 18             | 20    | 22    | 24    | 26    | 28    | 30    | 32    | 34    | 36    | 38    | 40                        | Po/Pa |
| 0.930 | 1.121 | 1.124          | 1.128 | 1.131 | 1.135 | 1.138 | 1.142 | 1.145 | 1.148 | 1.152 | 1.155 | 1.158 | 1.162                     | 0.930 |
| 0.931 | 1.122 | 1.126          | 1.129 | 1.133 | 1.136 | 1.139 | 1.143 | 1.146 | 1.150 | 1.153 | 1.156 | 1.160 | 1.163                     | 0.931 |
| 0.932 | 1.124 | 1.127          | 1.130 | 1.134 | 1.137 | 1.141 | 1.144 | 1.148 | 1.151 | 1.154 | 1.158 | 1.161 | 1.164                     | 0.932 |
| 0.933 | 1.125 | 1.128          | 1.132 | 1.135 | 1.139 | 1.142 | 1.145 | 1.149 | 1.152 | 1.156 | 1.159 | 1.162 | 1.166                     | 0.933 |
| 0.934 | 1.126 | 1.130          | 1.133 | 1.136 | 1.140 | 1.143 | 1.147 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167                     | 0.934 |
| 0.935 | 1.127 | 1.131          | 1.134 | 1.138 | 1.141 | 1.145 | 1.148 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.168                     | 0.935 |
| 0.936 | 1.129 | 1.132          | 1.136 | 1.139 | 1.142 | 1.146 | 1.149 | 1.153 | 1.156 | 1.159 | 1.163 | 1.166 | 1.170                     | 0.936 |
| 0.937 | 1.130 | 1.133          | 1.137 | 1.140 | 1.144 | 1.147 | 1.151 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171                     | 0.937 |
| 0.938 | 1.131 | 1.135          | 1.138 | 1.142 | 1.145 | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 1.165 | 1.169 | 1.172                     | 0.938 |
| 0.939 | 1.132 | 1.136          | 1.139 | 1.143 | 1.146 | 1.150 | 1.153 | 1.157 | 1.160 | 1.163 | 1.167 | 1.170 | 1.173                     | 0.939 |
| 0.940 | 1.134 | 1.137          | 1.141 | 1.144 | 1.148 | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.171 | 1.175                     | 0.940 |
| 0.941 | 1.135 | 1.138          | 1.142 | 1.145 | 1.149 | 1.152 | 1.156 | 1.159 | 1.163 | 1.166 | 1.169 | 1.173 | 1.176                     | 0.941 |
| 0.942 | 1.136 | 1.140          | 1.143 | 1.147 | 1.150 | 1.154 | 1.157 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.177                     | 0.942 |
| 0.943 | 1.138 | 1.141          | 1.144 | 1.148 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.175 | 1.179                     | 0.943 |
| 0.944 | 1.139 | 1.142          | 1.146 | 1.149 | 1.153 | 1.156 | 1.160 | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180                     | 0.944 |
| 0.945 | 1.140 | 1.144          | 1.147 | 1.151 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.181                     | 0.945 |
| 0.946 | 1.141 | 1.145          | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.179 | 1.183                     | 0.946 |
| 0.947 | 1.143 | 1.146          | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184                     | 0.947 |
| 0.948 | 1.144 | 1.147          | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.185                     | 0.948 |
| 0.949 | 1.145 | 1.149          | 1.152 | 1.156 | 1.159 | 1.163 | 1.166 | 1.170 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187                     | 0.949 |
| 0.950 | 1.146 | 1.150          | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188                     | 0.950 |
| 0.951 | 1.148 | 1.151          | 1.155 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 1.186 | 1.189                     | 0.951 |
| 0.952 | 1.149 | 1.152          | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191                     | 0.952 |
| 0.953 | 1.150 | 1.154          | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192                     | 0.953 |
| 0.954 | 1.151 | 1.155          | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.186 | 1.190 | 1.193                     | 0.954 |
| 0.955 | 1.153 | 1.156          | 1.160 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195                     | 0.955 |
| 0.956 | 1.154 | 1.158          | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.192 | 1.196                     | 0.956 |
| 0.957 | 1.155 | 1.159          | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197                     | 0.957 |
| 0.958 | 1.157 | 1.160          | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199                     | 0.958 |
| 0.959 | 1.158 | 1.161          | 1.165 | 1.168 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200                     | 0.959 |
| 0.960 | 1.159 | 1.163          | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201                     | 0.960 |
| 0.961 | 1.160 | 1.164          | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.202                     | 0.961 |
| 0.962 | 1.162 | 1.165          | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204                     | 0.962 |
| 0.963 | 1.163 | 1.167          | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205                     | 0.963 |
| 0.964 | 1.164 | 1.168          | 1.171 | 1.175 | 1.178 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.199 | 1.203 | 1.206                     | 0.964 |
| 0.965 | 1.165 | 1.169          | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208                     | 0.965 |
| 0.966 | 1.167 | 1.170          | 1.174 | 1.177 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209                     | 0.966 |
| 0.967 | 1.168 | 1.172          | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210                     | 0.967 |
| 0.968 | 1.169 | 1.173          | 1.176 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212                     | 0.968 |
| 0.969 | 1.171 | 1.174          | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213                     | 0.969 |
| 0.970 | 1.172 | 1.175          | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214                     | 0.970 |
| 0.971 | 1.173 | 1.177          | 1.180 | 1.184 | 1.187 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216                     | 0.971 |
| 0.972 | 1.174 | 1.178          | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217                     | 0.972 |
| 0.973 | 1.176 | 1.179          | 1.183 | 1.186 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218                     | 0.973 |
| 0.974 | 1.177 | 1.181          | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220                     | 0.974 |
| 0.975 | 1.178 | 1.182          | 1.185 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221                     | 0.975 |
| 0.976 | 1.179 | 1.183          | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222                     | 0.976 |
| 0.977 | 1.181 | 1.184          | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.217 | 1.220 | 1.224                     | 0.977 |
| 0.978 | 1.182 | 1.186          | 1.189 | 1.193 | 1.196 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225                     | 0.978 |
| 0.979 | 1.183 | 1.187          | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226                     | 0.979 |

TEMPERATURE °C Flow rate m3/min (actual)

| Po/Pa | 26    | 28    | 30    | 32    | 34    | 36    | 38    | 40    | 42    | 44    | 46    | 48    | 50    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 1.138 | 1.142 | 1.145 | 1.148 | 1.152 | 1.155 | 1.158 | 1.162 | 1.165 | 1.168 | 1.172 | 1.175 | 1.178 | 0.930 |
| 0.931 | 1.139 | 1.143 | 1.146 | 1.150 | 1.153 | 1.156 | 1.160 | 1.163 | 1.166 | 1.170 | 1.173 | 1.176 | 1.179 | 0.931 |
| 0.932 | 1.141 | 1.144 | 1.148 | 1.151 | 1.154 | 1.158 | 1.161 | 1.164 | 1.168 | 1.171 | 1.174 | 1.178 | 1.181 | 0.932 |
| 0.933 | 1.142 | 1.145 | 1.149 | 1.152 | 1.156 | 1.159 | 1.162 | 1.166 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 0.933 |
| 0.934 | 1.143 | 1.147 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 1.170 | 1.174 | 1.177 | 1.180 | 1.183 | 0.934 |
| 0.935 | 1.145 | 1.148 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.168 | 1.172 | 1.175 | 1.178 | 1.182 | 1.185 | 0.935 |
| 0.936 | 1.146 | 1.149 | 1.153 | 1.156 | 1.159 | 1.163 | 1.166 | 1.170 | 1.173 | 1.176 | 1.180 | 1.183 | 1.186 | 0.936 |
| 0.937 | 1.147 | 1.151 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.174 | 1.178 | 1.181 | 1.184 | 1.187 | 0.937 |
| 0.938 | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 1.186 | 1.189 | 0.938 |
| 0.939 | 1.150 | 1.153 | 1.157 | 1.160 | 1.163 | 1.167 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.190 | 0.939 |
| 0.940 | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.188 | 1.191 | 0.940 |
| 0.941 | 1.152 | 1.156 | 1.159 | 1.163 | 1.166 | 1.169 | 1.173 | 1.176 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 0.941 |
| 0.942 | 1.154 | 1.157 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.194 | 0.942 |
| 0.943 | 1.155 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.175 | 1.179 | 1.182 | 1.185 | 1.189 | 1.192 | 1.195 | 0.943 |
| 0.944 | 1.156 | 1.160 | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.183 | 1.187 | 1.190 | 1.193 | 1.197 | 0.944 |
| 0.945 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.181 | 1.185 | 1.188 | 1.191 | 1.195 | 1.198 | 0.945 |
| 0.946 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.179 | 1.183 | 1.186 | 1.189 | 1.193 | 1.196 | 1.199 | 0.946 |
| 0.947 | 1.160 | 1.164 | 1.167 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.187 | 1.191 | 1.194 | 1.197 | 1.201 | 0.947 |
| 0.948 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.185 | 1.189 | 1.192 | 1.195 | 1.199 | 1.202 | 0.948 |
| 0.949 | 1.163 | 1.166 | 1.170 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.193 | 1.197 | 1.200 | 1.203 | 0.949 |
| 0.950 | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.191 | 1.195 | 1.198 | 1.201 | 1.205 | 0.950 |
| 0.951 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.199 | 1.203 | 1.206 | 0.951 |
| 0.952 | 1.167 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 0.952 |
| 0.953 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.195 | 1.199 | 1.202 | 1.205 | 1.209 | 0.953 |
| 0.954 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.203 | 1.207 | 1.210 | 0.954 |
| 0.955 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 0.955 |
| 0.956 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.209 | 1.213 | 0.956 |
| 0.957 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.207 | 1.211 | 1.214 | 0.957 |
| 0.958 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 0.958 |
| 0.959 | 1.176 | 1.179 | 1.183 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.213 | 1.217 | 0.959 |
| 0.960 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.211 | 1.215 | 1.218 | 0.960 |
| 0.961 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220 | 0.961 |
| 0.962 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 1.217 | 1.221 | 0.962 |
| 0.963 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.215 | 1.219 | 1.222 | 0.963 |
| 0.964 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 1.220 | 1.224 | 0.964 |
| 0.965 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 1.221 | 1.225 | 0.965 |
| 0.966 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.219 | 1.223 | 1.226 | 0.966 |
| 0.967 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 1.224 | 1.228 | 0.967 |
| 0.968 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 1.225 | 1.229 | 0.968 |
| 0.969 | 1.188 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.216 | 1.220 | 1.223 | 1.227 | 1.230 | 0.969 |
| 0.970 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 1.228 | 1.232 | 0.970 |
| 0.971 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226 | 1.229 | 1.233 | 0.971 |
| 0.972 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 1.220 | 1.224 | 1.227 | 1.231 | 1.234 | 0.972 |
| 0.973 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 1.222 | 1.225 | 1.229 | 1.232 | 1.236 | 0.973 |
| 0.974 | 1.195 | 1.198 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 1.227 | 1.230 | 1.233 | 1.237 | 0.974 |
| 0.975 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 1.224 | 1.228 | 1.231 | 1.235 | 1.238 | 0.975 |
| 0.976 | 1.197 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 1.226 | 1.229 | 1.233 | 1.236 | 1.240 | 0.976 |
| 0.977 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.217 | 1.220 | 1.224 | 1.227 | 1.231 | 1.234 | 1.237 | 1.241 | 0.977 |
| 0.978 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 1.228 | 1.232 | 1.235 | 1.239 | 1.242 | 0.978 |
| 0.979 | 1.201 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226 | 1.230 | 1.233 | 1.237 | 1.240 | 1.244 | 0.979 |

| TEMPERATURE °F Flow rate ft3/min (actual) |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Po/Pa                                     | -12   | -8    | -4    | 0     | 4     | 8     | 12    | 16    | 20    | 24    | 28    | 32    | 36    | Po/Pa |
| 0.930                                     | 37.03 | 37.17 | 37.32 | 37.46 | 37.61 | 37.75 | 37.89 | 38.03 | 38.18 | 38.32 | 38.46 | 38.60 | 38.74 | 0.930 |
| 0.931                                     | 37.07 | 37.21 | 37.36 | 37.50 | 37.65 | 37.79 | 37.93 | 38.08 | 38.22 | 38.36 | 38.50 | 38.64 | 38.78 | 0.931 |
| 0.932                                     | 37.11 | 37.26 | 37.40 | 37.55 | 37.69 | 37.83 | 37.98 | 38.12 | 38.26 | 38.40 | 38.54 | 38.68 | 38.82 | 0.932 |
| 0.933                                     | 37.15 | 37.30 | 37.44 | 37.59 | 37.73 | 37.88 | 38.02 | 38.16 | 38.31 | 38.45 | 38.59 | 38.73 | 38.87 | 0.933 |
| 0.934                                     | 37.19 | 37.34 | 37.49 | 37.63 | 37.78 | 37.92 | 38.06 | 38.21 | 38.35 | 38.49 | 38.63 | 38.77 | 38.91 | 0.934 |
| 0.935                                     | 37.24 | 37.38 | 37.53 | 37.67 | 37.82 | 37.96 | 38.11 | 38.25 | 38.39 | 38.53 | 38.68 | 38.82 | 38.96 | 0.935 |
| 0.936                                     | 37.28 | 37.42 | 37.57 | 37.72 | 37.86 | 38.01 | 38.15 | 38.29 | 38.44 | 38.58 | 38.72 | 38.86 | 39.00 | 0.936 |
| 0.937                                     | 37.32 | 37.47 | 37.61 | 37.76 | 37.90 | 38.05 | 38.19 | 38.34 | 38.48 | 38.62 | 38.76 | 38.90 | 39.04 | 0.937 |
| 0.938                                     | 37.36 | 37.51 | 37.66 | 37.80 | 37.95 | 38.09 | 38.24 | 38.38 | 38.52 | 38.66 | 38.81 | 38.95 | 39.09 | 0.938 |
| 0.939                                     | 37.40 | 37.55 | 37.70 | 37.84 | 37.99 | 38.13 | 38.28 | 38.42 | 38.56 | 38.71 | 38.85 | 38.99 | 39.13 | 0.939 |
| 0.940                                     | 37.44 | 37.59 | 37.74 | 37.89 | 38.03 | 38.18 | 38.32 | 38.46 | 38.61 | 38.75 | 38.89 | 39.03 | 39.18 | 0.940 |
| 0.941                                     | 37.49 | 37.63 | 37.78 | 37.93 | 38.07 | 38.22 | 38.36 | 38.51 | 38.65 | 38.79 | 38.94 | 39.08 | 39.22 | 0.941 |
| 0.942                                     | 37.53 | 37.68 | 37.82 | 37.97 | 38.12 | 38.26 | 38.41 | 38.55 | 38.69 | 38.84 | 38.98 | 39.12 | 39.26 | 0.942 |
| 0.943                                     | 37.57 | 37.72 | 37.87 | 38.01 | 38.16 | 38.31 | 38.45 | 38.59 | 38.74 | 38.88 | 39.02 | 39.17 | 39.31 | 0.943 |
| 0.944                                     | 37.61 | 37.76 | 37.91 | 38.06 | 38.20 | 38.35 | 38.49 | 38.64 | 38.78 | 38.92 | 39.07 | 39.21 | 39.35 | 0.944 |
| 0.945                                     | 37.65 | 37.80 | 37.95 | 38.10 | 38.24 | 38.39 | 38.54 | 38.68 | 38.82 | 38.97 | 39.11 | 39.25 | 39.39 | 0.945 |
| 0.946                                     | 37.70 | 37.85 | 37.99 | 38.14 | 38.29 | 38.43 | 38.58 | 38.72 | 38.87 | 39.01 | 39.15 | 39.30 | 39.44 | 0.946 |
| 0.947                                     | 37.74 | 37.89 | 38.04 | 38.18 | 38.33 | 38.48 | 38.62 | 38.77 | 38.91 | 39.05 | 39.20 | 39.34 | 39.48 | 0.947 |
| 0.948                                     | 37.78 | 37.93 | 38.08 | 38.23 | 38.37 | 38.52 | 38.66 | 38.81 | 38.95 | 39.10 | 39.24 | 39.38 | 39.53 | 0.948 |
| 0.949                                     | 37.82 | 37.97 | 38.12 | 38.27 | 38.42 | 38.56 | 38.71 | 38.85 | 39.00 | 39.14 | 39.29 | 39.43 | 39.57 | 0.949 |
| 0.950                                     | 37.86 | 38.01 | 38.16 | 38.31 | 38.46 | 38.60 | 38.75 | 38.90 | 39.04 | 39.19 | 39.33 | 39.47 | 39.61 | 0.950 |
| 0.951                                     | 37.91 | 38.06 | 38.20 | 38.35 | 38.50 | 38.65 | 38.79 | 38.94 | 39.08 | 39.23 | 39.37 | 39.52 | 39.66 | 0.951 |
| 0.952                                     | 37.95 | 38.10 | 38.25 | 38.40 | 38.54 | 38.69 | 38.84 | 38.98 | 39.13 | 39.27 | 39.42 | 39.56 | 39.70 | 0.952 |
| 0.953                                     | 37.99 | 38.14 | 38.29 | 38.44 | 38.59 | 38.73 | 38.88 | 39.03 | 39.17 | 39.32 | 39.46 | 39.60 | 39.75 | 0.953 |
| 0.954                                     | 38.03 | 38.18 | 38.33 | 38.48 | 38.63 | 38.78 | 38.92 | 39.07 | 39.21 | 39.36 | 39.50 | 39.65 | 39.79 | 0.954 |
| 0.955                                     | 38.07 | 38.22 | 38.37 | 38.52 | 38.67 | 38.82 | 38.97 | 39.11 | 39.26 | 39.40 | 39.55 | 39.69 | 39.83 | 0.955 |
| 0.956                                     | 38.12 | 38.27 | 38.42 | 38.57 | 38.71 | 38.86 | 39.01 | 39.15 | 39.30 | 39.45 | 39.59 | 39.73 | 39.88 | 0.956 |
| 0.957                                     | 38.16 | 38.31 | 38.46 | 38.61 | 38.76 | 38.90 | 39.05 | 39.20 | 39.34 | 39.49 | 39.63 | 39.78 | 39.92 | 0.957 |
| 0.958                                     | 38.20 | 38.35 | 38.50 | 38.65 | 38.80 | 38.95 | 39.09 | 39.24 | 39.39 | 39.53 | 39.68 | 39.82 | 39.97 | 0.958 |
| 0.959                                     | 38.24 | 38.39 | 38.54 | 38.69 | 38.84 | 38.99 | 39.14 | 39.28 | 39.43 | 39.58 | 39.72 | 39.87 | 40.01 | 0.959 |
| 0.960                                     | 38.28 | 38.44 | 38.59 | 38.74 | 38.88 | 39.03 | 39.18 | 39.33 | 39.47 | 39.62 | 39.76 | 39.91 | 40.05 | 0.960 |
| 0.961                                     | 38.33 | 38.48 | 38.63 | 38.78 | 38.93 | 39.08 | 39.22 | 39.37 | 39.52 | 39.66 | 39.81 | 39.95 | 40.10 | 0.961 |
| 0.962                                     | 38.37 | 38.52 | 38.67 | 38.82 | 38.97 | 39.12 | 39.27 | 39.41 | 39.56 | 39.71 | 39.85 | 40.00 | 40.14 | 0.962 |
| 0.963                                     | 38.41 | 38.56 | 38.71 | 38.86 | 39.01 | 39.16 | 39.31 | 39.46 | 39.60 | 39.75 | 39.90 | 40.04 | 40.19 | 0.963 |
| 0.964                                     | 38.45 | 38.60 | 38.75 | 38.91 | 39.05 | 39.20 | 39.35 | 39.50 | 39.65 | 39.79 | 39.94 | 40.08 | 40.23 | 0.964 |
| 0.965                                     | 38.49 | 38.65 | 38.80 | 38.95 | 39.10 | 39.25 | 39.40 | 39.54 | 39.69 | 39.84 | 39.98 | 40.13 | 40.27 | 0.965 |
| 0.966                                     | 38.54 | 38.69 | 38.84 | 38.99 | 39.14 | 39.29 | 39.44 | 39.59 | 39.73 | 39.88 | 40.03 | 40.17 | 40.32 | 0.966 |
| 0.967                                     | 38.58 | 38.73 | 38.88 | 39.03 | 39.18 | 39.33 | 39.48 | 39.63 | 39.78 | 39.92 | 40.07 | 40.22 | 40.36 | 0.967 |
| 0.968                                     | 38.62 | 38.77 | 38.92 | 39.08 | 39.23 | 39.38 | 39.52 | 39.67 | 39.82 | 39.97 | 40.11 | 40.26 | 40.40 | 0.968 |
| 0.969                                     | 38.66 | 38.81 | 38.97 | 39.12 | 39.27 | 39.42 | 39.57 | 39.72 | 39.86 | 40.01 | 40.16 | 40.30 | 40.45 | 0.969 |
| 0.970                                     | 38.70 | 38.86 | 39.01 | 39.16 | 39.31 | 39.46 | 39.61 | 39.76 | 39.91 | 40.05 | 40.20 | 40.35 | 40.49 | 0.970 |
| 0.971                                     | 38.75 | 38.90 | 39.05 | 39.20 | 39.35 | 39.50 | 39.65 | 39.80 | 39.95 | 40.10 | 40.24 | 40.39 | 40.54 | 0.971 |
| 0.972                                     | 38.79 | 38.94 | 39.09 | 39.25 | 39.40 | 39.55 | 39.70 | 39.85 | 39.99 | 40.14 | 40.29 | 40.43 | 40.58 | 0.972 |
| 0.973                                     | 38.83 | 38.98 | 39.14 | 39.29 | 39.44 | 39.59 | 39.74 | 39.89 | 40.04 | 40.18 | 40.33 | 40.48 | 40.62 | 0.973 |
| 0.974                                     | 38.87 | 39.03 | 39.18 | 39.33 | 39.48 | 39.63 | 39.78 | 39.93 | 40.08 | 40.23 | 40.38 | 40.52 | 40.67 | 0.974 |
| 0.975                                     | 38.91 | 39.07 | 39.22 | 39.37 | 39.52 | 39.68 | 39.83 | 39.97 | 40.12 | 40.27 | 40.42 | 40.57 | 40.71 | 0.975 |
| 0.976                                     | 38.96 | 39.11 | 39.26 | 39.42 | 39.57 | 39.72 | 39.87 | 40.02 | 40.17 | 40.32 | 40.46 | 40.61 | 40.76 | 0.976 |
| 0.977                                     | 39.00 | 39.15 | 39.31 | 39.46 | 39.61 | 39.76 | 39.91 | 40.06 | 40.21 | 40.36 | 40.51 | 40.65 | 40.80 | 0.977 |
| 0.978                                     | 39.04 | 39.19 | 39.35 | 39.50 | 39.65 | 39.80 | 39.95 | 40.10 | 40.25 | 40.40 | 40.55 | 40.70 | 40.84 | 0.978 |
| 0.979                                     | 39.08 | 39.24 | 39.39 | 39.54 | 39.70 | 39.85 | 40.00 | 40.15 | 40.30 | 40.45 | 40.59 | 40.74 | 40.89 | 0.979 |

TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | 18    | 22    | 26    | 30    | 34    | 38    | 42    | 46    | 50    | 54    | 58    | 62    | 66    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 38.11 | 38.25 | 38.39 | 38.53 | 38.67 | 38.81 | 38.94 | 39.08 | 39.22 | 39.36 | 39.49 | 39.63 | 39.76 | 0.930 |
| 0.931 | 38.15 | 38.29 | 38.43 | 38.57 | 38.71 | 38.85 | 38.99 | 39.13 | 39.26 | 39.40 | 39.54 | 39.67 | 39.81 | 0.931 |
| 0.932 | 38.19 | 38.33 | 38.47 | 38.61 | 38.75 | 38.89 | 39.03 | 39.17 | 39.31 | 39.45 | 39.58 | 39.72 | 39.85 | 0.932 |
| 0.933 | 38.23 | 38.38 | 38.52 | 38.66 | 38.80 | 38.94 | 39.08 | 39.21 | 39.35 | 39.49 | 39.63 | 39.76 | 39.90 | 0.933 |
| 0.934 | 38.28 | 38.42 | 38.56 | 38.70 | 38.84 | 38.98 | 39.12 | 39.26 | 39.40 | 39.53 | 39.67 | 39.81 | 39.94 | 0.934 |
| 0.935 | 38.32 | 38.46 | 38.60 | 38.75 | 38.89 | 39.03 | 39.16 | 39.30 | 39.44 | 39.58 | 39.72 | 39.85 | 39.99 | 0.935 |
| 0.936 | 38.36 | 38.51 | 38.65 | 38.79 | 38.93 | 39.07 | 39.21 | 39.35 | 39.49 | 39.62 | 39.76 | 39.90 | 40.03 | 0.936 |
| 0.937 | 38.41 | 38.55 | 38.69 | 38.83 | 38.97 | 39.11 | 39.25 | 39.39 | 39.53 | 39.67 | 39.81 | 39.94 | 40.08 | 0.937 |
| 0.938 | 38.45 | 38.59 | 38.73 | 38.88 | 39.02 | 39.16 | 39.30 | 39.44 | 39.57 | 39.71 | 39.85 | 39.99 | 40.12 | 0.938 |
| 0.939 | 38.49 | 38.64 | 38.78 | 38.92 | 39.06 | 39.20 | 39.34 | 39.48 | 39.62 | 39.76 | 39.90 | 40.03 | 40.17 | 0.939 |
| 0.940 | 38.54 | 38.68 | 38.82 | 38.96 | 39.10 | 39.25 | 39.39 | 39.52 | 39.66 | 39.80 | 39.94 | 40.08 | 40.21 | 0.940 |
| 0.941 | 38.58 | 38.72 | 38.87 | 39.01 | 39.15 | 39.29 | 39.43 | 39.57 | 39.71 | 39.85 | 39.98 | 40.12 | 40.26 | 0.941 |
| 0.942 | 38.62 | 38.77 | 38.91 | 39.05 | 39.19 | 39.33 | 39.47 | 39.61 | 39.75 | 39.89 | 40.03 | 40.17 | 40.30 | 0.942 |
| 0.943 | 38.67 | 38.81 | 38.95 | 39.09 | 39.24 | 39.38 | 39.52 | 39.66 | 39.80 | 39.94 | 40.07 | 40.21 | 40.35 | 0.943 |
| 0.944 | 38.71 | 38.85 | 39.00 | 39.14 | 39.28 | 39.42 | 39.56 | 39.70 | 39.84 | 39.98 | 40.12 | 40.26 | 40.39 | 0.944 |
| 0.945 | 38.75 | 38.90 | 39.04 | 39.18 | 39.32 | 39.47 | 39.61 | 39.75 | 39.89 | 40.03 | 40.16 | 40.30 | 40.44 | 0.945 |
| 0.946 | 38.80 | 38.94 | 39.08 | 39.23 | 39.37 | 39.51 | 39.65 | 39.79 | 39.93 | 40.07 | 40.21 | 40.35 | 40.48 | 0.946 |
| 0.947 | 38.84 | 38.98 | 39.13 | 39.27 | 39.41 | 39.55 | 39.69 | 39.83 | 39.97 | 40.11 | 40.25 | 40.39 | 40.53 | 0.947 |
| 0.948 | 38.88 | 39.03 | 39.17 | 39.31 | 39.46 | 39.60 | 39.74 | 39.88 | 40.02 | 40.16 | 40.30 | 40.44 | 40.57 | 0.948 |
| 0.949 | 38.93 | 39.07 | 39.21 | 39.36 | 39.50 | 39.64 | 39.78 | 39.92 | 40.06 | 40.20 | 40.34 | 40.48 | 40.62 | 0.949 |
| 0.950 | 38.97 | 39.11 | 39.26 | 39.40 | 39.54 | 39.69 | 39.83 | 39.97 | 40.11 | 40.25 | 40.39 | 40.53 | 40.66 | 0.950 |
| 0.951 | 39.01 | 39.16 | 39.30 | 39.44 | 39.59 | 39.73 | 39.87 | 40.01 | 40.15 | 40.29 | 40.43 | 40.57 | 40.71 | 0.951 |
| 0.952 | 39.05 | 39.20 | 39.34 | 39.49 | 39.63 | 39.77 | 39.92 | 40.06 | 40.20 | 40.34 | 40.48 | 40.62 | 40.75 | 0.952 |
| 0.953 | 39.10 | 39.24 | 39.39 | 39.53 | 39.67 | 39.82 | 39.96 | 40.10 | 40.24 | 40.38 | 40.52 | 40.66 | 40.80 | 0.953 |
| 0.954 | 39.14 | 39.29 | 39.43 | 39.57 | 39.72 | 39.86 | 40.00 | 40.14 | 40.29 | 40.43 | 40.57 | 40.71 | 40.84 | 0.954 |
| 0.955 | 39.18 | 39.33 | 39.47 | 39.62 | 39.76 | 39.91 | 40.05 | 40.19 | 40.33 | 40.47 | 40.61 | 40.75 | 40.89 | 0.955 |
| 0.956 | 39.23 | 39.37 | 39.52 | 39.66 | 39.81 | 39.95 | 40.09 | 40.23 | 40.38 | 40.52 | 40.66 | 40.80 | 40.94 | 0.956 |
| 0.957 | 39.27 | 39.42 | 39.56 | 39.71 | 39.85 | 39.99 | 40.14 | 40.28 | 40.42 | 40.56 | 40.70 | 40.84 | 40.98 | 0.957 |
| 0.958 | 39.31 | 39.46 | 39.61 | 39.75 | 39.89 | 40.04 | 40.18 | 40.32 | 40.46 | 40.61 | 40.75 | 40.89 | 41.03 | 0.958 |
| 0.959 | 39.36 | 39.50 | 39.65 | 39.79 | 39.94 | 40.08 | 40.22 | 40.37 | 40.51 | 40.65 | 40.79 | 40.93 | 41.07 | 0.959 |
| 0.960 | 39.40 | 39.55 | 39.69 | 39.84 | 39.98 | 40.13 | 40.27 | 40.41 | 40.55 | 40.69 | 40.84 | 40.98 | 41.12 | 0.960 |
| 0.961 | 39.44 | 39.59 | 39.74 | 39.88 | 40.03 | 40.17 | 40.31 | 40.46 | 40.60 | 40.74 | 40.88 | 41.02 | 41.16 | 0.961 |
| 0.962 | 39.49 | 39.63 | 39.78 | 39.92 | 40.07 | 40.21 | 40.36 | 40.50 | 40.64 | 40.78 | 40.92 | 41.07 | 41.21 | 0.962 |
| 0.963 | 39.53 | 39.68 | 39.82 | 39.97 | 40.11 | 40.26 | 40.40 | 40.54 | 40.69 | 40.83 | 40.97 | 41.11 | 41.25 | 0.963 |
| 0.964 | 39.57 | 39.72 | 39.87 | 40.01 | 40.16 | 40.30 | 40.45 | 40.59 | 40.73 | 40.87 | 41.01 | 41.16 | 41.30 | 0.964 |
| 0.965 | 39.62 | 39.76 | 39.91 | 40.06 | 40.20 | 40.35 | 40.49 | 40.63 | 40.78 | 40.92 | 41.06 | 41.20 | 41.34 | 0.965 |
| 0.966 | 39.66 | 39.81 | 39.95 | 40.10 | 40.24 | 40.39 | 40.53 | 40.68 | 40.82 | 40.96 | 41.10 | 41.25 | 41.39 | 0.966 |
| 0.967 | 39.70 | 39.85 | 40.00 | 40.14 | 40.29 | 40.43 | 40.58 | 40.72 | 40.86 | 41.01 | 41.15 | 41.29 | 41.43 | 0.967 |
| 0.968 | 39.75 | 39.89 | 40.04 | 40.19 | 40.33 | 40.48 | 40.62 | 40.77 | 40.91 | 41.05 | 41.19 | 41.34 | 41.48 | 0.968 |
| 0.969 | 39.79 | 39.94 | 40.08 | 40.23 | 40.38 | 40.52 | 40.67 | 40.81 | 40.95 | 41.10 | 41.24 | 41.38 | 41.52 | 0.969 |
| 0.970 | 39.83 | 39.98 | 40.13 | 40.27 | 40.42 | 40.57 | 40.71 | 40.85 | 41.00 | 41.14 | 41.28 | 41.43 | 41.57 | 0.970 |
| 0.971 | 39.88 | 40.02 | 40.17 | 40.32 | 40.46 | 40.61 | 40.75 | 40.90 | 41.04 | 41.19 | 41.33 | 41.47 | 41.61 | 0.971 |
| 0.972 | 39.92 | 40.07 | 40.21 | 40.36 | 40.51 | 40.65 | 40.80 | 40.94 | 41.09 | 41.23 | 41.37 | 41.52 | 41.66 | 0.972 |
| 0.973 | 39.96 | 40.11 | 40.26 | 40.41 | 40.55 | 40.70 | 40.84 | 40.99 | 41.13 | 41.27 | 41.42 | 41.56 | 41.70 | 0.973 |
| 0.974 | 40.01 | 40.15 | 40.30 | 40.45 | 40.60 | 40.74 | 40.89 | 41.03 | 41.18 | 41.32 | 41.46 | 41.61 | 41.75 | 0.974 |
| 0.975 | 40.05 | 40.20 | 40.35 | 40.49 | 40.64 | 40.79 | 40.93 | 41.08 | 41.22 | 41.36 | 41.51 | 41.65 | 41.79 | 0.975 |
| 0.976 | 40.09 | 40.24 | 40.39 | 40.54 | 40.68 | 40.83 | 40.98 | 41.12 | 41.26 | 41.41 | 41.55 | 41.70 | 41.84 | 0.976 |
| 0.977 | 40.14 | 40.28 | 40.43 | 40.58 | 40.73 | 40.87 | 41.02 | 41.16 | 41.31 | 41.45 | 41.60 | 41.74 | 41.88 | 0.977 |
| 0.978 | 40.18 | 40.33 | 40.48 | 40.62 | 40.77 | 40.92 | 41.06 | 41.21 | 41.35 | 41.50 | 41.64 | 41.79 | 41.93 | 0.978 |
| 0.979 | 40.22 | 40.37 | 40.52 | 40.67 | 40.82 | 40.96 | 41.11 | 41.25 | 41.40 | 41.54 | 41.69 | 41.83 | 41.97 | 0.979 |

| TEMPERATURE °F Flow rate ft3/min (actual) |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Po/Pa                                     | 48    | 52    | 56    | 60    | 64    | 68    | 72    | 76    | 80    | 84    | 88    | 92    | 96    | Po/Pa |
| 0.930                                     | 39.15 | 39.29 | 39.42 | 39.56 | 39.70 | 39.83 | 39.97 | 40.10 | 40.23 | 40.37 | 40.50 | 40.63 | 40.76 | 0.930 |
| 0.931                                     | 39.20 | 39.33 | 39.47 | 39.61 | 39.74 | 39.88 | 40.01 | 40.14 | 40.28 | 40.41 | 40.54 | 40.68 | 40.81 | 0.931 |
| 0.932                                     | 39.24 | 39.38 | 39.51 | 39.65 | 39.79 | 39.92 | 40.06 | 40.19 | 40.32 | 40.46 | 40.59 | 40.72 | 40.85 | 0.932 |
| 0.933                                     | 39.28 | 39.42 | 39.56 | 39.69 | 39.83 | 39.97 | 40.10 | 40.24 | 40.37 | 40.50 | 40.64 | 40.77 | 40.90 | 0.933 |
| 0.934                                     | 39.33 | 39.47 | 39.60 | 39.74 | 39.88 | 40.01 | 40.15 | 40.28 | 40.42 | 40.55 | 40.68 | 40.81 | 40.95 | 0.934 |
| 0.935                                     | 39.37 | 39.51 | 39.65 | 39.78 | 39.92 | 40.06 | 40.19 | 40.33 | 40.46 | 40.59 | 40.73 | 40.86 | 40.99 | 0.935 |
| 0.936                                     | 39.42 | 39.55 | 39.69 | 39.83 | 39.97 | 40.10 | 40.24 | 40.37 | 40.51 | 40.64 | 40.77 | 40.91 | 41.04 | 0.936 |
| 0.937                                     | 39.46 | 39.60 | 39.74 | 39.87 | 40.01 | 40.15 | 40.28 | 40.42 | 40.55 | 40.69 | 40.82 | 40.95 | 41.09 | 0.937 |
| 0.938                                     | 39.51 | 39.64 | 39.78 | 39.92 | 40.06 | 40.19 | 40.33 | 40.46 | 40.60 | 40.73 | 40.87 | 41.00 | 41.13 | 0.938 |
| 0.939                                     | 39.55 | 39.69 | 39.83 | 39.96 | 40.10 | 40.24 | 40.37 | 40.51 | 40.64 | 40.78 | 40.91 | 41.04 | 41.18 | 0.939 |
| 0.940                                     | 39.59 | 39.73 | 39.87 | 40.01 | 40.15 | 40.28 | 40.42 | 40.55 | 40.69 | 40.82 | 40.96 | 41.09 | 41.22 | 0.940 |
| 0.941                                     | 39.64 | 39.78 | 39.92 | 40.05 | 40.19 | 40.33 | 40.46 | 40.60 | 40.73 | 40.87 | 41.00 | 41.14 | 41.27 | 0.941 |
| 0.942                                     | 39.68 | 39.82 | 39.96 | 40.10 | 40.24 | 40.37 | 40.51 | 40.64 | 40.78 | 40.91 | 41.05 | 41.18 | 41.32 | 0.942 |
| 0.943                                     | 39.73 | 39.87 | 40.01 | 40.14 | 40.28 | 40.42 | 40.55 | 40.69 | 40.83 | 40.96 | 41.09 | 41.23 | 41.36 | 0.943 |
| 0.944                                     | 39.77 | 39.91 | 40.05 | 40.19 | 40.33 | 40.46 | 40.60 | 40.74 | 40.87 | 41.01 | 41.14 | 41.27 | 41.41 | 0.944 |
| 0.945                                     | 39.82 | 39.96 | 40.09 | 40.23 | 40.37 | 40.51 | 40.64 | 40.78 | 40.92 | 41.05 | 41.19 | 41.32 | 41.45 | 0.945 |
| 0.946                                     | 39.86 | 40.00 | 40.14 | 40.28 | 40.42 | 40.55 | 40.69 | 40.83 | 40.96 | 41.10 | 41.23 | 41.37 | 41.50 | 0.946 |
| 0.947                                     | 39.90 | 40.04 | 40.18 | 40.32 | 40.46 | 40.60 | 40.74 | 40.87 | 41.01 | 41.14 | 41.28 | 41.41 | 41.55 | 0.947 |
| 0.948                                     | 39.95 | 40.09 | 40.23 | 40.37 | 40.51 | 40.64 | 40.78 | 40.92 | 41.05 | 41.19 | 41.32 | 41.46 | 41.59 | 0.948 |
| 0.949                                     | 39.99 | 40.13 | 40.27 | 40.41 | 40.55 | 40.69 | 40.83 | 40.96 | 41.10 | 41.23 | 41.37 | 41.50 | 41.64 | 0.949 |
| 0.950                                     | 40.04 | 40.18 | 40.32 | 40.46 | 40.60 | 40.73 | 40.87 | 41.01 | 41.14 | 41.28 | 41.42 | 41.55 | 41.69 | 0.950 |
| 0.951                                     | 40.08 | 40.22 | 40.36 | 40.50 | 40.64 | 40.78 | 40.92 | 41.05 | 41.19 | 41.33 | 41.46 | 41.60 | 41.73 | 0.951 |
| 0.952                                     | 40.13 | 40.27 | 40.41 | 40.55 | 40.69 | 40.82 | 40.96 | 41.10 | 41.24 | 41.37 | 41.51 | 41.64 | 41.78 | 0.952 |
| 0.953                                     | 40.17 | 40.31 | 40.45 | 40.59 | 40.73 | 40.87 | 41.01 | 41.14 | 41.28 | 41.42 | 41.55 | 41.69 | 41.82 | 0.953 |
| 0.954                                     | 40.22 | 40.36 | 40.50 | 40.64 | 40.78 | 40.91 | 41.05 | 41.19 | 41.33 | 41.46 | 41.60 | 41.74 | 41.87 | 0.954 |
| 0.955                                     | 40.26 | 40.40 | 40.54 | 40.68 | 40.82 | 40.96 | 41.10 | 41.24 | 41.37 | 41.51 | 41.65 | 41.78 | 41.92 | 0.955 |
| 0.956                                     | 40.30 | 40.45 | 40.59 | 40.73 | 40.87 | 41.00 | 41.14 | 41.28 | 41.42 | 41.56 | 41.69 | 41.83 | 41.96 | 0.956 |
| 0.957                                     | 40.35 | 40.49 | 40.63 | 40.77 | 40.91 | 41.05 | 41.19 | 41.33 | 41.46 | 41.60 | 41.74 | 41.87 | 42.01 | 0.957 |
| 0.958                                     | 40.39 | 40.53 | 40.68 | 40.82 | 40.96 | 41.09 | 41.23 | 41.37 | 41.51 | 41.65 | 41.78 | 41.92 | 42.06 | 0.958 |
| 0.959                                     | 40.44 | 40.58 | 40.72 | 40.86 | 41.00 | 41.14 | 41.28 | 41.42 | 41.56 | 41.69 | 41.83 | 41.97 | 42.10 | 0.959 |
| 0.960                                     | 40.48 | 40.62 | 40.76 | 40.91 | 41.05 | 41.19 | 41.32 | 41.46 | 41.60 | 41.74 | 41.88 | 42.01 | 42.15 | 0.960 |
| 0.961                                     | 40.53 | 40.67 | 40.81 | 40.95 | 41.09 | 41.23 | 41.37 | 41.51 | 41.65 | 41.78 | 41.92 | 42.06 | 42.19 | 0.961 |
| 0.962                                     | 40.57 | 40.71 | 40.85 | 41.00 | 41.14 | 41.28 | 41.41 | 41.55 | 41.69 | 41.83 | 41.97 | 42.10 | 42.24 | 0.962 |
| 0.963                                     | 40.62 | 40.76 | 40.90 | 41.04 | 41.18 | 41.32 | 41.46 | 41.60 | 41.74 | 41.88 | 42.01 | 42.15 | 42.29 | 0.963 |
| 0.964                                     | 40.66 | 40.80 | 40.94 | 41.09 | 41.23 | 41.37 | 41.51 | 41.64 | 41.78 | 41.92 | 42.06 | 42.20 | 42.33 | 0.964 |
| 0.965                                     | 40.70 | 40.85 | 40.99 | 41.13 | 41.27 | 41.41 | 41.55 | 41.69 | 41.83 | 41.97 | 42.10 | 42.24 | 42.38 | 0.965 |
| 0.966                                     | 40.75 | 40.89 | 41.03 | 41.17 | 41.32 | 41.46 | 41.60 | 41.74 | 41.87 | 42.01 | 42.15 | 42.29 | 42.43 | 0.966 |
| 0.967                                     | 40.79 | 40.94 | 41.08 | 41.22 | 41.36 | 41.50 | 41.64 | 41.78 | 41.92 | 42.06 | 42.20 | 42.33 | 42.47 | 0.967 |
| 0.968                                     | 40.84 | 40.98 | 41.12 | 41.26 | 41.41 | 41.55 | 41.69 | 41.83 | 41.97 | 42.10 | 42.24 | 42.38 | 42.52 | 0.968 |
| 0.969                                     | 40.88 | 41.02 | 41.17 | 41.31 | 41.45 | 41.59 | 41.73 | 41.87 | 42.01 | 42.15 | 42.29 | 42.43 | 42.56 | 0.969 |
| 0.970                                     | 40.93 | 41.07 | 41.21 | 41.35 | 41.50 | 41.64 | 41.78 | 41.92 | 42.06 | 42.20 | 42.33 | 42.47 | 42.61 | 0.970 |
| 0.971                                     | 40.97 | 41.11 | 41.26 | 41.40 | 41.54 | 41.68 | 41.82 | 41.96 | 42.10 | 42.24 | 42.38 | 42.52 | 42.66 | 0.971 |
| 0.972                                     | 41.02 | 41.16 | 41.30 | 41.44 | 41.59 | 41.73 | 41.87 | 42.01 | 42.15 | 42.29 | 42.43 | 42.56 | 42.70 | 0.972 |
| 0.973                                     | 41.06 | 41.20 | 41.35 | 41.49 | 41.63 | 41.77 | 41.91 | 42.05 | 42.19 | 42.33 | 42.47 | 42.61 | 42.75 | 0.973 |
| 0.974                                     | 41.10 | 41.25 | 41.39 | 41.53 | 41.68 | 41.82 | 41.96 | 42.10 | 42.24 | 42.38 | 42.52 | 42.66 | 42.80 | 0.974 |
| 0.975                                     | 41.15 | 41.29 | 41.44 | 41.58 | 41.72 | 41.86 | 42.00 | 42.15 | 42.29 | 42.43 | 42.56 | 42.70 | 42.84 | 0.975 |
| 0.976                                     | 41.19 | 41.34 | 41.48 | 41.62 | 41.77 | 41.91 | 42.05 | 42.19 | 42.33 | 42.47 | 42.61 | 42.75 | 42.89 | 0.976 |
| 0.977                                     | 41.24 | 41.38 | 41.53 | 41.67 | 41.81 | 41.95 | 42.10 | 42.24 | 42.38 | 42.52 | 42.66 | 42.80 | 42.93 | 0.977 |
| 0.978                                     | 41.28 | 41.43 | 41.57 | 41.71 | 41.86 | 42.00 | 42.14 | 42.28 | 42.42 | 42.56 | 42.70 | 42.84 | 42.98 | 0.978 |
| 0.979                                     | 41.33 | 41.47 | 41.61 | 41.76 | 41.90 | 42.04 | 42.19 | 42.33 | 42.47 | 42.61 | 42.75 | 42.89 | 43.03 | 0.979 |

TEMPERATURE °F Flow rate ft<sup>3</sup>/min (actual)

| Po/Pa | 76    | 80    | 84    | 88    | 92    | 96    | 100   | 104   | 108   | 112   | 116   | 120   | 124   | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 40.10 | 40.23 | 40.37 | 40.50 | 40.63 | 40.76 | 40.89 | 41.02 | 41.15 | 41.28 | 41.41 | 41.54 | 41.67 | 0.930 |
| 0.931 | 40.14 | 40.28 | 40.41 | 40.54 | 40.68 | 40.81 | 40.94 | 41.07 | 41.20 | 41.33 | 41.46 | 41.59 | 41.72 | 0.931 |
| 0.932 | 40.19 | 40.32 | 40.46 | 40.59 | 40.72 | 40.85 | 40.99 | 41.12 | 41.25 | 41.38 | 41.51 | 41.64 | 41.76 | 0.932 |
| 0.933 | 40.24 | 40.37 | 40.50 | 40.64 | 40.77 | 40.90 | 41.03 | 41.16 | 41.29 | 41.42 | 41.55 | 41.68 | 41.81 | 0.933 |
| 0.934 | 40.28 | 40.42 | 40.55 | 40.68 | 40.81 | 40.95 | 41.08 | 41.21 | 41.34 | 41.47 | 41.60 | 41.73 | 41.86 | 0.934 |
| 0.935 | 40.33 | 40.46 | 40.59 | 40.73 | 40.86 | 40.99 | 41.12 | 41.26 | 41.39 | 41.52 | 41.65 | 41.78 | 41.91 | 0.935 |
| 0.936 | 40.37 | 40.51 | 40.64 | 40.77 | 40.91 | 41.04 | 41.17 | 41.30 | 41.43 | 41.56 | 41.69 | 41.82 | 41.95 | 0.936 |
| 0.937 | 40.42 | 40.55 | 40.69 | 40.82 | 40.95 | 41.09 | 41.22 | 41.35 | 41.48 | 41.61 | 41.74 | 41.87 | 42.00 | 0.937 |
| 0.938 | 40.46 | 40.60 | 40.73 | 40.87 | 41.00 | 41.13 | 41.26 | 41.40 | 41.53 | 41.66 | 41.79 | 41.92 | 42.05 | 0.938 |
| 0.939 | 40.51 | 40.64 | 40.78 | 40.91 | 41.04 | 41.18 | 41.31 | 41.44 | 41.57 | 41.70 | 41.83 | 41.96 | 42.09 | 0.939 |
| 0.940 | 40.55 | 40.69 | 40.82 | 40.96 | 41.09 | 41.22 | 41.36 | 41.49 | 41.62 | 41.75 | 41.88 | 42.01 | 42.14 | 0.940 |
| 0.941 | 40.60 | 40.73 | 40.87 | 41.00 | 41.14 | 41.27 | 41.40 | 41.53 | 41.67 | 41.80 | 41.93 | 42.06 | 42.19 | 0.941 |
| 0.942 | 40.64 | 40.78 | 40.91 | 41.05 | 41.18 | 41.32 | 41.45 | 41.58 | 41.71 | 41.84 | 41.98 | 42.11 | 42.24 | 0.942 |
| 0.943 | 40.69 | 40.83 | 40.96 | 41.09 | 41.23 | 41.36 | 41.50 | 41.63 | 41.76 | 41.89 | 42.02 | 42.15 | 42.28 | 0.943 |
| 0.944 | 40.74 | 40.87 | 41.01 | 41.14 | 41.27 | 41.41 | 41.54 | 41.67 | 41.81 | 41.94 | 42.07 | 42.20 | 42.33 | 0.944 |
| 0.945 | 40.78 | 40.92 | 41.05 | 41.19 | 41.32 | 41.45 | 41.59 | 41.72 | 41.85 | 41.98 | 42.12 | 42.25 | 42.38 | 0.945 |
| 0.946 | 40.83 | 40.96 | 41.10 | 41.23 | 41.37 | 41.50 | 41.63 | 41.77 | 41.90 | 42.03 | 42.16 | 42.29 | 42.42 | 0.946 |
| 0.947 | 40.87 | 41.01 | 41.14 | 41.28 | 41.41 | 41.55 | 41.68 | 41.81 | 41.95 | 42.08 | 42.21 | 42.34 | 42.47 | 0.947 |
| 0.948 | 40.92 | 41.05 | 41.19 | 41.32 | 41.46 | 41.59 | 41.73 | 41.86 | 41.99 | 42.13 | 42.26 | 42.39 | 42.52 | 0.948 |
| 0.949 | 40.96 | 41.10 | 41.23 | 41.37 | 41.50 | 41.64 | 41.77 | 41.91 | 42.04 | 42.17 | 42.30 | 42.44 | 42.57 | 0.949 |
| 0.950 | 41.01 | 41.14 | 41.28 | 41.42 | 41.55 | 41.69 | 41.82 | 41.95 | 42.09 | 42.22 | 42.35 | 42.48 | 42.61 | 0.950 |
| 0.951 | 41.05 | 41.19 | 41.33 | 41.46 | 41.60 | 41.73 | 41.87 | 42.00 | 42.13 | 42.27 | 42.40 | 42.53 | 42.66 | 0.951 |
| 0.952 | 41.10 | 41.24 | 41.37 | 41.51 | 41.64 | 41.78 | 41.91 | 42.05 | 42.18 | 42.31 | 42.44 | 42.58 | 42.71 | 0.952 |
| 0.953 | 41.14 | 41.28 | 41.42 | 41.55 | 41.69 | 41.82 | 41.96 | 42.09 | 42.23 | 42.36 | 42.49 | 42.62 | 42.76 | 0.953 |
| 0.954 | 41.19 | 41.33 | 41.46 | 41.60 | 41.74 | 41.87 | 42.00 | 42.14 | 42.27 | 42.41 | 42.54 | 42.67 | 42.80 | 0.954 |
| 0.955 | 41.24 | 41.37 | 41.51 | 41.65 | 41.78 | 41.92 | 42.05 | 42.19 | 42.32 | 42.45 | 42.59 | 42.72 | 42.85 | 0.955 |
| 0.956 | 41.28 | 41.42 | 41.56 | 41.69 | 41.83 | 41.96 | 42.10 | 42.23 | 42.37 | 42.50 | 42.63 | 42.77 | 42.90 | 0.956 |
| 0.957 | 41.33 | 41.46 | 41.60 | 41.74 | 41.87 | 42.01 | 42.14 | 42.28 | 42.41 | 42.55 | 42.68 | 42.81 | 42.94 | 0.957 |
| 0.958 | 41.37 | 41.51 | 41.65 | 41.78 | 41.92 | 42.06 | 42.19 | 42.33 | 42.46 | 42.59 | 42.73 | 42.86 | 42.99 | 0.958 |
| 0.959 | 41.42 | 41.56 | 41.69 | 41.83 | 41.97 | 42.10 | 42.24 | 42.37 | 42.51 | 42.64 | 42.77 | 42.91 | 43.04 | 0.959 |
| 0.960 | 41.46 | 41.60 | 41.74 | 41.88 | 42.01 | 42.15 | 42.28 | 42.42 | 42.55 | 42.69 | 42.82 | 42.95 | 43.09 | 0.960 |
| 0.961 | 41.51 | 41.65 | 41.78 | 41.92 | 42.06 | 42.19 | 42.33 | 42.46 | 42.60 | 42.73 | 42.87 | 43.00 | 43.13 | 0.961 |
| 0.962 | 41.55 | 41.69 | 41.83 | 41.97 | 42.10 | 42.24 | 42.38 | 42.51 | 42.65 | 42.78 | 42.91 | 43.05 | 43.18 | 0.962 |
| 0.963 | 41.60 | 41.74 | 41.88 | 42.01 | 42.15 | 42.29 | 42.42 | 42.56 | 42.69 | 42.83 | 42.96 | 43.10 | 43.23 | 0.963 |
| 0.964 | 41.64 | 41.78 | 41.92 | 42.06 | 42.20 | 42.33 | 42.47 | 42.60 | 42.74 | 42.87 | 43.01 | 43.14 | 43.28 | 0.964 |
| 0.965 | 41.69 | 41.83 | 41.97 | 42.10 | 42.24 | 42.38 | 42.52 | 42.65 | 42.79 | 42.92 | 43.06 | 43.19 | 43.32 | 0.965 |
| 0.966 | 41.74 | 41.87 | 42.01 | 42.15 | 42.29 | 42.43 | 42.56 | 42.70 | 42.83 | 42.97 | 43.10 | 43.24 | 43.37 | 0.966 |
| 0.967 | 41.78 | 41.92 | 42.06 | 42.20 | 42.33 | 42.47 | 42.61 | 42.74 | 42.88 | 43.01 | 43.15 | 43.28 | 43.42 | 0.967 |
| 0.968 | 41.83 | 41.97 | 42.10 | 42.24 | 42.38 | 42.52 | 42.65 | 42.79 | 42.93 | 43.06 | 43.20 | 43.33 | 43.46 | 0.968 |
| 0.969 | 41.87 | 42.01 | 42.15 | 42.29 | 42.43 | 42.56 | 42.70 | 42.84 | 42.97 | 43.11 | 43.24 | 43.38 | 43.51 | 0.969 |
| 0.970 | 41.92 | 42.06 | 42.20 | 42.33 | 42.47 | 42.61 | 42.75 | 42.88 | 43.02 | 43.16 | 43.29 | 43.42 | 43.56 | 0.970 |
| 0.971 | 41.96 | 42.10 | 42.24 | 42.38 | 42.52 | 42.66 | 42.79 | 42.93 | 43.07 | 43.20 | 43.34 | 43.47 | 43.61 | 0.971 |
| 0.972 | 42.01 | 42.15 | 42.29 | 42.43 | 42.56 | 42.70 | 42.84 | 42.98 | 43.11 | 43.25 | 43.38 | 43.52 | 43.65 | 0.972 |
| 0.973 | 42.05 | 42.19 | 42.33 | 42.47 | 42.61 | 42.75 | 42.89 | 43.02 | 43.16 | 43.30 | 43.43 | 43.57 | 43.70 | 0.973 |
| 0.974 | 42.10 | 42.24 | 42.38 | 42.52 | 42.66 | 42.80 | 42.93 | 43.07 | 43.21 | 43.34 | 43.48 | 43.61 | 43.75 | 0.974 |
| 0.975 | 42.15 | 42.29 | 42.43 | 42.56 | 42.70 | 42.84 | 42.98 | 43.12 | 43.25 | 43.39 | 43.53 | 43.66 | 43.80 | 0.975 |
| 0.976 | 42.19 | 42.33 | 42.47 | 42.61 | 42.75 | 42.89 | 43.03 | 43.16 | 43.30 | 43.44 | 43.57 | 43.71 | 43.84 | 0.976 |
| 0.977 | 42.24 | 42.38 | 42.52 | 42.66 | 42.80 | 42.93 | 43.07 | 43.21 | 43.35 | 43.48 | 43.62 | 43.76 | 43.89 | 0.977 |
| 0.978 | 42.28 | 42.42 | 42.56 | 42.70 | 42.84 | 42.98 | 43.12 | 43.26 | 43.39 | 43.53 | 43.67 | 43.80 | 43.94 | 0.978 |
| 0.979 | 42.33 | 42.47 | 42.61 | 42.75 | 42.89 | 43.03 | 43.16 | 43.30 | 43.44 | 43.58 | 43.71 | 43.85 | 43.98 | 0.979 |

09-0014

**Thermo Scientific**  
**Flow Look-Up Table for PM10 VFC**  
**High Volume Air Sampler**

**Serial # P9328 X**

**Calibrated with Rootsmeter serial # 0438320**

**Date Calibrated: 05/08/15**

## USE OF LOOK-UP-TABLE FOR DETERMINATION OF FLOW RATE PM10 VFC High Volume Air Sampler

1. Determine and record atmospheric properties.
2. Operate sampler and allow to warm up. Perform leak test and make sure all gaskets are in place and that there are no leaks.
3. Read the differential pressure across the filter ( $P_f$ ), inches of  $H_2O$  that has to be converted to mm Hg. Reading is taken with a manometer where one side is open to atmosphere and the other is connected to pressure tap on side of filter holder. Filter should be in place for this measurement.
4. Calculate pressure ratio,  $P_o / P_a$   $P_o / P_a = 1 - (P_f / P_a)$   
 $P_f$  and  $P_a$  should be in mm Hg
5. Look up flow rate in look up table. The first 4 pages are in Celsius and actual  $m^3/min$  the last 4 pages are in Fahrenheit and actual cubic feet.

### Example

(NOTE: Individual Look Up Tables will vary.)

1. Suppose the ambient conditions are:

Temperature:  $T_a = 24^\circ C$

Barometric Pressure:  $P_a = 762$  mm Hg (this must be station pressure which is not corrected to sea level)

2. Assume system is allowed to warm up for stable operation.
3. Measure filter pressure differential,  $P_f$ . This reading is the set-up reading plus pick-up reading divided by 2 for an average reading. This is taken with a differential manometer with one side of the manometer connected to the stagnation tap on the filter holder (or the Bulkhead Fitting) and the other side open to the atmosphere. Filter must be in place during this measurement.

Assume that:

Set-up Reading:  $P_f = 18.60$  in  $H_2O$

Pick-up Reading:  $P_f = 19.80$  in  $H_2O$

$P_f = (18.60 + 19.80)/2 = 19.20$  in  $H_2O$ .

4. Convert  $P_f =$  to same units as barometric pressure.

$$P_f = 19.20 \text{ in H}_2\text{O} / 13.61 \times 25.4 = 35.83 \text{ mm Hg}$$

$$P_f = 35.83 \text{ mm Hg}$$

5. Calculate pressure ratio.

$$P_o/P_a = 1 - (P_f/P_a)$$

NOTE:  $P_f$  and  $P_a$  MUST HAVE CONSISTENT UNITS

$$P_o/P_a = 1 - (35.83 / 762) \quad P_o/P_a = .953$$

6. Look up Flow Rate from table.

Table 1 (pages 1 – 4) is set up with temperature in °C and the Flow Rate is read in units of  $\text{m}^3/\text{min}$  (actual, ACMM). In table 2 (pages 5 – 8) the temperature is in °F and Flow Rate is read in  $\text{ft}^3/\text{min}$  (actual, ACFM).

a) For the example we will use Table 1.

Locate the temperature and pressure ratio entries nearest the conditions of:

$$T_a = 24^\circ\text{C}$$

$$P_o/P_a = .953$$

Example: Look-Up Table for Actual Flow Rate in Units of  $\text{m}^3/\text{min}$

|       | Temperature °C |              |       |       |       |
|-------|----------------|--------------|-------|-------|-------|
| Po/Pa | 22             | 24           | 26    | 28    | 30    |
| 0.950 | 1.142          | 1.146        | 1.149 | 1.153 | 1.156 |
| 0.951 | 1.144          | 1.147        | 1.150 | 1.154 | 1.157 |
| 0.952 | 1.145          | 1.148        | 1.152 | 1.155 | 1.159 |
| 0.953 | 1.146          | <b>1.150</b> | 1.153 | 1.156 | 1.160 |
| 0.954 | 1.147          | 1.151        | 1.154 | 1.158 | 1.161 |
| 0.955 | 1.149          | 1.152        | 1.156 | 1.159 | 1.162 |

b) The reading of flow rate is:  $Q_a = 1.150 \text{ m}^3/\text{min}$  (actual)

If your  $P_o/P_a$  number is not in look up table ie;  $>.979$  then interpolate.

7. Determine flow rate in terms of standard air.

$$Q_{\text{std}} = 1.150 \text{ m}^3 / \text{min} \left( \frac{762 \text{ mm Hg}}{760 \text{ mm Hg}} \right) \left( \frac{298\text{K}}{(273 + 24) \text{K}} \right)$$

$$Q_{\text{std}} = 1.157 \text{ std m}^3/\text{min}$$

It is always a good idea to contact the lab that you are dealing with to determine what information that they need including actual or standard air with respect to flow rate.

|       |  | TEMPERATURE °C Flow rate m3/min (actual) |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------|--|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Po/Pa |  | -32                                      | -30   | -28   | -26   | -24   | -22   | -20   | -18   | -16   | -14   | -12   | -10   | -8    | Po/Pa |
| 0.930 |  | 1.038                                    | 1.042 | 1.046 | 1.050 | 1.053 | 1.057 | 1.061 | 1.065 | 1.068 | 1.072 | 1.076 | 1.079 | 1.083 | 0.930 |
| 0.931 |  | 1.040                                    | 1.043 | 1.047 | 1.051 | 1.055 | 1.058 | 1.062 | 1.066 | 1.069 | 1.073 | 1.077 | 1.080 | 1.084 | 0.931 |
| 0.932 |  | 1.041                                    | 1.044 | 1.048 | 1.052 | 1.056 | 1.060 | 1.063 | 1.067 | 1.071 | 1.074 | 1.078 | 1.082 | 1.085 | 0.932 |
| 0.933 |  | 1.042                                    | 1.046 | 1.049 | 1.053 | 1.057 | 1.061 | 1.064 | 1.068 | 1.072 | 1.076 | 1.079 | 1.083 | 1.087 | 0.933 |
| 0.934 |  | 1.043                                    | 1.047 | 1.051 | 1.054 | 1.058 | 1.062 | 1.066 | 1.069 | 1.073 | 1.077 | 1.080 | 1.084 | 1.088 | 0.934 |
| 0.935 |  | 1.044                                    | 1.048 | 1.052 | 1.056 | 1.059 | 1.063 | 1.067 | 1.071 | 1.074 | 1.078 | 1.082 | 1.085 | 1.089 | 0.935 |
| 0.936 |  | 1.045                                    | 1.049 | 1.053 | 1.057 | 1.061 | 1.064 | 1.068 | 1.072 | 1.076 | 1.079 | 1.083 | 1.087 | 1.090 | 0.936 |
| 0.937 |  | 1.047                                    | 1.050 | 1.054 | 1.058 | 1.062 | 1.066 | 1.069 | 1.073 | 1.077 | 1.080 | 1.084 | 1.088 | 1.091 | 0.937 |
| 0.938 |  | 1.048                                    | 1.052 | 1.055 | 1.059 | 1.063 | 1.067 | 1.070 | 1.074 | 1.078 | 1.082 | 1.085 | 1.089 | 1.093 | 0.938 |
| 0.939 |  | 1.049                                    | 1.053 | 1.057 | 1.060 | 1.064 | 1.068 | 1.072 | 1.075 | 1.079 | 1.083 | 1.087 | 1.090 | 1.094 | 0.939 |
| 0.940 |  | 1.050                                    | 1.054 | 1.058 | 1.062 | 1.065 | 1.069 | 1.073 | 1.077 | 1.080 | 1.084 | 1.088 | 1.091 | 1.095 | 0.940 |
| 0.941 |  | 1.051                                    | 1.055 | 1.059 | 1.063 | 1.067 | 1.070 | 1.074 | 1.078 | 1.082 | 1.085 | 1.089 | 1.093 | 1.096 | 0.941 |
| 0.942 |  | 1.052                                    | 1.056 | 1.060 | 1.064 | 1.068 | 1.072 | 1.075 | 1.079 | 1.083 | 1.087 | 1.090 | 1.094 | 1.098 | 0.942 |
| 0.943 |  | 1.054                                    | 1.057 | 1.061 | 1.065 | 1.069 | 1.073 | 1.076 | 1.080 | 1.084 | 1.088 | 1.091 | 1.095 | 1.099 | 0.943 |
| 0.944 |  | 1.055                                    | 1.059 | 1.062 | 1.066 | 1.070 | 1.074 | 1.078 | 1.081 | 1.085 | 1.089 | 1.093 | 1.096 | 1.100 | 0.944 |
| 0.945 |  | 1.056                                    | 1.060 | 1.064 | 1.068 | 1.071 | 1.075 | 1.079 | 1.083 | 1.086 | 1.090 | 1.094 | 1.098 | 1.101 | 0.945 |
| 0.946 |  | 1.057                                    | 1.061 | 1.065 | 1.069 | 1.073 | 1.076 | 1.080 | 1.084 | 1.088 | 1.091 | 1.095 | 1.099 | 1.103 | 0.946 |
| 0.947 |  | 1.058                                    | 1.062 | 1.066 | 1.070 | 1.074 | 1.078 | 1.081 | 1.085 | 1.089 | 1.093 | 1.096 | 1.100 | 1.104 | 0.947 |
| 0.948 |  | 1.059                                    | 1.063 | 1.067 | 1.071 | 1.075 | 1.079 | 1.083 | 1.086 | 1.090 | 1.094 | 1.098 | 1.101 | 1.105 | 0.948 |
| 0.949 |  | 1.061                                    | 1.065 | 1.068 | 1.072 | 1.076 | 1.080 | 1.084 | 1.087 | 1.091 | 1.095 | 1.099 | 1.102 | 1.106 | 0.949 |
| 0.950 |  | 1.062                                    | 1.066 | 1.070 | 1.073 | 1.077 | 1.081 | 1.085 | 1.089 | 1.092 | 1.096 | 1.100 | 1.104 | 1.107 | 0.950 |
| 0.951 |  | 1.063                                    | 1.067 | 1.071 | 1.075 | 1.078 | 1.082 | 1.086 | 1.090 | 1.094 | 1.097 | 1.101 | 1.105 | 1.109 | 0.951 |
| 0.952 |  | 1.064                                    | 1.068 | 1.072 | 1.076 | 1.080 | 1.084 | 1.087 | 1.091 | 1.095 | 1.099 | 1.102 | 1.106 | 1.110 | 0.952 |
| 0.953 |  | 1.065                                    | 1.069 | 1.073 | 1.077 | 1.081 | 1.085 | 1.089 | 1.092 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 0.953 |
| 0.954 |  | 1.067                                    | 1.070 | 1.074 | 1.078 | 1.082 | 1.086 | 1.090 | 1.094 | 1.097 | 1.101 | 1.105 | 1.109 | 1.112 | 0.954 |
| 0.955 |  | 1.068                                    | 1.072 | 1.076 | 1.079 | 1.083 | 1.087 | 1.091 | 1.095 | 1.099 | 1.102 | 1.106 | 1.110 | 1.114 | 0.955 |
| 0.956 |  | 1.069                                    | 1.073 | 1.077 | 1.081 | 1.084 | 1.088 | 1.092 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 1.115 | 0.956 |
| 0.957 |  | 1.070                                    | 1.074 | 1.078 | 1.082 | 1.086 | 1.089 | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 0.957 |
| 0.958 |  | 1.071                                    | 1.075 | 1.079 | 1.083 | 1.087 | 1.091 | 1.095 | 1.098 | 1.102 | 1.106 | 1.110 | 1.113 | 1.117 | 0.958 |
| 0.959 |  | 1.072                                    | 1.076 | 1.080 | 1.084 | 1.088 | 1.092 | 1.096 | 1.100 | 1.103 | 1.107 | 1.111 | 1.115 | 1.118 | 0.959 |
| 0.960 |  | 1.074                                    | 1.078 | 1.081 | 1.085 | 1.089 | 1.093 | 1.097 | 1.101 | 1.105 | 1.108 | 1.112 | 1.116 | 1.120 | 0.960 |
| 0.961 |  | 1.075                                    | 1.079 | 1.083 | 1.087 | 1.090 | 1.094 | 1.098 | 1.102 | 1.106 | 1.110 | 1.113 | 1.117 | 1.121 | 0.961 |
| 0.962 |  | 1.076                                    | 1.080 | 1.084 | 1.088 | 1.092 | 1.095 | 1.099 | 1.103 | 1.107 | 1.111 | 1.115 | 1.118 | 1.122 | 0.962 |
| 0.963 |  | 1.077                                    | 1.081 | 1.085 | 1.089 | 1.093 | 1.097 | 1.101 | 1.104 | 1.108 | 1.112 | 1.116 | 1.120 | 1.123 | 0.963 |
| 0.964 |  | 1.078                                    | 1.082 | 1.086 | 1.090 | 1.094 | 1.098 | 1.102 | 1.106 | 1.109 | 1.113 | 1.117 | 1.121 | 1.125 | 0.964 |
| 0.965 |  | 1.080                                    | 1.083 | 1.087 | 1.091 | 1.095 | 1.099 | 1.103 | 1.107 | 1.111 | 1.114 | 1.118 | 1.122 | 1.126 | 0.965 |
| 0.966 |  | 1.081                                    | 1.085 | 1.089 | 1.092 | 1.096 | 1.100 | 1.104 | 1.108 | 1.112 | 1.116 | 1.119 | 1.123 | 1.127 | 0.966 |
| 0.967 |  | 1.082                                    | 1.086 | 1.090 | 1.094 | 1.098 | 1.101 | 1.105 | 1.109 | 1.113 | 1.117 | 1.121 | 1.125 | 1.128 | 0.967 |
| 0.968 |  | 1.083                                    | 1.087 | 1.091 | 1.095 | 1.099 | 1.103 | 1.107 | 1.110 | 1.114 | 1.118 | 1.122 | 1.126 | 1.130 | 0.968 |
| 0.969 |  | 1.084                                    | 1.088 | 1.092 | 1.096 | 1.100 | 1.104 | 1.108 | 1.112 | 1.115 | 1.119 | 1.123 | 1.127 | 1.131 | 0.969 |
| 0.970 |  | 1.085                                    | 1.089 | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.113 | 1.117 | 1.121 | 1.124 | 1.128 | 1.132 | 0.970 |
| 0.971 |  | 1.087                                    | 1.091 | 1.095 | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.118 | 1.122 | 1.126 | 1.129 | 1.133 | 0.971 |
| 0.972 |  | 1.088                                    | 1.092 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 1.115 | 1.119 | 1.123 | 1.127 | 1.131 | 1.134 | 0.972 |
| 0.973 |  | 1.089                                    | 1.093 | 1.097 | 1.101 | 1.105 | 1.109 | 1.113 | 1.116 | 1.120 | 1.124 | 1.128 | 1.132 | 1.136 | 0.973 |
| 0.974 |  | 1.090                                    | 1.094 | 1.098 | 1.102 | 1.106 | 1.110 | 1.114 | 1.118 | 1.122 | 1.125 | 1.129 | 1.133 | 1.137 | 0.974 |
| 0.975 |  | 1.091                                    | 1.095 | 1.099 | 1.103 | 1.107 | 1.111 | 1.115 | 1.119 | 1.123 | 1.127 | 1.130 | 1.134 | 1.138 | 0.975 |
| 0.976 |  | 1.092                                    | 1.096 | 1.100 | 1.104 | 1.108 | 1.112 | 1.116 | 1.120 | 1.124 | 1.128 | 1.132 | 1.136 | 1.139 | 0.976 |
| 0.977 |  | 1.094                                    | 1.098 | 1.102 | 1.106 | 1.110 | 1.113 | 1.117 | 1.121 | 1.125 | 1.129 | 1.133 | 1.137 | 1.141 | 0.977 |
| 0.978 |  | 1.095                                    | 1.099 | 1.103 | 1.107 | 1.111 | 1.115 | 1.119 | 1.123 | 1.126 | 1.130 | 1.134 | 1.138 | 1.142 | 0.978 |
| 0.979 |  | 1.096                                    | 1.100 | 1.104 | 1.108 | 1.112 | 1.116 | 1.120 | 1.124 | 1.128 | 1.131 | 1.135 | 1.139 | 1.143 | 0.979 |

TEMPERATURE °C Flow rate m3/min (actual)

| Po/Pa | -6    | -4    | -2    | 0     | 2     | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 18    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 1.087 | 1.090 | 1.094 | 1.097 | 1.101 | 1.104 | 1.108 | 1.111 | 1.115 | 1.119 | 1.122 | 1.125 | 1.129 | 0.930 |
| 0.931 | 1.088 | 1.091 | 1.095 | 1.099 | 1.102 | 1.106 | 1.109 | 1.113 | 1.116 | 1.120 | 1.123 | 1.127 | 1.130 | 0.931 |
| 0.932 | 1.089 | 1.093 | 1.096 | 1.100 | 1.103 | 1.107 | 1.110 | 1.114 | 1.118 | 1.121 | 1.125 | 1.128 | 1.131 | 0.932 |
| 0.933 | 1.090 | 1.094 | 1.097 | 1.101 | 1.105 | 1.108 | 1.112 | 1.115 | 1.119 | 1.122 | 1.126 | 1.129 | 1.133 | 0.933 |
| 0.934 | 1.091 | 1.095 | 1.099 | 1.102 | 1.106 | 1.109 | 1.113 | 1.117 | 1.120 | 1.124 | 1.127 | 1.131 | 1.134 | 0.934 |
| 0.935 | 1.093 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 1.114 | 1.118 | 1.121 | 1.125 | 1.128 | 1.132 | 1.135 | 0.935 |
| 0.936 | 1.094 | 1.098 | 1.101 | 1.105 | 1.108 | 1.112 | 1.115 | 1.119 | 1.123 | 1.126 | 1.130 | 1.133 | 1.137 | 0.936 |
| 0.937 | 1.095 | 1.099 | 1.102 | 1.106 | 1.110 | 1.113 | 1.117 | 1.120 | 1.124 | 1.127 | 1.131 | 1.134 | 1.138 | 0.937 |
| 0.938 | 1.096 | 1.100 | 1.104 | 1.107 | 1.111 | 1.114 | 1.118 | 1.122 | 1.125 | 1.129 | 1.132 | 1.136 | 1.139 | 0.938 |
| 0.939 | 1.098 | 1.101 | 1.105 | 1.108 | 1.112 | 1.116 | 1.119 | 1.123 | 1.126 | 1.130 | 1.133 | 1.137 | 1.140 | 0.939 |
| 0.940 | 1.099 | 1.102 | 1.106 | 1.110 | 1.113 | 1.117 | 1.121 | 1.124 | 1.128 | 1.131 | 1.135 | 1.138 | 1.142 | 0.940 |
| 0.941 | 1.100 | 1.104 | 1.107 | 1.111 | 1.115 | 1.118 | 1.122 | 1.125 | 1.129 | 1.132 | 1.136 | 1.139 | 1.143 | 0.941 |
| 0.942 | 1.101 | 1.105 | 1.109 | 1.112 | 1.116 | 1.119 | 1.123 | 1.127 | 1.130 | 1.134 | 1.137 | 1.141 | 1.144 | 0.942 |
| 0.943 | 1.103 | 1.106 | 1.110 | 1.113 | 1.117 | 1.121 | 1.124 | 1.128 | 1.131 | 1.135 | 1.139 | 1.142 | 1.146 | 0.943 |
| 0.944 | 1.104 | 1.107 | 1.111 | 1.115 | 1.118 | 1.122 | 1.126 | 1.129 | 1.133 | 1.136 | 1.140 | 1.143 | 1.147 | 0.944 |
| 0.945 | 1.105 | 1.109 | 1.112 | 1.116 | 1.120 | 1.123 | 1.127 | 1.130 | 1.134 | 1.138 | 1.141 | 1.145 | 1.148 | 0.945 |
| 0.946 | 1.106 | 1.110 | 1.114 | 1.117 | 1.121 | 1.124 | 1.128 | 1.132 | 1.135 | 1.139 | 1.142 | 1.146 | 1.149 | 0.946 |
| 0.947 | 1.107 | 1.111 | 1.115 | 1.118 | 1.122 | 1.126 | 1.129 | 1.133 | 1.136 | 1.140 | 1.144 | 1.147 | 1.151 | 0.947 |
| 0.948 | 1.109 | 1.112 | 1.116 | 1.120 | 1.123 | 1.127 | 1.131 | 1.134 | 1.138 | 1.141 | 1.145 | 1.148 | 1.152 | 0.948 |
| 0.949 | 1.110 | 1.114 | 1.117 | 1.121 | 1.125 | 1.128 | 1.132 | 1.135 | 1.139 | 1.143 | 1.146 | 1.150 | 1.153 | 0.949 |
| 0.950 | 1.111 | 1.115 | 1.118 | 1.122 | 1.126 | 1.129 | 1.133 | 1.137 | 1.140 | 1.144 | 1.147 | 1.151 | 1.155 | 0.950 |
| 0.951 | 1.112 | 1.116 | 1.120 | 1.123 | 1.127 | 1.131 | 1.134 | 1.138 | 1.142 | 1.145 | 1.149 | 1.152 | 1.156 | 0.951 |
| 0.952 | 1.114 | 1.117 | 1.121 | 1.125 | 1.128 | 1.132 | 1.136 | 1.139 | 1.143 | 1.146 | 1.150 | 1.154 | 1.157 | 0.952 |
| 0.953 | 1.115 | 1.119 | 1.122 | 1.126 | 1.130 | 1.133 | 1.137 | 1.140 | 1.144 | 1.148 | 1.151 | 1.155 | 1.158 | 0.953 |
| 0.954 | 1.116 | 1.120 | 1.123 | 1.127 | 1.131 | 1.134 | 1.138 | 1.142 | 1.145 | 1.149 | 1.153 | 1.156 | 1.160 | 0.954 |
| 0.955 | 1.117 | 1.121 | 1.125 | 1.128 | 1.132 | 1.136 | 1.139 | 1.143 | 1.147 | 1.150 | 1.154 | 1.157 | 1.161 | 0.955 |
| 0.956 | 1.119 | 1.122 | 1.126 | 1.130 | 1.133 | 1.137 | 1.141 | 1.144 | 1.148 | 1.151 | 1.155 | 1.159 | 1.162 | 0.956 |
| 0.957 | 1.120 | 1.123 | 1.127 | 1.131 | 1.135 | 1.138 | 1.142 | 1.145 | 1.149 | 1.153 | 1.156 | 1.160 | 1.163 | 0.957 |
| 0.958 | 1.121 | 1.125 | 1.128 | 1.132 | 1.136 | 1.139 | 1.143 | 1.147 | 1.150 | 1.154 | 1.158 | 1.161 | 1.165 | 0.958 |
| 0.959 | 1.122 | 1.126 | 1.130 | 1.133 | 1.137 | 1.141 | 1.144 | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 1.166 | 0.959 |
| 0.960 | 1.123 | 1.127 | 1.131 | 1.135 | 1.138 | 1.142 | 1.146 | 1.149 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 0.960 |
| 0.961 | 1.125 | 1.128 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 1.169 | 0.961 |
| 0.962 | 1.126 | 1.130 | 1.133 | 1.137 | 1.141 | 1.144 | 1.148 | 1.152 | 1.155 | 1.159 | 1.163 | 1.166 | 1.170 | 0.962 |
| 0.963 | 1.127 | 1.131 | 1.135 | 1.138 | 1.142 | 1.146 | 1.149 | 1.153 | 1.157 | 1.160 | 1.164 | 1.168 | 1.171 | 0.963 |
| 0.964 | 1.128 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.154 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 0.964 |
| 0.965 | 1.130 | 1.133 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.159 | 1.163 | 1.166 | 1.170 | 1.174 | 0.965 |
| 0.966 | 1.131 | 1.135 | 1.138 | 1.142 | 1.146 | 1.149 | 1.153 | 1.157 | 1.160 | 1.164 | 1.168 | 1.171 | 1.175 | 0.966 |
| 0.967 | 1.132 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.154 | 1.158 | 1.162 | 1.165 | 1.169 | 1.173 | 1.176 | 0.967 |
| 0.968 | 1.133 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.159 | 1.163 | 1.167 | 1.170 | 1.174 | 1.178 | 0.968 |
| 0.969 | 1.135 | 1.138 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.164 | 1.168 | 1.172 | 1.175 | 1.179 | 0.969 |
| 0.970 | 1.136 | 1.140 | 1.143 | 1.147 | 1.151 | 1.154 | 1.158 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 0.970 |
| 0.971 | 1.137 | 1.141 | 1.145 | 1.148 | 1.152 | 1.156 | 1.159 | 1.163 | 1.167 | 1.170 | 1.174 | 1.178 | 1.181 | 0.971 |
| 0.972 | 1.138 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.164 | 1.168 | 1.172 | 1.175 | 1.179 | 1.183 | 0.972 |
| 0.973 | 1.139 | 1.143 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.169 | 1.173 | 1.177 | 1.180 | 1.184 | 0.973 |
| 0.974 | 1.141 | 1.144 | 1.148 | 1.152 | 1.156 | 1.159 | 1.163 | 1.167 | 1.171 | 1.174 | 1.178 | 1.182 | 1.185 | 0.974 |
| 0.975 | 1.142 | 1.146 | 1.150 | 1.153 | 1.157 | 1.161 | 1.164 | 1.168 | 1.172 | 1.176 | 1.179 | 1.183 | 1.187 | 0.975 |
| 0.976 | 1.143 | 1.147 | 1.151 | 1.155 | 1.158 | 1.162 | 1.166 | 1.169 | 1.173 | 1.177 | 1.181 | 1.184 | 1.188 | 0.976 |
| 0.977 | 1.144 | 1.148 | 1.152 | 1.156 | 1.160 | 1.163 | 1.167 | 1.171 | 1.174 | 1.178 | 1.182 | 1.185 | 1.189 | 0.977 |
| 0.978 | 1.146 | 1.149 | 1.153 | 1.157 | 1.161 | 1.165 | 1.168 | 1.172 | 1.176 | 1.179 | 1.183 | 1.187 | 1.190 | 0.978 |
| 0.979 | 1.147 | 1.151 | 1.154 | 1.158 | 1.162 | 1.166 | 1.170 | 1.173 | 1.177 | 1.181 | 1.184 | 1.188 | 1.192 | 0.979 |

TEMPERATURE °C Flow rate m3/min (actual)

| Po/Pa | 16    | 18    | 20    | 22    | 24    | 26    | 28    | 30    | 32    | 34    | 36    | 38    | 40    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 1.125 | 1.129 | 1.132 | 1.136 | 1.139 | 1.143 | 1.146 | 1.149 | 1.153 | 1.156 | 1.160 | 1.163 | 1.166 | 0.930 |
| 0.931 | 1.127 | 1.130 | 1.134 | 1.137 | 1.141 | 1.144 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 1.164 | 1.168 | 0.931 |
| 0.932 | 1.128 | 1.131 | 1.135 | 1.138 | 1.142 | 1.145 | 1.149 | 1.152 | 1.155 | 1.159 | 1.162 | 1.166 | 1.169 | 0.932 |
| 0.933 | 1.129 | 1.133 | 1.136 | 1.140 | 1.143 | 1.147 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 1.170 | 0.933 |
| 0.934 | 1.131 | 1.134 | 1.138 | 1.141 | 1.144 | 1.148 | 1.151 | 1.155 | 1.158 | 1.161 | 1.165 | 1.168 | 1.172 | 0.934 |
| 0.935 | 1.132 | 1.135 | 1.139 | 1.142 | 1.146 | 1.149 | 1.153 | 1.156 | 1.159 | 1.163 | 1.166 | 1.170 | 1.173 | 0.935 |
| 0.936 | 1.133 | 1.137 | 1.140 | 1.144 | 1.147 | 1.150 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.174 | 0.936 |
| 0.937 | 1.134 | 1.138 | 1.141 | 1.145 | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 0.937 |
| 0.938 | 1.136 | 1.139 | 1.143 | 1.146 | 1.150 | 1.153 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 0.938 |
| 0.939 | 1.137 | 1.140 | 1.144 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.171 | 1.175 | 1.178 | 0.939 |
| 0.940 | 1.138 | 1.142 | 1.145 | 1.149 | 1.152 | 1.156 | 1.159 | 1.163 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 0.940 |
| 0.941 | 1.139 | 1.143 | 1.147 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.177 | 1.181 | 0.941 |
| 0.942 | 1.141 | 1.144 | 1.148 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.175 | 1.179 | 1.182 | 0.942 |
| 0.943 | 1.142 | 1.146 | 1.149 | 1.153 | 1.156 | 1.160 | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.183 | 0.943 |
| 0.944 | 1.143 | 1.147 | 1.150 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.181 | 1.185 | 0.944 |
| 0.945 | 1.145 | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 1.166 | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 0.945 |
| 0.946 | 1.146 | 1.149 | 1.153 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.187 | 0.946 |
| 0.947 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.185 | 1.189 | 0.947 |
| 0.948 | 1.148 | 1.152 | 1.155 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 0.948 |
| 0.949 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.191 | 0.949 |
| 0.950 | 1.151 | 1.155 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 0.950 |
| 0.951 | 1.152 | 1.156 | 1.159 | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 0.951 |
| 0.952 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.195 | 0.952 |
| 0.953 | 1.155 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 0.953 |
| 0.954 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 0.954 |
| 0.955 | 1.157 | 1.161 | 1.164 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.192 | 1.196 | 1.199 | 0.955 |
| 0.956 | 1.159 | 1.162 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 0.956 |
| 0.957 | 1.160 | 1.163 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 0.957 |
| 0.958 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 0.958 |
| 0.959 | 1.162 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 0.959 |
| 0.960 | 1.164 | 1.167 | 1.171 | 1.174 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 0.960 |
| 0.961 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 0.961 |
| 0.962 | 1.166 | 1.170 | 1.173 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 0.962 |
| 0.963 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 0.963 |
| 0.964 | 1.169 | 1.172 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 0.964 |
| 0.965 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 0.965 |
| 0.966 | 1.171 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 0.966 |
| 0.967 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 0.967 |
| 0.968 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 0.968 |
| 0.969 | 1.175 | 1.179 | 1.182 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 1.218 | 0.969 |
| 0.970 | 1.176 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 0.970 |
| 0.971 | 1.178 | 1.181 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.214 | 1.217 | 1.221 | 0.971 |
| 0.972 | 1.179 | 1.183 | 1.186 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 1.222 | 0.972 |
| 0.973 | 1.180 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 0.973 |
| 0.974 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 1.224 | 0.974 |
| 0.975 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 1.226 | 0.975 |
| 0.976 | 1.184 | 1.188 | 1.191 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.217 | 1.220 | 1.224 | 1.227 | 0.976 |
| 0.977 | 1.185 | 1.189 | 1.193 | 1.196 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 1.228 | 0.977 |
| 0.978 | 1.187 | 1.190 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226 | 1.230 | 0.978 |
| 0.979 | 1.188 | 1.192 | 1.195 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 1.220 | 1.224 | 1.228 | 1.231 | 0.979 |

TEMPERATURE °C Flow rate m3/min (actual)

| Po/Pa | 26    | 28    | 30    | 32    | 34    | 36    | 38    | 40    | 42    | 44    | 46    | 48    | 50    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 1.143 | 1.146 | 1.149 | 1.153 | 1.156 | 1.160 | 1.163 | 1.166 | 1.170 | 1.173 | 1.176 | 1.180 | 1.183 | 0.930 |
| 0.931 | 1.144 | 1.147 | 1.151 | 1.154 | 1.158 | 1.161 | 1.164 | 1.168 | 1.171 | 1.174 | 1.178 | 1.181 | 1.184 | 0.931 |
| 0.932 | 1.145 | 1.149 | 1.152 | 1.155 | 1.159 | 1.162 | 1.166 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 1.186 | 0.932 |
| 0.933 | 1.147 | 1.150 | 1.153 | 1.157 | 1.160 | 1.164 | 1.167 | 1.170 | 1.174 | 1.177 | 1.180 | 1.184 | 1.187 | 0.933 |
| 0.934 | 1.148 | 1.151 | 1.155 | 1.158 | 1.161 | 1.165 | 1.168 | 1.172 | 1.175 | 1.178 | 1.182 | 1.185 | 1.188 | 0.934 |
| 0.935 | 1.149 | 1.153 | 1.156 | 1.159 | 1.163 | 1.166 | 1.170 | 1.173 | 1.176 | 1.180 | 1.183 | 1.186 | 1.190 | 0.935 |
| 0.936 | 1.150 | 1.154 | 1.157 | 1.161 | 1.164 | 1.168 | 1.171 | 1.174 | 1.178 | 1.181 | 1.184 | 1.188 | 1.191 | 0.936 |
| 0.937 | 1.152 | 1.155 | 1.159 | 1.162 | 1.165 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 1.186 | 1.189 | 1.192 | 0.937 |
| 0.938 | 1.153 | 1.156 | 1.160 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 1.180 | 1.184 | 1.187 | 1.190 | 1.194 | 0.938 |
| 0.939 | 1.154 | 1.158 | 1.161 | 1.165 | 1.168 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.188 | 1.192 | 1.195 | 0.939 |
| 0.940 | 1.156 | 1.159 | 1.163 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.186 | 1.190 | 1.193 | 1.196 | 0.940 |
| 0.941 | 1.157 | 1.160 | 1.164 | 1.167 | 1.171 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.194 | 1.198 | 0.941 |
| 0.942 | 1.158 | 1.162 | 1.165 | 1.169 | 1.172 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.192 | 1.196 | 1.199 | 0.942 |
| 0.943 | 1.160 | 1.163 | 1.166 | 1.170 | 1.173 | 1.177 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.200 | 0.943 |
| 0.944 | 1.161 | 1.164 | 1.168 | 1.171 | 1.175 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.198 | 1.202 | 0.944 |
| 0.945 | 1.162 | 1.166 | 1.169 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.196 | 1.200 | 1.203 | 0.945 |
| 0.946 | 1.163 | 1.167 | 1.170 | 1.174 | 1.177 | 1.181 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.204 | 0.946 |
| 0.947 | 1.165 | 1.168 | 1.172 | 1.175 | 1.179 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.202 | 1.206 | 0.947 |
| 0.948 | 1.166 | 1.169 | 1.173 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 0.948 |
| 0.949 | 1.167 | 1.171 | 1.174 | 1.178 | 1.181 | 1.185 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.208 | 0.949 |
| 0.950 | 1.169 | 1.172 | 1.176 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.206 | 1.210 | 0.950 |
| 0.951 | 1.170 | 1.173 | 1.177 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 0.951 |
| 0.952 | 1.171 | 1.175 | 1.178 | 1.182 | 1.185 | 1.189 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.212 | 0.952 |
| 0.953 | 1.172 | 1.176 | 1.179 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.210 | 1.214 | 0.953 |
| 0.954 | 1.174 | 1.177 | 1.181 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 0.954 |
| 0.955 | 1.175 | 1.179 | 1.182 | 1.186 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.216 | 0.955 |
| 0.956 | 1.176 | 1.180 | 1.183 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.214 | 1.218 | 0.956 |
| 0.957 | 1.178 | 1.181 | 1.185 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 0.957 |
| 0.958 | 1.179 | 1.182 | 1.186 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.220 | 0.958 |
| 0.959 | 1.180 | 1.184 | 1.187 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.218 | 1.222 | 0.959 |
| 0.960 | 1.182 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 0.960 |
| 0.961 | 1.183 | 1.186 | 1.190 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.224 | 0.961 |
| 0.962 | 1.184 | 1.188 | 1.191 | 1.195 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 1.222 | 1.226 | 0.962 |
| 0.963 | 1.185 | 1.189 | 1.192 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 1.220 | 1.224 | 1.227 | 0.963 |
| 0.964 | 1.187 | 1.190 | 1.194 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 1.222 | 1.225 | 1.228 | 0.964 |
| 0.965 | 1.188 | 1.192 | 1.195 | 1.199 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.219 | 1.223 | 1.226 | 1.230 | 0.965 |
| 0.966 | 1.189 | 1.193 | 1.196 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 1.224 | 1.228 | 1.231 | 0.966 |
| 0.967 | 1.191 | 1.194 | 1.198 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 1.226 | 1.229 | 1.232 | 0.967 |
| 0.968 | 1.192 | 1.195 | 1.199 | 1.203 | 1.206 | 1.210 | 1.213 | 1.217 | 1.220 | 1.223 | 1.227 | 1.230 | 1.234 | 0.968 |
| 0.969 | 1.193 | 1.197 | 1.200 | 1.204 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 1.228 | 1.232 | 1.235 | 0.969 |
| 0.970 | 1.194 | 1.198 | 1.202 | 1.205 | 1.209 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226 | 1.230 | 1.233 | 1.237 | 0.970 |
| 0.971 | 1.196 | 1.199 | 1.203 | 1.206 | 1.210 | 1.214 | 1.217 | 1.221 | 1.224 | 1.227 | 1.231 | 1.234 | 1.238 | 0.971 |
| 0.972 | 1.197 | 1.201 | 1.204 | 1.208 | 1.211 | 1.215 | 1.218 | 1.222 | 1.225 | 1.229 | 1.232 | 1.236 | 1.239 | 0.972 |
| 0.973 | 1.198 | 1.202 | 1.206 | 1.209 | 1.213 | 1.216 | 1.220 | 1.223 | 1.227 | 1.230 | 1.234 | 1.237 | 1.241 | 0.973 |
| 0.974 | 1.200 | 1.203 | 1.207 | 1.210 | 1.214 | 1.217 | 1.221 | 1.224 | 1.228 | 1.231 | 1.235 | 1.238 | 1.242 | 0.974 |
| 0.975 | 1.201 | 1.205 | 1.208 | 1.212 | 1.215 | 1.219 | 1.222 | 1.226 | 1.229 | 1.233 | 1.236 | 1.240 | 1.243 | 0.975 |
| 0.976 | 1.202 | 1.206 | 1.209 | 1.213 | 1.217 | 1.220 | 1.224 | 1.227 | 1.231 | 1.234 | 1.238 | 1.241 | 1.245 | 0.976 |
| 0.977 | 1.204 | 1.207 | 1.211 | 1.214 | 1.218 | 1.221 | 1.225 | 1.228 | 1.232 | 1.235 | 1.239 | 1.242 | 1.246 | 0.977 |
| 0.978 | 1.205 | 1.208 | 1.212 | 1.216 | 1.219 | 1.223 | 1.226 | 1.230 | 1.233 | 1.237 | 1.240 | 1.244 | 1.247 | 0.978 |
| 0.979 | 1.206 | 1.210 | 1.213 | 1.217 | 1.220 | 1.224 | 1.228 | 1.231 | 1.235 | 1.238 | 1.242 | 1.245 | 1.249 | 0.979 |

## TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | -12   | -8    | -4    | 0     | 4     | 8     | 12    | 16    | 20    | 24    | 28    | 32    | 36    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 37.17 | 37.32 | 37.46 | 37.61 | 37.75 | 37.90 | 38.04 | 38.19 | 38.33 | 38.47 | 38.61 | 38.75 | 38.89 | 0.930 |
| 0.931 | 37.21 | 37.36 | 37.51 | 37.65 | 37.80 | 37.94 | 38.09 | 38.23 | 38.37 | 38.51 | 38.65 | 38.79 | 38.93 | 0.931 |
| 0.932 | 37.26 | 37.40 | 37.55 | 37.70 | 37.84 | 37.98 | 38.13 | 38.27 | 38.41 | 38.56 | 38.70 | 38.84 | 38.98 | 0.932 |
| 0.933 | 37.30 | 37.45 | 37.59 | 37.74 | 37.88 | 38.03 | 38.17 | 38.31 | 38.46 | 38.60 | 38.74 | 38.88 | 39.02 | 0.933 |
| 0.934 | 37.34 | 37.49 | 37.63 | 37.78 | 37.93 | 38.07 | 38.21 | 38.36 | 38.50 | 38.64 | 38.78 | 38.93 | 39.07 | 0.934 |
| 0.935 | 37.38 | 37.53 | 37.68 | 37.82 | 37.97 | 38.11 | 38.26 | 38.40 | 38.54 | 38.69 | 38.83 | 38.97 | 39.11 | 0.935 |
| 0.936 | 37.42 | 37.57 | 37.72 | 37.87 | 38.01 | 38.16 | 38.30 | 38.44 | 38.59 | 38.73 | 38.87 | 39.01 | 39.15 | 0.936 |
| 0.937 | 37.47 | 37.61 | 37.76 | 37.91 | 38.05 | 38.20 | 38.34 | 38.49 | 38.63 | 38.77 | 38.92 | 39.06 | 39.20 | 0.937 |
| 0.938 | 37.51 | 37.66 | 37.80 | 37.95 | 38.10 | 38.24 | 38.39 | 38.53 | 38.67 | 38.82 | 38.96 | 39.10 | 39.24 | 0.938 |
| 0.939 | 37.55 | 37.70 | 37.85 | 37.99 | 38.14 | 38.29 | 38.43 | 38.57 | 38.72 | 38.86 | 39.00 | 39.15 | 39.29 | 0.939 |
| 0.940 | 37.59 | 37.74 | 37.89 | 38.04 | 38.18 | 38.33 | 38.47 | 38.62 | 38.76 | 38.90 | 39.05 | 39.19 | 39.33 | 0.940 |
| 0.941 | 37.63 | 37.78 | 37.93 | 38.08 | 38.22 | 38.37 | 38.52 | 38.66 | 38.80 | 38.95 | 39.09 | 39.23 | 39.38 | 0.941 |
| 0.942 | 37.68 | 37.83 | 37.97 | 38.12 | 38.27 | 38.41 | 38.56 | 38.70 | 38.85 | 38.99 | 39.13 | 39.28 | 39.42 | 0.942 |
| 0.943 | 37.72 | 37.87 | 38.02 | 38.16 | 38.31 | 38.46 | 38.60 | 38.75 | 38.89 | 39.04 | 39.18 | 39.32 | 39.46 | 0.943 |
| 0.944 | 37.76 | 37.91 | 38.06 | 38.21 | 38.35 | 38.50 | 38.65 | 38.79 | 38.94 | 39.08 | 39.22 | 39.37 | 39.51 | 0.944 |
| 0.945 | 37.80 | 37.95 | 38.10 | 38.25 | 38.40 | 38.54 | 38.69 | 38.83 | 38.98 | 39.12 | 39.27 | 39.41 | 39.55 | 0.945 |
| 0.946 | 37.85 | 37.99 | 38.14 | 38.29 | 38.44 | 38.59 | 38.73 | 38.88 | 39.02 | 39.17 | 39.31 | 39.45 | 39.60 | 0.946 |
| 0.947 | 37.89 | 38.04 | 38.19 | 38.33 | 38.48 | 38.63 | 38.77 | 38.92 | 39.07 | 39.21 | 39.35 | 39.50 | 39.64 | 0.947 |
| 0.948 | 37.93 | 38.08 | 38.23 | 38.38 | 38.52 | 38.67 | 38.82 | 38.96 | 39.11 | 39.25 | 39.40 | 39.54 | 39.68 | 0.948 |
| 0.949 | 37.97 | 38.12 | 38.27 | 38.42 | 38.57 | 38.71 | 38.86 | 39.01 | 39.15 | 39.30 | 39.44 | 39.58 | 39.73 | 0.949 |
| 0.950 | 38.01 | 38.16 | 38.31 | 38.46 | 38.61 | 38.76 | 38.90 | 39.05 | 39.20 | 39.34 | 39.48 | 39.63 | 39.77 | 0.950 |
| 0.951 | 38.06 | 38.21 | 38.36 | 38.50 | 38.65 | 38.80 | 38.95 | 39.09 | 39.24 | 39.38 | 39.53 | 39.67 | 39.82 | 0.951 |
| 0.952 | 38.10 | 38.25 | 38.40 | 38.55 | 38.70 | 38.84 | 38.99 | 39.14 | 39.28 | 39.43 | 39.57 | 39.72 | 39.86 | 0.952 |
| 0.953 | 38.14 | 38.29 | 38.44 | 38.59 | 38.74 | 38.89 | 39.03 | 39.18 | 39.33 | 39.47 | 39.62 | 39.76 | 39.90 | 0.953 |
| 0.954 | 38.18 | 38.33 | 38.48 | 38.63 | 38.78 | 38.93 | 39.08 | 39.22 | 39.37 | 39.51 | 39.66 | 39.80 | 39.95 | 0.954 |
| 0.955 | 38.22 | 38.38 | 38.53 | 38.68 | 38.82 | 38.97 | 39.12 | 39.27 | 39.41 | 39.56 | 39.70 | 39.85 | 39.99 | 0.955 |
| 0.956 | 38.27 | 38.42 | 38.57 | 38.72 | 38.87 | 39.02 | 39.16 | 39.31 | 39.46 | 39.60 | 39.75 | 39.89 | 40.04 | 0.956 |
| 0.957 | 38.31 | 38.46 | 38.61 | 38.76 | 38.91 | 39.06 | 39.21 | 39.35 | 39.50 | 39.65 | 39.79 | 39.94 | 40.08 | 0.957 |
| 0.958 | 38.35 | 38.50 | 38.65 | 38.80 | 38.95 | 39.10 | 39.25 | 39.40 | 39.54 | 39.69 | 39.83 | 39.98 | 40.12 | 0.958 |
| 0.959 | 38.39 | 38.54 | 38.70 | 38.85 | 39.00 | 39.14 | 39.29 | 39.44 | 39.59 | 39.73 | 39.88 | 40.02 | 40.17 | 0.959 |
| 0.960 | 38.44 | 38.59 | 38.74 | 38.89 | 39.04 | 39.19 | 39.34 | 39.48 | 39.63 | 39.78 | 39.92 | 40.07 | 40.21 | 0.960 |
| 0.961 | 38.48 | 38.63 | 38.78 | 38.93 | 39.08 | 39.23 | 39.38 | 39.53 | 39.67 | 39.82 | 39.97 | 40.11 | 40.26 | 0.961 |
| 0.962 | 38.52 | 38.67 | 38.82 | 38.97 | 39.12 | 39.27 | 39.42 | 39.57 | 39.72 | 39.86 | 40.01 | 40.16 | 40.30 | 0.962 |
| 0.963 | 38.56 | 38.71 | 38.87 | 39.02 | 39.17 | 39.32 | 39.46 | 39.61 | 39.76 | 39.91 | 40.05 | 40.20 | 40.34 | 0.963 |
| 0.964 | 38.60 | 38.76 | 38.91 | 39.06 | 39.21 | 39.36 | 39.51 | 39.66 | 39.80 | 39.95 | 40.10 | 40.24 | 40.39 | 0.964 |
| 0.965 | 38.65 | 38.80 | 38.95 | 39.10 | 39.25 | 39.40 | 39.55 | 39.70 | 39.85 | 39.99 | 40.14 | 40.29 | 40.43 | 0.965 |
| 0.966 | 38.69 | 38.84 | 38.99 | 39.14 | 39.29 | 39.44 | 39.59 | 39.74 | 39.89 | 40.04 | 40.19 | 40.33 | 40.48 | 0.966 |
| 0.967 | 38.73 | 38.88 | 39.04 | 39.19 | 39.34 | 39.49 | 39.64 | 39.79 | 39.93 | 40.08 | 40.23 | 40.38 | 40.52 | 0.967 |
| 0.968 | 38.77 | 38.93 | 39.08 | 39.23 | 39.38 | 39.53 | 39.68 | 39.83 | 39.98 | 40.13 | 40.27 | 40.42 | 40.57 | 0.968 |
| 0.969 | 38.81 | 38.97 | 39.12 | 39.27 | 39.42 | 39.57 | 39.72 | 39.87 | 40.02 | 40.17 | 40.32 | 40.46 | 40.61 | 0.969 |
| 0.970 | 38.86 | 39.01 | 39.16 | 39.31 | 39.47 | 39.62 | 39.77 | 39.92 | 40.06 | 40.21 | 40.36 | 40.51 | 40.65 | 0.970 |
| 0.971 | 38.90 | 39.05 | 39.21 | 39.36 | 39.51 | 39.66 | 39.81 | 39.96 | 40.11 | 40.26 | 40.40 | 40.55 | 40.70 | 0.971 |
| 0.972 | 38.94 | 39.10 | 39.25 | 39.40 | 39.55 | 39.70 | 39.85 | 40.00 | 40.15 | 40.30 | 40.45 | 40.60 | 40.74 | 0.972 |
| 0.973 | 38.98 | 39.14 | 39.29 | 39.44 | 39.59 | 39.75 | 39.90 | 40.05 | 40.20 | 40.34 | 40.49 | 40.64 | 40.79 | 0.973 |
| 0.974 | 39.03 | 39.18 | 39.33 | 39.49 | 39.64 | 39.79 | 39.94 | 40.09 | 40.24 | 40.39 | 40.54 | 40.68 | 40.83 | 0.974 |
| 0.975 | 39.07 | 39.22 | 39.38 | 39.53 | 39.68 | 39.83 | 39.98 | 40.13 | 40.28 | 40.43 | 40.58 | 40.73 | 40.87 | 0.975 |
| 0.976 | 39.11 | 39.26 | 39.42 | 39.57 | 39.72 | 39.87 | 40.03 | 40.18 | 40.33 | 40.47 | 40.62 | 40.77 | 40.92 | 0.976 |
| 0.977 | 39.15 | 39.31 | 39.46 | 39.61 | 39.77 | 39.92 | 40.07 | 40.22 | 40.37 | 40.52 | 40.67 | 40.82 | 40.96 | 0.977 |
| 0.978 | 39.19 | 39.35 | 39.50 | 39.66 | 39.81 | 39.96 | 40.11 | 40.26 | 40.41 | 40.56 | 40.71 | 40.86 | 41.01 | 0.978 |
| 0.979 | 39.24 | 39.39 | 39.55 | 39.70 | 39.85 | 40.00 | 40.16 | 40.31 | 40.46 | 40.61 | 40.75 | 40.90 | 41.05 | 0.979 |

TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | 18    | 22    | 26    | 30    | 34    | 38    | 42    | 46    | 50    | 54    | 58    | 62    | 66    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 38.26 | 38.40 | 38.54 | 38.68 | 38.82 | 38.96 | 39.10 | 39.24 | 39.38 | 39.51 | 39.65 | 39.79 | 39.92 | 0.930 |
| 0.931 | 38.30 | 38.44 | 38.58 | 38.72 | 38.86 | 39.00 | 39.14 | 39.28 | 39.42 | 39.56 | 39.70 | 39.83 | 39.97 | 0.931 |
| 0.932 | 38.34 | 38.49 | 38.63 | 38.77 | 38.91 | 39.05 | 39.19 | 39.33 | 39.47 | 39.60 | 39.74 | 39.88 | 40.01 | 0.932 |
| 0.933 | 38.39 | 38.53 | 38.67 | 38.81 | 38.95 | 39.09 | 39.23 | 39.37 | 39.51 | 39.65 | 39.78 | 39.92 | 40.06 | 0.933 |
| 0.934 | 38.43 | 38.57 | 38.71 | 38.86 | 39.00 | 39.14 | 39.28 | 39.42 | 39.55 | 39.69 | 39.83 | 39.97 | 40.10 | 0.934 |
| 0.935 | 38.47 | 38.62 | 38.76 | 38.90 | 39.04 | 39.18 | 39.32 | 39.46 | 39.60 | 39.74 | 39.87 | 40.01 | 40.15 | 0.935 |
| 0.936 | 38.52 | 38.66 | 38.80 | 38.94 | 39.08 | 39.22 | 39.37 | 39.50 | 39.64 | 39.78 | 39.92 | 40.06 | 40.19 | 0.936 |
| 0.937 | 38.56 | 38.70 | 38.85 | 38.99 | 39.13 | 39.27 | 39.41 | 39.55 | 39.69 | 39.83 | 39.96 | 40.10 | 40.24 | 0.937 |
| 0.938 | 38.60 | 38.75 | 38.89 | 39.03 | 39.17 | 39.31 | 39.45 | 39.59 | 39.73 | 39.87 | 40.01 | 40.15 | 40.28 | 0.938 |
| 0.939 | 38.65 | 38.79 | 38.93 | 39.07 | 39.22 | 39.36 | 39.50 | 39.64 | 39.78 | 39.92 | 40.05 | 40.19 | 40.33 | 0.939 |
| 0.940 | 38.69 | 38.83 | 38.98 | 39.12 | 39.26 | 39.40 | 39.54 | 39.68 | 39.82 | 39.96 | 40.10 | 40.24 | 40.37 | 0.940 |
| 0.941 | 38.73 | 38.88 | 39.02 | 39.16 | 39.30 | 39.45 | 39.59 | 39.73 | 39.87 | 40.01 | 40.14 | 40.28 | 40.42 | 0.941 |
| 0.942 | 38.78 | 38.92 | 39.06 | 39.21 | 39.35 | 39.49 | 39.63 | 39.77 | 39.91 | 40.05 | 40.19 | 40.33 | 40.46 | 0.942 |
| 0.943 | 38.82 | 38.96 | 39.11 | 39.25 | 39.39 | 39.53 | 39.68 | 39.82 | 39.96 | 40.10 | 40.23 | 40.37 | 40.51 | 0.943 |
| 0.944 | 38.86 | 39.01 | 39.15 | 39.29 | 39.44 | 39.58 | 39.72 | 39.86 | 40.00 | 40.14 | 40.28 | 40.42 | 40.56 | 0.944 |
| 0.945 | 38.91 | 39.05 | 39.19 | 39.34 | 39.48 | 39.62 | 39.76 | 39.90 | 40.04 | 40.18 | 40.32 | 40.46 | 40.60 | 0.945 |
| 0.946 | 38.95 | 39.09 | 39.24 | 39.38 | 39.52 | 39.67 | 39.81 | 39.95 | 40.09 | 40.23 | 40.37 | 40.51 | 40.65 | 0.946 |
| 0.947 | 38.99 | 39.14 | 39.28 | 39.43 | 39.57 | 39.71 | 39.85 | 39.99 | 40.13 | 40.27 | 40.41 | 40.55 | 40.69 | 0.947 |
| 0.948 | 39.04 | 39.18 | 39.33 | 39.47 | 39.61 | 39.75 | 39.90 | 40.04 | 40.18 | 40.32 | 40.46 | 40.60 | 40.74 | 0.948 |
| 0.949 | 39.08 | 39.22 | 39.37 | 39.51 | 39.66 | 39.80 | 39.94 | 40.08 | 40.22 | 40.36 | 40.50 | 40.64 | 40.78 | 0.949 |
| 0.950 | 39.12 | 39.27 | 39.41 | 39.56 | 39.70 | 39.84 | 39.99 | 40.13 | 40.27 | 40.41 | 40.55 | 40.69 | 40.83 | 0.950 |
| 0.951 | 39.17 | 39.31 | 39.46 | 39.60 | 39.74 | 39.89 | 40.03 | 40.17 | 40.31 | 40.45 | 40.59 | 40.73 | 40.87 | 0.951 |
| 0.952 | 39.21 | 39.36 | 39.50 | 39.64 | 39.79 | 39.93 | 40.07 | 40.22 | 40.36 | 40.50 | 40.64 | 40.78 | 40.92 | 0.952 |
| 0.953 | 39.25 | 39.40 | 39.54 | 39.69 | 39.83 | 39.98 | 40.12 | 40.26 | 40.40 | 40.54 | 40.68 | 40.82 | 40.96 | 0.953 |
| 0.954 | 39.30 | 39.44 | 39.59 | 39.73 | 39.88 | 40.02 | 40.16 | 40.30 | 40.45 | 40.59 | 40.73 | 40.87 | 41.01 | 0.954 |
| 0.955 | 39.34 | 39.49 | 39.63 | 39.78 | 39.92 | 40.06 | 40.21 | 40.35 | 40.49 | 40.63 | 40.77 | 40.91 | 41.05 | 0.955 |
| 0.956 | 39.38 | 39.53 | 39.67 | 39.82 | 39.96 | 40.11 | 40.25 | 40.39 | 40.54 | 40.68 | 40.82 | 40.96 | 41.10 | 0.956 |
| 0.957 | 39.43 | 39.57 | 39.72 | 39.86 | 40.01 | 40.15 | 40.30 | 40.44 | 40.58 | 40.72 | 40.86 | 41.00 | 41.14 | 0.957 |
| 0.958 | 39.47 | 39.62 | 39.76 | 39.91 | 40.05 | 40.20 | 40.34 | 40.48 | 40.63 | 40.77 | 40.91 | 41.05 | 41.19 | 0.958 |
| 0.959 | 39.51 | 39.66 | 39.81 | 39.95 | 40.10 | 40.24 | 40.38 | 40.53 | 40.67 | 40.81 | 40.95 | 41.09 | 41.23 | 0.959 |
| 0.960 | 39.56 | 39.70 | 39.85 | 40.00 | 40.14 | 40.28 | 40.43 | 40.57 | 40.71 | 40.86 | 41.00 | 41.14 | 41.28 | 0.960 |
| 0.961 | 39.60 | 39.75 | 39.89 | 40.04 | 40.18 | 40.33 | 40.47 | 40.62 | 40.76 | 40.90 | 41.04 | 41.18 | 41.32 | 0.961 |
| 0.962 | 39.64 | 39.79 | 39.94 | 40.08 | 40.23 | 40.37 | 40.52 | 40.66 | 40.80 | 40.95 | 41.09 | 41.23 | 41.37 | 0.962 |
| 0.963 | 39.69 | 39.83 | 39.98 | 40.13 | 40.27 | 40.42 | 40.56 | 40.71 | 40.85 | 40.99 | 41.13 | 41.27 | 41.42 | 0.963 |
| 0.964 | 39.73 | 39.88 | 40.02 | 40.17 | 40.32 | 40.46 | 40.61 | 40.75 | 40.89 | 41.04 | 41.18 | 41.32 | 41.46 | 0.964 |
| 0.965 | 39.77 | 39.92 | 40.07 | 40.21 | 40.36 | 40.51 | 40.65 | 40.79 | 40.94 | 41.08 | 41.22 | 41.36 | 41.51 | 0.965 |
| 0.966 | 39.82 | 39.96 | 40.11 | 40.26 | 40.40 | 40.55 | 40.69 | 40.84 | 40.98 | 41.13 | 41.27 | 41.41 | 41.55 | 0.966 |
| 0.967 | 39.86 | 40.01 | 40.16 | 40.30 | 40.45 | 40.59 | 40.74 | 40.88 | 41.03 | 41.17 | 41.31 | 41.45 | 41.60 | 0.967 |
| 0.968 | 39.90 | 40.05 | 40.20 | 40.35 | 40.49 | 40.64 | 40.78 | 40.93 | 41.07 | 41.21 | 41.36 | 41.50 | 41.64 | 0.968 |
| 0.969 | 39.95 | 40.10 | 40.24 | 40.39 | 40.54 | 40.68 | 40.83 | 40.97 | 41.12 | 41.26 | 41.40 | 41.55 | 41.69 | 0.969 |
| 0.970 | 39.99 | 40.14 | 40.29 | 40.43 | 40.58 | 40.73 | 40.87 | 41.02 | 41.16 | 41.30 | 41.45 | 41.59 | 41.73 | 0.970 |
| 0.971 | 40.03 | 40.18 | 40.33 | 40.48 | 40.62 | 40.77 | 40.92 | 41.06 | 41.21 | 41.35 | 41.49 | 41.64 | 41.78 | 0.971 |
| 0.972 | 40.08 | 40.23 | 40.37 | 40.52 | 40.67 | 40.81 | 40.96 | 41.11 | 41.25 | 41.39 | 41.54 | 41.68 | 41.82 | 0.972 |
| 0.973 | 40.12 | 40.27 | 40.42 | 40.57 | 40.71 | 40.86 | 41.01 | 41.15 | 41.30 | 41.44 | 41.58 | 41.73 | 41.87 | 0.973 |
| 0.974 | 40.16 | 40.31 | 40.46 | 40.61 | 40.76 | 40.90 | 41.05 | 41.19 | 41.34 | 41.48 | 41.63 | 41.77 | 41.91 | 0.974 |
| 0.975 | 40.21 | 40.36 | 40.51 | 40.65 | 40.80 | 40.95 | 41.09 | 41.24 | 41.38 | 41.53 | 41.67 | 41.82 | 41.96 | 0.975 |
| 0.976 | 40.25 | 40.40 | 40.55 | 40.70 | 40.84 | 40.99 | 41.14 | 41.28 | 41.43 | 41.57 | 41.72 | 41.86 | 42.00 | 0.976 |
| 0.977 | 40.29 | 40.44 | 40.59 | 40.74 | 40.89 | 41.04 | 41.18 | 41.33 | 41.47 | 41.62 | 41.76 | 41.91 | 42.05 | 0.977 |
| 0.978 | 40.34 | 40.49 | 40.64 | 40.79 | 40.93 | 41.08 | 41.23 | 41.37 | 41.52 | 41.66 | 41.81 | 41.95 | 42.09 | 0.978 |
| 0.979 | 40.38 | 40.53 | 40.68 | 40.83 | 40.98 | 41.12 | 41.27 | 41.42 | 41.56 | 41.71 | 41.85 | 42.00 | 42.14 | 0.979 |

TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | 48    | 52    | 56    | 60    | 64    | 68    | 72    | 76    | 80    | 84    | 88    | 92    | 96    | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 39.31 | 39.44 | 39.58 | 39.72 | 39.85 | 39.99 | 40.13 | 40.26 | 40.39 | 40.53 | 40.66 | 40.79 | 40.93 | 0.930 |
| 0.931 | 39.35 | 39.49 | 39.63 | 39.76 | 39.90 | 40.04 | 40.17 | 40.31 | 40.44 | 40.57 | 40.71 | 40.84 | 40.97 | 0.931 |
| 0.932 | 39.40 | 39.53 | 39.67 | 39.81 | 39.94 | 40.08 | 40.22 | 40.35 | 40.49 | 40.62 | 40.75 | 40.89 | 41.02 | 0.932 |
| 0.933 | 39.44 | 39.58 | 39.72 | 39.85 | 39.99 | 40.13 | 40.26 | 40.40 | 40.53 | 40.67 | 40.80 | 40.93 | 41.06 | 0.933 |
| 0.934 | 39.48 | 39.62 | 39.76 | 39.90 | 40.04 | 40.17 | 40.31 | 40.44 | 40.58 | 40.71 | 40.84 | 40.98 | 41.11 | 0.934 |
| 0.935 | 39.53 | 39.67 | 39.81 | 39.94 | 40.08 | 40.22 | 40.35 | 40.49 | 40.62 | 40.76 | 40.89 | 41.02 | 41.16 | 0.935 |
| 0.936 | 39.57 | 39.71 | 39.85 | 39.99 | 40.13 | 40.26 | 40.40 | 40.53 | 40.67 | 40.80 | 40.94 | 41.07 | 41.20 | 0.936 |
| 0.937 | 39.62 | 39.76 | 39.90 | 40.03 | 40.17 | 40.31 | 40.44 | 40.58 | 40.71 | 40.85 | 40.98 | 41.12 | 41.25 | 0.937 |
| 0.938 | 39.66 | 39.80 | 39.94 | 40.08 | 40.22 | 40.35 | 40.49 | 40.62 | 40.76 | 40.89 | 41.03 | 41.16 | 41.30 | 0.938 |
| 0.939 | 39.71 | 39.85 | 39.99 | 40.12 | 40.26 | 40.40 | 40.53 | 40.67 | 40.81 | 40.94 | 41.08 | 41.21 | 41.34 | 0.939 |
| 0.940 | 39.75 | 39.89 | 40.03 | 40.17 | 40.31 | 40.44 | 40.58 | 40.72 | 40.85 | 40.99 | 41.12 | 41.26 | 41.39 | 0.940 |
| 0.941 | 39.80 | 39.94 | 40.07 | 40.21 | 40.35 | 40.49 | 40.63 | 40.76 | 40.90 | 41.03 | 41.17 | 41.30 | 41.44 | 0.941 |
| 0.942 | 39.84 | 39.98 | 40.12 | 40.26 | 40.40 | 40.53 | 40.67 | 40.81 | 40.94 | 41.08 | 41.21 | 41.35 | 41.48 | 0.942 |
| 0.943 | 39.89 | 40.03 | 40.16 | 40.30 | 40.44 | 40.58 | 40.72 | 40.85 | 40.99 | 41.12 | 41.26 | 41.39 | 41.53 | 0.943 |
| 0.944 | 39.93 | 40.07 | 40.21 | 40.35 | 40.49 | 40.62 | 40.76 | 40.90 | 41.03 | 41.17 | 41.31 | 41.44 | 41.57 | 0.944 |
| 0.945 | 39.97 | 40.11 | 40.25 | 40.39 | 40.53 | 40.67 | 40.81 | 40.94 | 41.08 | 41.22 | 41.35 | 41.49 | 41.62 | 0.945 |
| 0.946 | 40.02 | 40.16 | 40.30 | 40.44 | 40.58 | 40.71 | 40.85 | 40.99 | 41.13 | 41.26 | 41.40 | 41.53 | 41.67 | 0.946 |
| 0.947 | 40.06 | 40.20 | 40.34 | 40.48 | 40.62 | 40.76 | 40.90 | 41.04 | 41.17 | 41.31 | 41.44 | 41.58 | 41.71 | 0.947 |
| 0.948 | 40.11 | 40.25 | 40.39 | 40.53 | 40.67 | 40.81 | 40.94 | 41.08 | 41.22 | 41.35 | 41.49 | 41.62 | 41.76 | 0.948 |
| 0.949 | 40.15 | 40.29 | 40.43 | 40.57 | 40.71 | 40.85 | 40.99 | 41.13 | 41.26 | 41.40 | 41.54 | 41.67 | 41.81 | 0.949 |
| 0.950 | 40.20 | 40.34 | 40.48 | 40.62 | 40.76 | 40.90 | 41.03 | 41.17 | 41.31 | 41.45 | 41.58 | 41.72 | 41.85 | 0.950 |
| 0.951 | 40.24 | 40.38 | 40.52 | 40.66 | 40.80 | 40.94 | 41.08 | 41.22 | 41.35 | 41.49 | 41.63 | 41.76 | 41.90 | 0.951 |
| 0.952 | 40.29 | 40.43 | 40.57 | 40.71 | 40.85 | 40.99 | 41.13 | 41.26 | 41.40 | 41.54 | 41.67 | 41.81 | 41.95 | 0.952 |
| 0.953 | 40.33 | 40.47 | 40.61 | 40.75 | 40.89 | 41.03 | 41.17 | 41.31 | 41.45 | 41.58 | 41.72 | 41.86 | 41.99 | 0.953 |
| 0.954 | 40.38 | 40.52 | 40.66 | 40.80 | 40.94 | 41.08 | 41.22 | 41.35 | 41.49 | 41.63 | 41.77 | 41.90 | 42.04 | 0.954 |
| 0.955 | 40.42 | 40.56 | 40.70 | 40.84 | 40.98 | 41.12 | 41.26 | 41.40 | 41.54 | 41.68 | 41.81 | 41.95 | 42.08 | 0.955 |
| 0.956 | 40.46 | 40.61 | 40.75 | 40.89 | 41.03 | 41.17 | 41.31 | 41.45 | 41.58 | 41.72 | 41.86 | 41.99 | 42.13 | 0.956 |
| 0.957 | 40.51 | 40.65 | 40.79 | 40.93 | 41.07 | 41.21 | 41.35 | 41.49 | 41.63 | 41.77 | 41.90 | 42.04 | 42.18 | 0.957 |
| 0.958 | 40.55 | 40.70 | 40.84 | 40.98 | 41.12 | 41.26 | 41.40 | 41.54 | 41.68 | 41.81 | 41.95 | 42.09 | 42.22 | 0.958 |
| 0.959 | 40.60 | 40.74 | 40.88 | 41.02 | 41.16 | 41.30 | 41.44 | 41.58 | 41.72 | 41.86 | 42.00 | 42.13 | 42.27 | 0.959 |
| 0.960 | 40.64 | 40.79 | 40.93 | 41.07 | 41.21 | 41.35 | 41.49 | 41.63 | 41.77 | 41.91 | 42.04 | 42.18 | 42.32 | 0.960 |
| 0.961 | 40.69 | 40.83 | 40.97 | 41.11 | 41.25 | 41.39 | 41.53 | 41.67 | 41.81 | 41.95 | 42.09 | 42.23 | 42.36 | 0.961 |
| 0.962 | 40.73 | 40.87 | 41.02 | 41.16 | 41.30 | 41.44 | 41.58 | 41.72 | 41.86 | 42.00 | 42.13 | 42.27 | 42.41 | 0.962 |
| 0.963 | 40.78 | 40.92 | 41.06 | 41.20 | 41.34 | 41.49 | 41.63 | 41.77 | 41.90 | 42.04 | 42.18 | 42.32 | 42.46 | 0.963 |
| 0.964 | 40.82 | 40.96 | 41.11 | 41.25 | 41.39 | 41.53 | 41.67 | 41.81 | 41.95 | 42.09 | 42.23 | 42.36 | 42.50 | 0.964 |
| 0.965 | 40.87 | 41.01 | 41.15 | 41.29 | 41.44 | 41.58 | 41.72 | 41.86 | 42.00 | 42.13 | 42.27 | 42.41 | 42.55 | 0.965 |
| 0.966 | 40.91 | 41.05 | 41.20 | 41.34 | 41.48 | 41.62 | 41.76 | 41.90 | 42.04 | 42.18 | 42.32 | 42.46 | 42.59 | 0.966 |
| 0.967 | 40.96 | 41.10 | 41.24 | 41.38 | 41.53 | 41.67 | 41.81 | 41.95 | 42.09 | 42.23 | 42.37 | 42.50 | 42.64 | 0.967 |
| 0.968 | 41.00 | 41.14 | 41.29 | 41.43 | 41.57 | 41.71 | 41.85 | 41.99 | 42.13 | 42.27 | 42.41 | 42.55 | 42.69 | 0.968 |
| 0.969 | 41.04 | 41.19 | 41.33 | 41.47 | 41.62 | 41.76 | 41.90 | 42.04 | 42.18 | 42.32 | 42.46 | 42.60 | 42.73 | 0.969 |
| 0.970 | 41.09 | 41.23 | 41.38 | 41.52 | 41.66 | 41.80 | 41.94 | 42.09 | 42.23 | 42.36 | 42.50 | 42.64 | 42.78 | 0.970 |
| 0.971 | 41.13 | 41.28 | 41.42 | 41.56 | 41.71 | 41.85 | 41.99 | 42.13 | 42.27 | 42.41 | 42.55 | 42.69 | 42.83 | 0.971 |
| 0.972 | 41.18 | 41.32 | 41.47 | 41.61 | 41.75 | 41.89 | 42.04 | 42.18 | 42.32 | 42.46 | 42.60 | 42.74 | 42.87 | 0.972 |
| 0.973 | 41.22 | 41.37 | 41.51 | 41.65 | 41.80 | 41.94 | 42.08 | 42.22 | 42.36 | 42.50 | 42.64 | 42.78 | 42.92 | 0.973 |
| 0.974 | 41.27 | 41.41 | 41.56 | 41.70 | 41.84 | 41.98 | 42.13 | 42.27 | 42.41 | 42.55 | 42.69 | 42.83 | 42.97 | 0.974 |
| 0.975 | 41.31 | 41.46 | 41.60 | 41.74 | 41.89 | 42.03 | 42.17 | 42.31 | 42.45 | 42.59 | 42.73 | 42.87 | 43.01 | 0.975 |
| 0.976 | 41.36 | 41.50 | 41.65 | 41.79 | 41.93 | 42.08 | 42.22 | 42.36 | 42.50 | 42.64 | 42.78 | 42.92 | 43.06 | 0.976 |
| 0.977 | 41.40 | 41.55 | 41.69 | 41.83 | 41.98 | 42.12 | 42.26 | 42.40 | 42.55 | 42.69 | 42.83 | 42.97 | 43.11 | 0.977 |
| 0.978 | 41.45 | 41.59 | 41.74 | 41.88 | 42.02 | 42.17 | 42.31 | 42.45 | 42.59 | 42.73 | 42.87 | 43.01 | 43.15 | 0.978 |
| 0.979 | 41.49 | 41.64 | 41.78 | 41.92 | 42.07 | 42.21 | 42.35 | 42.50 | 42.64 | 42.78 | 42.92 | 43.06 | 43.20 | 0.979 |

## TEMPERATURE °F Flow rate ft3/min (actual)

| Po/Pa | 76    | 80    | 84    | 88    | 92    | 96    | 100   | 104   | 108   | 112   | 116   | 120   | 124   | Po/Pa |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.930 | 40.26 | 40.39 | 40.53 | 40.66 | 40.79 | 40.93 | 41.06 | 41.19 | 41.32 | 41.45 | 41.58 | 41.71 | 41.84 | 0.930 |
| 0.931 | 40.31 | 40.44 | 40.57 | 40.71 | 40.84 | 40.97 | 41.10 | 41.23 | 41.37 | 41.50 | 41.63 | 41.76 | 41.88 | 0.931 |
| 0.932 | 40.35 | 40.49 | 40.62 | 40.75 | 40.89 | 41.02 | 41.15 | 41.28 | 41.41 | 41.54 | 41.67 | 41.80 | 41.93 | 0.932 |
| 0.933 | 40.40 | 40.53 | 40.67 | 40.80 | 40.93 | 41.06 | 41.20 | 41.33 | 41.46 | 41.59 | 41.72 | 41.85 | 41.98 | 0.933 |
| 0.934 | 40.44 | 40.58 | 40.71 | 40.84 | 40.98 | 41.11 | 41.24 | 41.37 | 41.51 | 41.64 | 41.77 | 41.90 | 42.03 | 0.934 |
| 0.935 | 40.49 | 40.62 | 40.76 | 40.89 | 41.02 | 41.16 | 41.29 | 41.42 | 41.55 | 41.68 | 41.81 | 41.94 | 42.07 | 0.935 |
| 0.936 | 40.53 | 40.67 | 40.80 | 40.94 | 41.07 | 41.20 | 41.34 | 41.47 | 41.60 | 41.73 | 41.86 | 41.99 | 42.12 | 0.936 |
| 0.937 | 40.58 | 40.71 | 40.85 | 40.98 | 41.12 | 41.25 | 41.38 | 41.51 | 41.65 | 41.78 | 41.91 | 42.04 | 42.17 | 0.937 |
| 0.938 | 40.62 | 40.76 | 40.89 | 41.03 | 41.16 | 41.30 | 41.43 | 41.56 | 41.69 | 41.82 | 41.96 | 42.09 | 42.22 | 0.938 |
| 0.939 | 40.67 | 40.81 | 40.94 | 41.08 | 41.21 | 41.34 | 41.48 | 41.61 | 41.74 | 41.87 | 42.00 | 42.13 | 42.26 | 0.939 |
| 0.940 | 40.72 | 40.85 | 40.99 | 41.12 | 41.26 | 41.39 | 41.52 | 41.65 | 41.79 | 41.92 | 42.05 | 42.18 | 42.31 | 0.940 |
| 0.941 | 40.76 | 40.90 | 41.03 | 41.17 | 41.30 | 41.44 | 41.57 | 41.70 | 41.83 | 41.97 | 42.10 | 42.23 | 42.36 | 0.941 |
| 0.942 | 40.81 | 40.94 | 41.08 | 41.21 | 41.35 | 41.48 | 41.61 | 41.75 | 41.88 | 42.01 | 42.14 | 42.28 | 42.41 | 0.942 |
| 0.943 | 40.85 | 40.99 | 41.12 | 41.26 | 41.39 | 41.53 | 41.66 | 41.79 | 41.93 | 42.06 | 42.19 | 42.32 | 42.45 | 0.943 |
| 0.944 | 40.90 | 41.03 | 41.17 | 41.31 | 41.44 | 41.57 | 41.71 | 41.84 | 41.97 | 42.11 | 42.24 | 42.37 | 42.50 | 0.944 |
| 0.945 | 40.94 | 41.08 | 41.22 | 41.35 | 41.49 | 41.62 | 41.75 | 41.89 | 42.02 | 42.15 | 42.29 | 42.42 | 42.55 | 0.945 |
| 0.946 | 40.99 | 41.13 | 41.26 | 41.40 | 41.53 | 41.67 | 41.80 | 41.93 | 42.07 | 42.20 | 42.33 | 42.46 | 42.60 | 0.946 |
| 0.947 | 41.04 | 41.17 | 41.31 | 41.44 | 41.58 | 41.71 | 41.85 | 41.98 | 42.11 | 42.25 | 42.38 | 42.51 | 42.64 | 0.947 |
| 0.948 | 41.08 | 41.22 | 41.35 | 41.49 | 41.62 | 41.76 | 41.89 | 42.03 | 42.16 | 42.29 | 42.43 | 42.56 | 42.69 | 0.948 |
| 0.949 | 41.13 | 41.26 | 41.40 | 41.54 | 41.67 | 41.81 | 41.94 | 42.07 | 42.21 | 42.34 | 42.47 | 42.61 | 42.74 | 0.949 |
| 0.950 | 41.17 | 41.31 | 41.45 | 41.58 | 41.72 | 41.85 | 41.99 | 42.12 | 42.26 | 42.39 | 42.52 | 42.65 | 42.79 | 0.950 |
| 0.951 | 41.22 | 41.35 | 41.49 | 41.63 | 41.76 | 41.90 | 42.03 | 42.17 | 42.30 | 42.44 | 42.57 | 42.70 | 42.83 | 0.951 |
| 0.952 | 41.26 | 41.40 | 41.54 | 41.67 | 41.81 | 41.95 | 42.08 | 42.21 | 42.35 | 42.48 | 42.62 | 42.75 | 42.88 | 0.952 |
| 0.953 | 41.31 | 41.45 | 41.58 | 41.72 | 41.86 | 41.99 | 42.13 | 42.26 | 42.40 | 42.53 | 42.66 | 42.80 | 42.93 | 0.953 |
| 0.954 | 41.35 | 41.49 | 41.63 | 41.77 | 41.90 | 42.04 | 42.17 | 42.31 | 42.44 | 42.58 | 42.71 | 42.84 | 42.97 | 0.954 |
| 0.955 | 41.40 | 41.54 | 41.68 | 41.81 | 41.95 | 42.08 | 42.22 | 42.35 | 42.49 | 42.62 | 42.76 | 42.89 | 43.02 | 0.955 |
| 0.956 | 41.45 | 41.58 | 41.72 | 41.86 | 41.99 | 42.13 | 42.27 | 42.40 | 42.54 | 42.67 | 42.80 | 42.94 | 43.07 | 0.956 |
| 0.957 | 41.49 | 41.63 | 41.77 | 41.90 | 42.04 | 42.18 | 42.31 | 42.45 | 42.58 | 42.72 | 42.85 | 42.98 | 43.12 | 0.957 |
| 0.958 | 41.54 | 41.68 | 41.81 | 41.95 | 42.09 | 42.22 | 42.36 | 42.49 | 42.63 | 42.76 | 42.90 | 43.03 | 43.16 | 0.958 |
| 0.959 | 41.58 | 41.72 | 41.86 | 42.00 | 42.13 | 42.27 | 42.41 | 42.54 | 42.68 | 42.81 | 42.95 | 43.08 | 43.21 | 0.959 |
| 0.960 | 41.63 | 41.77 | 41.91 | 42.04 | 42.18 | 42.32 | 42.45 | 42.59 | 42.72 | 42.86 | 42.99 | 43.13 | 43.26 | 0.960 |
| 0.961 | 41.67 | 41.81 | 41.95 | 42.09 | 42.23 | 42.36 | 42.50 | 42.63 | 42.77 | 42.91 | 43.04 | 43.17 | 43.31 | 0.961 |
| 0.962 | 41.72 | 41.86 | 42.00 | 42.13 | 42.27 | 42.41 | 42.55 | 42.68 | 42.82 | 42.95 | 43.09 | 43.22 | 43.35 | 0.962 |
| 0.963 | 41.77 | 41.90 | 42.04 | 42.18 | 42.32 | 42.46 | 42.59 | 42.73 | 42.86 | 43.00 | 43.13 | 43.27 | 43.40 | 0.963 |
| 0.964 | 41.81 | 41.95 | 42.09 | 42.23 | 42.36 | 42.50 | 42.64 | 42.78 | 42.91 | 43.05 | 43.18 | 43.32 | 43.45 | 0.964 |
| 0.965 | 41.86 | 42.00 | 42.13 | 42.27 | 42.41 | 42.55 | 42.69 | 42.82 | 42.96 | 43.09 | 43.23 | 43.36 | 43.50 | 0.965 |
| 0.966 | 41.90 | 42.04 | 42.18 | 42.32 | 42.46 | 42.59 | 42.73 | 42.87 | 43.00 | 43.14 | 43.28 | 43.41 | 43.54 | 0.966 |
| 0.967 | 41.95 | 42.09 | 42.23 | 42.37 | 42.50 | 42.64 | 42.78 | 42.92 | 43.05 | 43.19 | 43.32 | 43.46 | 43.59 | 0.967 |
| 0.968 | 41.99 | 42.13 | 42.27 | 42.41 | 42.55 | 42.69 | 42.83 | 42.96 | 43.10 | 43.23 | 43.37 | 43.50 | 43.64 | 0.968 |
| 0.969 | 42.04 | 42.18 | 42.32 | 42.46 | 42.60 | 42.73 | 42.87 | 43.01 | 43.15 | 43.28 | 43.42 | 43.55 | 43.69 | 0.969 |
| 0.970 | 42.09 | 42.23 | 42.36 | 42.50 | 42.64 | 42.78 | 42.92 | 43.06 | 43.19 | 43.33 | 43.46 | 43.60 | 43.73 | 0.970 |
| 0.971 | 42.13 | 42.27 | 42.41 | 42.55 | 42.69 | 42.83 | 42.96 | 43.10 | 43.24 | 43.38 | 43.51 | 43.65 | 43.78 | 0.971 |
| 0.972 | 42.18 | 42.32 | 42.46 | 42.60 | 42.74 | 42.87 | 43.01 | 43.15 | 43.29 | 43.42 | 43.56 | 43.69 | 43.83 | 0.972 |
| 0.973 | 42.22 | 42.36 | 42.50 | 42.64 | 42.78 | 42.92 | 43.06 | 43.20 | 43.33 | 43.47 | 43.61 | 43.74 | 43.88 | 0.973 |
| 0.974 | 42.27 | 42.41 | 42.55 | 42.69 | 42.83 | 42.97 | 43.10 | 43.24 | 43.38 | 43.52 | 43.65 | 43.79 | 43.92 | 0.974 |
| 0.975 | 42.31 | 42.45 | 42.59 | 42.73 | 42.87 | 43.01 | 43.15 | 43.29 | 43.43 | 43.56 | 43.70 | 43.84 | 43.97 | 0.975 |
| 0.976 | 42.36 | 42.50 | 42.64 | 42.78 | 42.92 | 43.06 | 43.20 | 43.34 | 43.47 | 43.61 | 43.75 | 43.88 | 44.02 | 0.976 |
| 0.977 | 42.40 | 42.55 | 42.69 | 42.83 | 42.97 | 43.11 | 43.24 | 43.38 | 43.52 | 43.66 | 43.79 | 43.93 | 44.07 | 0.977 |
| 0.978 | 42.45 | 42.59 | 42.73 | 42.87 | 43.01 | 43.15 | 43.29 | 43.43 | 43.57 | 43.70 | 43.84 | 43.98 | 44.11 | 0.978 |
| 0.979 | 42.50 | 42.64 | 42.78 | 42.92 | 43.06 | 43.20 | 43.34 | 43.48 | 43.61 | 43.75 | 43.89 | 44.03 | 44.16 | 0.979 |

# ANEXO N° 3.3



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## Data Meteorológica

**Registro horario de las variables meteorológicas estación CA-VMP-1**

| Fecha      | Hora  | PBAR  | TEMP | HR | ws  | wd    |
|------------|-------|-------|------|----|-----|-------|
| 01/03/2019 | 00:00 | 752,8 | 23,5 | 76 | 0,6 | 189,1 |
| 01/03/2019 | 01:00 | 752,6 | 23,1 | 77 | 0,2 | 180   |
| 01/03/2019 | 02:00 | 752,2 | 23,1 | 77 | 0,2 | 158   |
| 01/03/2019 | 03:00 | 751,9 | 22,9 | 77 | 0,2 | 135   |
| 01/03/2019 | 04:00 | 751,6 | 22,8 | 78 | 0,4 | 203   |
| 01/03/2019 | 05:00 | 752,0 | 22,6 | 78 | 0,4 | 169   |
| 01/03/2019 | 06:00 | 752,5 | 22,3 | 79 | 0,0 | 0     |
| 01/03/2019 | 07:00 | 753,2 | 23,0 | 79 | 0,4 | 203   |
| 01/03/2019 | 08:00 | 753,9 | 25,9 | 71 | 0,6 | 204   |
| 01/03/2019 | 09:00 | 754,0 | 28,5 | 63 | 0,8 | 237,4 |
| 01/03/2019 | 10:00 | 754,0 | 28,9 | 62 | 1,3 | 258,8 |
| 01/03/2019 | 11:00 | 753,7 | 30,0 | 65 | 1,8 | 270,0 |
| 01/03/2019 | 12:00 | 753,5 | 30,7 | 62 | 1,8 | 270,0 |
| 01/03/2019 | 13:00 | 753,2 | 30,9 | 62 | 1,8 | 258,8 |
| 01/03/2019 | 14:00 | 752,7 | 30,1 | 63 | 1,8 | 270   |
| 01/03/2019 | 15:00 | 752,5 | 30,1 | 62 | 1,8 | 258,8 |
| 01/03/2019 | 16:00 | 752,5 | 29,5 | 63 | 1,6 | 270   |
| 01/03/2019 | 17:00 | 752,6 | 28,8 | 64 | 1,3 | 270   |
| 01/03/2019 | 18:00 | 753,1 | 27,5 | 69 | 1,3 | 248   |
| 01/03/2019 | 19:00 | 753,8 | 25,9 | 74 | 0,9 | 214   |
| 01/03/2019 | 20:00 | 754,4 | 25,4 | 74 | 0,6 | 180,0 |
| 01/03/2019 | 21:00 | 754,8 | 24,9 | 75 | 0,6 | 257   |
| 01/03/2019 | 22:00 | 755,0 | 24,9 | 75 | 0,4 | 281,2 |
| 01/03/2019 | 23:00 | 754,9 | 24,8 | 75 | 0,4 | 191,2 |
| 02/03/2019 | 00:00 | 754,6 | 24,2 | 76 | 0,6 | 176,8 |
| 02/03/2019 | 01:00 | 754,0 | 23,9 | 76 | 0,4 | 180   |
| 02/03/2019 | 02:00 | 753,4 | 24,2 | 77 | 0,2 | 203   |
| 02/03/2019 | 03:00 | 753,0 | 23,5 | 77 | 0,4 | 180   |
| 02/03/2019 | 04:00 | 752,8 | 23,3 | 77 | 0,4 | 203   |
| 02/03/2019 | 05:00 | 752,8 | 23,2 | 77 | 0,2 | 225   |
| 02/03/2019 | 06:00 | 752,8 | 23,2 | 77 | 0,0 | 0     |
| 02/03/2019 | 07:00 | 753,0 | 23,8 | 76 | 0,4 | 180   |
| 02/03/2019 | 08:00 | 753,5 | 26,1 | 70 | 0,9 | 203   |
| 02/03/2019 | 09:00 | 754,0 | 27,0 | 67 | 0,9 | 270,0 |
| 02/03/2019 | 10:00 | 754,0 | 29,2 | 60 | 1,1 | 270   |
| 02/03/2019 | 11:00 | 754,0 | 30,8 | 61 | 2,0 | 215   |
| 02/03/2019 | 12:00 | 753,8 | 30,5 | 62 | 2,2 | 258,8 |
| 02/03/2019 | 13:00 | 752,9 | 30,8 | 60 | 2,5 | 270,0 |
| 02/03/2019 | 14:00 | 752,0 | 32,0 | 57 | 2,7 | 270,0 |
| 02/03/2019 | 15:00 | 751,8 | 32,8 | 53 | 3,1 | 225   |
| 02/03/2019 | 16:00 | 751,6 | 31,3 | 56 | 2,9 | 180   |
| 02/03/2019 | 17:00 | 752,1 | 29,7 | 61 | 2,5 | 203   |
| 02/03/2019 | 18:00 | 752,3 | 28,4 | 65 | 2,0 | 190   |
| 02/03/2019 | 19:00 | 752,5 | 27,5 | 66 | 0,9 | 270,0 |
| 02/03/2019 | 20:00 | 752,9 | 27,7 | 65 | 0,6 | 268   |
| 02/03/2019 | 21:00 | 753,3 | 27,8 | 66 | 1,1 | 180   |
| 02/03/2019 | 22:00 | 753,7 | 26,9 | 68 | 0,4 | 191   |
| 02/03/2019 | 23:00 | 753,8 | 24,8 | 73 | 0,9 | 225   |
| 03/03/2019 | 00:00 | 753,6 | 23,6 | 75 | 0,6 | 246   |
| 03/03/2019 | 01:00 | 752,8 | 23,6 | 75 | 0,0 | 0     |
| 03/03/2019 | 02:00 | 752,5 | 23,6 | 75 | 0,0 | 0,0   |
| 03/03/2019 | 03:00 | 752,0 | 23,4 | 75 | 0,0 |       |
| 03/03/2019 | 04:00 | 751,6 | 22,9 | 76 | 0,0 | 0     |
| 03/03/2019 | 05:00 | 751,9 | 22,6 | 76 | 0,4 | 135   |
| 03/03/2019 | 06:00 | 752,0 | 22,4 | 77 | 0,4 | 135,0 |
| 03/03/2019 | 07:00 | 752,4 | 23,0 | 77 | 0,4 | 180   |
| 03/03/2019 | 08:00 | 752,7 | 26,1 | 68 | 0,4 | 169   |
| 03/03/2019 | 09:00 | 753,0 | 27,9 | 64 | 1,4 | 255,0 |
| 03/03/2019 | 10:00 | 753,3 | 28,9 | 61 | 1,3 | 258,8 |
| 03/03/2019 | 11:00 | 753,0 | 29,6 | 64 | 1,8 | 270,0 |
| 03/03/2019 | 12:00 | 752,9 | 29,6 | 65 | 2,2 | 258,8 |
| 03/03/2019 | 13:00 | 752,1 | 29,7 | 64 | 2,5 | 270,0 |
| 03/03/2019 | 14:00 | 751,8 | 29,8 | 64 | 2,5 | 270,0 |
| 03/03/2019 | 15:00 | 751,0 | 30,6 | 61 | 2,7 | 270,0 |
| 03/03/2019 | 16:00 | 751,0 | 31,4 | 58 | 2,2 | 247,5 |
| 03/03/2019 | 17:00 | 751,1 | 30,3 | 61 | 1,8 | 247,5 |

**Registro horario de las variables meteorológicas estación CA-VMP-1**

| <b>Fecha</b> | <b>Hora</b> | <b>PBAR</b> | <b>TEMP</b> | <b>HR</b> | <b>ws</b> | <b>wd</b> |
|--------------|-------------|-------------|-------------|-----------|-----------|-----------|
| 03/03/2019   | 18:00       | 751,7       | 27,6        | 68        | 1,6       | 270,0     |
| 03/03/2019   | 19:00       | 752,2       | 26,2        | 69        | 1,1       | 270       |
| 03/03/2019   | 20:00       | 752,5       | 25,1        | 74        | 0,6       | 250,7     |
| 03/03/2019   | 21:00       | 752,8       | 24,5        | 74        | 0,6       | 246       |
| 03/03/2019   | 22:00       | 753,0       | 24,0        | 75        | 0,9       | 191,2     |
| 03/03/2019   | 23:00       | 753,0       | 23,4        | 77        | 0,6       | 216       |
| 04/03/2019   | 00:00       | 752,5       | 23,1        | 77        | 0,2       | 135       |

### Registro horario de las variables meteorológicas estación CA-VMP-2

| Fecha      | Hora  | PBAR  | TEMP | HR | ws  | wd    |
|------------|-------|-------|------|----|-----|-------|
| 01/03/2019 | 00:00 | 756,4 | 22,3 | 82 | 0,4 | 213,7 |
| 01/03/2019 | 01:00 | 756,2 | 22,5 | 82 | 0,4 | 225   |
| 01/03/2019 | 02:00 | 756,0 | 22,4 | 82 | 0,4 | 214   |
| 01/03/2019 | 03:00 | 755,5 | 22,5 | 82 | 0,2 | 225   |
| 01/03/2019 | 04:00 | 755,2 | 22,1 | 83 | 0,4 | 225   |
| 01/03/2019 | 05:00 | 755,8 | 22,1 | 83 | 0,4 | 248   |
| 01/03/2019 | 06:00 | 756,2 | 22,4 | 82 | 0,2 | 360   |
| 01/03/2019 | 07:00 | 756,9 | 22,6 | 81 | 0,4 | 236   |
| 01/03/2019 | 08:00 | 757,5 | 24,5 | 77 | 0,6 | 257   |
| 01/03/2019 | 09:00 | 757,7 | 26,6 | 69 | 1,1 | 220,7 |
| 01/03/2019 | 10:00 | 757,7 | 27,8 | 65 | 1,3 | 236,2 |
| 01/03/2019 | 11:00 | 757,3 | 28,4 | 61 | 1,6 | 270,0 |
| 01/03/2019 | 12:00 | 757,0 | 29,1 | 58 | 1,8 | 281,2 |
| 01/03/2019 | 13:00 | 756,6 | 28,6 | 60 | 2,0 | 240,1 |
| 01/03/2019 | 14:00 | 756,3 | 28,8 | 59 | 1,8 | 270   |
| 01/03/2019 | 15:00 | 756,0 | 28,7 | 57 | 2,0 | 240,1 |
| 01/03/2019 | 16:00 | 756,1 | 28,2 | 58 | 1,6 | 270   |
| 01/03/2019 | 17:00 | 756,2 | 28,1 | 57 | 1,8 | 270   |
| 01/03/2019 | 18:00 | 756,7 | 25,4 | 70 | 2,0 | 270   |
| 01/03/2019 | 19:00 | 757,3 | 23,9 | 77 | 1,1 | 283   |
| 01/03/2019 | 20:00 | 758,0 | 24,1 | 77 | 0,9 | 236,2 |
| 01/03/2019 | 21:00 | 758,3 | 24,4 | 76 | 0,9 | 293   |
| 01/03/2019 | 22:00 | 758,5 | 24,4 | 76 | 0,9 | 281,2 |
| 01/03/2019 | 23:00 | 758,5 | 24,1 | 78 | 0,6 | 228,8 |
| 02/03/2019 | 00:00 | 758,1 | 23,4 | 80 | 0,6 | 285,6 |
| 02/03/2019 | 01:00 | 757,5 | 23,6 | 79 | 0,2 | 315   |
| 02/03/2019 | 02:00 | 756,9 | 23,4 | 79 | 0,4 | 225   |
| 02/03/2019 | 03:00 | 756,7 | 22,9 | 80 | 0,6 | 283   |
| 02/03/2019 | 04:00 | 756,5 | 23,0 | 80 | 0,4 | 304   |
| 02/03/2019 | 05:00 | 756,5 | 23,0 | 80 | 0,2 | 270   |
| 02/03/2019 | 06:00 | 756,4 | 23,1 | 79 | 0,2 | 248   |
| 02/03/2019 | 07:00 | 756,7 | 23,4 | 78 | 0,4 | 236   |
| 02/03/2019 | 08:00 | 757,2 | 25,0 | 74 | 0,9 | 248   |
| 02/03/2019 | 09:00 | 757,7 | 25,9 | 71 | 1,3 | 270,0 |
| 02/03/2019 | 10:00 | 757,7 | 28,1 | 63 | 1,1 | 270   |
| 02/03/2019 | 11:00 | 757,5 | 29,1 | 57 | 1,8 | 270   |
| 02/03/2019 | 12:00 | 757,2 | 29,1 | 58 | 2,2 | 270,0 |
| 02/03/2019 | 13:00 | 756,4 | 30,6 | 51 | 2,0 | 240,1 |
| 02/03/2019 | 14:00 | 755,7 | 31,4 | 48 | 2,2 | 180,0 |
| 02/03/2019 | 15:00 | 755,3 | 31,8 | 46 | 2,7 | 169   |
| 02/03/2019 | 16:00 | 755,2 | 30,5 | 49 | 2,9 | 170   |
| 02/03/2019 | 17:00 | 755,5 | 28,9 | 55 | 2,7 | 158   |
| 02/03/2019 | 18:00 | 755,8 | 27,9 | 59 | 2,9 | 135   |
| 02/03/2019 | 19:00 | 755,9 | 27,6 | 58 | 2,5 | 135,0 |
| 02/03/2019 | 20:00 | 756,4 | 27,6 | 58 | 1,1 | 162   |
| 02/03/2019 | 21:00 | 756,9 | 27,7 | 57 | 0,9 | 124   |
| 02/03/2019 | 22:00 | 757,3 | 26,1 | 64 | 0,6 | 279   |
| 02/03/2019 | 23:00 | 757,5 | 23,8 | 73 | 1,1 | 288   |
| 03/03/2019 | 00:00 | 757,0 | 23,1 | 77 | 0,6 | 293   |
| 03/03/2019 | 01:00 | 756,4 | 23,0 | 77 | 0,4 | 259   |
| 03/03/2019 | 02:00 | 756,0 | 22,8 | 78 | 0,4 | 225,0 |
| 03/03/2019 | 03:00 | 755,7 | 22,7 | 77 | 0,2 | 225   |
| 03/03/2019 | 04:00 | 755,3 | 22,3 | 79 | 0,4 | 214   |
| 03/03/2019 | 05:00 | 755,5 | 21,9 | 80 | 0,4 | 236   |
| 03/03/2019 | 06:00 | 755,8 | 21,8 | 82 | 0,2 | 247,5 |
| 03/03/2019 | 07:00 | 756,1 | 22,8 | 79 | 0,2 | 225   |
| 03/03/2019 | 08:00 | 756,4 | 25,0 | 72 | 0,4 | 225   |
| 03/03/2019 | 09:00 | 756,7 | 26,4 | 68 | 1,1 | 202,5 |
| 03/03/2019 | 10:00 | 756,8 | 27,3 | 65 | 1,3 | 258,8 |
| 03/03/2019 | 11:00 | 756,5 | 28,1 | 61 | 2,0 | 270,0 |
| 03/03/2019 | 12:00 | 756,3 | 28,2 | 61 | 1,8 | 258,8 |
| 03/03/2019 | 13:00 | 755,7 | 28,8 | 59 | 2,5 | 270,0 |
| 03/03/2019 | 14:00 | 755,2 | 30,1 | 55 | 1,8 | 225,0 |
| 03/03/2019 | 15:00 | 754,7 | 30,5 | 51 | 2,0 | 190,1 |
| 03/03/2019 | 16:00 | 754,5 | 29,6 | 52 | 2,7 | 180,0 |
| 03/03/2019 | 17:00 | 754,7 | 29,2 | 52 | 2,2 | 180,0 |

**Registro horario de las variables meteorológicas estación CA-VMP-2**

| <b>Fecha</b> | <b>Hora</b> | <b>PBAR</b> | <b>TEMP</b> | <b>HR</b> | <b>ws</b> | <b>wd</b> |
|--------------|-------------|-------------|-------------|-----------|-----------|-----------|
| 03/03/2019   | 18:00       | 755,2       | 27,7        | 57        | 2,0       | 180,0     |
| 03/03/2019   | 19:00       | 755,7       | 25,9        | 64        | 1,3       | 225       |
| 03/03/2019   | 20:00       | 756,1       | 23,9        | 75        | 1,4       | 277,5     |
| 03/03/2019   | 21:00       | 756,4       | 23,6        | 76        | 0,6       | 270       |
| 03/03/2019   | 22:00       | 756,7       | 23,1        | 78        | 0,9       | 236,2     |
| 03/03/2019   | 23:00       | 756,7       | 22,8        | 80        | 0,6       | 270       |
| 04/03/2019   | 00:00       | 756,1       | 22,9        | 79        | 0,4       | 259       |

### Registro horario de las variables meteorológicas estación CA-VMP-6

| Fecha      | Hora  | PBAR  | TEMP | HR | ws  | wd    |
|------------|-------|-------|------|----|-----|-------|
| 01/03/2019 | 00:00 | 756,4 | 22,3 | 82 | 0,4 | 213,7 |
| 01/03/2019 | 01:00 | 756,2 | 22,5 | 82 | 0,4 | 225   |
| 01/03/2019 | 02:00 | 756,0 | 22,4 | 82 | 0,4 | 214   |
| 01/03/2019 | 03:00 | 755,5 | 22,5 | 82 | 0,2 | 225   |
| 01/03/2019 | 04:00 | 755,2 | 22,1 | 83 | 0,4 | 225   |
| 01/03/2019 | 05:00 | 755,8 | 22,1 | 83 | 0,4 | 248   |
| 01/03/2019 | 06:00 | 756,2 | 22,4 | 82 | 0,2 | 360   |
| 01/03/2019 | 07:00 | 756,9 | 22,6 | 81 | 0,4 | 236   |
| 01/03/2019 | 08:00 | 757,5 | 24,5 | 77 | 0,6 | 257   |
| 01/03/2019 | 09:00 | 757,7 | 26,6 | 69 | 1,1 | 220,7 |
| 01/03/2019 | 10:00 | 757,7 | 27,8 | 65 | 1,3 | 236,2 |
| 01/03/2019 | 11:00 | 757,3 | 28,4 | 61 | 1,6 | 270,0 |
| 01/03/2019 | 12:00 | 757,0 | 29,1 | 58 | 1,8 | 281,2 |
| 01/03/2019 | 13:00 | 756,6 | 28,6 | 60 | 2,0 | 240,1 |
| 01/03/2019 | 14:00 | 756,3 | 28,8 | 59 | 1,8 | 270   |
| 01/03/2019 | 15:00 | 756,0 | 28,7 | 57 | 2,0 | 240,1 |
| 01/03/2019 | 16:00 | 756,1 | 28,2 | 58 | 1,6 | 270   |
| 01/03/2019 | 17:00 | 756,2 | 28,1 | 57 | 1,8 | 270   |
| 01/03/2019 | 18:00 | 756,7 | 25,4 | 70 | 2,0 | 270   |
| 01/03/2019 | 19:00 | 757,3 | 23,9 | 77 | 1,1 | 283   |
| 01/03/2019 | 20:00 | 758,0 | 24,1 | 77 | 0,9 | 236,2 |
| 01/03/2019 | 21:00 | 758,3 | 24,4 | 76 | 0,9 | 293   |
| 01/03/2019 | 22:00 | 758,5 | 24,4 | 76 | 0,9 | 281,2 |
| 01/03/2019 | 23:00 | 758,5 | 24,1 | 78 | 0,6 | 228,8 |
| 02/03/2019 | 00:00 | 758,1 | 23,4 | 80 | 0,6 | 285,6 |
| 02/03/2019 | 01:00 | 757,5 | 23,6 | 79 | 0,2 | 315   |
| 02/03/2019 | 02:00 | 756,9 | 23,4 | 79 | 0,4 | 225   |
| 02/03/2019 | 03:00 | 756,7 | 22,9 | 80 | 0,6 | 283   |
| 02/03/2019 | 04:00 | 756,5 | 23,0 | 80 | 0,4 | 304   |
| 02/03/2019 | 05:00 | 756,5 | 23,0 | 80 | 0,2 | 270   |
| 02/03/2019 | 06:00 | 756,4 | 23,1 | 79 | 0,2 | 248   |
| 02/03/2019 | 07:00 | 756,7 | 23,4 | 78 | 0,4 | 236   |
| 02/03/2019 | 08:00 | 757,2 | 25,0 | 74 | 0,9 | 248   |
| 02/03/2019 | 09:00 | 757,7 | 25,9 | 71 | 1,3 | 270,0 |
| 02/03/2019 | 10:00 | 757,7 | 28,1 | 63 | 1,1 | 270   |
| 02/03/2019 | 11:00 | 757,5 | 29,1 | 57 | 1,8 | 270   |
| 02/03/2019 | 12:00 | 757,2 | 29,1 | 58 | 2,2 | 270,0 |
| 02/03/2019 | 13:00 | 756,4 | 30,6 | 51 | 2,0 | 240,1 |
| 02/03/2019 | 14:00 | 755,7 | 31,4 | 48 | 2,2 | 180,0 |
| 02/03/2019 | 15:00 | 755,3 | 31,8 | 46 | 2,7 | 169   |
| 02/03/2019 | 16:00 | 755,2 | 30,5 | 49 | 2,9 | 170   |
| 02/03/2019 | 17:00 | 755,5 | 28,9 | 55 | 2,7 | 158   |
| 02/03/2019 | 18:00 | 755,8 | 27,9 | 59 | 2,9 | 135   |
| 02/03/2019 | 19:00 | 755,9 | 27,6 | 58 | 2,5 | 135,0 |
| 02/03/2019 | 20:00 | 756,4 | 27,6 | 58 | 1,1 | 162   |
| 02/03/2019 | 21:00 | 756,9 | 27,7 | 57 | 0,9 | 124   |
| 02/03/2019 | 22:00 | 757,3 | 26,1 | 64 | 0,6 | 279   |
| 02/03/2019 | 23:00 | 757,5 | 23,8 | 73 | 1,1 | 288   |
| 03/03/2019 | 00:00 | 757,0 | 23,1 | 77 | 0,6 | 293   |
| 03/03/2019 | 01:00 | 756,4 | 23,0 | 77 | 0,4 | 259   |
| 03/03/2019 | 02:00 | 756,0 | 22,8 | 78 | 0,4 | 225,0 |
| 03/03/2019 | 03:00 | 755,7 | 22,7 | 77 | 0,2 | 225   |
| 03/03/2019 | 04:00 | 755,3 | 22,3 | 79 | 0,4 | 214   |
| 03/03/2019 | 05:00 | 755,5 | 21,9 | 80 | 0,4 | 236   |
| 03/03/2019 | 06:00 | 755,8 | 21,8 | 82 | 0,2 | 247,5 |
| 03/03/2019 | 07:00 | 756,1 | 22,8 | 79 | 0,2 | 225   |
| 03/03/2019 | 08:00 | 756,4 | 25,0 | 72 | 0,4 | 225   |
| 03/03/2019 | 09:00 | 756,7 | 26,4 | 68 | 1,1 | 202,5 |
| 03/03/2019 | 10:00 | 756,8 | 27,3 | 65 | 1,3 | 258,8 |
| 03/03/2019 | 11:00 | 756,5 | 28,1 | 61 | 2,0 | 270,0 |
| 03/03/2019 | 12:00 | 756,3 | 28,2 | 61 | 1,8 | 258,8 |
| 03/03/2019 | 13:00 | 755,7 | 28,8 | 59 | 2,5 | 270,0 |
| 03/03/2019 | 14:00 | 755,2 | 30,1 | 55 | 1,8 | 225,0 |
| 03/03/2019 | 15:00 | 754,7 | 30,5 | 51 | 2,0 | 190,1 |
| 03/03/2019 | 16:00 | 754,5 | 29,6 | 52 | 2,7 | 180,0 |
| 03/03/2019 | 17:00 | 754,7 | 29,2 | 52 | 2,2 | 180,0 |

**Registro horario de las variables meteorológicas estación CA-VMP-6**

| <b>Fecha</b> | <b>Hora</b> | <b>PBAR</b> | <b>TEMP</b> | <b>HR</b> | <b>ws</b> | <b>wd</b> |
|--------------|-------------|-------------|-------------|-----------|-----------|-----------|
| 03/03/2019   | 18:00       | 755,2       | 27,7        | 57        | 2,0       | 180,0     |
| 03/03/2019   | 19:00       | 755,7       | 25,9        | 64        | 1,3       | 225       |
| 03/03/2019   | 20:00       | 756,1       | 23,9        | 75        | 1,4       | 277,5     |
| 03/03/2019   | 21:00       | 756,4       | 23,6        | 76        | 0,6       | 270       |
| 03/03/2019   | 22:00       | 756,7       | 23,1        | 78        | 0,9       | 236,2     |
| 03/03/2019   | 23:00       | 756,7       | 22,8        | 80        | 0,6       | 270       |
| 04/03/2019   | 00:00       | 756,1       | 22,9        | 79        | 0,4       | 259       |

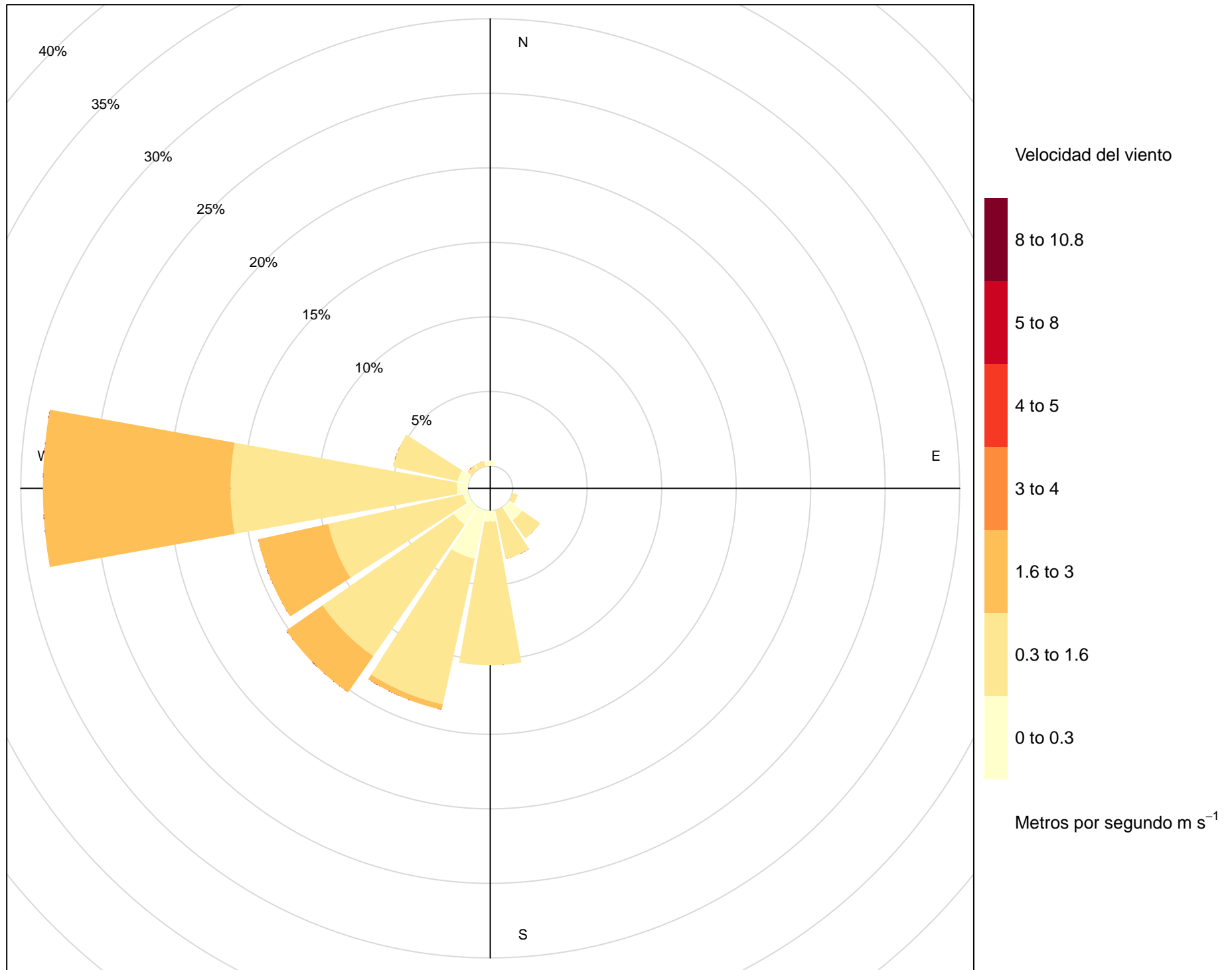
### Registro horario de las variables meteorológicas estación CA-VMP-7

| Fecha      | Hora  | PBAR  | TEMP | HR | ws  | wd    |
|------------|-------|-------|------|----|-----|-------|
| 01/03/2019 | 00:00 | 752,8 | 23,5 | 76 | 0,6 | 189,1 |
| 01/03/2019 | 01:00 | 752,6 | 23,1 | 77 | 0,2 | 180   |
| 01/03/2019 | 02:00 | 752,2 | 23,1 | 77 | 0,2 | 158   |
| 01/03/2019 | 03:00 | 751,9 | 22,9 | 77 | 0,2 | 135   |
| 01/03/2019 | 04:00 | 751,6 | 22,8 | 78 | 0,4 | 203   |
| 01/03/2019 | 05:00 | 752,0 | 22,6 | 78 | 0,4 | 169   |
| 01/03/2019 | 06:00 | 752,5 | 22,3 | 79 | 0,0 | 0     |
| 01/03/2019 | 07:00 | 753,2 | 23,0 | 79 | 0,4 | 203   |
| 01/03/2019 | 08:00 | 753,9 | 25,9 | 71 | 0,6 | 204   |
| 01/03/2019 | 09:00 | 754,0 | 28,5 | 63 | 0,8 | 237,4 |
| 01/03/2019 | 10:00 | 754,0 | 28,9 | 62 | 1,3 | 258,8 |
| 01/03/2019 | 11:00 | 753,7 | 30,0 | 65 | 1,8 | 270,0 |
| 01/03/2019 | 12:00 | 753,5 | 30,7 | 62 | 1,8 | 270,0 |
| 01/03/2019 | 13:00 | 753,2 | 30,9 | 62 | 1,8 | 258,8 |
| 01/03/2019 | 14:00 | 752,7 | 30,1 | 63 | 1,8 | 270   |
| 01/03/2019 | 15:00 | 752,5 | 30,1 | 62 | 1,8 | 258,8 |
| 01/03/2019 | 16:00 | 752,5 | 29,5 | 63 | 1,6 | 270   |
| 01/03/2019 | 17:00 | 752,6 | 28,8 | 64 | 1,3 | 270   |
| 01/03/2019 | 18:00 | 753,1 | 27,5 | 69 | 1,3 | 248   |
| 01/03/2019 | 19:00 | 753,8 | 25,9 | 74 | 0,9 | 214   |
| 01/03/2019 | 20:00 | 754,4 | 25,4 | 74 | 0,6 | 180,0 |
| 01/03/2019 | 21:00 | 754,8 | 24,9 | 75 | 0,6 | 257   |
| 01/03/2019 | 22:00 | 755,0 | 24,9 | 75 | 0,4 | 281,2 |
| 01/03/2019 | 23:00 | 754,9 | 24,8 | 75 | 0,4 | 191,2 |
| 02/03/2019 | 00:00 | 754,6 | 24,2 | 76 | 0,6 | 176,8 |
| 02/03/2019 | 01:00 | 754,0 | 23,9 | 76 | 0,4 | 180   |
| 02/03/2019 | 02:00 | 753,4 | 24,2 | 77 | 0,2 | 203   |
| 02/03/2019 | 03:00 | 753,0 | 23,5 | 77 | 0,4 | 180   |
| 02/03/2019 | 04:00 | 752,8 | 23,3 | 77 | 0,4 | 203   |
| 02/03/2019 | 05:00 | 752,8 | 23,2 | 77 | 0,2 | 225   |
| 02/03/2019 | 06:00 | 752,8 | 23,2 | 77 | 0,0 | 0     |
| 02/03/2019 | 07:00 | 753,0 | 23,8 | 76 | 0,4 | 180   |
| 02/03/2019 | 08:00 | 753,5 | 26,1 | 70 | 0,9 | 203   |
| 02/03/2019 | 09:00 | 754,0 | 27,0 | 67 | 0,9 | 270,0 |
| 02/03/2019 | 10:00 | 754,0 | 29,2 | 60 | 1,1 | 270   |
| 02/03/2019 | 11:00 | 754,0 | 30,8 | 61 | 2,0 | 215   |
| 02/03/2019 | 12:00 | 753,8 | 30,5 | 62 | 2,2 | 258,8 |
| 02/03/2019 | 13:00 | 752,9 | 30,8 | 60 | 2,5 | 270,0 |
| 02/03/2019 | 14:00 | 752,0 | 32,0 | 57 | 2,7 | 270,0 |
| 02/03/2019 | 15:00 | 751,8 | 32,8 | 53 | 3,1 | 225   |
| 02/03/2019 | 16:00 | 751,6 | 31,3 | 56 | 2,9 | 180   |
| 02/03/2019 | 17:00 | 752,1 | 29,7 | 61 | 2,5 | 203   |
| 02/03/2019 | 18:00 | 752,3 | 28,4 | 65 | 2,0 | 190   |
| 02/03/2019 | 19:00 | 752,5 | 27,5 | 66 | 0,9 | 270,0 |
| 02/03/2019 | 20:00 | 752,9 | 27,7 | 65 | 0,6 | 268   |
| 02/03/2019 | 21:00 | 753,3 | 27,8 | 66 | 1,1 | 180   |
| 02/03/2019 | 22:00 | 753,7 | 26,9 | 68 | 0,4 | 191   |
| 02/03/2019 | 23:00 | 753,8 | 24,8 | 73 | 0,9 | 225   |
| 03/03/2019 | 00:00 | 753,6 | 23,6 | 75 | 0,6 | 246   |
| 03/03/2019 | 01:00 | 752,8 | 23,6 | 75 | 0,0 | 0     |
| 03/03/2019 | 02:00 | 752,5 | 23,6 | 75 | 0,0 | 0,0   |
| 03/03/2019 | 03:00 | 752,0 | 23,4 | 75 | 0,0 |       |
| 03/03/2019 | 04:00 | 751,6 | 22,9 | 76 | 0,0 | 0     |
| 03/03/2019 | 05:00 | 751,9 | 22,6 | 76 | 0,4 | 135   |
| 03/03/2019 | 06:00 | 752,0 | 22,4 | 77 | 0,4 | 135,0 |
| 03/03/2019 | 07:00 | 752,4 | 23,0 | 77 | 0,4 | 180   |
| 03/03/2019 | 08:00 | 752,7 | 26,1 | 68 | 0,4 | 169   |
| 03/03/2019 | 09:00 | 753,0 | 27,9 | 64 | 1,4 | 255,0 |
| 03/03/2019 | 10:00 | 753,3 | 28,9 | 61 | 1,3 | 258,8 |
| 03/03/2019 | 11:00 | 753,0 | 29,6 | 64 | 1,8 | 270,0 |
| 03/03/2019 | 12:00 | 752,9 | 29,6 | 65 | 2,2 | 258,8 |
| 03/03/2019 | 13:00 | 752,1 | 29,7 | 64 | 2,5 | 270,0 |
| 03/03/2019 | 14:00 | 751,8 | 29,8 | 64 | 2,5 | 270,0 |
| 03/03/2019 | 15:00 | 751,0 | 30,6 | 61 | 2,7 | 270,0 |
| 03/03/2019 | 16:00 | 751,0 | 31,4 | 58 | 2,2 | 247,5 |
| 03/03/2019 | 17:00 | 751,1 | 30,3 | 61 | 1,8 | 247,5 |

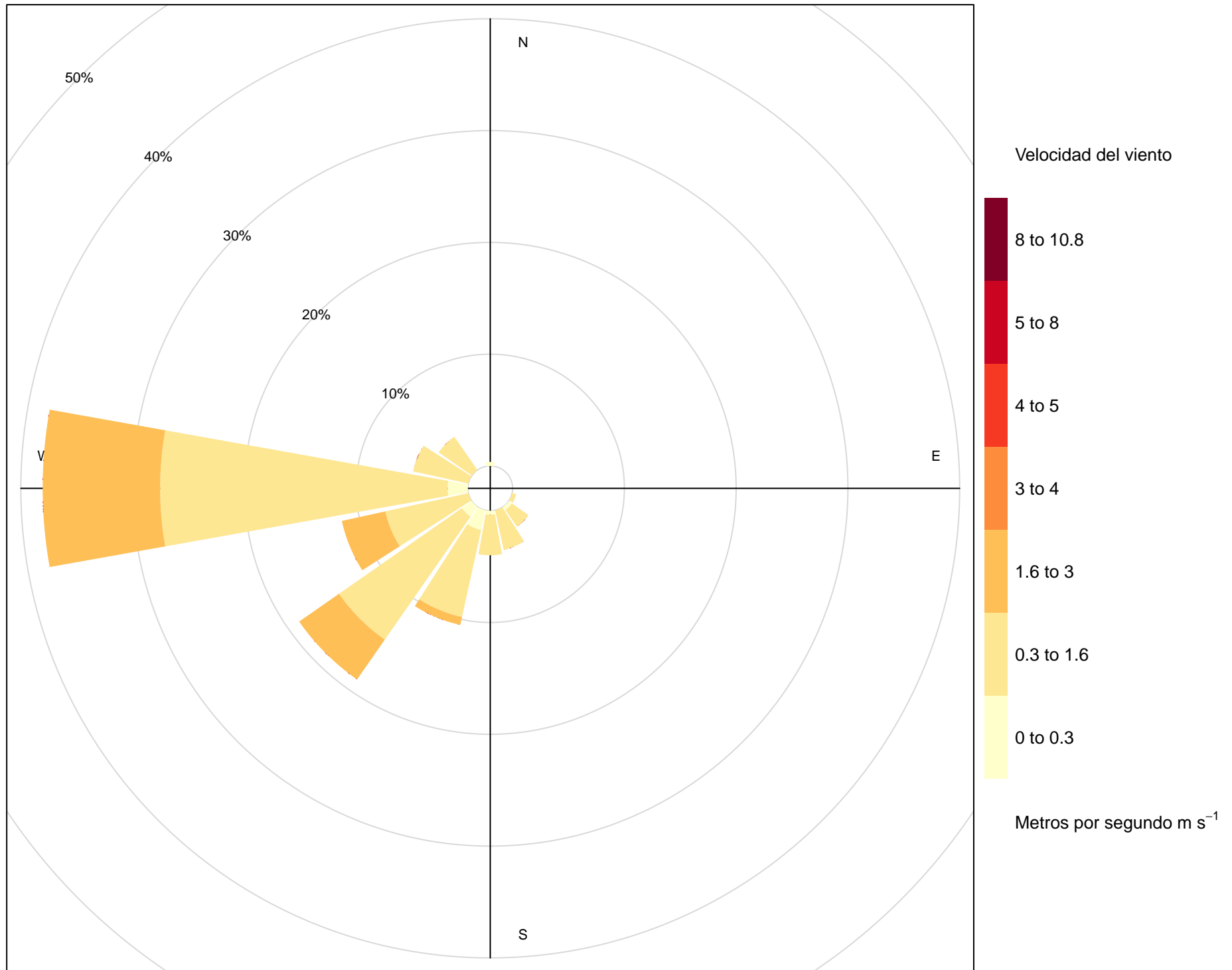
**Registro horario de las variables meteorológicas estación CA-VMP-7**

| <b>Fecha</b> | <b>Hora</b> | <b>PBAR</b> | <b>TEMP</b> | <b>HR</b> | <b>ws</b> | <b>wd</b> |
|--------------|-------------|-------------|-------------|-----------|-----------|-----------|
| 03/03/2019   | 18:00       | 751,7       | 27,6        | 68        | 1,6       | 270,0     |
| 03/03/2019   | 19:00       | 752,2       | 26,2        | 69        | 1,1       | 270       |
| 03/03/2019   | 20:00       | 752,5       | 25,1        | 74        | 0,6       | 250,7     |
| 03/03/2019   | 21:00       | 752,8       | 24,5        | 74        | 0,6       | 246       |
| 03/03/2019   | 22:00       | 753,0       | 24,0        | 75        | 0,9       | 191,2     |
| 03/03/2019   | 23:00       | 753,0       | 23,4        | 77        | 0,6       | 216       |
| 04/03/2019   | 00:00       | 752,5       | 23,1        | 77        | 0,2       | 135       |

a) Punto CA-VMP-1



b) Punto CA-VMP-6



# ANEXO N° 3.4



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## Resultados de laboratorio

**Tabla A.3.1.** Resultados del componente aire del punto CA-VMP-1 comparados con el Decreto Supremo N° 003-2017-MINAM

| Parámetros       | Unidad                   | Laboratorio   | Método de referencia   | ECA para Aire ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-1  |           |            |            |            |            |
|------------------|--------------------------|---------------|--|--|-----------|-----------|------------|------------|------------|------------|
|                  |                          |               |  |  | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| PM <sub>10</sub> | $\mu\text{g}/\text{m}^3$ | Certimin S.A. | EPA/625/R-96/010a - Compendium Method IO-3.1; Item 4 y 5 (excepto 5.1.1; 5.2.3.7 y 5.3), june 1999- (validado) | 100  | 68,99     | 116,84    | 77,88      | 101,54     | 89,52      | 108,39     |

Nota: Concentración calculada a T=25 °C ó 298,15 °K

Excede los ECA para aire

**Tabla A.3.2.** Resultados del componente aire del punto CA-VMP-2 comparados con el Decreto Supremo N° 003-2017-MINAM

| Parámetros        | Unidad                   | Laboratorio   | Método de referencia   | ECA para Aire ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-2  |           |            |            |            |            |
|-------------------|--------------------------|---------------|--|--|-----------|-----------|------------|------------|------------|------------|
|                   |                          |               |  |  | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| PM <sub>10</sub>  | $\mu\text{g}/\text{m}^3$ | Certimin S.A. | EPA/625/R-96/010a - Compendium Method IO-3.1; Item 4 y 5 (excepto 5.1.1; 5.2.3.7 y 5.3), june 1999- (validado) | 100  | 78,70     | 110,65    | 102,59     | 104,39     | 112,99     | 119,93     |
| PM <sub>2,5</sub> | $\mu\text{g}/\text{m}^3$ |               |  | 50   | 25,00     | 32,87     | 27,89      | 24,91      | 26,38      | 34,62      |

Nota: Concentración calculada a T=25 °C ó 298,15 °K

Excede los ECA para aire

**Tabla A.3.3.** Resultados del componente aire del punto CA-VMP-6 comparados con el Decreto Supremo N° 003-2017-MINAM

| Parámetros       | Unidad                   | Laboratorio   | Método de referencia   | ECA para Aire ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-6  |           |            |            |            |            |
|------------------|--------------------------|---------------|--|--|-----------|-----------|------------|------------|------------|------------|
|                  |                          |               |  |  | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| PM <sub>10</sub> | $\mu\text{g}/\text{m}^3$ | Certimin S.A. | EPA/625/R-96/010a - Compendium Method IO-3.1; Item 4 y 5 (excepto 5.1.1; 5.2.3.7 y 5.3), june 1999- (validado) | 100  | 56,93     | 92,99     | 70,98      | 79,25      | 81,59      | 99,29      |

Nota: Concentración calculada a T=25 °C ó 298,15 °K

Excede los ECA para aire

**Tabla A.3.4.** Resultados del componente aire del punto CA-VMP-7 comparados con el Decreto Supremo N° 003-2017-MINAM

| Parámetros       | Unidad                   | Laboratorio   | Método de referencia   | ECA para Aire ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-7  |           |            |            |            |            |
|------------------|--------------------------|---------------|--|--|-----------|-----------|------------|------------|------------|------------|
|                  |                          |               |  |  | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| PM <sub>10</sub> | $\mu\text{g}/\text{m}^3$ | Certimin S.A. | EPA/625/R-96/010a - Compendium Method IO-3.1; Item 4 y 5 (excepto 5.1.1; 5.2.3.7 y 5.3), june 1999- (validado) | 100  | 68,89     | 114,65    | 86,90      | 102,64     | 97,28      | 112,79     |

Nota: Concentración calculada a T=25 °C ó 298,15 °K

Excede los ECA para aire

**Tabla A.4.1.** Resultados de metales del componente aire del punto CA-VMP-1 comparados referencialmente con los Ontario's Ambient Air Quality Criteria

| Parámetros                          | Unidad | Laboratorio              | Método de referencia | Norma Canadiense ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-1  |           |            |            |            |            |       |
|-------------------------------------|--------|--------------------------|----------------------|---|-----------|-----------|------------|------------|------------|------------|-------|
|                                     |        |                          |                      |   | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |       |
| Metales medidos en PM <sub>10</sub> |        |                          |                      |   |           |           |            |            |            |            |       |
| Plata                               | Ag     | $\mu\text{g}/\text{m}^3$ | Certimin S.A.        | EPA IO-3.5, June 1999                         | 1         | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Aluminio                            | Al     | $\mu\text{g}/\text{m}^3$ |                      |   | -         | 0,74      | 1,23       | 0,72       | 0,89       | 0,65       | 1,03  |
| Arsenico                            | As     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,3       | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Bario                               | Ba     | $\mu\text{g}/\text{m}^3$ |                      |   |           | 0,015     | 0,028      | 0,015      | 0,017      | 0,014      | 0,022 |
| Berilio                             | Be     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,01      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Bismuto                             | Bi     | $\mu\text{g}/\text{m}^3$ |                      |   |           | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Boro                                | B      | $\mu\text{g}/\text{m}^3$ |                      |   | 120       | 0,022     | 0,020      | 0,036      | 0,030      | 0,008      | 0,061 |
| Calcio                              | Ca     | $\mu\text{g}/\text{m}^3$ |                      |   | -         | 2,41      | 4,11       | 2,41       | 2,72       | 2,35       | 3,04  |
| Cadmio                              | Cd     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,025     | 0,002     | 0,004      | 0,002      | 0,002      | 0,002      | 0,008 |
| Cobalto                             | Co     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,1       | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Cromo                               | Cr     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,5       | 0,030     | 0,020      | 0,026      | 0,022      | 0,019      | 0,027 |
| Cobre                               | Cu     | $\mu\text{g}/\text{m}^3$ |                      |   | 50        | 0,182     | 0,340      | 0,197      | 0,180      | 0,203      | 0,253 |
| Hierro                              | Fe     | $\mu\text{g}/\text{m}^3$ |                      |   | 4         | 1,33      | 2,16       | 1,31       | 1,47       | 1,17       | 1,78  |
| Potasio                             | K      | $\mu\text{g}/\text{m}^3$ |                      |   | -         | 0,399     | 0,646      | 0,437      | 0,520      | 0,420      | 0,605 |
| Mercurio                            | Hg     | $\mu\text{g}/\text{m}^3$ |                      |   | 2         | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Litio                               | Li     | $\mu\text{g}/\text{m}^3$ |                      |   | 20        | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Magnesio                            | Mg     | $\mu\text{g}/\text{m}^3$ |                      |   | -         | 0,85      | 1,31       | 0,95       | 1,10       | 0,97       | 1,04  |
| Manganeso                           | Mn     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,2       | 0,028     | 0,052      | 0,028      | 0,031      | 0,028      | 0,036 |
| Molibdeno                           | Mo     | $\mu\text{g}/\text{m}^3$ |                      |   | 120       | 0,062     | 0,103      | 0,011      | 0,003      | 0,003      | 0,022 |
| Sodio                               | Na     | $\mu\text{g}/\text{m}^3$ |                      |   | -         | 3,91      | 5,95       | 5,09       | 6,06       | 5,51       | 5,29  |
| Niquel                              | Ni     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,1       | 0,008     | 0,013      | 0,012      | N.D.       | 0,011      | 0,007 |
| Fosforo                             | P      | $\mu\text{g}/\text{m}^3$ |                      |   | -         | 0,154     | 0,266      | 0,160      | 0,175      | 0,095      | 0,204 |
| Plomo                               | Pb     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,5       | 0,217     | 0,673      | 0,300      | 0,286      | 0,471      | 0,782 |
| Antimonio                           | Sb     | $\mu\text{g}/\text{m}^3$ |                      |   | 25        | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | 0,009 |
| Selenio                             | Se     | $\mu\text{g}/\text{m}^3$ | 10                   | N.D.  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       |            |       |
| Silicio                             | Si     | $\mu\text{g}/\text{m}^3$ | -                    | 1,60  | 2,24      | 1,67      | 1,47       | 1,28       | 1,62       |            |       |
| Estaño                              | Sn     | $\mu\text{g}/\text{m}^3$ | 10                   | N.D.  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       |            |       |
| Estroncio                           | Sr     | $\mu\text{g}/\text{m}^3$ | 120                  | 0,011   | 0,019     | 0,012     | 0,013      | 0,012      | 0,014      |            |       |

| Parámetros | Unidad | Laboratorio              | Método de referencia | Norma Canadiense ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-1  |           |            |            |            |            |
|------------|--------|--------------------------|----------------------|---|-----------|-----------|------------|------------|------------|------------|
|            |        |                          |                      |   | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| Titanio    | Ti     | $\mu\text{g}/\text{m}^3$ |                      | 120   | 0,033     | 0,056     | 0,031      | 0,040      | 0,027      | 0,047      |
| Talio      | Tl     | $\mu\text{g}/\text{m}^3$ |                      | -   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Vanadio    | V      | $\mu\text{g}/\text{m}^3$ |                      | 2   | 0,050     | 0,041     | 0,055      | 0,033      | 0,044      | 0,026      |
| Zinc       | Zn     | $\mu\text{g}/\text{m}^3$ |                      | 120   | 0,129     | 0,273     | 0,197      | 0,147      | 0,121      | 0,285      |

Nota: Concentración de metales calculados a  $T=10\text{ }^\circ\text{C}$  ó  $283,15\text{ }^\circ\text{K}$

Excede la Norma Canadiense Ontario's Ambient Air Quality Criteria

**N.D.:** No detectable

-: No presenta valor de comparación

**Tabla A.4.2.** Resultados de metales del componente aire del punto CA-VMP-2 comparados referencialmente con los Ontario's Ambient Air Quality Criteria

| Parámetros                          | Unidad | Laboratorio              | Método de referencia | Norma Canadiense ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-2  |           |            |            |            |            |
|-------------------------------------|--------|--------------------------|----------------------|---|-----------|-----------|------------|------------|------------|------------|
|                                     |        |                          |                      |   | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| Metales medidos en $\text{PM}_{10}$ |        |                          |                      |   |           |           |            |            |            |            |
| Plata                               | Ag     | $\mu\text{g}/\text{m}^3$ |                      | 1   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | 0,001      |
| Aluminio                            | Al     | $\mu\text{g}/\text{m}^3$ |                      | -   | 0,46      | 1,04      | 1,28       | 1,04       | 1,40       | 1,01       |
| Arsenico                            | As     | $\mu\text{g}/\text{m}^3$ |                      | 0,3   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Bario                               | Ba     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,013     | 0,028     | 0,023      | 0,020      | 0,022      | 0,029      |
| Berilio                             | Be     | $\mu\text{g}/\text{m}^3$ |                      | 0,01  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Bismuto                             | Bi     | $\mu\text{g}/\text{m}^3$ |                      |   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Boro                                | B      | $\mu\text{g}/\text{m}^3$ |                      | 120   | N.D.      | 0,012     | 0,025      | N.D.       | 0,008      | 0,023      |
| Calcio                              | Ca     | $\mu\text{g}/\text{m}^3$ |                      | -   | 1,59      | 3,77      | 3,48       | 2,87       | 3,21       | 3,74       |
| Cadmio                              | Cd     | $\mu\text{g}/\text{m}^3$ |                      | 0,025   | 0,008     | 0,008     | 0,012      | 0,006      | 0,012      | 0,008      |
| Cobalto                             | Co     | $\mu\text{g}/\text{m}^3$ |                      | 0,1   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Cromo                               | Cr     | $\mu\text{g}/\text{m}^3$ |                      | 0,5   | 0,019     | 0,018     | 0,022      | 0,043      | 0,023      | 0,043      |
| Cobre                               | Cu     | $\mu\text{g}/\text{m}^3$ |                      | 50  | 0,110     | 0,759     | 0,222      | 0,143      | 0,144      | 0,260      |
| Hierro                              | Fe     | $\mu\text{g}/\text{m}^3$ |                      | 4   | 0,85      | 1,86      | 2,11       | 1,84       | 2,22       | 1,97       |
| Potasio                             | K      | $\mu\text{g}/\text{m}^3$ |                      | -   | 0,259     | 0,558     | 0,562      | 0,525      | 0,547      | 0,586      |
| Mercurio                            | Hg     | $\mu\text{g}/\text{m}^3$ |                      | 2   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |

| Parámetros |    | Unidad                   | Laboratorio | Método de referencia | Norma Canadiense ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-2  |           |            |            |            |            |
|------------|----|--------------------------|-------------|----------------------|---|-----------|-----------|------------|------------|------------|------------|
|            |    |                          |             |                      |   | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| Litio      | Li | $\mu\text{g}/\text{m}^3$ |             |                      | 20  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Magnesio   | Mg | $\mu\text{g}/\text{m}^3$ |             |                      | -   | 0,55      | 1,18      | 1,25       | 1,16       | 1,30       | 1,16       |
| Manganeso  | Mn | $\mu\text{g}/\text{m}^3$ |             |                      | 0,2   | 0,019     | 0,046     | 0,042      | 0,037      | 0,044      | 0,041      |
| Molibdeno  | Mo | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | 0,063     | N.D.      | N.D.       | N.D.       | N.D.       | 0,015      |
| Sodio      | Na | $\mu\text{g}/\text{m}^3$ |             |                      | -   | 2,32      | 5,13      | 5,15       | 5,31       | 4,70       | 5,27       |
| Niquel     | Ni | $\mu\text{g}/\text{m}^3$ |             |                      | 0,1   | N.D.      | 0,005     | 0,012      | N.D.       | 0,012      | 0,009      |
| Fosforo    | P  | $\mu\text{g}/\text{m}^3$ |             |                      | -   | 0,074     | 0,244     | 0,159      | 0,140      | 0,117      | 0,230      |
| Plomo      | Pb | $\mu\text{g}/\text{m}^3$ |             |                      | 0,5   | 0,095     | 0,420     | 0,201      | 0,202      | 0,127      | 0,458      |
| Antimonio  | Sb | $\mu\text{g}/\text{m}^3$ |             |                      | 25  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Selenio    | Se | $\mu\text{g}/\text{m}^3$ |             |                      | 10  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Silicio    | Si | $\mu\text{g}/\text{m}^3$ |             |                      | -   | 0,93      | 1,82      | 2,52       | 1,86       | 2,23       | 1,42       |
| Estaño     | Sn | $\mu\text{g}/\text{m}^3$ |             |                      | 10  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Estroncio  | Sr | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | 0,007     | 0,017     | 0,017      | 0,014      | 0,015      | 0,017      |
| Titanio    | Ti | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | 0,020     | 0,044     | 0,062      | 0,044      | 0,061      | 0,041      |
| Talio      | Tl | $\mu\text{g}/\text{m}^3$ |             |                      | -   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Vanadio    | V  | $\mu\text{g}/\text{m}^3$ |             |                      | 2   | 0,027     | 0,038     | 0,055      | 0,027      | 0,038      | 0,025      |
| Zinc       | Zn | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | 0,087     | 0,280     | 0,218      | 0,125      | 0,115      | 0,305      |

Nota: Concentración de metales calculados a  $T=10\text{ }^\circ\text{C}$  ó  $283,15\text{ }^\circ\text{K}$

Excede la Norma Canadiense Ontario's Ambient Air Quality Criteria

**N.D.:** No detectable

-: No presenta valor de comparación

**Tabla A.4.3.** Resultados de metales del componente aire del punto CA-VMP-6 comparados referencialmente con los Ontario's Ambient Air Quality Criteria

| Parámetros                          |    | Unidad                   | Laboratorio   | Método de referencia  | Norma Canadiense ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-6  |           |            |            |            |            |
|-------------------------------------|----|--------------------------|---------------|-----------------------|---|-----------|-----------|------------|------------|------------|------------|
|                                     |    |                          |               |                       |   | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| Metales medidos en $\text{PM}_{10}$ |    |                          |               |                       |   |           |           |            |            |            |            |
| Plata                               | Ag | $\mu\text{g}/\text{m}^3$ | Certimin S.A. | EPA IO-3.5, June 1999 | 1   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Aluminio                            | Al | $\mu\text{g}/\text{m}^3$ |               |                       | -   | 0,28      | 0,64      | 0,49       | 0,41       | 0,39       | 0,85       |
| Arsenico                            | As | $\mu\text{g}/\text{m}^3$ |               |                       | 0,3   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |

| Parámetros |    | Unidad                   | Laboratorio | Método de referencia | Norma Canadiense ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-6  |           |            |            |            |            |
|------------|----|--------------------------|-------------|----------------------|---|-----------|-----------|------------|------------|------------|------------|
|            |    |                          |             |                      |   | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| Bario      | Ba | $\mu\text{g}/\text{m}^3$ |             |                      |   | 0,009     | 0,019     | 0,013      | 0,012      | 0,012      | 0,024      |
| Berilio    | Be | $\mu\text{g}/\text{m}^3$ |             |                      | 0,01  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Bismuto    | Bi | $\mu\text{g}/\text{m}^3$ |             |                      |   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Boro       | B  | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Calcio     | Ca | $\mu\text{g}/\text{m}^3$ |             |                      | -   | 1,33      | 2,92      | 1,98       | 1,98       | 2,22       | 3,04       |
| Cadmio     | Cd | $\mu\text{g}/\text{m}^3$ |             |                      | 0,025   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Cobalto    | Co | $\mu\text{g}/\text{m}^3$ |             |                      | 0,1   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Cromo      | Cr | $\mu\text{g}/\text{m}^3$ |             |                      | 0,5   | 0,035     | 0,034     | 0,016      | 0,015      | 0,016      | 0,010      |
| Cobre      | Cu | $\mu\text{g}/\text{m}^3$ |             |                      | 50  | 0,026     | 0,056     | 0,061      | 0,037      | 0,044      | 0,061      |
| Hierro     | Fe | $\mu\text{g}/\text{m}^3$ |             |                      | 4   | 0,67      | 1,34      | 0,96       | 0,78       | 0,77       | 1,47       |
| Potasio    | K  | $\mu\text{g}/\text{m}^3$ |             |                      | -   | 0,267     | 0,524     | 0,409      | 0,429      | 0,422      | 0,536      |
| Mercurio   | Hg | $\mu\text{g}/\text{m}^3$ |             |                      | 2   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Litio      | Li | $\mu\text{g}/\text{m}^3$ |             |                      | 20  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Magnesio   | Mg | $\mu\text{g}/\text{m}^3$ |             |                      | -   | 0,55      | 1,03      | 0,89       | 0,98       | 0,96       | 1,05       |
| Manganeso  | Mn | $\mu\text{g}/\text{m}^3$ |             |                      | 0,2   | 0,014     | 0,034     | 0,022      | 0,020      | 0,019      | 0,033      |
| Molibdeno  | Mo | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | 0,012     | N.D.      | N.D.       | N.D.       | N.D.       | 0,002      |
| Sodio      | Na | $\mu\text{g}/\text{m}^3$ |             |                      | -   | 3,11      | 5,61      | 5,30       | 6,30       | 6,25       | 5,39       |
| Niquel     | Ni | $\mu\text{g}/\text{m}^3$ |             |                      | 0,1   | 0,004     | N.D.      | 0,008      | N.D.       | 0,009      | 0,005      |
| Fosforo    | P  | $\mu\text{g}/\text{m}^3$ |             |                      | -   | 0,080     | 0,161     | 0,098      | 0,136      | 0,084      | 0,177      |
| Plomo      | Pb | $\mu\text{g}/\text{m}^3$ |             |                      | 0,5   | 0,033     | 0,095     | 0,070      | 0,070      | 0,040      | 0,073      |
| Antimonio  | Sb | $\mu\text{g}/\text{m}^3$ |             |                      | 25  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Selenio    | Se | $\mu\text{g}/\text{m}^3$ |             |                      | 10  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Silicio    | Si | $\mu\text{g}/\text{m}^3$ |             |                      | -   | 0,60      | 1,21      | 1,17       | 0,83       | 0,80       | 1,96       |
| Estaño     | Sn | $\mu\text{g}/\text{m}^3$ |             |                      | 10  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Estroncio  | Sr | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | 0,007     | 0,014     | 0,011      | 0,011      | 0,012      | 0,014      |
| Titanio    | Ti | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | 0,012     | 0,027     | 0,021      | 0,017      | 0,016      | 0,042      |
| Talio      | Tl | $\mu\text{g}/\text{m}^3$ |             |                      | -   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Vanadio    | V  | $\mu\text{g}/\text{m}^3$ |             |                      | 2   | 0,032     | 0,025     | 0,045      | 0,023      | 0,041      | 0,019      |
| Zinc       | Zn | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | 0,070     | 0,155     | 0,187      | 0,109      | 0,113      | 0,219      |

Nota: Concentración de metales calculados a  $T=10\text{ }^\circ\text{C}$  ó  $283,15\text{ }^\circ\text{K}$

Excede la Norma Canadiense Ontario's Ambient Air Quality Criteria

**N.D.:** No detectable

| Parámetros | Unidad | Laboratorio | Método de referencia | Norma Canadiense ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-6  |           |            |            |            |            |
|------------|--------|-------------|----------------------|---|-----------|-----------|------------|------------|------------|------------|
|            |        |             |                      |   | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |

-: No presenta valor de comparación

**Tabla A.4.4.** Resultados de metales del componente aire del punto CA-VMP-7 comparados referencialmente con los Ontario's Ambient Air Quality Criteria

| Parámetros                          | Unidad | Laboratorio              | Método de referencia | Norma Canadiense ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-7  |           |            |            |            |            |       |
|-------------------------------------|--------|--------------------------|----------------------|---|-----------|-----------|------------|------------|------------|------------|-------|
|                                     |        |                          |                      |   | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |       |
| Metales medidos en PM <sub>10</sub> |        |                          |                      |   |           |           |            |            |            |            |       |
| Plata                               | Ag     | $\mu\text{g}/\text{m}^3$ | Certimin S.A.        | EPA IO-3.5, June 1999                         | 1         | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Aluminio                            | Al     | $\mu\text{g}/\text{m}^3$ |                      |   | -         | 0,68      | 0,96       | 0,65       | 0,71       | 0,67       | 0,93  |
| Arsenico                            | As     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,3       | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Bario                               | Ba     | $\mu\text{g}/\text{m}^3$ |                      |   |           | 0,014     | 0,026      | 0,018      | 0,018      | 0,015      | 0,024 |
| Berilio                             | Be     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,01      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Bismuto                             | Bi     | $\mu\text{g}/\text{m}^3$ |                      |   |           | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Boro                                | B      | $\mu\text{g}/\text{m}^3$ |                      |   | 120       | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Calcio                              | Ca     | $\mu\text{g}/\text{m}^3$ |                      |   | -         | 1,97      | 3,82       | 2,52       | 2,69       | 2,36       | 3,34  |
| Cadmio                              | Cd     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,025     | N.D.      | N.D.       | N.D.       | N.D.       | 0,002      | N.D.  |
| Cobalto                             | Co     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,1       | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Cromo                               | Cr     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,5       | 0,022     | 0,020      | 0,023      | 0,017      | 0,031      | 0,034 |
| Cobre                               | Cu     | $\mu\text{g}/\text{m}^3$ |                      |   | 50        | 0,056     | 0,151      | 0,112      | 0,069      | 0,105      | 0,175 |
| Hierro                              | Fe     | $\mu\text{g}/\text{m}^3$ |                      |   | 4         | 1,18      | 1,87       | 1,25       | 1,37       | 1,31       | 1,82  |
| Potasio                             | K      | $\mu\text{g}/\text{m}^3$ |                      |   | -         | 0,375     | 0,542      | 0,403      | 0,498      | 0,413      | 0,548 |
| Mercurio                            | Hg     | $\mu\text{g}/\text{m}^3$ |                      |   | 2         | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Litio                               | Li     | $\mu\text{g}/\text{m}^3$ |                      |   | 20        | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       | N.D.  |
| Magnesio                            | Mg     | $\mu\text{g}/\text{m}^3$ |                      |   | -         | 0,78      | 1,23       | 0,95       | 1,18       | 0,98       | 1,11  |
| Manganeso                           | Mn     | $\mu\text{g}/\text{m}^3$ |                      |   | 0,2       | 0,027     | 0,052      | 0,029      | 0,035      | 0,034      | 0,041 |
| Molibdeno                           | Mo     | $\mu\text{g}/\text{m}^3$ |                      |   | 120       | 0,045     | N.D.       | N.D.       | N.D.       | N.D.       | 0,020 |
| Sodio                               | Na     | $\mu\text{g}/\text{m}^3$ |                      |   | -         | 3,67      | 5,56       | 5,05       | 6,59       | 5,51       | 5,40  |
| Niquel                              | Ni     | $\mu\text{g}/\text{m}^3$ | 0,1                  | 0,017   | 0,005     | 0,015     | 0,011      | 0,008      | N.D.       |            |       |
| Fosforo                             | P      | $\mu\text{g}/\text{m}^3$ | -                    | 0,123   | 0,262     | 0,180     | 0,174      | 0,115      | 0,276      |            |       |
| Plomo                               | Pb     | $\mu\text{g}/\text{m}^3$ | 0,5                  | 0,048   | 0,204     | 0,142     | 0,107      | 0,094      | 0,326      |            |       |

| Parámetros |    | Unidad                   | Laboratorio | Método de referencia | Norma Canadiense ( $\mu\text{g}/\text{m}^3$ ) | CA-VMP-7  |           |            |            |            |            |
|------------|----|--------------------------|-------------|----------------------|---|-----------|-----------|------------|------------|------------|------------|
|            |    |                          |             |                      |   | 4/03/2019 | 7/03/2019 | 13/03/2019 | 16/03/2019 | 19/03/2019 | 29/03/2019 |
| Antimonio  | Sb | $\mu\text{g}/\text{m}^3$ |             |                      | 25  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Selenio    | Se | $\mu\text{g}/\text{m}^3$ |             |                      | 10  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Silicio    | Si | $\mu\text{g}/\text{m}^3$ |             |                      | -   | 1,61      | 1,68      | 1,36       | 1,40       | 1,45       | 1,84       |
| Estaño     | Sn | $\mu\text{g}/\text{m}^3$ |             |                      | 10  | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Estroncio  | Sr | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | 0,009     | 0,016     | 0,012      | 0,013      | 0,012      | 0,015      |
| Titanio    | Ti | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | 0,034     | 0,038     | 0,027      | 0,029      | 0,031      | 0,041      |
| Talio      | Tl | $\mu\text{g}/\text{m}^3$ |             |                      | -   | N.D.      | N.D.      | N.D.       | N.D.       | N.D.       | N.D.       |
| Vanadio    | V  | $\mu\text{g}/\text{m}^3$ |             |                      | 2   | 0,044     | 0,041     | 0,056      | 0,032      | 0,043      | 0,030      |
| Zinc       | Zn | $\mu\text{g}/\text{m}^3$ |             |                      | 120   | 0,107     | 0,257     | 0,213      | 0,143      | 0,119      | 0,311      |

Nota: Concentración de metales calculados a  $T=10\text{ }^\circ\text{C}$  ó  $283,15\text{ }^\circ\text{K}$

Excede la Norma Canadiense Ontario's Ambient Air Quality Criteria

**N.D.:** No detectable

-: No presenta valor de comparación

# ANEXO N° 4



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## Certificados de calibración de los equipos

REPORTE DE VERIFICACIÓN DE MUESTREADORES  
DE PARTÍCULAS HIVOL

1. Descripción del Instrumento

|                                    |                              |
|------------------------------------|------------------------------|
| Equipo : Muestreador de partículas | Medición : Flujo Volumétrico |
| Marca : THERMO                     | Flujo : 1.13                 |
| Modelo : HIVOL                     | Rango : 1.02 to 1.24 m3/min  |
| Serie : P9307                      | Resolución : 0,056 m3/min    |
| Código patrimonial : 60226409-0007 | Exactitud : ± 3.0 %          |
| Ubicación : VENTANILLA             | Procedencia : USA            |

2. Fecha de Verificación 13/08/2018 Próxima Verificación

3. Lugar de Verificación OEFA - CHORRILLOS

4. Método de Verificación La verificación se realizó según el procedimiento indicado en el manual de operación del fabricante<sup>1</sup>.

<sup>1</sup>OPERATIONS MANUAL - TE-6000 Series, Particulate Matter 10 Microns and less U.S. EPA Federal Reference Number RFP5-0202-141 High Volume Air Sampler

5. Trazabilidad Los resultados de la verificación tienen trazabilidad. Se utilizaron los siguientes patrones:

| Descripción         | Marca | Serie / Lote | Nº Certificado |
|---------------------|-------|--------------|----------------|
| VARIFLOW            | TISCH | 2941         | 2941           |
| CALIBRADOR DE FLUJO | BGI   | 162605       | 162605         |

6. Condiciones Ambientales

| Temperatura (°C) | Temperatura (°K) | Presión Barométrica (mmHg) |
|------------------|------------------|----------------------------|
| 20.6             | 293.6            | 757.5                      |

7. Resultados

| Calibrador |          |
|------------|----------|
| Slope (m)  | Int (b)  |
| 1.02503    | -0.01620 |

| Pto | Orificio "H2O | Qa m3/min | Muestreador "H2O | Pf mmHg | Po/Pa | Tabla de verificación m3/min | % Diferencia |
|-----|---------------|-----------|------------------|---------|-------|------------------------------|--------------|
| 1   | 3.75          | 1.19      | 12.00            | 22.40   | 0.970 | 1.179                        | 1.09         |
| 2   | 3.70          | 1.18      | 14.00            | 26.13   | 0.966 | 1.174                        | 0.85         |
| 3   | 3.62          | 1.17      | 16.10            | 30.05   | 0.960 | 1.166                        | 0.46         |
| 4   | 3.60          | 1.17      | 18.00            | 33.59   | 0.956 | 1.161                        | 0.62         |
| 5   | 3.50          | 1.15      | 20.80            | 38.82   | 0.949 | 1.152                        | 0.01         |


% Diferencia: Las directrices de la EPA indican que la diferencia porcentual debe estar dentro de ± 4%. Si es mayor puede deberse a fugas presente durante la verificación y debería ser verificado nuevamente.

| Cálculos   |
|--|
| $(Qa) = 1/m * (RAIZ(H2O * (Ta/Pa)) - b)$                     |
| $(Po/Pa) = 1 - Pf/Pa$  |
| $\% \text{ Diferencia} = (Look \ Up \ Flow - Qa) / Qa * 100$ |

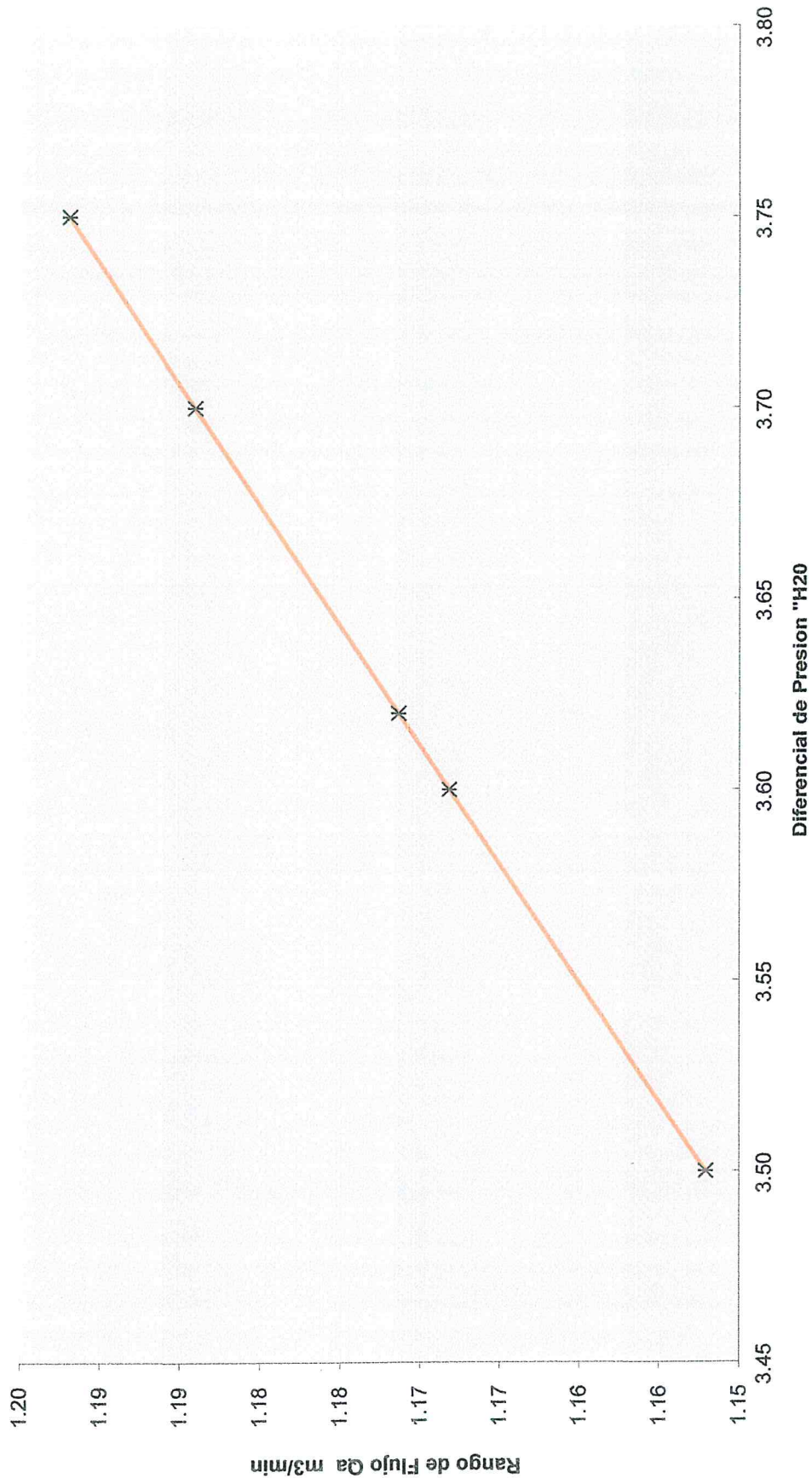
8. Conclusión

- \* Los resultados del presente documento son válidos únicamente para el objeto verificado.
- \* El instrumento se encuentra en buen estado y dentro de las tolerancias establecidas por el fabricante.

  
Técnico de calidad del aire  
Pedro Miranda Rodríguez

  
Coordinador de la gestión de  
muestras y equipos ambientales  
Omar Navarro Acosta

### Curva de Verificación



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# Certificate of Calibration

| Calibration Certification Information |                             |            |       |
|---------------------------------------|-----------------------------|------------|-------|
| Cal. Date: August 10, 2018            | Rootsmeter S/N: 438320      | Ta: 296    | °K    |
| Operator: Jim Tisch                   |                             | Pa: 750.57 | mm Hg |
| Calibration Model #: TE-5028A         | Calibrator S/N: <b>2941</b> |            |       |

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1   | 1              | 2               | 1          | 1.2970      | 4.1        | 1.50        |
| 2   | 3              | 4               | 1          | 1.0070      | 6.7        | 2.50        |
| 3   | 5              | 6               | 1          | 0.9190      | 8.1        | 3.00        |
| 4   | 7              | 8               | 1          | 0.8500      | 9.4        | 3.50        |
| 5   | 9              | 10              | 1          | 0.6450      | 16.2       | 6.00        |

| Data Tabulation |               |  |           |             |   |
|-----------------|---------------|--|-----------|-------------|---|
| Vstd (m3)       | Qstd (x-axis) | $\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis) | Va        | Qa (x-axis) | $\sqrt{\Delta H \left( Ta/Pa \right)}$ (y-axis) |
| 0.9888          | 0.7624        | 1.2212   | 0.9945    | 0.7668      | 0.7691  |
| 0.9854          | 0.9785        | 1.5766   | 0.9911    | 0.9842      | 0.9929  |
| 0.9835          | 1.0702        | 1.7271   | 0.9892    | 1.0764      | 1.0877  |
| 0.9818          | 1.1551        | 1.8655   | 0.9875    | 1.1617      | 1.1749  |
| 0.9728          | 1.5082        | 2.4425   | 0.9784    | 1.5169      | 1.5382  |
| <b>QSTD</b>     | m=            | <b>1.63696</b>   | <b>QA</b> | m=          | <b>1.02503</b>                                  |
|                 | b=            | <b>-0.02573</b>  |           | b=          | <b>-0.01620</b>                                 |
|                 | r=            | <b>1.00000</b>   |           | r=          | <b>1.00000</b>                                  |

| Calculations                           |   |             |  |
|--|---|-------------|--|
| <b>Vstd</b> =                          | $\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$   | <b>Va</b> = | $\Delta Vol((Pa-\Delta P)/Pa)$   |
| <b>Qstd</b> =                          | $Vstd/\Delta Time$  | <b>Qa</b> = | $Va/\Delta Time$   |
| For subsequent flow rate calculations: |   |             |  |
| <b>Qstd</b> =                          | $1/m \left( \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} \right) - b \right)$ | <b>Qa</b> = | $1/m \left( \left( \sqrt{\Delta H \left( Ta/Pa \right)} \right) - b \right)$ |

| Standard Conditions |                                       |
|---------------------|---------------------------------------|
| Tstd:               | 298.15 °K                             |
| Pstd:               | 760 mm Hg                             |
| Key                 |                                       |
| ΔH:                 | calibrator manometer reading (in H2O) |
| ΔP:                 | rootsmeter manometer reading (mm Hg)  |
| Ta:                 | actual absolute temperature (°K)      |
| Pa:                 | actual barometric pressure (mm Hg)    |
| b:                  | intercept                             |
| m:                  | slope                                 |

| RECALIBRATION   |
|---|
| US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30. |



GE Oil & Gas  
 Dresser Inc.  
 16240 Port Northwest Drive, Suite 100  
 Houston, TX 77041  
 USA  
 T +1 800 521 1114 +1 832 590 2303  
 F +1 800 335 5224 +1 832 590 2494

**Customer Information**

Name : CROCKER COMPANY  
 PO No. : 11032  
 Badge No. : NONE

Date Printed : 09 15 2015  
 Bill of Material 055217-172  
 Model : 5M175  
 Serial No. : 0438320  
 Sales Order No. 213535-1  
 Spec. Req. No.  
 Prover Used : 50 cu. ft.  
 WME :

**Unit Description**

5M175 SERIES B3 ROOTS METER, CEX,  
 WITH CONDUIT PORT W/4' PIGTAIL

| MIN STATIC TEST PRESSURE | MIN LEAK TEST PRESSURE | MAX ALLOWABLE OPER PRESSURE | TC Acc at (deg F) | Accuracy | Proof | % Error |
|--------------------------|------------------------|-----------------------------|-------------------|----------|-------|---------|
| 350 psig                 | 219 psig               | 175 psig                    |                   |          |       |         |

This meter has been tested and successfully passed a Shell Pressure Test and Leak Test at the above conditions.

**P R O V E R T E S T D A T A**

| Test Point | Flow Rate Dis Vol | % Rated Capacity | Meter Accuracy | ERROR +/- % | Diff Pressure | TC Meter Accuracy | TC Meter Proof % | ERROR +/- % |
|------------|-------------------|------------------|----------------|-------------|---------------|-------------------|------------------|-------------|
| 1          | 5006.9            | 100.1            | 100.27         | 0.27        | 1.17          |                   |                  |             |
| 2          | 3722.0            | 74.4             | 99.90          | -0.10       | 0.70          |                   |                  |             |
| 3          | 2489.5            | 49.8             | 100.19         | 0.19        | 0.31          |                   |                  |             |
| 4          | 1247.7            | 25.0             | 99.95          | -0.05       | 0.09          |                   |                  |             |
| 5          | 505.7             | 10.1             | 99.97          | -0.03       | 0.02          |                   |                  |             |

Above data has been determined from tests performed with air at atmospheric pressure and ambient temperature, using positive displacement bell or piston provers or sonic nozzle provers dimensionally traceable to the United States National Institute of Standards and Technology (NIST) and/or traceable to the Netherlands Measurement Institute (NMI) for volumetric flow rate.

NMI accredited laboratory no: CE-085

This meter conforms to purchaser specifications.

Test date 15-September-15 by BUSHART, DAVID

Mesa Labs 10 Park Place Butler, NJ 07405  
NIST Traceable Calibration Facility, ISO 9001:2008 Registered



### CERTIFICATE OF CALIBRATION - NIST TRACEABILITY

(Refer to instruction manual for further details of calibration)

tetraCal Serial Number: 162605

DATE: 26-Jul-2018

Calibration Operator: E. Albuja

**Critical Venturi Flow Meter:** Max Uncertainty = 0.346%  
Serial Number: 1A CEESI NVLAP NIST Data File 07BGI-0001  
Serial Number: 2A CEESI NVLAP NIST Data File 07BGI-0003  
Serial Number: 3A CEESI NVLAP NIST Data File 07BGI-0004  
Serial Number: 4A CEESI NVLAP NIST Data File 07BGI-0002

**Room Temperature:** +/- 0.03°C from -5°C - 70°C      Room Temperature: 21.3 °C  
Brand: Telatemp      Serial Number: 358654  
Std Cal Date      23-Oct-17      Std Cal Due Date      23-Oct-18  
tetraCal:  
Ambient Temperature (set):      21.3 °C      911  
Aux (filter) Temperature (set):      °C

**Barometric Pressure and Absolute Pressure**  
Vaisala Model PTB330(50-1100) Digital Accuracy: 0.03371%  
Serial Number: C4310002  
Std Cal Date      26-Mar-18      Std Cal Due Date      26-Mar-19  
tetraCal:  
Barometric pressure (set):      748 mm of Hg

#### Results of Venturi Calibration

Flow Rate (Q) vs. Pressure Drop (ΔP).

Where: Q=Lpm, ΔP= Cm of H2O

No. 1 C 5.35439 ΔP ^ 0.51955  
No. 2 C 1.16605 ΔP ^ 0.52384  
No. 3 C 0.21100 ΔP ^ 0.54025

Overall Uncertainty: 0.35%

Date Placed In Service \_\_\_\_\_  
(To be filled in by operator upon receipt)

Recommended Recalibration Date \_\_\_\_\_  
(12 months from date placed in service)

Revised: March 2016  
Cal102-03T1 Rev B

To Check a Tetra Cal  
 6 - 30.00 Lpm  
 VER.

26-Jul-2018 E. Albuja

BP= 748 mm of Hg

3.41P

Maximum allowable error at any flow rate is .75%.

Serial No. 162605

| Reading     |      | CV    |  |           |         |           |
|-------------|------|-------|--|-----------|---------|-----------|
| Abs. P      |      | Qa    |  | Qa        |         |           |
| Crit. Vent. | Room | Flow  |  | TriCal    | % Error |           |
| mm of Hg    | TEMP | Lpm   |  | Indicated |         |           |
| 193.73      | 21.3 | 7.60  |  | 7.65      | 0.73    |           |
| 486.64      | 21.3 | 19.38 |  | 19.39     | 0.04    | Average % |
| 729.47      | 21.3 | 29.15 |  | 29.06     | -0.33   | 0.15      |

To Check a Tetra Cal  
 1.20 - 6.00 Lpm

BP= 748 mm of Hg

| Reading     |      | CV   |  |           |         |           |
|-------------|------|------|--|-----------|---------|-----------|
| Abs. P      |      | Qa   |  | Qa        |         |           |
| Crit. Vent. | Room | Flow |  | Tri Cal   | % Error |           |
| mm of Hg    | TEMP | Lpm  |  | Indicated |         |           |
| 137.0       | 21.5 | 1.53 |  | 1.53      | 0.57    |           |
| 341.9       | 21.5 | 3.88 |  | 3.86      | -0.42   | Average % |
| 520.6       | 21.5 | 5.93 |  | 5.96      | 0.54    | 0.23      |

To Check a Tetra Cal  
 0.10 - 1.20 Lpm

BP= 748 mm of Hg

| Reading     |      | CV    |  |           |         |           |
|-------------|------|-------|--|-----------|---------|-----------|
| Abs. P      |      | Qa    |  | Qa        |         |           |
| Crit. Vent. | Room | Flow  |  | TriCal    | % Error |           |
| mm of Hg    | TEMP | Lpm   |  | Indicated |         |           |
| 219.15      | 21.7 | 0.397 |  | 0.399     | 0.50    |           |
| 553.82      | 21.7 | 1.049 |  | 1.049     | 0.00    | Average % |
| 625.4       | 21.7 | 1.188 |  | 1.194     | 0.47    | 0.32      |



## **REGISTER YOUR PRODUCT TODAY!**

Mesa Labs' BGI instruments are precision measuring instruments designed to provide highly-accurate and repeatable measurements. Recognized worldwide for their accuracy, Mesa's products are manufactured and serviced in our ISO 17025-accredited laboratory offering  $\pm 0.08\%$  Scope of Accreditation for gas flow by NVLAP of NIST. Harsh environments, accidental damage, environmental factors and simple time and use can, over time, impact the calibration of any instrument. Our NIST-traceable calibrations ensure all of your data readings are accurate and repeatable. Registering your product is the first step in maintaining world-class accuracy for your BGI instrument.

Visit [bgi.mesalabs.com](http://bgi.mesalabs.com) to complete the short form that will align your instrument with our product maintenance database. Once complete, you will be able to better manage your BGI fleet by receiving timely reminders at 45 and 15 days prior to the recommended calibration date of your instrument. In addition you will receive vital calibration and firmware/hardware updates. Taking the time to register ensures your instruments warranty claim information is properly documented in Mesa's database.

**We recommend annual service and calibration of your BGI instrument as a periodic quality assurance measure, as well as to provide you and your organization with a defensible audit trail of premier quality.**

## **WHAT IS INCLUDED IN FACTORY CALIBRATION?**

Maintenance of your BGI instrument is actually a full product refurbishment and calibration performed by the same experienced technicians that build the new BGI instruments. Our ISO 17025/ANSI Z-540 accreditation and documented traceability ensures our accuracy claims are met. A Mesa factory calibration includes:

- Disassembly and inspection of the instrument for wear, defect, contaminants and damage
- Full cleaning, repair and/or replacement of parts as needed
- Battery test/replacement
- Upgraded firmware and hardware
- Temperature and pressure sensor calibration if required
- Multi-point flow calibration with adjustment
- NIST-traceable calibration certificate with As-Found (pre) and As-Left (post) data
- 90-day service warranty

## **FACTORY CALIBRATION vs. 3<sup>RD</sup> PARTY CALIBRATION LABORATORIES**

Mesa Labs is the only laboratory that can perform a BGI calibration in the US. Third party calibration laboratories cannot adjust your instrument. These other labs can only perform verifications, not calibrations and will only issue a NIST-traceable certificate that identifies the instrument falls within claimed accuracy specifications.

This means that they cannot reset calibration points, perform repairs and maintenance with authorized parts, provide hardware and firmware updates or even check and change batteries.

Please feel free to contact us with any questions or concerns at [csbutler@mesalabs.com](mailto:csbutler@mesalabs.com) or at 973-492-8400.

REPORTE DE VERIFICACIÓN DE MUESTREADORES  
DE PARTÍCULAS HIVOL

1. Descripción del Instrumento

|                                    |                              |
|------------------------------------|------------------------------|
| Equipo : Muestreador de partículas | Medición : Flujo Volumétrico |
| Marca : THERMO                     | Flujo : 1.13                 |
| Modelo : HIVOL                     | Rango : 1.02 to 1.24 m3/min  |
| Serie : P9308                      | Resolución : 0,056 m3/min    |
| Código patrimonial : 60226409-0006 | Exactitud : ± 3.0 %          |
| Ubicación : VENTANILLA             | Procedencia : USA            |

2. Fecha de Verificación 13/08/2018 Próxima Verificación

3. Lugar de Verificación OEFA - CHORRILLOS

4. Método de Verificación La verificación se realizó según el procedimiento indicado en el manual de operación del fabricante<sup>1</sup>.

<sup>1</sup>OPERATIONS MANUAL - TE-6000 Series, Particulate Matter 10 Microns and less U.S. EPA Federal Reference Number RFP5-0202-141 High Volume Air Sampler

5. Trazabilidad Los resultados de la verificación tienen trazabilidad. Se utilizaron los siguientes patrones:

| Descripción         | Marca | Serie / Lote | Nº Certificado |
|---------------------|-------|--------------|----------------|
| VARIFLOW            | TISCH | 2941         | 2941           |
| CALIBRADOR DE FLUJO | BGI   | 162605       | 162605         |

6. Condiciones Ambientales

| Temperatura (°C) | Temperatura (°K) | Presión Barométrica (mmHg) |
|------------------|------------------|----------------------------|
| 20.6             | 293.6            | 757.5                      |

7. Resultados

| Calibrador |          |
|------------|----------|
| Slope (m)  | Int.(b)  |
| 1.02503    | -0.01620 |

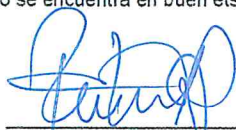
| Pto | Orificio "H2O | Qa m3/min | Muestreador "H2O | Pf mmHg | Po/Pa | Tabla de verificación m3/min | % Diferencia |
|-----|---------------|-----------|------------------|---------|-------|------------------------------|--------------|
| 1   | 3.80          | 1.20      | 11.90            | 22.21   | 0.971 | 1.188                        | 0.98         |
| 2   | 3.75          | 1.19      | 13.90            | 25.94   | 0.966 | 1.181                        | 0.92         |
| 3   | 3.70          | 1.18      | 16.10            | 30.05   | 0.960 | 1.174                        | 0.85         |
| 4   | 3.65          | 1.18      | 18.10            | 33.78   | 0.955 | 1.167                        | 0.78         |
| 5   | 3.55          | 1.16      | 21.10            | 39.38   | 0.948 | 1.158                        | 0.19         |


% Diferencia: Las directrices de la EPA indican que la diferencia porcentual debe estar dentro de ± 4%. Si es mayor puede deberse a fugas presente durante la verificación y debería ser verificado nuevamente.

| Cálculos   |
|--|
| $(Qa) = 1/m * (RAIZ(H2O * (Ta/Pa)) - b)$         |
| $(Po/Pa) = 1 - Pf/Pa$                            |
| $\% Diferencia = (Look Up Flow - Qa) / Qa * 100$ |

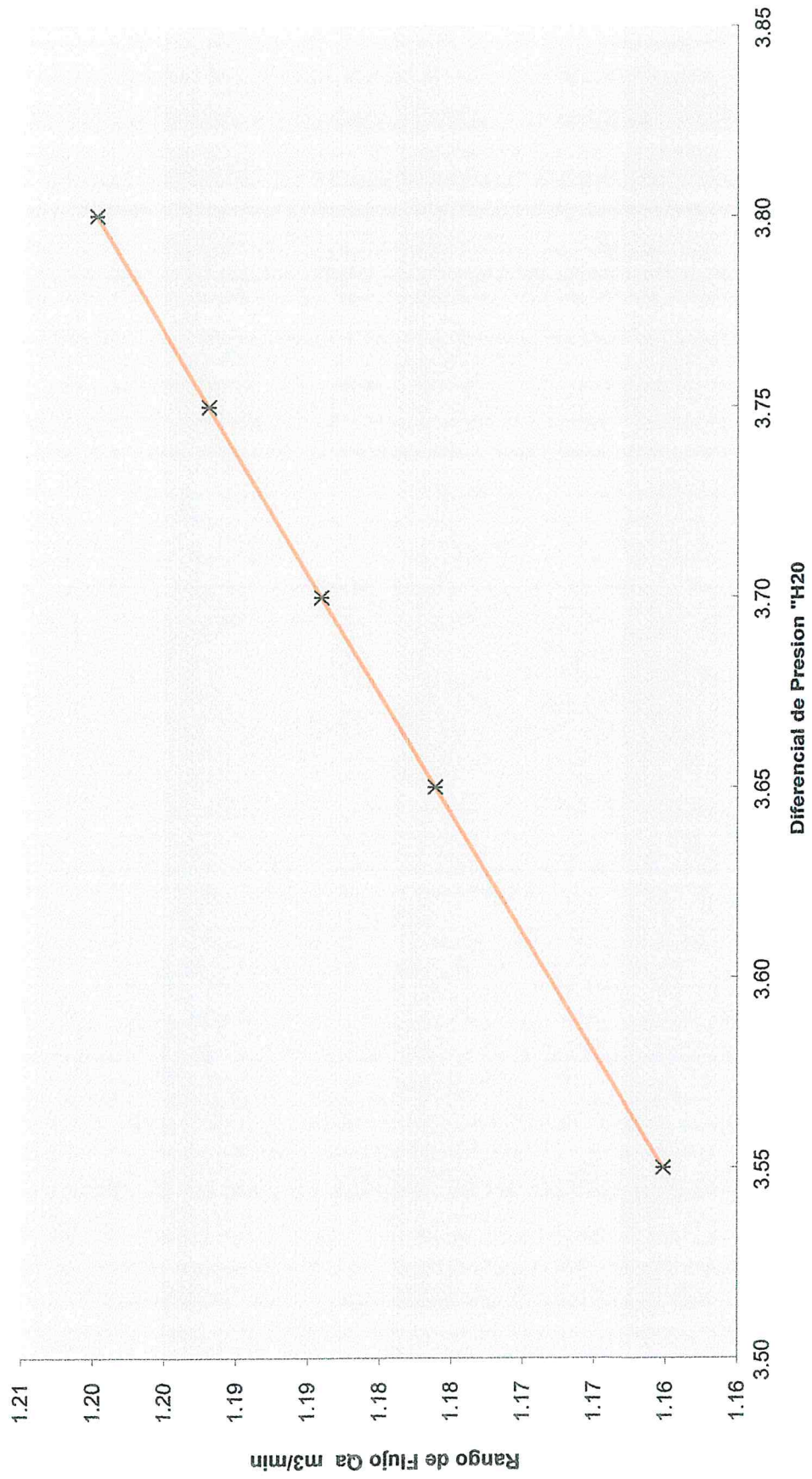
8. Conclusión

- \* Los resultados del presente documento son válidos únicamente para el objeto verificado.
- \* El instrumento se encuentra en buen estado y dentro de las tolerancias establecidas por el fabricante.

  
Técnico de calidad del aire  
Pedro Miranda Rodríguez

  
Coordinador de la gestión de  
muestras y equipos ambientales  
Omar Navarro Acosta

### Curva de Verificación



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# Certificate of Calibration

| Calibration Certification Information |                        |            |       |
|---------------------------------------|------------------------|------------|-------|
| Cal. Date: August 10, 2018            | Rootsmeter S/N: 438320 | Ta: 296    | °K    |
| Operator: Jim Tisch                   |                        | Pa: 750.57 | mm Hg |
| Calibration Model #: TE-5028A         | Calibrator S/N: 2941   |            |       |

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1   | 1              | 2               | 1          | 1.2970      | 4.1        | 1.50        |
| 2   | 3              | 4               | 1          | 1.0070      | 6.7        | 2.50        |
| 3   | 5              | 6               | 1          | 0.9190      | 8.1        | 3.00        |
| 4   | 7              | 8               | 1          | 0.8500      | 9.4        | 3.50        |
| 5   | 9              | 10              | 1          | 0.6450      | 16.2       | 6.00        |

| Data Tabulation |               |  |           |             |   |
|-----------------|---------------|--|-----------|-------------|---|
| Vstd (m3)       | Qstd (x-axis) | $\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis) | Va        | Qa (x-axis) | $\sqrt{\Delta H \left( Ta/Pa \right)}$ (y-axis) |
| 0.9888          | 0.7624        | 1.2212   | 0.9945    | 0.7668      | 0.7691  |
| 0.9854          | 0.9785        | 1.5766   | 0.9911    | 0.9842      | 0.9929  |
| 0.9835          | 1.0702        | 1.7271   | 0.9892    | 1.0764      | 1.0877  |
| 0.9818          | 1.1551        | 1.8655   | 0.9875    | 1.1617      | 1.1749  |
| 0.9728          | 1.5082        | 2.4425   | 0.9784    | 1.5169      | 1.5382  |
| <b>QSTD</b>     | m=            | <b>1.63696</b>   | <b>QA</b> | m=          | <b>1.02503</b>                                  |
|                 | b=            | <b>-0.02573</b>  |           | b=          | <b>-0.01620</b>                                 |
|                 | r=            | <b>1.00000</b>   |           | r=          | <b>1.00000</b>                                  |

| Calculations                           |   |             |  |
|--|---|-------------|--|
| <b>Vstd</b> =                          | $\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$   | <b>Va</b> = | $\Delta Vol((Pa-\Delta P)/Pa)$   |
| <b>Qstd</b> =                          | $Vstd/\Delta Time$  | <b>Qa</b> = | $Va/\Delta Time$   |
| For subsequent flow rate calculations: |   |             |  |
| <b>Qstd</b> =                          | $1/m \left( \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} \right) - b \right)$ | <b>Qa</b> = | $1/m \left( \left( \sqrt{\Delta H \left( Ta/Pa \right)} \right) - b \right)$ |

| Standard Conditions |                                       |
|---------------------|---------------------------------------|
| Tstd:               | 298.15 °K                             |
| Pstd:               | 760 mm Hg                             |
| Key                 |                                       |
| ΔH:                 | calibrator manometer reading (in H2O) |
| ΔP:                 | rootsmeter manometer reading (mm Hg)  |
| Ta:                 | actual absolute temperature (°K)      |
| Pa:                 | actual barometric pressure (mm Hg)    |
| b:                  | intercept                             |
| m:                  | slope                                 |

| RECALIBRATION   |
|---|
| US EPA recommends annual recalibration per 1998<br>40 Code of Federal Regulations Part 50 to 51,<br>Appendix B to Part 50, Reference Method for the<br>Determination of Suspended Particulate Matter in<br>the Atmosphere, 9.2.17, page 30. |



GE Oil & Gas  
 Dresser Inc.  
 16240 Port Northwest Drive, Suite 100  
 Houston, TX 77041  
 USA  
 T +1 800 521 1114 +1 832 590 2303  
 F +1 800 335 5224 +1 832 590 2494

**Customer Information**

Name : CROCKER COMPANY  
 PO No. : 11032  
 Badge No. : NONE

Date Printed : 09 15 2015  
 Bill of Material 055217-172  
 Model : 5M175  
 Serial No. : 0438320  
 Sales Order No. 213535-1  
 Spec. Req. No.  
 Prover Used : 50 cu. ft.  
 WME :

**Unit Description**

5M175 SERIES B3 ROOTS METER, CEX,  
 WITH CONDUIT PORT W/4' PIGTAIL

| MIN STATIC TEST PRESSURE | MIN LEAK TEST PRESSURE | MAX ALLOWABLE OPER PRESSURE | TC Acc at (deg F) | Accuracy | Proof | % Error |
|--------------------------|------------------------|-----------------------------|-------------------|----------|-------|---------|
| 350 psig                 | 219 psig               | 175 psig                    |                   |          |       |         |

This meter has been tested and successfully passed a Shell Pressure Test and Leak Test at the above conditions.

**P R O V E R T E S T D A T A**

| Test Point | Flow Rate Dis Vol | % Rated Capacity | Meter Accuracy | ERROR +/- % | Diff Pressure | TC Meter Accuracy | TC Meter Proof % | ERROR +/- % |
|------------|-------------------|------------------|----------------|-------------|---------------|-------------------|------------------|-------------|
| 1          | 5006.9            | 100.1            | 100.27         | 0.27        | 1.17          |                   |                  |             |
| 2          | 3722.0            | 74.4             | 99.90          | -0.10       | 0.70          |                   |                  |             |
| 3          | 2489.5            | 49.8             | 100.19         | 0.19        | 0.31          |                   |                  |             |
| 4          | 1247.7            | 25.0             | 99.95          | -0.05       | 0.09          |                   |                  |             |
| 5          | 505.7             | 10.1             | 99.97          | -0.03       | 0.02          |                   |                  |             |

Above data has been determined from tests performed with air at atmospheric pressure and ambient temperature, using positive displacement bell or piston provers or sonic nozzle provers dimensionally traceable to the United States National Institute of Standards and Technology (NIST) and/or traceable to the Netherlands Measurement Institute (NMI) for volumetric flow rate.

NMI accredited laboratory no: CE-085

This meter conforms to purchaser specifications.

Test date 15-September-15 by BUSHART, DAVID

Mesa Labs 10 Park Place Butler, NJ 07405  
NIST Traceable Calibration Facility, ISO 9001:2008 Registered



### CERTIFICATE OF CALIBRATION - NIST TRACEABILITY

(Refer to instruction manual for further details of calibration)

tetraCal Serial Number: 162605

DATE: 26-Jul-2018

Calibration Operator: E. Albuja

**Critical Venturi Flow Meter:** Max Uncertainty = 0.346%  
Serial Number: 1A CEESI NVLAP NIST Data File 07BGI-0001  
Serial Number: 2A CEESI NVLAP NIST Data File 07BGI-0003  
Serial Number: 3A CEESI NVLAP NIST Data File 07BGI-0004  
Serial Number: 4A CEESI NVLAP NIST Data File 07BGI-0002

|  |                   |                  |           |
|--|-------------------|------------------|-----------|
| <b>Room Temperature:</b> +/- 0.03°C from -5°C - 70°C | Room Temperature: | 21.3 °C          |           |
| Brand: Telatemp                                      | Serial Number:    | 358654           |           |
| Std Cal Date   | 23-Oct-17         | Std Cal Due Date | 23-Oct-18 |
| tetraCal:  |                   |                  |           |
| Ambient Temperature (set):                           | 21.3 °C           |                  | 911       |
| Aux (filter) Temperature (set):                      | °C                |                  |           |

#### Barometric Pressure and Absolute Pressure

Vaisala Model PTB330(50-1100) Digital Accuracy: 0.03371%  
Serial Number: C4310002  
Std Cal Date 26-Mar-18 Std Cal Due Date 26-Mar-19  
tetraCal:  
Barometric pressure (set): 748 mm of Hg

#### Results of Venturi Calibration

Flow Rate (Q) vs. Pressure Drop ( $\Delta P$ ).

Where: Q=Lpm,  $\Delta P$ = Cm of H2O

No. 1 C 5.35439  $\Delta P$  ^ 0.51955  
No. 2 C 1.16605  $\Delta P$  ^ 0.52384  
No. 3 C 0.21100  $\Delta P$  ^ 0.54025

Overall Uncertainty: 0.35%

Date Placed In Service \_\_\_\_\_  
(To be filled in by operator upon receipt)

Recommended Recalibration Date \_\_\_\_\_  
(12 months from date placed in service)

Revised: March 2016  
Cal102-03T1 Rev B

To Check a Tetra Cal  
 6 - 30.00 Lpm  
 VER.

26-Jul-2018 E. Albuja

BP= 748 mm of Hg

3.41P

Maximum allowable error at any flow rate is .75%.

Serial No. 162605

| Reading     |      | CV    |  |           |         |           |
|-------------|------|-------|--|-----------|---------|-----------|
| Abs. P      |      | Qa    |  | Qa        |         |           |
| Crit. Vent. | Room | Flow  |  | TriCal    | % Error |           |
| mm of Hg    | TEMP | Lpm   |  | Indicated |         |           |
| 193.73      | 21.3 | 7.60  |  | 7.65      | 0.73    |           |
| 486.64      | 21.3 | 19.38 |  | 19.39     | 0.04    | Average % |
| 729.47      | 21.3 | 29.15 |  | 29.06     | -0.33   | 0.15      |

To Check a Tetra Cal  
 1.20 - 6.00 Lpm

BP= 748 mm of Hg

| Reading     |      | CV   |  |           |         |           |
|-------------|------|------|--|-----------|---------|-----------|
| Abs. P      |      | Qa   |  | Qa        |         |           |
| Crit. Vent. | Room | Flow |  | Tri Cal   | % Error |           |
| mm of Hg    | TEMP | Lpm  |  | Indicated |         |           |
| 137.0       | 21.5 | 1.53 |  | 1.53      | 0.57    |           |
| 341.9       | 21.5 | 3.88 |  | 3.86      | -0.42   | Average % |
| 520.6       | 21.5 | 5.93 |  | 5.96      | 0.54    | 0.23      |

To Check a Tetra Cal  
 0.10 - 1.20 Lpm

BP= 748 mm of Hg

| Reading     |      | CV    |  |           |         |           |
|-------------|------|-------|--|-----------|---------|-----------|
| Abs. P      |      | Qa    |  | Qa        |         |           |
| Crit. Vent. | Room | Flow  |  | TriCal    | % Error |           |
| mm of Hg    | TEMP | Lpm   |  | Indicated |         |           |
| 219.15      | 21.7 | 0.397 |  | 0.399     | 0.50    |           |
| 553.82      | 21.7 | 1.049 |  | 1.049     | 0.00    | Average % |
| 625.4       | 21.7 | 1.188 |  | 1.194     | 0.47    | 0.32      |



## **REGISTER YOUR PRODUCT TODAY!**

Mesa Labs' BGI instruments are precision measuring instruments designed to provide highly-accurate and repeatable measurements. Recognized worldwide for their accuracy, Mesa's products are manufactured and serviced in our ISO 17025-accredited laboratory offering  $\pm 0.08\%$  Scope of Accreditation for gas flow by NVLAP of NIST. Harsh environments, accidental damage, environmental factors and simple time and use can, over time, impact the calibration of any instrument. Our NIST-traceable calibrations ensure all of your data readings are accurate and repeatable. Registering your product is the first step in maintaining world-class accuracy for your BGI instrument.

Visit [bgi.mesalabs.com](http://bgi.mesalabs.com) to complete the short form that will align your instrument with our product maintenance database. Once complete, you will be able to better manage your BGI fleet by receiving timely reminders at 45 and 15 days prior to the recommended calibration date of your instrument. In addition you will receive vital calibration and firmware/hardware updates. Taking the time to register ensures your instruments warranty claim information is properly documented in Mesa's database.

**We recommend annual service and calibration of your BGI instrument as a periodic quality assurance measure, as well as to provide you and your organization with a defensible audit trail of premier quality.**

## **WHAT IS INCLUDED IN FACTORY CALIBRATION?**

Maintenance of your BGI instrument is actually a full product refurbishment and calibration performed by the same experienced technicians that build the new BGI instruments. Our ISO 17025/ANSI Z-540 accreditation and documented traceability ensures our accuracy claims are met. A Mesa factory calibration includes:

- Disassembly and inspection of the instrument for wear, defect, contaminants and damage
- Full cleaning, repair and/or replacement of parts as needed
- Battery test/replacement
- Upgraded firmware and hardware
- Temperature and pressure sensor calibration if required
- Multi-point flow calibration with adjustment
- NIST-traceable calibration certificate with As-Found (pre) and As-Left (post) data
- 90-day service warranty

## **FACTORY CALIBRATION vs. 3<sup>RD</sup> PARTY CALIBRATION LABORATORIES**

Mesa Labs is the only laboratory that can perform a BGI calibration in the US. Third party calibration laboratories cannot adjust your instrument. These other labs can only perform verifications, not calibrations and will only issue a NIST-traceable certificate that identifies the instrument falls within claimed accuracy specifications.

This means that they cannot reset calibration points, perform repairs and maintenance with authorized parts, provide hardware and firmware updates or even check and change batteries.

Please feel free to contact us with any questions or concerns at [csbutler@mesalabs.com](mailto:csbutler@mesalabs.com) or at 973-492-8400.

**REPORTE DE VERIFICACIÓN DE MUESTREADORES  
DE PARTÍCULAS HIVOL**

**1. Descripción del Instrumento**

|   |                                     |
|---|-------------------------------------|
| <b>Equipo :</b> Muestreador de partículas | <b>Medición :</b> Flujo Volumétrico |
| <b>Marca :</b> THERMO                     | <b>Flujo :</b> 1.13                 |
| <b>Modelo :</b> HIVOL                     | <b>Rango :</b> 1.02 to 1.24 m3/min  |
| <b>Serie :</b> P9309                      | <b>Resolución :</b> 0,056 m3/min    |
| <b>Código patrimonial :</b> 60226409-0013 | <b>Exactitud :</b> ± 3.0 %          |
| <b>Ubicación :</b> VENTANILLA             | <b>Procedencia :</b> USA            |

**2. Fecha de Verificación** 13/08/2018 **Próxima Verificación**

**3. Lugar de Verificación** OEFA - CHORRILLOS

**4. Método de Verificación** La verificación se realizó según el procedimiento indicado en el manual de operación del fabricante<sup>1</sup>.

<sup>1</sup>OPERATIONS MANUAL - TE-6000 Series, Particulate Matter 10 Microns and less U.S. EPA Federal Reference Number RFPS-0202-141 High Volume Air Sampler

**5. Trazabilidad** Los resultados de la verificación tienen trazabilidad. Se utilizaron los siguientes patrones:

| Descripción         | Marca | Serie / Lote | Nº Certificado |
|---------------------|-------|--------------|----------------|
| VARIFLOW            | TISCH | 2941         | 2941           |
| CALIBRADOR DE FLUJO | BGI   | 162605       | 162605         |

**6. Condiciones Ambientales**

| Temperatura (°C) | Temperatura (°K) | Presión Barométrica (mmHg) |
|------------------|------------------|----------------------------|
| 20.6             | 293.6            | 757.5                      |

**7. Resultados**

| Calibrador |          |
|------------|----------|
| Slope (m)  | Int (b)  |
| 1.02503    | -0.01620 |

| Pto | Orificio "H2O | Qa m3/min | Muestreador "H2O | Pf mmHg | Po/Pa | Tabla de verificación m3/min | % Diferencia |
|-----|---------------|-----------|------------------|---------|-------|------------------------------|--------------|
| 1   | 3.75          | 1.19      | 12.30            | 22.96   | 0.970 | 1.179                        | 1.09         |
| 2   | 3.70          | 1.18      | 14.40            | 26.87   | 0.965 | 1.175                        | 0.77         |
| 3   | 3.65          | 1.18      | 16.30            | 30.42   | 0.960 | 1.166                        | 0.87         |
| 4   | 3.60          | 1.17      | 18.30            | 34.15   | 0.955 | 1.160                        | 0.70         |
| 5   | 3.52          | 1.16      | 20.60            | 38.45   | 0.949 | 1.152                        | 0.29         |

**% Diferencia:** Las directrices de la EPA indican que la diferencia porcentual debe estar dentro de ± 4%. Si es mayor puede deberse a fugas presente durante la verificación y debería ser verificado nuevamente.

| Cálculos                                     |
|--|
| $(Qa) = 1/m*(RAIZ(H2O*(Ta/Pa))-b)$           |
| $(Po/Pa) = 1-Pf/Pa$                          |
| $\% Diferencia = (Look Up Flow - Qa)/Qa*100$ |

**8. Conclusión**

- \* Los resultados del presente documento son válidos únicamente para el objeto verificado.
- \* El instrumento se encuentra en buen estado y dentro de las tolerancias establecidas por el fabricante.

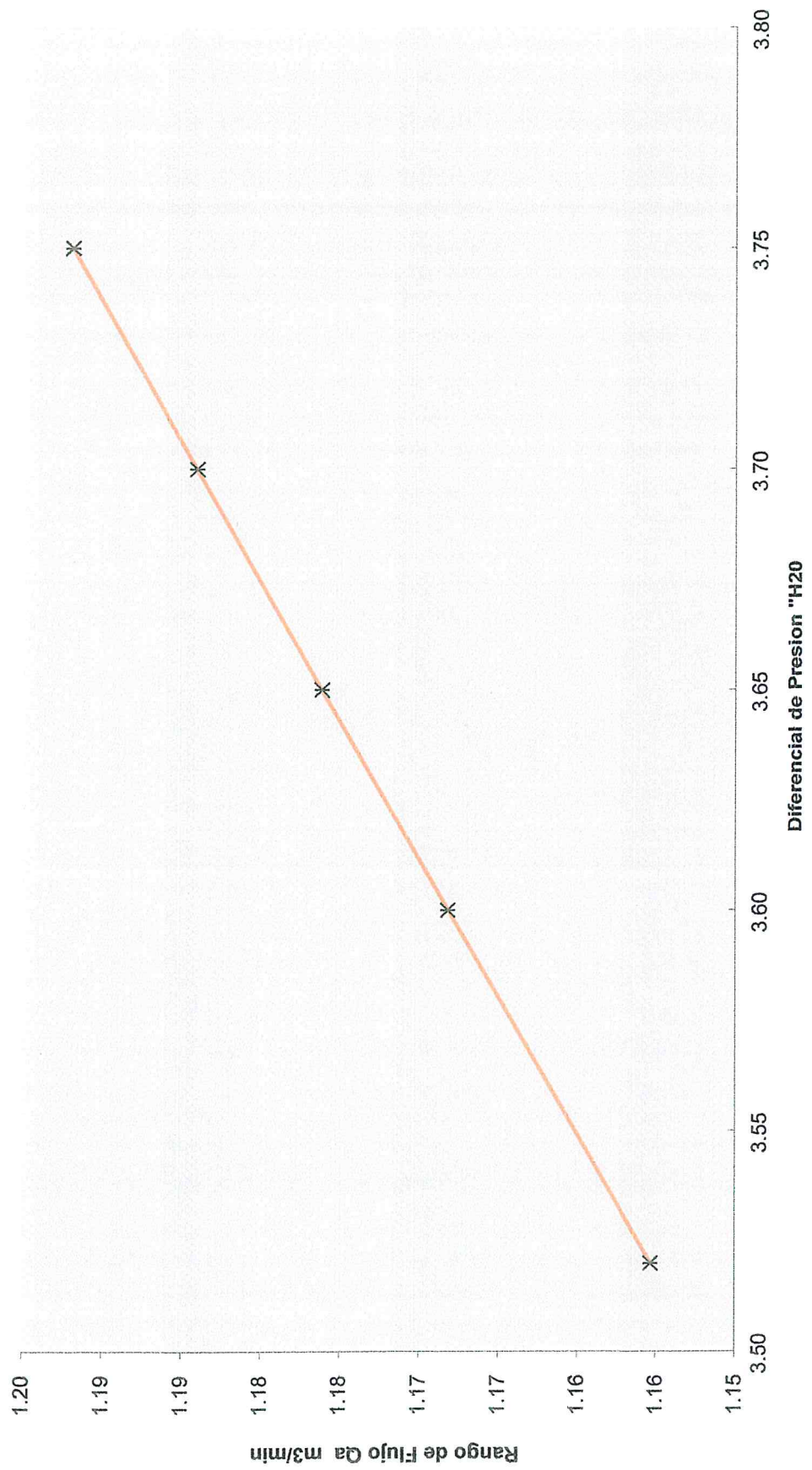


Técnico de calidad del aire  
Pedro Miranda Rodríguez



Coordinador de la gestión de  
muestras y equipos ambientales  
Omar Navarro Acosta

### Curva de Verificación



*Handwritten signature*

# Certificate of Calibration

| Calibration Certification Information |                        |            |       |
|---------------------------------------|------------------------|------------|-------|
| Cal. Date: August 10, 2018            | Rootsmeter S/N: 438320 | Ta: 296    | °K    |
| Operator: Jim Tisch                   |                        | Pa: 750.57 | mm Hg |
| Calibration Model #: TE-5028A         | Calibrator S/N: 2941   |            |       |

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1   | 1              | 2               | 1          | 1.2970      | 4.1        | 1.50        |
| 2   | 3              | 4               | 1          | 1.0070      | 6.7        | 2.50        |
| 3   | 5              | 6               | 1          | 0.9190      | 8.1        | 3.00        |
| 4   | 7              | 8               | 1          | 0.8500      | 9.4        | 3.50        |
| 5   | 9              | 10              | 1          | 0.6450      | 16.2       | 6.00        |

| Data Tabulation |               |  |           |             |   |
|-----------------|---------------|--|-----------|-------------|---|
| Vstd (m3)       | Qstd (x-axis) | $\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis) | Va        | Qa (x-axis) | $\sqrt{\Delta H \left( Ta/Pa \right)}$ (y-axis) |
| 0.9888          | 0.7624        | 1.2212   | 0.9945    | 0.7668      | 0.7691  |
| 0.9854          | 0.9785        | 1.5766   | 0.9911    | 0.9842      | 0.9929  |
| 0.9835          | 1.0702        | 1.7271   | 0.9892    | 1.0764      | 1.0877  |
| 0.9818          | 1.1551        | 1.8655   | 0.9875    | 1.1617      | 1.1749  |
| 0.9728          | 1.5082        | 2.4425   | 0.9784    | 1.5169      | 1.5382  |
| <b>QSTD</b>     | m=            | <b>1.63696</b>   | <b>QA</b> | m=          | <b>1.02503</b>                                  |
|                 | b=            | <b>-0.02573</b>  |           | b=          | <b>-0.01620</b>                                 |
|                 | r=            | <b>1.00000</b>   |           | r=          | <b>1.00000</b>                                  |

| Calculations                           |   |             |  |
|--|---|-------------|--|
| <b>Vstd</b> =                          | $\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$   | <b>Va</b> = | $\Delta Vol((Pa-\Delta P)/Pa)$   |
| <b>Qstd</b> =                          | $Vstd/\Delta Time$  | <b>Qa</b> = | $Va/\Delta Time$   |
| For subsequent flow rate calculations: |   |             |  |
| <b>Qstd</b> =                          | $1/m \left( \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} \right) - b \right)$ | <b>Qa</b> = | $1/m \left( \left( \sqrt{\Delta H \left( Ta/Pa \right)} \right) - b \right)$ |

| Standard Conditions |                                       |
|---------------------|---------------------------------------|
| Tstd:               | 298.15 °K                             |
| Pstd:               | 760 mm Hg                             |
| Key                 |                                       |
| ΔH:                 | calibrator manometer reading (in H2O) |
| ΔP:                 | rootsmeter manometer reading (mm Hg)  |
| Ta:                 | actual absolute temperature (°K)      |
| Pa:                 | actual barometric pressure (mm Hg)    |
| b:                  | intercept                             |
| m:                  | slope                                 |

| RECALIBRATION   |
|---|
| US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30. |



GE Oil & Gas  
 Dresser Inc.  
 16240 Port Northwest Drive, Suite 100  
 Houston, TX 77041  
 USA  
 T +1 800 521 1114 +1 832 590 2303  
 F +1 800 335 5224 +1 832 590 2494

**Customer Information**

Name : CROCKER COMPANY  
 PO No. : 11032  
 Badge No. : NONE

Date Printed : 09 15 2015  
 Bill of Material 055217-172  
 Model : 5M175  
 Serial No. : 0438320  
 Sales Order No. 213535-1  
 Spec. Req. No.  
 Prover Used : 50 cu. ft.  
 WME :

**Unit Description**

5M175 SERIES B3 ROOTS METER, CEX,  
 WITH CONDUIT PORT W/4' PIGTAIL

| MIN STATIC TEST PRESSURE | MIN LEAK TEST PRESSURE | MAX ALLOWABLE OPER PRESSURE | TC Acc at (deg F) | Accuracy | Proof | % Error |
|--------------------------|------------------------|-----------------------------|-------------------|----------|-------|---------|
| 350 psig                 | 219 psig               | 175 psig                    |                   |          |       |         |

This meter has been tested and successfully passed a Shell Pressure Test and Leak Test at the above conditions.

**P R O V E R T E S T D A T A**

| Test Point | Flow Rate Dis Vol | % Rated Capacity | Meter Accuracy | ERROR +/- % | Diff Pressure | TC Meter Accuracy | TC Meter Proof % | ERROR +/- % |
|------------|-------------------|------------------|----------------|-------------|---------------|-------------------|------------------|-------------|
| 1          | 5006.9            | 100.1            | 100.27         | 0.27        | 1.17          |                   |                  |             |
| 2          | 3722.0            | 74.4             | 99.90          | -0.10       | 0.70          |                   |                  |             |
| 3          | 2489.5            | 49.8             | 100.19         | 0.19        | 0.31          |                   |                  |             |
| 4          | 1247.7            | 25.0             | 99.95          | -0.05       | 0.09          |                   |                  |             |
| 5          | 505.7             | 10.1             | 99.97          | -0.03       | 0.02          |                   |                  |             |

Above data has been determined from tests performed with air at atmospheric pressure and ambient temperature, using positive displacement bell or piston provers or sonic nozzle provers dimensionally traceable to the United States National Institute of Standards and Technology (NIST) and/or traceable to the Netherlands Measurement Institute (NMI) for volumetric flow rate.

NMI accredited laboratory no: CE-085

This meter conforms to purchaser specifications.

Test date 15-September-15 by BUSHART, DAVID

Mesa Labs 10 Park Place Butler, NJ 07405  
NIST Traceable Calibration Facility, ISO 9001:2008 Registered



### CERTIFICATE OF CALIBRATION - NIST TRACEABILITY

(Refer to instruction manual for further details of calibration)

tetraCal Serial Number: 162605

DATE: 26-Jul-2018

Calibration Operator: E. Albuja

**Critical Venturi Flow Meter:** Max Uncertainty = 0.346%  
Serial Number: 1A CEESI NVLAP NIST Data File 07BGI-0001  
Serial Number: 2A CEESI NVLAP NIST Data File 07BGI-0003  
Serial Number: 3A CEESI NVLAP NIST Data File 07BGI-0004  
Serial Number: 4A CEESI NVLAP NIST Data File 07BGI-0002

|  |                   |                  |           |
|--|-------------------|------------------|-----------|
| <b>Room Temperature:</b> +/- 0.03°C from -5°C - 70°C | Room Temperature: | 21.3 °C          |           |
| Brand: Telatemp                                      | Serial Number:    | 358654           |           |
| Std Cal Date   | 23-Oct-17         | Std Cal Due Date | 23-Oct-18 |
| tetraCal:  |                   |                  |           |
| Ambient Temperature (set):                           | 21.3 °C           |                  | 911       |
| Aux (filter) Temperature (set):                      | °C                |                  |           |

#### Barometric Pressure and Absolute Pressure

Vaisala Model PTB330(50-1100) Digital Accuracy: 0.03371%  
Serial Number: C4310002  
Std Cal Date 26-Mar-18 Std Cal Due Date 26-Mar-19  
tetraCal:  
Barometric pressure (set): 748 mm of Hg

#### Results of Venturi Calibration

Flow Rate (Q) vs. Pressure Drop ( $\Delta P$ ).

Where: Q=Lpm,  $\Delta P$ = Cm of H2O

No. 1 C 5.35439  $\Delta P$  ^ 0.51955  
No. 2 C 1.16605  $\Delta P$  ^ 0.52384  
No. 3 C 0.21100  $\Delta P$  ^ 0.54025

Overall Uncertainty: 0.35%

Date Placed In Service \_\_\_\_\_  
(To be filled in by operator upon receipt)

Recommended Recalibration Date \_\_\_\_\_  
(12 months from date placed in service)

Revised: March 2016  
Cal102-03T1 Rev B

To Check a Tetra Cal  
 6 - 30.00 Lpm  
 VER.

26-Jul-2018 E. Albuja

BP= 748 mm of Hg

3.41P

Maximum allowable error at any flow rate is .75%.

Serial No. 162605

| Reading     |      | CV    |  |           |         |           |
|-------------|------|-------|--|-----------|---------|-----------|
| Abs. P      |      | Qa    |  | Qa        |         |           |
| Crit. Vent. | Room | Flow  |  | TriCal    | % Error |           |
| mm of Hg    | TEMP | Lpm   |  | Indicated |         |           |
| 193.73      | 21.3 | 7.60  |  | 7.65      | 0.73    |           |
| 486.64      | 21.3 | 19.38 |  | 19.39     | 0.04    | Average % |
| 729.47      | 21.3 | 29.15 |  | 29.06     | -0.33   | 0.15      |

To Check a Tetra Cal  
 1.20 - 6.00 Lpm

BP= 748 mm of Hg

| Reading     |      | CV   |  |           |         |           |
|-------------|------|------|--|-----------|---------|-----------|
| Abs. P      |      | Qa   |  | Qa        |         |           |
| Crit. Vent. | Room | Flow |  | Tri Cal   | % Error |           |
| mm of Hg    | TEMP | Lpm  |  | Indicated |         |           |
| 137.0       | 21.5 | 1.53 |  | 1.53      | 0.57    |           |
| 341.9       | 21.5 | 3.88 |  | 3.86      | -0.42   | Average % |
| 520.6       | 21.5 | 5.93 |  | 5.96      | 0.54    | 0.23      |

To Check a Tetra Cal  
 0.10 - 1.20 Lpm

BP= 748 mm of Hg

| Reading     |      | CV    |  |           |         |           |
|-------------|------|-------|--|-----------|---------|-----------|
| Abs. P      |      | Qa    |  | Qa        |         |           |
| Crit. Vent. | Room | Flow  |  | TriCal    | % Error |           |
| mm of Hg    | TEMP | Lpm   |  | Indicated |         |           |
| 219.15      | 21.7 | 0.397 |  | 0.399     | 0.50    |           |
| 553.82      | 21.7 | 1.049 |  | 1.049     | 0.00    | Average % |
| 625.4       | 21.7 | 1.188 |  | 1.194     | 0.47    | 0.32      |



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- Upgraded firmware and hardware
- Temperature and pressure sensor calibration if required
- Multi-point flow calibration with adjustment
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This means that they cannot reset calibration points, perform repairs and maintenance with authorized parts, provide hardware and firmware updates or even check and change batteries.

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REPORTE DE VERIFICACIÓN DE MUESTREADORES  
DE PARTÍCULAS HIVOL

1. Descripción del Instrumento

|                                    |                              |
|------------------------------------|------------------------------|
| Equipo : Muestreador de partículas | Medición : Flujo Volumétrico |
| Marca : THERMO                     | Flujo : 1.13                 |
| Modelo : HIVOL                     | Rango : 1.02 to 1.24 m3/min  |
| Serie : P9328                      | Resolución : 0,056 m3/min    |
| Código patrimonial : 60226409-0014 | Exactitud : ± 3.0 %          |
| Ubicación : Cerro de Pasco         | Procedencia : USA            |

2. Fecha de Verificación 10/08/2018

Próxima Verificación

3. Lugar de Verificación Cerro de Pasco

4. Método de Verificación La verificación se realizó según el procedimiento indicado en el manual de operación del fabricante<sup>1</sup>.

<sup>1</sup>OPERATIONS MANUAL - TE-6000 Series, Particulate Matter 10 Microns and less U.S. EPA Federal Reference Number RFP5-0202-141 High Volume Air Sampler

5. Trazabilidad Los resultados de la verificación tienen trazabilidad. Se utilizaron los siguientes patrones:

| Descripción                   | Marca               | Serie / Lote | Nº Certificado |
|-------------------------------|---------------------|--------------|----------------|
| VARIFLOW                      | TISCH               | 2974         | 2974           |
| PATRÓN DE PRESIÓN ATMOSFÉRICA | CHINOOK ENGINEERING | C100207      | LF-2282018     |

6. Condiciones Ambientales

| Temperatura (°C) | Temperatura (°K) | Presión Barométrica (mmHg) |
|------------------|------------------|----------------------------|
| 18.0             | 291.0            | 459.9                      |

7. Resultados

| Calibrador |          |
|------------|----------|
| Slope (m)  | Int (b)  |
| 1.01646    | -0.00760 |

| Pto | Orificio "H2O | Qa m3/min | Muestreador "H2O | Pf mmHg | Po/Pa | Tabla de verificación m3/m in | % Diferencia |
|-----|---------------|-----------|------------------|---------|-------|-------------------------------|--------------|
| 1   | 2.20          | 1.17      | 5.10             | 9.52    | 0.979 | 1.192                         | -2.04        |
| 2   | 2.25          | 1.18      | 7.10             | 13.25   | 0.971 | 1.181                         | 0.03         |
| 3   | 2.30          | 1.19      | 9.10             | 16.98   | 0.963 | 1.171                         | 1.95         |
| 4   | 2.33          | 1.20      | 11.20            | 20.90   | 0.955 | 1.161                         | 3.41         |
| 5   | 2.33          | 1.20      | 12.00            | 22.40   | 0.951 | 1.156                         | 3.83         |

% Diferencia: Las directrices de la EPA indican que la diferencia porcentual debe estar dentro de ± 4%. Si es mayor puede deberse a fugas presente durante la verificación y debería ser verificado nuevamente.


| Cálculos  |
|---|
| $(Qa) = 1/m * (RAIZ(H2O * (Ta/Pa)) - b)$ $(Po/Pa) = 1 - Pf/Pa$ $\% \text{ Diferencia} = (Look Up Flow - Qa)/Qa * 100$ |

8. Conclusión

- \* Los resultados del presente documento son válidos únicamente para el objeto verificado.
- \* El instrumento se encuentra en buen estado y dentro de las tolerancias establecidas por el fabricante.

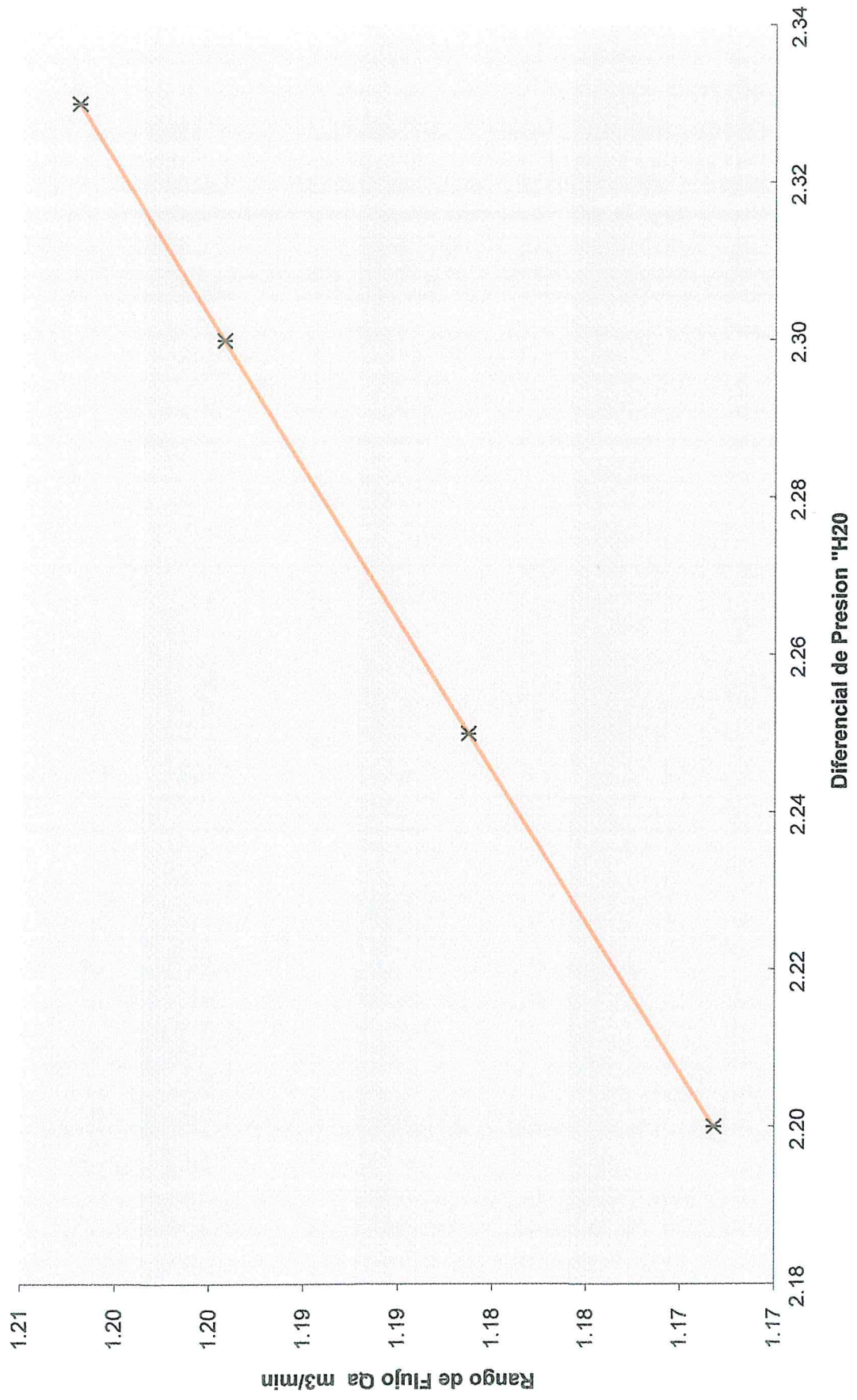


Técnico de calidad del aire  
Pedro Miranda Rodríguez



Coordinador de la gestión de  
muestras y equipos ambientales  
Omar Navarro Acosta

### Curva de Verificación



*[Handwritten signature]*

# Certificate of Calibration

| Calibration Certification Information |                        |                  |  |
|---------------------------------------|------------------------|------------------|--|
| Cal. Date: August 10, 2018            | Rootsmeter S/N: 438320 | Ta: 296 °K       |  |
| Operator: Jim Tisch                   |                        | Pa: 750.57 mm Hg |  |
| Calibration Model #: TE-5028A         | Calibrator S/N: 2974   |                  |  |

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1   | 1              | 2               | 1          | 1.2980      | 4.1        | 1.50        |
| 2   | 3              | 4               | 1          | 1.0090      | 6.8        | 2.50        |
| 3   | 5              | 6               | 1          | 0.9210      | 8.2        | 3.00        |
| 4   | 7              | 8               | 1          | 0.8460      | 9.6        | 3.50        |
| 5   | 9              | 10              | 1          | 0.6430      | 16.5       | 6.00        |

| Data Tabulation |               |  |           |             |   |  |
|-----------------|---------------|--|-----------|-------------|---|--|
| Vstd (m3)       | Qstd (x-axis) | $\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis) | Va        | Qa (x-axis) | $\sqrt{\Delta H \left( Ta/Pa \right)}$ (y-axis) |  |
| 0.9888          | 0.7618        | 1.2212   | 0.9945    | 0.7662      | 0.7691  |  |
| 0.9853          | 0.9765        | 1.5766   | 0.9909    | 0.9821      | 0.9929  |  |
| 0.9834          | 1.0678        | 1.7271   | 0.9891    | 1.0739      | 1.0877  |  |
| 0.9815          | 1.1602        | 1.8655   | 0.9872    | 1.1669      | 1.1749  |  |
| 0.9724          | 1.5123        | 2.4425   | 0.9780    | 1.5210      | 1.5382  |  |
| <b>QSTD</b>     | m=            | <b>1.62327</b>   | <b>QA</b> | m=          | <b>1.01646</b>                                  |  |
|                 | b=            | <b>-0.01207</b>  |           | b=          | <b>-0.00760</b>                                 |  |
|                 | r=            | <b>0.99994</b>   |           | r=          | <b>0.99994</b>                                  |  |

| Calculations                           |   |     |  |
|--|---|-----|--|
| Vstd=                                  | $\Delta Vol \left( \frac{Pa - \Delta P}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)$                                 | Va= | $\Delta Vol \left( \frac{Pa - \Delta P}{Pa} \right)$                         |
| Qstd=                                  | Vstd/ΔTime  | Qa= | Va/ΔTime   |
| For subsequent flow rate calculations: |   |     |  |
| Qstd=                                  | $1/m \left( \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} \right) - b \right)$ | Qa= | $1/m \left( \left( \sqrt{\Delta H \left( Ta/Pa \right)} \right) - b \right)$ |

| Standard Conditions                       |           |
|---|-----------|
| Tstd:                                     | 298.15 °K |
| Pstd:                                     | 760 mm Hg |
| Key                                       |           |
| ΔH: calibrator manometer reading (in H2O) |           |
| ΔP: rootsmeter manometer reading (mm Hg)  |           |
| Ta: actual absolute temperature (°K)      |           |
| Pa: actual barometric pressure (mm Hg)    |           |
| b: intercept                              |           |
| m: slope                                  |           |

| RECALIBRATION   |
|---|
| US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30. |



GE Oil & Gas  
 Dresser Inc.  
 16240 Port Northwest Drive, Suite 100  
 Houston, TX 77041  
 USA  
 T +1 800 521 1114 +1 832 590 2303  
 F +1 800 335 5224 +1 832 590 2494

**Customer Information**

Name : CROCKER COMPANY  
 PO No. : 11032  
 Badge No. : NONE

Date Printed : 09 15 2015  
 Bill of Material 055217-172  
 Model : 5M175  
 Serial No. : 0438320  
 Sales Order No. 213535-1  
 Spec. Req. No.  
 Prover Used : 50 cu. ft.  
 WME :

**Unit Description**

5M175 SERIES B3 ROOTS METER, CEX,  
 WITH CONDUIT PORT W/4' PIGTAIL

| MIN STATIC TEST PRESSURE | MIN LEAK TEST PRESSURE | MAX ALLOWABLE OPER PRESSURE | TC Acc at (deg F) | Accuracy | Proof | % Error |
|--------------------------|------------------------|-----------------------------|-------------------|----------|-------|---------|
| 350 psig                 | 219 psig               | 175 psig                    |                   |          |       |         |

This meter has been tested and successfully passed a Shell Pressure Test and Leak Test at the above conditions.

**P R O V E R T E S T D A T A**

| Test Point | Flow Rate Dis Vol | % Rated Capacity | Meter Accuracy | ERROR +/- % | Diff Pressure | TC Meter Accuracy | TC Meter Proof % | ERROR +/- % |
|------------|-------------------|------------------|----------------|-------------|---------------|-------------------|------------------|-------------|
| 1          | 5006.9            | 100.1            | 100.27         | 0.27        | 1.17          |                   |                  |             |
| 2          | 3722.0            | 74.4             | 99.90          | -0.10       | 0.70          |                   |                  |             |
| 3          | 2489.5            | 49.8             | 100.19         | 0.19        | 0.31          |                   |                  |             |
| 4          | 1247.7            | 25.0             | 99.95          | -0.05       | 0.09          |                   |                  |             |
| 5          | 505.7             | 10.1             | 99.97          | -0.03       | 0.02          |                   |                  |             |

Above data has been determined from tests performed with air at atmospheric pressure and ambient temperature, using positive displacement bell or piston provers or sonic nozzle provers dimensionally traceable to the United States National Institute of Standards and Technology (NIST) and/or traceable to the Netherlands Measurement Institute (NMI) for volumetric flow rate.

NMI accredited laboratory no: CE-085

This meter conforms to purchaser specifications.

Test date 15-September-15 by BUSHART, DAVID

1. **Cliente** : ORGANISMO DE EVALUACION Y FISCALIZACION AMBIENTAL - OEFA
2. **Dirección** : Av. Faustino Sánchez Carrión Nro. 603 Lima - Lima - Jesús María
3. **Datos del Instrumento**
- |                                |                            |                                |                                  |
|--------------------------------|----------------------------|--------------------------------|----------------------------------|
| <b>Instrumento de medición</b> | : Medidor de flujo digital | <b>Intervalo de indicación</b> | : 0,9 L/min a 19,0 L/min         |
| <b>Marca</b>                   | : Chinook Engineering      | <b>Serie unidad de control</b> | : C100207                        |
| <b>Modelo</b>                  | : Streamline Pro - M       | <b>Resolución</b>              | : 0,01 L/min                     |
| <b>Código Interno</b>          | : No indica                | <b>Precisión (±)</b>           | : 1,2% de la escala completa (*) |
4. **Lugar de Calibración** : Laboratorio de flujo de aire - Green Group PE S.A.C.
5. **Fecha de Calibración** : 2018-07-31
6. **Condiciones Ambientales** :

|                | Temperatura (°C) | Humedad relativa (% hr) | Presión atmosférica (mbar) |
|----------------|------------------|-------------------------|----------------------------|
| <b>Inicial</b> | 20,0             | 70,8                    | 1000,8                     |
| <b>Final</b>   | 20,1             | 71,2                    | 1000,8                     |

7. **Trazabilidad**

| Patrón           | Código Interno | Nº de Certificado | F. Vencimiento |
|------------------|----------------|-------------------|----------------|
| Medidor de flujo | GGP-66         | 193151            | 2018-10-27     |

8. **Método de Calibración.**

La calibración se realizó por comparación del instrumento con patrones trazables según "PCG-005 Procedimiento para la Calibración de Medidores de Flujo - Green Group"

9. **Resultado de Medición.**

| Patrón (L/min) | Instrumento (L/min) | Corrección (L/min) | Incertidumbre (L/min) |
|----------------|---------------------|--------------------|-----------------------|
| 1,585          | 1,64                | -0,055             | 0,009                 |
| 4,663          | 4,40                | 0,263              | 0,014                 |
| 10,263         | 9,74                | 0,523              | 0,032                 |
| 16,679         | 14,92               | 1,759              | 0,046                 |
| 18,708         | 16,32               | 2,388              | 0,051                 |

| Verificación   | Patrón | Instrumento | Corrección |
|----------------|--------|-------------|------------|
|                | T (°C) | 19,7        | 19,5       |
| Presión (mmHg) | 750,7  | 749,0       | 1,7        |


10. **Observaciones:**

- a) El número M100207 está grabado en la unidad de medida.  
(\*) Dato tomado del manual del instrumento.

- La Incertidumbre de medición expandida reportada es la incertidumbre de medición estándar multiplicada por el factor de cobertura k=2 de modo que la probabilidad de cobertura corresponde aproximadamente a un nivel de confianza del 95%.
- Los resultados emitidos son válidos solo para el instrumento en el momento de la calibración.
- Se recomienda al usuario recalibrar a intervalos adecuados, los cuales deben ser elegidos con base a las características del instrumento.
- La incertidumbre declarada en el presente certificado ha sido estimado siguiendo las directrices de: "Guía para la expresión de la incertidumbre de medida" primera edición, septiembre 2008 CEM.
- El certificado de calibración solo puede ser difundido completamente y sin modificaciones, sin firma y sellos carecen de validez.

Fecha de Emisión

2018-07-31



**Enzo Barrera Zavala**  
Jefe de Laboratorio de Calibración  
GREEN GROUP PE S.A.C.



NVLAP Lab Code 200661-0

### Calibration Certificate

Certificate No. 193151  
Product 200-510H Defender 510 High Flow  
Serial No. 132229  
Cal. Date 27-Oct-2017

Sold To: Green Group PE SAC  
Av. Aviacion N 4210  
Surquillo - Lima, Peru

All calibrations are performed at Mesa Laboratories, Inc., 10 Park Place, Butler, NJ, 07405, an ISO 17025:2005 accredited laboratory through NVLAP of NIST. This report shall not be reproduced except in full without the written approval of the laboratory. Results only relate to the items calibrated. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

### As Received Calibration Data

|                    |                      |           |                     |              |
|--------------------|----------------------|-----------|---------------------|--------------|
| Technician         | Sonia Otero          |           | Lab. Pressure       | 746 mmHg     |
|                    |                      |           | Lab. Temperature    | 22.2 °C      |
| Instrument Reading | Lab Standard Reading | Deviation | Allowable Deviation | As Received  |
| 25008 ccm          | 25058.5 ccm          | -0.2%     | 1.00%               | In Tolerance |
| 5018.1 ccm         | 5006.7 ccm           | 0.23%     | 1.00%               | In Tolerance |
| 1509.1 ccm         | 1503.45 ccm          | 0.38%     | 1.00%               | In tolerance |

### Mesa Laboratories Standards Used

|             |                        |                  |                      |
|-------------|------------------------|------------------|----------------------|
| Description | Standard Serial Number | Calibration Date | Calibration Due Date |
| ML 500-44   | 113762                 | 26-Apr-2017      | 26-Apr-2018          |



NVLAP Lab Code 200661-0

### As Shipped Calibration Data

|                    |                      |                  |                     |              |
|--------------------|----------------------|------------------|---------------------|--------------|
| Certificate No     | 193151               | Lab. Pressure    | 754 mmHg            |              |
| Technician         | Sonia Otero          | Lab. Temperature | 22.5 °C             |              |
| Instrument Reading | Lab Standard Reading | Deviation        | Allowable Deviation | As Shipped   |
| 25622.1 ccm        | 25705.4 ccm          | -0.32%           | 1.00%               | In Tolerance |
| 5130.66 ccm        | 5126.42 ccm          | 0.08%            | 1.00%               | In Tolerance |
| 1567.6 ccm         | 1563.54 ccm          | 0.26%            | 1.00%               | In Tolerance |

### Mesa Laboratories Standards Used

|             |                        |                  |                      |
|-------------|------------------------|------------------|----------------------|
| Description | Standard Serial Number | Calibration Date | Calibration Due Date |
| ML-500-44   | 113761                 | 27-Feb-2017      | 27-Feb-2018          |

#### Calibration Notes

The expanded uncertainty of flow has a coverage factor of  $k = 2$  for a confidence interval of approximately 95%.

Flow testing is in accordance with our test number PR17-13 with an expanded uncertainty of 0.27% using high-purity nitrogen or filtered laboratory air.

Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

#### Technician Notes:

Mohammed Aziz  
Director of Engineering  
Mesa Laboratories, Inc., Butler, NJ

1. Cliente : ORGANISMO DE EVALUACION Y FISCALIZACION AMBIENTAL - OEFA
2. Dirección : Av. Faustino Sánchez Carrión Nro. 603 Lima - Lima - Jesús María
3. Datos del Instrumento
- |                         |                             |                  |                          |
|-------------------------|-----------------------------|------------------|--------------------------|
| Instrumento de medición | : Muestreador de Partículas | Flujo de Trabajo | : 16,67 L/min            |
| Marca                   | : BGI                       | Serie            | : 2085                   |
| Modelo                  | : PQ 200                    | Resolución       | : 0,01 L/min             |
| Código Interno          | : 60226408-0006             | Precisión (±)    | : 5% del valor seteado * |
4. Lugar de Calibración : Laboratorio de flujo de aire - Green Group PE S.A.C.
5. Fecha de Calibración : 2018-07-30
6. Condiciones Ambientales :

|         | Temperatura (°C) | Humedad relativa (% h.r) | Presión atmosférica (mbar) |
|---------|------------------|--------------------------|----------------------------|
| Inicial | 20,3             | 71,8                     | 1002,1                     |
| Final   | 20,4             | 70,2                     | 1001,2                     |

7. Patrones de referencia.

| Patrón           | Código Interno | Nº Certificado | F. Vencimiento |
|------------------|----------------|----------------|----------------|
| Medidor de flujo | GGP-05         | 193152         | 2018-10-27     |

8. Método de Calibración.

La calibración se realizó por comparación del instrumento con patrones trazables según "PCG-005 Procedimiento para la Calibración de Medidores de Flujo - Green Group"

9. Resultado de Medición.

| Patrón (L/min) | Instrumento (L/min) | Corrección (L/min) | Incertidumbre (L/min) |
|----------------|---------------------|--------------------|-----------------------|
| 16,701         | 16,67               | 0,031              | 0,046                 |

| Verificación | Patrón         |             |            |
|--------------|----------------|-------------|------------|
|              | T (°C)         | Instrumento | Corrección |
|              | 20,7           | 20,7        | 0,0        |
|              | Presión (mmHg) | 753,3       | 753        |
|              |                |             | 0,3        |

10. Observaciones:

- a) Para la calibración se utilizó el impactador PM2.5 con S/N 190514-66  
\*) Dato tomado del manual del instrumento.

- La Incertidumbre de medición expandida reportada es la incertidumbre de medición estándar multiplicada por el factor de cobertura  $k=2$  de modo que la probabilidad de cobertura corresponde aproximadamente a un nivel de confianza del 95%.
- Los resultados emitidos son válidos solo para el instrumento y filtro adecuado, en el momento de la calibración.
- Se recomienda al usuario recalibrar a intervalos adecuados, los cuales deben ser elegidos con base a las características del instrumento
- La incertidumbre declarada en el presente certificado ha sido estimado siguiendo las directrices de: "Guía para la expresión de la incertidumbre de medida" primera edición, septiembre 2008 CEM.
- El certificado de calibración solo puede ser difundido completamente y sin modificaciones, sin firma y sellos carecen de validez.

Fecha de Emisión

2018-07-31



**Enzo Barrera Zavala**  
Jefe de Laboratorio de Calibración  
GREEN GROUP PE S.A.C.

## CERTIFICADO DE CALIBRACIÓN

*Certificate of calibration*

N°: LG - 1512017

Página (Page) 1 de 3

### Green Group PE S.A.C

Av. Aviación 4210 Surquillo Lima - Perú

www.greengroup.com.pe

Central: 560-6134 / 273-3550

|   |  |
|---|--|
| <b>INSTRUMENTO</b><br><i>Equipment</i>                        | Analizador Continuo de Dióxido de Azufre, Sulfuro de Hidrógeno.  |
| <b>FABRICANTE</b><br><i>Manufacturer</i>                      | Thermo Scientific  |
| <b>MODELO</b><br><i>Model</i>                                 | 450i   |
| <b>IDENTIFICACIÓN</b><br><i>Identification</i>                | 1009241444   |
| <b>SOLICITANTE</b><br><i>Customer</i>                         | ORGANISMO DE EVALUACION Y FISCALIZACION AMBIENTAL - OEFA<br>Av. Faustino Sánchez Carrión Nro. 603 Lima - Jesús María |
| <b>FECHA/S DE CALIBRACIÓN</b><br><i>Date/s of calibration</i> | 2017-08-09   |

**Signatario/s autorizado/s**  
*Authorized signatory/ies*

**Fecha de emisión**  
*Date of issue*



Enzo Barrera  
Jefe de laboratorio de Calibración

2017-08-09

- . La Incertidumbre de medición expandida reportada es la incertidumbre de medición estándar multiplicada por el factor de cobertura  $k=2$  de modo que la probabilidad de cobertura corresponde aproximadamente a un nivel de confianza del 95%.
- . Los resultados emitidos son válidos solo para el instrumento y sensores calibrados, en el momento de la calibración.
- . Se recomienda al usuario recalibrar a intervalos adecuados, los cuales deben ser elegidos con base a las características del instrumento.
- . La incertidumbre declarada en el presente certificado ha sido estimado siguiendo las directrices de: "Guía para la expresión de la incertidumbre de medida" primera edición, septiembre 2008 CEM.
- . Este certificado de calibración solo puede ser ditundido completamente y sin modificaciones, sin firma y sello carecen de validez.
- . Este certificado no podrá ser reproducido parcialmente sin la aprobación por escrito del laboratorio que lo emite



## 1. DATOS TÉCNICOS DEL INSTRUMENTO

Página 2 de 3

Linealidad: 1% de Escala  
 Precisión: 1 ppb  
 Deriva: 1% de Escala  
 Resolución: 1 ppb, 0,1 ppb

## 2. MÉTODO DE CALIBRACIÓN

La calibración se realizó por lecturas del equipo con gases patrón según "Procedimiento PCG-001 para la calibración de analizadores de Gases" Green Group PE SAC.

## 3. LUGAR DE CALIBRACIÓN.

Laboratorio de Gases - Green Group PE SAC

## 4. CONDICIONES AMBIENTALES

|         | Temperatura °C | Humedad relativa %hr | Presión Atmosférica mbar |
|---------|----------------|----------------------|--------------------------|
| Inicial | 24,0           | 64%                  | 999,4                    |
| Final   | 23,0           | 68%                  | 996,8                    |

## 5. TRAZABILIDAD

| Patrón usado        | Código Interno  | N° de lote o N° de certificado | F. Vencimiento |
|---------------------|-----------------|--------------------------------|----------------|
| MFC CALIBRACIÓN 1   | GGP-41.1        | MM04132017KC01                 | 2018-04-13     |
| MFC CALIBRACIÓN 2   | GGP-41.2        | MM04132017KC02                 | 2018-04-13     |
| MFC DILUCIÓN        | GGP-41.3        | MM04072017KC01                 | 2018-04-07     |
| CILINDRO DE GAS H2S | GGP - CG - 03-1 | CC473791                       | 2018-12-03     |
| CILINDRO DE GAS SO2 | GGP-CG-13       | CC473867                       | 2019-12-02     |
| CILINDRO DE GAS SO2 | GGP-CG-04.1     | SA15728                        | 2019-02-12     |

## 6. PARÁMETROS DE MEDICIÓN

| Parámetros         | Inicial | Final  | Rango               |
|--------------------|---------|--------|---------------------|
| Rango (ppb)        | 500     | 500    | (0 - 20) ppm        |
| Average Time (sec) | 60      | 60     | (0 a 300) s         |
| SO2 BKG            | 6,8     | 5,8    | -                   |
| SO2 Coef           | 0,676   | 0,656  | -                   |
| H2S Coef           | 0,929   | 0,95   | -                   |
| Internal Temp (°C) | 31      | 28,9   | (8 a 47) °C         |
| Chamb Temp (°C)    | 45      | 44,9   | (47 a 51) °C        |
| Convert Temp       | 322,8   | 324,7  | (300 a 400)°C       |
| Press (mmHg)       | 763,6   | 762,8  | (300 a 800) mmHg    |
| Flow (L/min)       | 0,954   | 0,962  | (0,3 a 1) L/min     |
| Lamp Intens (Hz)   | 84      | 84     | (60 a 120) Hz       |
| Lamp Voltage (v)   | 849     | 830    | (600 a 1200) Volt.  |
| PMT Supply (v)     | -680,4  | -680,8 | (-400 a -900) Volt. |

## 7. LECTURAS DE AJUSTE DEL INSTRUMENTO

### Lectura de SO<sub>2</sub>

|      | Patrón | Lectura inicial | Lectura Final | Unidades |
|------|--------|-----------------|---------------|----------|
| Zero | 0,5    | 1,5             | 1,5           | ppb      |
| Span | 400    | 409             | 399           | ppb      |
| Zero | 0,5    | 0,9             | 1,1           | ppb      |

### Lectura de H<sub>2</sub>S

|      | Patrón | Lectura inicial | Lectura Final | Unidades |
|------|--------|-----------------|---------------|----------|
| Zero | 0,5    | 0,5             | 0,6           | ppb      |
| Span | 80     | 83,2            | 81,2          | ppb      |
| Zero | 0,5    | 1               | 0,8           | ppb      |

## 8. RESULTADO DE MEDICIÓN

### Lectura de SO<sub>2</sub>

| Lectura del instrumento | Concentración del patrón | Corrección | Incertidumbre |
|-------------------------|--------------------------|------------|---------------|
| ppb                     | ppb                      | ppb        | ppb           |
| 302,2                   | 302,0                    | -0,2       | 5,2           |
| 195,1                   | 199,7                    | 4,6        | 4,5           |
| 96,2                    | 100,1                    | 3,9        | 4,0           |
| 48,4                    | 51,1                     | 2,7        | 3,8           |
| 0,7                     | 0,5                      | -0,2       | 0,6           |

### Lectura de H<sub>2</sub>S

| Lectura del instrumento | Concentración del patrón | Corrección | Incertidumbre |
|-------------------------|--------------------------|------------|---------------|
| ppb                     | ppb                      | ppb        | ppb           |
| 81,8                    | 80,6                     | -1,2       | 4,0           |
| 61,3                    | 60,6                     | -0,7       | 3,9           |
| 40,5                    | 40,5                     | 0,0        | 3,8           |
| 21,2                    | 20,5                     | -0,7       | 3,8           |
| 0,3                     | 0,5                      | 0,2        | 0,6           |

## 9. OBSERVACIONES

- El instrumento se ajustó antes de la calibración.
  - La calibración se inició después de un periodo de atemperamiento y estabilización.
  - Considerar que 1 ppb equivale a  $1 \cdot 10^{-9}$  mol/mol.
  - La identificación interna del equipo es: 67220261-0003
- \* La incertidumbre de la Impureza del aire cero no se encuentra dentro del alcance de la calibración.

# ANEXO N° 5



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## Cadenas de custodia

**CERTIMIN S.A. VOBº** **FECHA**  
**RECEPCIÓN 1 :** 19/04/2019  
**RECEPCIÓN 2 :** 19/04/2019

P19-2135-  
 D321065.019



**CADENA DE CUSTODIA - CALIDAD DE AIRE**

**DATOS GENERALES**  
 Organismo de Evaluación y Fiscalización Ambiental  
 Av. Faustino Sánchez Carrión N° 803, 607, 615 - Jesús María  
 Martella Alata / Cindy Alfaro  
 936340841 / 999883864

**DATOS DEL MUESTREO**  
 Ubicación: Vantallilla y Ml. Peru  
 Provincia: Constitucional del Callao  
 Departamento: -

**DATOS DEL ENVÍO**  
 Envío por: Fecha: Hora:  
 Medio de Envío: Aerolínea  Agencia   
 T. Privado  Otro

Nombre o Razón social: Dirección: Persona de contacto: Teléfono/Anexo: Correo Electrónico: Referencia:

| CÓDIGO DE LABORATORIO | CÓDIGO DEL PUNTO DE MUESTREO | INICIO           |       | FINAL            |       | PM 10 (1) | Metales (1) | PARAMETROS (Marcar con "X") | CÓDIGO DE FILTRO |        |       |
|-----------------------|------------------------------|------------------|-------|------------------|-------|-----------|-------------|-----------------------------|------------------|--------|-------|
|                       |                              | FECHA (DD/MM/AA) | HORA  | FECHA (DD/MM/AA) | HORA  |           |             |                             | PM 10            | PM 2.5 | OTROS |
|                       | CA-VMP-1                     | 4/03/2019        | 16:43 | 5/03/2019        | 16:18 | X         | X           | 0058A.R19                   | -                | -      | -     |
|                       | CA-VMP-1                     | 7/03/2019        | 12:54 | 8/03/2019        | 11:54 | X         | X           | 0066A.R19                   | -                | -      | -     |
|                       | CA-VMP-1                     | 13/03/2019       | 15:32 | 14/03/2019       | 14:32 | X         | X           | 0069A.R19                   | -                | -      | -     |
|                       | CA-VMP-1                     | 16/03/2019       | 11:40 | 17/03/2019       | 11:15 | X         | X           | 0073A.R19                   | -                | -      | -     |
|                       | CA-VMP-1                     | 19/03/2019       | 11:31 | 20/03/2019       | 11:31 | X         | X           | 0077A.R19                   | -                | -      | -     |
|                       | CA-VMP-1                     | 29/03/2019       | 12:57 | 30/03/2019       | 12:27 | X         | X           | 0081A.R19                   | -                | -      | -     |
|                       | CA-VMP-2                     | 4/03/2019        | 15:28 | 5/03/2019        | 14:58 | X         | X           | 0031A.R19                   | -                | -      | -     |
|                       | CA-VMP-2                     | 7/03/2019        | 11:48 | 8/03/2019        | 11:18 | X         | X           | 0064A.R19                   | -                | -      | -     |
|                       | CA-VMP-2                     | 13/03/2019       | 15:47 | 14/03/2019       | 14:47 | X         | X           | 0070A.R19                   | -                | -      | -     |
|                       | CA-VMP-2                     | 16/03/2019       | 11:53 | 17/03/2019       | 11:25 | X         | X           | 0074A.R19                   | -                | -      | -     |
|                       | CA-VMP-2                     | 19/03/2019       | 11:44 | 20/03/2019       | 11:44 | X         | X           | 0076A.R19                   | -                | -      | -     |
|                       | CA-VMP-2                     | 29/03/2019       | 13:36 | 30/03/2019       | 13:06 | X         | X           | 0082A.R19                   | -                | -      | -     |

OBSERVACIONES GENERALES

(1) Alto volumen

Se solicita devolver los filtros evaluados luego de emitida la conformidad

**CERTIMIN S.A.**  
 03 ABR 2019  
 15:30  
**Recepcion Ambiental**

PARAMETROS METEOROLOGICOS (Marcar con "X")

Humedad  Velocidad/Dirección del Viento   
 Temperatura  Radiación   
 Presión  Precipitación

PARA SER LLENADO POR EL AREA DE RECEPCIÓN DEL LABORATORIO

**CONDICIONES DE RECEPCIÓN DE MUESTRAS PARA LAS SOLUCIONES CAPTADORAS**

Envases adecuados  SI  NO  
 Con Ice pack     
 Dentro del tiempo de vida útil

**CONFORMIDAD DE RECEPCIÓN DE MUESTRAS**

Fecha de Recepción: Hora de Recepción: Recibido por: Firma:

**OBSERVACIONES**

RESPONSABLE 1: FIRMA: Cindy Alfaro  
 RESPONSABLE 2: FIRMA: Martella Alata

01 MD 694 0118

SSD 2º 304



CADENA DE CUSTODIA - CALIDAD DE AIRE

DATOS GENERALES

Organismo de Evaluación y Fiscalización Ambiental  
 Av. Faustino Sánchez Carrión N° 603, 607, 615 - Jesús María  
 Manella Alata / Cindy Alfaro  
 936340981 / 999883684  
 manella.alata.alvarez@gmail.com / cindy.alfaro.guiochea@gmail.com

CUC: 0001-3-2019-401  
 UBICACIÓN: Distrito: Ventanilla y Mi Perú  
 Provincia: Constitucional del Callao  
 Departamento: -

RS N°: 363-2019

PÁGINA 2 de 2  
 DATOS DEL ENVÍO  
 Envío por: \_\_\_\_\_ Hora: \_\_\_\_\_  
 Fecha: \_\_\_\_\_  
 Medio de Envío: Aerolínea  Agencia   
 T. Privado   
 Otro

**CERTIMIN S.A. VºBº FECHA**  
**RECEPCIÓN 1 :** 219 PY 103  
**RECEPCIÓN 2 :** -1-1-  
 219 PY 103  
 -1-1-

PARAMETROS (Marcar con "X")

| CÓDIGO DE LABORATORIO DE MUESTREO | CÓDIGO DEL PUNTO DE MUESTREO | INICIO           |            | FINAL            |      | PM 10 (1) | Metales (1) | PARAMETROS (Marcar con "X") |        |       |
|-----------------------------------|------------------------------|------------------|------------|------------------|------|-----------|-------------|-----------------------------|--------|-------|
|                                   |                              | FECHA (DD/MM/AA) | HORA       | FECHA (DD/MM/AA) | HORA |           |             | PM 10                       | PM 2.5 | OTROS |
| CA-VMP-6                          | 4/03/2019                    | 14:03            | 5/03/2019  | 14:03            | X    | X         | 0027A.R19   | -                           | -      |       |
| CA-VMP-6                          | 7/03/2019                    | 11:25            | 8/03/2019  | 11:09            | X    | X         | 0063A.R19   | -                           | -      |       |
| CA-VMP-6                          | 13/03/2019                   | 14:56            | 14/03/2019 | 14:07            | X    | X         | 0067A.R19   | -                           | -      |       |
| CA-VMP-6                          | 16/03/2019                   | 10:20            | 17/03/2019 | 10:43            | X    | X         | 0071A.R19   | -                           | -      |       |
| CA-VMP-6                          | 19/03/2019                   | 11:00            | 20/03/2019 | 11:00            | X    | X         | 0075A.R19   | -                           | -      |       |
| CA-VMP-6                          | 29/03/2019                   | 11:30            | 30/03/2019 | 11:30            | X    | X         | 0079A.R19   | -                           | -      |       |
| CA-VMP-7                          | 4/03/2019                    | 16:23            | 5/03/2019  | 15:53            | X    | X         | 0033A.R19   | -                           | -      |       |
| CA-VMP-7                          | 7/03/2019                    | 12:35            | 8/03/2019  | 11:35            | X    | X         | 0065A.R19   | -                           | -      |       |
| CA-VMP-7                          | 13/03/2019                   | 15:17            | 14/03/2019 | 14:17            | X    | X         | 0068A.R19   | -                           | -      |       |
| CA-VMP-7                          | 16/03/2019                   | 10:45            | 17/03/2019 | 10:15            | X    | X         | 0072A.R19   | -                           | -      |       |
| CA-VMP-7                          | 19/03/2019                   | 11:21            | 20/03/2019 | 11:21            | X    | X         | 0076A.R19   | -                           | -      |       |
| CA-VMP-7                          | 29/03/2019                   | 12:10            | 30/03/2019 | 12:00            | X    | X         | 0080A.R19   | -                           | -      |       |

OBSERVACIONES GENERALES

(1) Alto volumen

Se solicita devolver los filtros evaluados luego de emitida la conformidad

**CERTIMIN S.A.**  
 03 ABR 2019 15:20  
**Recepcion Ambiental**

PARAMETROS METEOROLOGICOS (Marcar con "X")

Humedad  Velocidad/Dirección del Viento   
 Temperatura  Radiación   
 Presión  Precipitación

CONDICIONES DE RECEPCIÓN DE MUESTRAS PARA LAS SOLUCIONES CAPTADORAS

Envases adecuados  SI  NO  
 Con Ice pack    
 Dentro del tiempo de vida útil

CONFORMIDAD DE RECEPCIÓN DE MUESTRAS

Fecha de Recepción: \_\_\_\_\_  
 Hora de Recepción: \_\_\_\_\_  
 Recibido por: \_\_\_\_\_  
 Firma: \_\_\_\_\_

OBSERVACIONES

RESPONSABLE 1  
 Cindy Alfaro  
 FIRMA:

RESPONSABLE 2  
 Manella Alata  
 FIRMA:

537 MD 694 01 18

SSD N° 10Y

P. 19. 2436  
DQE 2066. 2019

**CERTIMIN S.A. VºBº** **FECHA**  
**RECEPCIÓN 1 :** 19/04/19  
**RECEPCIÓN 2 :** 19/04/19

P19-2V33  
 D32069.e19



**CADENA DE CUSTODIA - CALIDAD DE AIRE**

CUC: 0001-3-2019-401

RS N°: 363-2019

PÁGINA 1 de 1

**DATOS GENERALES**

Organismo de Evaluación y Fiscalización Ambiental  
 Av. Faustino Sánchez Carrión N° 603, 607, 615 - Jesús María

Persona de contacto: Mariella Atala / Cindy Alfaro  
 Teléfono/Anexo: 936340841 / 999883684  
 Correo Electrónico: mariella.atala.alvarez@gmail.com / cindy.alfaro.goticochear@gmail.com

DISTRICTO: Ventanilla y Mi Perú  
 PROVINCIA: Constitucional del Callao  
 DEPARTAMENTO: -

UBICACIÓN: -

Envío por: Fecha: Hora:  
 Medio de Envío: Aerolínea  Agencia   
 T. Privado  Otro

| CÓDIGO DE LABORATORIO | CÓDIGO DEL PUNTO DE MUESTREO | INICIO           |       | FINAL            |       | PM 2,5 (1) | PARÁMETROS (Marcar con "X") | CÓDIGO DE FILTRO |        |       |
|-----------------------|------------------------------|------------------|-------|------------------|-------|------------|-----------------------------|------------------|--------|-------|
|                       |                              | FECHA (DD/MM/AA) | HORA  | FECHA (DD/MM/AA) | HORA  |            |                             | PM 10            | PM 2.5 | OTROS |
| CA-VMP-2              | CA-VMP-2                     | 4/03/2019        | 15:28 | 5/03/2019        | 14:58 | X          | -                           | 0039T.R19        | -      | -     |
| CA-VMP-2              | CA-VMP-2                     | 7/03/2019        | 11:48 | 8/03/2019        | 11:18 | X          | -                           | 0040T.R19        | -      | -     |
| CA-VMP-2              | CA-VMP-2                     | 13/03/2019       | 15:47 | 14/03/2019       | 14:47 | X          | -                           | 0041T.R19        | -      | -     |
| CA-VMP-2              | CA-VMP-2                     | 16/03/2019       | 11:53 | 17/03/2019       | 11:23 | X          | -                           | 0042T.R19        | -      | -     |
| CA-VMP-2              | CA-VMP-2                     | 19/03/2019       | 11:44 | 20/03/2019       | 11:44 | X          | -                           | 0043T.R19        | -      | -     |
| CA-VMP-2              | CA-VMP-2                     | 29/03/2019       | 13:36 | 30/03/2019       | 13:06 | X          | -                           | 0044T.R19        | -      | -     |

**OBSERVACIONES GENERALES**

(1) Bajo volumen

**CERTIMIN S.A.**  
 03 ABR 2019  
 Recepcion Ambiental

**PARÁMETROS METEOROLÓGICOS**  
 (Marcar con "X")

Humedad  Velocidad/Dircción   
 Temperatura  Radiación   
 Presión  Precipitación

**RESPONSABLE 1**  
 Cindy Alfaro  
 FIRMA:

**CONDICIONES DE RECEPCIÓN DE MUESTRAS PARA LAS SOLUCIONES CAPTADORAS**

Envases adecuados  SI  NO  
 Con Ice pack    
 Dentro del tiempo de vida útil

**RESPONSABLE 2**  
 FIRMA:

**RESPONSABLE DE GRUPO**  
 Mariella Atala  
 FIRMA:

**PARA SER LLENADO POR EL ÁREA DE RECEPCIÓN DEL LABORATORIO**

Fecha de Recepción: \_\_\_\_\_  
 Hora de Recepción: \_\_\_\_\_  
 Recibido por: \_\_\_\_\_  
 Firma: \_\_\_\_\_

**CONFORMIDAD DE RECEPCIÓN DE MUESTRAS**

**OBSERVACIONES**

C51 no 69 y 01 18

SSD N° 10Y



CADENA DE CUSTODIA: CALIDAD DE AIRE

UBICACIÓN

RS N°: 383-2019

PÁGINA 1 de 1

DATOS GENERALES

Organismo de Evaluación y Fiscalización Ambiental  
 Av. Faustino Sánchez Carrón N° 603, 607, 615 - Jesús María  
 Dirección: Marella Alata / Cindy Alfaro  
 Teléfono/Anejo: 936340841 / 999883884  
 Correo Electrónico: marella.alata.alvarez@gmail.com / cindy.alfaro.guococoe@gmail.com  
 Referencia:

DISTRICTO: Ventanilla y Mi Perú  
 PROVINCIA: Constitucional del Callao  
 DEPARTAMENTO: -

Enviado por: \_\_\_\_\_ Hora: \_\_\_\_\_  
 Fecha: \_\_\_\_\_  
 Medio de Envío:  Aerolínea  Agencia   
 T. Privado  Otro

**CERTIMIN S.A. V.O.B. FECHA**  
 RECEPCIÓN 1 : 219 10/10/03  
 RECEPCIÓN 2 : -1-1-

P19-2438  
 D921068.219

MUESTREO

PARAMETROS (Marcar con "X")

DATOS DEL MUESTREO

PARAMETROS METEOROLOGICOS (Marcar con "X")

| CODIGO DE LABORATORIO DE MUESTREO | CODIGO DEL PUNTO DE MUESTREO | INICIO           |       | FINAL            |       | PM 10 (1) | PM 2,5 (2) | PM 10     | PM 2,5 | OTROS |
|-----------------------------------|------------------------------|------------------|-------|------------------|-------|-----------|------------|-----------|--------|-------|
|                                   |                              | FECHA (DD/MM/AA) | HORA  | FECHA (DD/MM/AA) | HORA  |           |            |           |        |       |
|                                   | CA-VMP-1                     | 29/03/2019       | 12:47 | 29/03/2019       | 12:52 | X         | -          | 0083A R19 | -      | -     |
|                                   | CA-VMP-2                     | 29/03/2019       | 13:19 | 29/03/2019       | 13:26 | X         | -          | 0084A R19 | -      | -     |
|                                   | CA-VMP-7                     | 29/03/2019       | 11:55 | 29/03/2019       | 12:00 | X         | -          | 0030A R19 | -      | -     |
|                                   | CA-VMP-2                     | 29/03/2019       | 13:22 | 29/03/2019       | 13:27 | X         | -          | 0045T R19 | -      | -     |

OBSERVACIONES GENERALES

- (1) Alto volumen
- (2) Bajo volumen

**CERTIMIN S.A.**  
 03 ABR 2019  
 Recepcion Ambiental

PARAMETROS METEOROLOGICOS (Marcar con "X")

Humedad  Velocidad/Dirección del Viento   
 Temperatura  Radiación   
 Presión  Precipitación

PARA SER LLENADO POR EL AREA DE RECEPCIÓN DEL LABORATORIO

|                      |                           |   |                                      |               |
|----------------------|---------------------------|---|--------------------------------------|---------------|
| RESPONSABLE 1        | FIRMA: <u>[Signature]</u> | CONDICIONES DE RECEPCIÓN DE MUESTRAS PARA LAS SOLUCIONES CAPTADORAS                                       | CONFORMIDAD DE RECEPCIÓN DE MUESTRAS | OBSERVACIONES |
| RESPONSABLE 2        | FIRMA: _____              | Envases adecuados <input type="checkbox"/> SI <input type="checkbox"/> NO                                 | Fecha de Recepción: _____            |               |
| RESPONSABLE DE GRUPO | FIRMA: <u>[Signature]</u> | Con Ice pack <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                   | Hora de Recepción: _____             |               |
|                      |                           | Dentro del tiempo de vida útil <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Recibido por: _____                  |               |
|                      |                           |   | Firma: _____                         |               |

550 28 69V 0118

550 28 10V

# ANEXO N° 6



Organismo  
de Evaluación  
y Fiscalización  
Ambiental

## Informes de ensayo de laboratorio



## INFORME DE ENSAYO N° ABR1065.R19

"EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE"

|  |  |
|--|--|
| <b>SOLICITANTE :</b>                                 | ORGANISMO DE EVALUACIÓN Y FISCALIZACIÓN AMBIENTAL  |
| <b>DOMICILIO LEGAL :</b>                             | Av. Faustino Sánchez Carrión N° 603<br>Jesús María, Lima   |
| <b>SOLICITADO POR :</b>                              | Dirección de Evaluación Ambiental  |
| <b>SOLICITUD DE SERVICIO AMBIENTAL:</b>              | SSA N° 104-19  |
| <b>REFERENCIA :</b>                                  | CUC: 0001-3-2019-401<br>RS N°: 363-2019<br>Ventanilla y Mi Perú / Callao<br>Monitoreo de Calidad de Aire |
| <b>FECHA DE MUESTREO :</b>                           | 2019/03/04 al 2019/03/30   |
| <b>MUESTRA TOMADA POR :</b>                          | EL CLIENTE   |
| <b>PROTOCOLO :</b>                                   | --   |
| <b>TIPO DE MUESTRA:</b>                              | Filtro   |
| <b>NÚMERO DE MUESTRAS :</b>                          | 12   |
| <b>PRESENTACIÓN DE LAS MUESTRAS :</b>                | Filtro de Cuarzo de 8"x10"   |
| <b>CONDICIÓN DE LAS MUESTRAS :<br/>RECEPCIONADAS</b> | Muestras en buenas condiciones para los análisis solicitados.  |
| <b>FECHA DE RECEPCIÓN :</b>                          | miércoles, 03 de Abril de 2019   |
| <b>IDENTIFICACIÓN DE LAS MUESTRAS :</b>              | Según se indica  |
| <b>FECHA DE EJECUCIÓN DE ENSAYO :</b>                | 2019-04-03 al 2019-04-10   |
| <b>FECHA DE REPORTE :</b>                            | miércoles, 10 de Abril de 2019   |
| <b>PERIODO DE CUSTODIA :</b>                         | Hasta un mes. De acuerdo a las recomendaciones de la metodología o norma empleada.                       |

**EDGAR NINA VELÁSQUEZ**  
**Jefe Ambiental**  
**CQP. 729**

Lima, 10 de Abril de 2019

"Prohibida la reproducción total o parcial de este informe, sin autorización escrita de CERTIMIN S.A."  
"Los resultados de los ensayos no deben ser utilizados como una certificación de conformidad con normas de producto o como certificado del sistema de calidad de la entidad que lo produce".  
Los resultados corresponden a las muestras indicadas.  
El laboratorio no es responsable de la información proporcionada por el cliente.  
Los resultados se aplican a la muestra cómo se recibió por parte del cliente.



**RESULTADOS**

| Muestras |  | Elementos   |   |                                     |                                       |                                     |  |   |
|----------|--|---|---|-------------------------------------|---------------------------------------|-------------------------------------|--|---|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | MON0000<br>Fecha<br>Monitoreo                     | MON0000<br>Tipo<br>Muestra                        | MA1000<br>Codigo de Filtro*<br>PM10 | MA0216<br>Peso. Inicial*<br>PM10<br>g | MA0216<br>Peso. Final*<br>PM10<br>g | MA0216<br>Determinación de Peso: PM10_AV<br>µg/Muestra<br>5582<br>1229 | Incertidumbre<br>Determinación de Peso: PM10_AV<br>µg/Muestra |
|          | 1  | CA-VMP-1  | Inicio: 2019-03-04 16:43<br>Fin: 2019-03-05 16:18 | Filtro                              | 0058A.R19                             | 3.2211                              | 3.3346   | 113500  |
| 2        | CA-VMP-1   | Inicio: 2019-03-07 12:54<br>Fin: 2019-03-08 11:54 | Filtro  | 0066A.R19                           | 3.1937                                | 3.3808                              | 187100   | 2988  |
| 3        | CA-VMP-1   | Inicio: 2019-03-13 15:32<br>Fin: 2019-03-14 14:32 | Filtro  | 0069A.R19                           | 3.2205                                | 3.3458                              | 125300   | 2741  |
| 4        | CA-VMP-1   | Inicio: 2019-03-16 11:40<br>Fin: 2019-03-17 11:15 | Filtro  | 0073A.R19                           | 3.3661                                | 3.5331                              | 167000   | 2902  |
| 5        | CA-VMP-1   | Inicio: 2019-03-19 11:31<br>Fin: 2019-03-20 11:31 | Filtro  | 0077A.R19                           | 3.3896                                | 3.5402                              | 150600   | 2836  |
| 6        | CA-VMP-1   | Inicio: 2019-03-29 12:57<br>Fin: 2019-03-30 12:27 | Filtro  | 0081A.R19                           | 3.2625                                | 3.4411                              | 178600   | 2951  |
| 7        | CA-VMP-2   | Inicio: 2019-03-04 15:28<br>Fin: 2019-03-05 14:58 | Filtro  | 0031A.R19                           | 3.2581                                | 3.3877                              | 129600   | 2757  |
| 8        | CA-VMP-2   | Inicio: 2019-03-07 11:48<br>Fin: 2019-03-08 11:18 | Filtro  | 0064A.R19                           | 3.1897                                | 3.3713                              | 181600   | 2964  |
| 9        | CA-VMP-2   | Inicio: 2019-03-13 15:47<br>Fin: 2019-03-14 14:47 | Filtro  | 0070A.R19                           | 3.1964                                | 3.3625                              | 166100   | 2898  |
| 10       | CA-VMP-2   | Inicio: 2019-03-16 11:53<br>Fin: 2019-03-17 11:25 | Filtro  | 0074A.R19                           | 3.3744                                | 3.5479                              | 173500   | 2929  |
| 11       | CA-VMP-2   | Inicio: 2019-03-19 11:44<br>Fin: 2019-03-20 11:44 | Filtro  | 0078A.R19                           | 3.3917                                | 3.5845                              | 192800   | 3013  |
| 12       | CA-VMP-2   | Inicio: 2019-03-29 13:36<br>Fin: 2019-03-30 13:06 | Filtro  | 0082A.R19                           | 3.2551                                | 3.4545                              | 199400   | 3043  |

"EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE"



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO  
DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1065.R19

| Muestras |  | Elementos                  |                  |                               |                  |                               |                  |                            |                  |                              |                  |                              |               |
|----------|--|----------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|----------------------------|------------------|------------------------------|------------------|------------------------------|---------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | MA1510                     | Incertidumbre    | MA1510                        | Incertidumbre    | MA1510                        | Incertidumbre    | MA1510                     | Incertidumbre    | MA1510                       | Incertidumbre    | MA1510                       | Incertidumbre |
|          |  | Ag*<br>Plata<br>µg/Muestra | Ag<br>µg/Muestra | Al*<br>Aluminio<br>µg/Muestra | Al<br>µg/Muestra | As*<br>Arsenico<br>µg/Muestra | As<br>µg/Muestra | Ba*<br>Bario<br>µg/Muestra | Ba<br>µg/Muestra | Be*<br>Berilio<br>µg/Muestra | Be<br>µg/Muestra | Bi*<br>Bismuto<br>µg/Muestra |               |
|          |  | 1<br>0.3                   |                  | 20<br>7                       |                  | 9<br>3                        |                  | 1<br>0.3                   |                  | 1<br>0.3                     |                  | 1<br>0.3                     |               |
| 1        | CA-VMP-1   | <1                         | --               | 1156                          | 206              | <9                            | --               | 23                         | 0.48             | <1                           | --               | <350                         |               |
| 2        | CA-VMP-1   | 1                          | 0.18             | 1869                          | 361              | <9                            | --               | 43                         | 0.90             | <1                           | --               | <350                         |               |
| 3        | CA-VMP-1   | <1                         | --               | 1104                          | 196              | 17                            | 0.37             | 23                         | 0.48             | <1                           | --               | <350                         |               |
| 4        | CA-VMP-1   | <1                         | --               | 1388                          | 254              | 12                            | 0.26             | 27                         | 0.56             | <1                           | --               | <350                         |               |
| 5        | CA-VMP-1   | <1                         | --               | 1044                          | 184              | <9                            | --               | 22                         | 0.46             | <1                           | --               | <350                         |               |
| 6        | CA-VMP-1   | <1                         | --               | 1608                          | 302              | <9                            | --               | 35                         | 0.73             | <1                           | --               | <350                         |               |
| 7        | CA-VMP-2   | <1                         | --               | 720                           | 122              | <9                            | --               | 20                         | 0.42             | <1                           | --               | <350                         |               |
| 8        | CA-VMP-2   | 1                          | 0.18             | 1626                          | 306              | <9                            | --               | 44                         | 0.92             | <1                           | --               | <350                         |               |
| 9        | CA-VMP-2   | <1                         | --               | 1967                          | 384              | <9                            | --               | 36                         | 0.75             | <1                           | --               | <350                         |               |
| 10       | CA-VMP-2   | <1                         | --               | 1635                          | 308              | <9                            | --               | 31                         | 0.64             | <1                           | --               | <350                         |               |
| 11       | CA-VMP-2   | <1                         | --               | 2274                          | 458              | <9                            | --               | 36                         | 0.75             | <1                           | --               | <350                         |               |
| 12       | CA-VMP-2   | 2                          | 0.36             | 1601                          | 300              | 20                            | 0.44             | 46                         | 0.97             | <1                           | --               | <350                         |               |

"EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE"



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1065.R19

| Muestras |  | Elementos     |            |               |            |               |            |               |            |               |            |               |
|----------|--|---------------|------------|---------------|------------|---------------|------------|---------------|------------|---------------|------------|---------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre |
|          |  | Bi            | B*         | B             | Ca*        | Ca            | Cd*        | Cd            | Co*        | Co            | Cr*        | Cr            |
|          |  | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    |
|          |  |               | 10         |               | 40         |               | 2          |               | 6          |               | 4          |               |
|          |  |               | 3          |               | 13         |               | 1          |               | 2          |               | 1          |               |
| 1        | CA-VMP-1   | --            | 35         | 7             | 3759       | 178           | 3          | 0.06          | <6         | --            | 47         | 7             |
| 2        | CA-VMP-1   | --            | 30         | 6             | 6245       | 268           | 6          | 0.13          | <6         | --            | 30         | 5             |
| 3        | CA-VMP-1   | --            | 55         | 12            | 3687       | 175           | 3          | 0.06          | <6         | --            | 39         | 6             |
| 4        | CA-VMP-1   | --            | 47         | 10            | 4245       | 197           | 3          | 0.06          | <6         | --            | 35         | 5             |
| 5        | CA-VMP-1   | --            | 12         | 3             | 3752       | 177           | 3          | 0.06          | <6         | --            | 31         | 5             |
| 6        | CA-VMP-1   | --            | 96         | 20            | 4760       | 217           | 12         | 0.26          | <6         | --            | 43         | 7             |
| 7        | CA-VMP-2   | --            | <10        | --            | 2493       | 123           | 13         | 0.28          | <6         | --            | 29         | 4             |
| 8        | CA-VMP-2   | --            | 18         | 4             | 5873       | 256           | 13         | 0.28          | <6         | --            | 28         | 4             |
| 9        | CA-VMP-2   | --            | 39         | 8             | 5358       | 238           | 18         | 0.38          | <6         | --            | 34         | 5             |
| 10       | CA-VMP-2   | --            | 25         | 5             | 4524       | 208           | 10         | 0.21          | <6         | --            | 68         | 10            |
| 11       | CA-VMP-2   | --            | 13         | 3             | 5207       | 233           | 19         | 0.41          | <6         | --            | 37         | 6             |
| 12       | CA-VMP-2   | --            | 36         | 8             | 5898       | 257           | 12         | 0.26          | <6         | --            | 68         | 10            |

\*EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE\*



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1065.R19

| Muestras |  | Elementos  |               |            |               |            |               |            |               |            |               |            |               |
|----------|--|------------|---------------|------------|---------------|------------|---------------|------------|---------------|------------|---------------|------------|---------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | MA1510     | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre |
|          |  | Cu*        | Cu            | Fe*        | Fe            | K*         | K             | Hg*        | Hg            | Li*        | Li            | Mg*        | Mg            |
|          |  | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    |
|          |  | 5          |               | 15         |               | 75         |               | 20         |               | 2          |               | 9          |               |
|          |  | 2          |               | 5          |               | 25         |               | 6.7        |               | 0.7        |               | 3          |               |
| 1        | CA-VMP-1   | 285        | 28            | 2071       | 261           | 624        | 77            | <20        | --            | <2         | --            | 1326       |               |
| 2        | CA-VMP-1   | 517        | 52            | 3284       | 456           | 982        | 118           | <20        | --            | <2         | --            | 1991       |               |
| 3        | CA-VMP-1   | 301        | 29            | 2009       | 252           | 668        | 82            | <20        | --            | <2         | --            | 1447       |               |
| 4        | CA-VMP-1   | 281        | 27            | 2300       | 295           | 813        | 99            | <20        | --            | <2         | --            | 1717       |               |
| 5        | CA-VMP-1   | 324        | 32            | 1872       | 232           | 671        | 83            | <20        | --            | <2         | --            | 1554       |               |
| 6        | CA-VMP-1   | 396        | 39            | 2784       | 372           | 947        | 114           | <20        | --            | <2         | --            | 1635       |               |
| 7        | CA-VMP-2   | 172        | 16            | 1329       | 157           | 405        | 51            | <20        | --            | <2         | --            | 857        |               |
| 8        | CA-VMP-2   | 1183       | 132           | 2897       | 390           | 870        | 105           | <20        | --            | <2         | --            | 1833       |               |
| 9        | CA-VMP-2   | 341        | 33            | 3237       | 448           | 864        | 105           | <20        | --            | <2         | --            | 1918       |               |
| 10       | CA-VMP-2   | 226        | 22            | 2901       | 391           | 829        | 101           | <20        | --            | <2         | --            | 1835       |               |
| 11       | CA-VMP-2   | 234        | 22            | 3598       | 511           | 887        | 107           | <20        | --            | <2         | --            | 2110       |               |
| 12       | CA-VMP-2   | 410        | 41            | 3110       | 426           | 926        | 111           | <20        | --            | <2         | --            | 1828       |               |

\*EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE\*



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1065.R19

| Muestras |  | Elementos     |                                     |               |                                   |               |                                 |               |                                  |               |                                     |               |
|----------|--|---------------|-------------------------------------|---------------|-----------------------------------|---------------|---------------------------------|---------------|----------------------------------|---------------|-------------------------------------|---------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | Incertidumbre | MA1510                              | Incertidumbre | MA1510                            | Incertidumbre | MA1510                          | Incertidumbre | MA1510                           | Incertidumbre | MA1510                              | Incertidumbre |
|          |  | Mg            | Mn*                                 | Mn            | Mo*                               | Mo            | Na*                             | Na            | Ni*                              | Ni            | P*                                  | P             |
|          |  | µg/Muestra    | Manganeso<br>µg/Muestra<br>2<br>0.7 | µg/Muestra    | Molibdeno<br>µg/Muestra<br>3<br>1 | µg/Muestra    | Sodio<br>µg/Muestra<br>8<br>2.7 | µg/Muestra    | Niquel<br>µg/Muestra<br>5<br>1.7 | µg/Muestra    | Fósforo<br>µg/Muestra<br>35<br>11.7 | µg/Muestra    |
| 1        | CA-VMP-1   | 95            | 44                                  | 2             | 97                                | 2.73          | 6110                            | 402           | 13                               | 1             | 240                                 | 13            |
| 2        | CA-VMP-1   | 167           | 79                                  | 3             | 156                               | 4.34          | 9050                            | 411           | 20                               | 2             | 405                                 | 21            |
| 3        | CA-VMP-1   | 107           | 43                                  | 2             | 17                                | 0.49          | 7780                            | 422           | 19                               | 2             | 244                                 | 13            |
| 4        | CA-VMP-1   | 136           | 49                                  | 2             | 5                                 | 0.14          | 9462                            | 402           | <5                               | --            | 273                                 | 14            |
| 5        | CA-VMP-1   | 118           | 44                                  | 2             | 4                                 | 0.11          | 8806                            | 415           | 17                               | 1             | 152                                 | 8             |
| 6        | CA-VMP-1   | 127           | 56                                  | 2             | 34                                | 0.97          | 8283                            | 420           | 11                               | 1             | 320                                 | 17            |
| 7        | CA-VMP-2   | 54            | 29                                  | 1             | 99                                | 2.78          | 3627                            | 301           | <5                               | --            | 115                                 | 6             |
| 8        | CA-VMP-2   | 149           | 71                                  | 3             | 30                                | 0.86          | 7994                            | 421           | 8                                | 1             | 380                                 | 20            |
| 9        | CA-VMP-2   | 159           | 64                                  | 2             | 7                                 | 0.20          | 7920                            | 422           | 18                               | 1             | 245                                 | 13            |
| 10       | CA-VMP-2   | 149           | 59                                  | 2             | <3                                | --            | 8385                            | 419           | <5                               | --            | 221                                 | 12            |
| 11       | CA-VMP-2   | 182           | 72                                  | 3             | <3                                | --            | 7624                            | 422           | 19                               | 2             | 189                                 | 10            |
| 12       | CA-VMP-2   | 148           | 65                                  | 3             | 23                                | 0.66          | 8327                            | 420           | 14                               | 1             | 363                                 | 19            |

\*EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE\*



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO  
DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1065.R19

| Muestras |  | Elementos           |                     |                         |                     |                       |                     |                       |                     |                      |                     |                         |
|----------|--|---------------------|---------------------|-------------------------|---------------------|-----------------------|---------------------|-----------------------|---------------------|----------------------|---------------------|-------------------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | MA1510<br>Pb*       | Incertidumbre<br>Pb | MA1510<br>Sb*           | Incertidumbre<br>Sb | MA1510<br>Se*         | Incertidumbre<br>Se | MA1510<br>Si*         | Incertidumbre<br>Si | MA1510<br>Sn*        | Incertidumbre<br>Sn | MA1510<br>Sr*           |
|          |  | Plomo<br>µg/Muestra | µg/Muestra          | Antimonio<br>µg/Muestra | µg/Muestra          | Selenio<br>µg/Muestra | µg/Muestra          | Silicio<br>µg/Muestra | µg/Muestra          | Estaño<br>µg/Muestra | µg/Muestra          | Estroncio<br>µg/Muestra |
|          |  | 12                  |                     | 9                       |                     | 55                    |                     | 60                    |                     | 15                   |                     | 0.3                     |
|          |  | 4                   |                     | 3                       |                     | 18                    |                     | 20                    |                     | 5                    |                     | 0.1                     |
| 1        | CA-VMP-1   | 339                 | 10                  | <9                      | --                  | <55                   | --                  | 2507                  | 288                 | <15                  | --                  | 17.6                    |
| 2        | CA-VMP-1   | 1024                | 66                  | 25                      | 4                   | <55                   | --                  | 3412                  | 325                 | <15                  | --                  | 28.7                    |
| 3        | CA-VMP-1   | 459                 | 16                  | <9                      | --                  | <55                   | --                  | 2546                  | 290                 | <15                  | --                  | 18.6                    |
| 4        | CA-VMP-1   | 447                 | 15                  | <9                      | --                  | <55                   | --                  | 2302                  | 275                 | <15                  | --                  | 21.0                    |
| 5        | CA-VMP-1   | 753                 | 38                  | <9                      | --                  | <55                   | --                  | 2053                  | 256                 | <15                  | --                  | 18.9                    |
| 6        | CA-VMP-1   | 1224                | 91                  | 14                      | 2                   | <55                   | --                  | 2541                  | 290                 | <15                  | --                  | 22.5                    |
| 7        | CA-VMP-2   | 148                 | 3                   | <9                      | --                  | <55                   | --                  | 1450                  | 200                 | <15                  | --                  | 11.7                    |
| 8        | CA-VMP-2   | 654                 | 30                  | 14                      | 2                   | <55                   | --                  | 2831                  | 305                 | <15                  | --                  | 26.4                    |
| 9        | CA-VMP-2   | 309                 | 9                   | <9                      | --                  | <55                   | --                  | 3871                  | 330                 | <15                  | --                  | 25.6                    |
| 10       | CA-VMP-2   | 319                 | 9                   | <9                      | --                  | <55                   | --                  | 2939                  | 310                 | <15                  | --                  | 22.2                    |
| 11       | CA-VMP-2   | 205                 | 5                   | <9                      | --                  | <55                   | --                  | 3619                  | 329                 | <15                  | --                  | 24.6                    |
| 12       | CA-VMP-2   | 723                 | 35                  | 17                      | 3                   | <55                   | --                  | 2239                  | 270                 | <15                  | --                  | 26.1                    |

\*EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE\*



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



Registro N°LE -022

INFORME DE ENSAYO  
N° ABR1065.R19

| Muestras |  | Elementos     |                                   |               |                                 |               |                                     |               |                                |               |
|----------|--|---------------|-----------------------------------|---------------|---------------------------------|---------------|-------------------------------------|---------------|--------------------------------|---------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | Incertidumbre | MA1510                            | Incertidumbre | MA1510                          | Incertidumbre | MA1510                              | Incertidumbre | MA1510                         | Incertidumbre |
|          |  | Sr            | Ti*                               | Ti            | Tl*                             | Tl            | V*                                  | V             | Zn*                            | Zn            |
|          |  | µg/Muestra    | Titanio<br>µg/Muestra<br>1<br>0.3 | µg/Muestra    | Talio<br>µg/Muestra<br>60<br>20 | µg/Muestra    | Vanadio<br>µg/Muestra<br>2.5<br>0.8 | µg/Muestra    | Zinc<br>µg/Muestra<br>45<br>15 | µg/Muestra    |
| 1        | CA-VMP-1   | 3.4           | 52                                | 1             | <60                             | --            | 78.1                                | 16.3          | 202                            | 23            |
| 2        | CA-VMP-1   | 5.5           | 85                                | 2             | <60                             | --            | 62.2                                | 12.9          | 415                            | 55            |
| 3        | CA-VMP-1   | 3.5           | 48                                | 1             | <60                             | --            | 84.1                                | 17.5          | 301                            | 37            |
| 4        | CA-VMP-1   | 4             | 62                                | 1             | <60                             | --            | 52.1                                | 10.8          | 230                            | 27            |
| 5        | CA-VMP-1   | 3.6           | 43                                | 1             | <60                             | --            | 70.2                                | 14.6          | 193                            | 22            |
| 6        | CA-VMP-1   | 4.3           | 73                                | 2             | <60                             | --            | 40.7                                | 8.4           | 446                            | 60            |
| 7        | CA-VMP-2   | 2.2           | 31                                | 1             | <60                             | --            | 41.9                                | 8.7           | 136                            | 15            |
| 8        | CA-VMP-2   | 5             | 68                                | 1             | <60                             | --            | 59.6                                | 12.4          | 437                            | 59            |
| 9        | CA-VMP-2   | 4.9           | 95                                | 2             | <60                             | --            | 85.0                                | 17.7          | 335                            | 42            |
| 10       | CA-VMP-2   | 4.2           | 69                                | 1             | <60                             | --            | 42.8                                | 8.9           | 198                            | 22            |
| 11       | CA-VMP-2   | 4.7           | 99                                | 2             | <60                             | --            | 61.6                                | 12.8          | 186                            | 21            |
| 12       | CA-VMP-2   | 5             | 64                                | 1             | <60                             | --            | 38.8                                | 8             | 481                            | 66            |

"EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE"



**CONTROL DE CALIDAD**

| Muestras QC |   | Elementos           |                   |  |                        |                         |                        |                        |                        |                          |                        |
|-------------|---|---------------------|-------------------|--|------------------------|-------------------------|------------------------|------------------------|------------------------|--------------------------|------------------------|
| N°          | Codigo de Servicio<br>Elemento<br>Unidad<br>Limite de Cuantificación LC | MA0216              | MA0216            | MA0216   | MA1510                 | MA1510                  | MA1510                 | MA1510                 | MA1510                 | MA1510                   | MA1510                 |
|             |   | Peso. Inicial*<br>g | Peso. Final*<br>g | Determinación de Peso: PM10_AV<br>µg/Muestra<br>5582 | Ag*<br>µg/Muestra<br>1 | Al*<br>µg/Muestra<br>20 | As*<br>µg/Muestra<br>9 | Ba*<br>µg/Muestra<br>1 | Be*<br>µg/Muestra<br>1 | Bi*<br>µg/Muestra<br>350 | B*<br>µg/Muestra<br>10 |
| 1           | Adición (% Recup.)  | --                  | --                | --   | 117.3                  | 90.2                    | 107.6                  | 101.3                  | 104.0                  | --                       | 93.8                   |
| 2           | Adición Rango (%)   | --                  | --                | --   | 75.0 - 125.0           | 75.0 - 125.0            | 75.0 - 125.0           | 75.0 - 125.0           | 75.0 - 125.0           | --                       | 75.0 - 125.0           |
| 3           | STD - Recuperación Obtenido (%)   | --                  | --                | --   | 112.8                  | 108.1                   | 105.6                  | 101.7                  | 104.2                  | 105.3                    | 101.1                  |
| 4           | STD - Rango (%)   | --                  | --                | --   | 80.0-120.0             | 80.0-120.0              | 80.0-120.0             | 80.0-120.0             | 80.0-120.0             | 80.0-120.0               | 80.0-120.0             |
| 5           | CA-VMP-1 (Original)   | --                  | --                | --   | 1                      | 1869                    | <9                     | 43                     | <1                     | <350                     | 30                     |
| 6           | CA-VMP-1 (Dup)  | --                  | --                | --   | 1                      | 1869                    | <9                     | 43                     | <1                     | <350                     | 30                     |
| 7           | CA-VMP-2 (Original)   | 3.1897              | 3.3713            | 181600   | --                     | --                      | --                     | --                     | --                     | --                       | --                     |
| 8           | CA-VMP-2 (Dup)  | 3.1897              | 3.3710            | 181300   | --                     | --                      | --                     | --                     | --                     | --                       | --                     |
| 9           | Blanco  | --                  | --                | --   | <1                     | <20                     | <9                     | <1                     | <1                     | <350                     | <10                    |

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LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO  
DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1065.R19

Registro N°LE -022

| Muestras QC |   | Elementos                         |                                  |                                  |                                  |                                  |                                   |                                  |                                   |                                  |                                  |                                  |                                  |                                  |
|-------------|---|-----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| N°          | Codigo de Servicio<br>Elemento<br>Unidad<br>Limite de Cuantificación LC | MA1510<br>Ca*<br>µg/Muestra<br>40 | MA1510<br>Cd*<br>µg/Muestra<br>2 | MA1510<br>Co*<br>µg/Muestra<br>6 | MA1510<br>Cr*<br>µg/Muestra<br>4 | MA1510<br>Cu*<br>µg/Muestra<br>5 | MA1510<br>Fe*<br>µg/Muestra<br>15 | MA1510<br>K*<br>µg/Muestra<br>75 | MA1510<br>Hg*<br>µg/Muestra<br>20 | MA1510<br>Li*<br>µg/Muestra<br>2 | MA1510<br>Mg*<br>µg/Muestra<br>9 | MA1510<br>Mn*<br>µg/Muestra<br>2 | MA1510<br>Mo*<br>µg/Muestra<br>3 | MA1510<br>Na*<br>µg/Muestra<br>8 |
| 1           | Adición (% Recup.)  | 108.9                             | 102.7                            | 103.1                            | 93.8                             | 92.4                             | 120.4                             | 107.1                            | 99.6                              | 110.7                            | 98.2                             | 99.6                             | 103.6                            | 79.6                             |
| 2           | Adición Rango (%)   | 75.0 - 125.0                      | 75.0 - 125.0                     | 75.0 - 125.0                     | 75.0 - 125.0                     | 75.0 - 125.0                     | 75.0 - 125.0                      | 75.0 - 125.0                     | 75.0 - 125.0                      | 75.0 - 125.0                     | 75.0 - 125.0                     | 75.0 - 125.0                     | 75.0 - 125.0                     | 75.0 - 125.0                     |
| 3           | STD - Recuperación Obtenido (%)   | 111.4                             | 103.9                            | 102.8                            | 102.8                            | 102.5                            | 103.9                             | 113.1                            | 102.8                             | 100.0                            | 101.9                            | 101.1                            | 102.5                            | 116.1                            |
| 4           | STD - Rango (%)   | 80.0-120.0                        | 80.0-120.0                       | 80.0-120.0                       | 80.0-120.0                       | 80.0-120.0                       | 80.0-120.0                        | 80.0-120.0                       | 80.0-120.0                        | 80.0-120.0                       | 80.0-120.0                       | 80.0-120.0                       | 80.0-120.0                       | 80.0-120.0                       |
| 5           | CA-VMP-1 (Original)   | 6245                              | 6                                | <6                               | 30                               | 517                              | 3284                              | 982                              | <20                               | <2                               | 1991                             | 79                               | 156                              | 9050                             |
| 6           | CA-VMP-1 (Dup)  | 6261                              | 6                                | <6                               | 31                               | 519                              | 3276                              | 948                              | <20                               | <2                               | 1991                             | 80                               | 157                              | 9141                             |
| 7           | CA-VMP-2 (Original)   | --                                | --                               | --                               | --                               | --                               | --                                | --                               | --                                | --                               | --                               | --                               | --                               | --                               |
| 8           | CA-VMP-2 (Dup)  | --                                | --                               | --                               | --                               | --                               | --                                | --                               | --                                | --                               | --                               | --                               | --                               | --                               |
| 9           | Blanco  | <40                               | <2                               | <6                               | <4                               | <5                               | <15                               | <75                              | <20                               | <2                               | <9                               | <2                               | <3                               | <8                               |

"EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE"



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1065.R19

| Muestras QC |   | Elementos       |                  |                  |                 |                  |                  |                  |                   |                 |                  |                   |                  |
|-------------|---|-----------------|------------------|------------------|-----------------|------------------|------------------|------------------|-------------------|-----------------|------------------|-------------------|------------------|
| N°          | Codigo de Servicio<br>Elemento<br>Unidad<br>Limite de Cuantificación LC | MA1510          | MA1510           | MA1510           | MA1510          | MA1510           | MA1510           | MA1510           | MA1510            | MA1510          | MA1510           | MA1510            | MA1510           |
|             |   | Ni*             | P*               | Pb*              | Sb*             | Se*              | Si*              | Sn*              | Sr*               | Ti*             | Tl*              | V*                | Zn*              |
|             |   | µg/Muestra<br>5 | µg/Muestra<br>35 | µg/Muestra<br>12 | µg/Muestra<br>9 | µg/Muestra<br>55 | µg/Muestra<br>60 | µg/Muestra<br>15 | µg/Muestra<br>0.3 | µg/Muestra<br>1 | µg/Muestra<br>60 | µg/Muestra<br>2.5 | µg/Muestra<br>45 |
| 1           | Adición (% Recup.)  | 110.7           | 96.0             | 90.2             | 104.0           | 100.4            | 85.3             | 98.7             | 106.1             | 97.3            | 96.9             | 100.1             | 93.8             |
| 2           | Adición Rango (%)   | 75.0 - 125.0    | 75.0 - 125.0     | 75.0 - 125.0     | 75.0 - 125.0    | 75.0 - 125.0     | 75.0 - 125.0     | 75.0 - 125.0     | 75.0 - 125.0      | 75.0 - 125.0    | 75.0 - 125.0     | 75.0 - 125.0      | 75.0 - 125.0     |
| 3           | STD - Recuperación Obtenido (%)   | 104.7           | 115.6            | 106.4            | 106.1           | 100.3            | 109.2            | 99.7             | 103.8             | 101.9           | 98.9             | 101.4             | 103.3            |
| 4           | STD - Rango (%)   | 80.0-120.0      | 80.0-120.0       | 80.0-120.0       | 80.0-120.0      | 80.0-120.0       | 80.0-120.0       | 80.0-120.0       | 80.0-120.0        | 80.0-120.0      | 80.0-120.0       | 80.0-120.0        | 80.0-120.0       |
| 5           | CA-VMP-1 (Original)   | 20              | 405              | 1024             | 25              | <55              | 3412             | <15              | 28.7              | 85              | <60              | 62.2              | 415              |
| 6           | CA-VMP-1 (Dup)  | 19              | 414              | 1042             | 27              | <55              | 3402             | <15              | 28.8              | 85              | <60              | 62.2              | 415              |
| 7           | CA-VMP-2 (Original)   | --              | --               | --               | --              | --               | --               | --               | --                | --              | --               | --                | --               |
| 8           | CA-VMP-2 (Dup)  | --              | --               | --               | --              | --               | --               | --               | --                | --              | --               | --                | --               |
| 9           | Blanco  | <5              | <35              | <12              | <9              | <55              | <60              | <15              | <0.3              | <1              | <60              | <2.5              | <45              |

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LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO  
DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1065.R19

## METODOS DE ENSAYO Y CODIGOS DE SERVICIO

| N° | Descripción  |  |               |  |
|----|--|--|---------------|--|
|    | Analito  | Denominación                                       | Cod. Serv     | (1) Norma o Referencia   |
| 1  | Determinación de Peso: PM10_AV                       | Determinación de Peso: Filtro PM10 Alto Volumen    | MA0216        | IC-MA-95 Rev.02 (Validado) 2017. Determinación de Peso: Filtro M10 y PM2.5 Alto Volumen  |
| 2  | <b>Metales por ICP OES Filro PM10 Alto Volumen *</b> | <b>Metales por ICP OES Filro PM10 Alto Volumen</b> | <b>MA1510</b> | <b>EPA Compendium Method IO-3 4. 1999. Determination of Metals in Ambient Particulate Matter using Inductively Coupled Plasma(ICP) Spectroscopy. Excepto Muestreo.</b> |

(\*) Los métodos indicados no han sido acreditados por el INACAL-DA.

(1) SMEWW: Standard Methods for the Examination of Water and Wastewater.

APHA : American Public Health Association.

AWWA: American Water Works Association.

WEF : Water Environment Federation.

EPA : Environmental Protection Agency.

ASTM: American Society for Testing and Materials.

ISO: International Organization for Standardization.

NTP: Norma Técnica Peruana.

NIOSH: The National Institute for Occupational Safety and Health.



## INFORME DE ENSAYO N° ABR1066.R19

|  |  |
|--|--|
| <b>SOLICITANTE :</b>                                 | ORGANISMO DE EVALUACIÓN Y FISCALIZACIÓN AMBIENTAL  |
| <b>DOMICILIO LEGAL :</b>                             | Av. Faustino Sánchez Carrión N° 603<br>Jesús María, Lima   |
| <b>SOLICITADO POR :</b>                              | Dirección de Evaluación Ambiental  |
| <b>SOLICITUD DE SERVICIO AMBIENTAL:</b>              | SSA N° 104-19  |
| <b>REFERENCIA :</b>                                  | CUC: 0001-3-2019-401<br>RS N°: 363-2019<br>Ventanilla y Mi Perú / Callao<br>Monitoreo de Calidad de Aire |
| <b>FECHA DE MUESTREO :</b>                           | 2019/03/04 al 2019/03/30   |
| <b>MUESTRA TOMADA POR :</b>                          | EL CLIENTE   |
| <b>PROTOCOLO :</b>                                   | --   |
| <b>TIPO DE MUESTRA:</b>                              | Filtro   |
| <b>NÚMERO DE MUESTRAS :</b>                          | 12   |
| <b>PRESENTACIÓN DE LAS MUESTRAS :</b>                | Filtro de Cuarzo de 8"x10"   |
| <b>CONDICIÓN DE LAS MUESTRAS :<br/>RECEPCIONADAS</b> | Muestras en buenas condiciones para los análisis solicitados.  |
| <b>FECHA DE RECEPCIÓN :</b>                          | miércoles, 03 de Abril de 2019   |
| <b>IDENTIFICACIÓN DE LAS MUESTRAS :</b>              | Según se indica  |
| <b>FECHA DE EJECUCIÓN DE ENSAYO :</b>                | 2019-04-03 al 2019-04-10   |
| <b>FECHA DE REPORTE :</b>                            | miércoles, 10 de Abril de 2019   |
| <b>PERIODO DE CUSTODIA :</b>                         | Hasta un mes. De acuerdo a las recomendaciones de la metodología o norma empleada.                       |

**EDGAR NINA VELÁSQUEZ**  
**Jefe Ambiental**  
**CQP. 729**

Lima, 10 de Abril de 2019

"Prohibida la reproducción total o parcial de este informe, sin autorización escrita de CERTIMIN S.A."  
"Los resultados de los ensayos no deben ser utilizados como una certificación de conformidad con normas de producto o como certificado del sistema de calidad de la entidad que lo produce".  
Los resultados corresponden a las muestras indicadas.  
El laboratorio no es responsable de la información proporcionada por el cliente.  
Los resultados se aplican a la muestra cómo se recibió por parte del cliente.



**RESULTADOS**

| Muestras |  | Elementos   |                            |                                     |                                       |                                     |  |   |
|----------|--|---|----------------------------|-------------------------------------|---------------------------------------|-------------------------------------|--|---|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | MON0000<br>Fecha<br>Monitoreo                     | MON0000<br>Tipo<br>Muestra | MA1000<br>Codigo de Filtro*<br>PM10 | MA0216<br>Peso. Inicial*<br>PM10<br>g | MA0216<br>Peso. Final*<br>PM10<br>g | MA0216<br>Determinación de Peso: PM10_AV<br>PM10<br>µg/Muestra<br>5582<br>1229 | Incertidumbre<br>Determinación de Peso: PM10_AV<br>µg/Muestra |
| 1        | CA-VMP-6   | Inicio: 2019-03-04 14:03<br>Fin: 2019-03-05 14:03 | Filtro                     | 0027A.R19                           | 3.2618                                | 3.3581                              | 96300  | 2644  |
| 2        | CA-VMP-6   | Inicio: 2019-03-07 11:25<br>Fin: 2019-03-08 11:09 | Filtro                     | 0063A.R19                           | 3.1883                                | 3.3427                              | 154400   | 2851  |
| 3        | CA-VMP-6   | Inicio: 2019-03-13 14:56<br>Fin: 2019-03-14 14:07 | Filtro                     | 0067A.R19                           | 3.1968                                | 3.3129                              | 116100   | 2709  |
| 4        | CA-VMP-6   | Inicio: 2019-03-16 10:20<br>Fin: 2019-03-17 10:43 | Filtro                     | 0071A.R19                           | 3.1988                                | 3.3354                              | 136600   | 2782  |
| 5        | CA-VMP-6   | Inicio: 2019-03-19 11:00<br>Fin: 2019-03-20 11:00 | Filtro                     | 0075A.R19                           | 3.3963                                | 3.5347                              | 138400   | 2789  |
| 6        | CA-VMP-6   | Inicio: 2019-03-29 11:30<br>Fin: 2019-03-30 11:30 | Filtro                     | 0079A.R19                           | 3.2534                                | 3.4221                              | 168700   | 2909  |
| 7        | CA-VMP-7   | Inicio: 2019-03-04 16:23<br>Fin: 2019-03-05 15:53 | Filtro                     | 0033A.R19                           | 3.2938                                | 3.4076                              | 113800   | 2701  |
| 8        | CA-VMP-7   | Inicio: 2019-03-07 12:35<br>Fin: 2019-03-08 11:35 | Filtro                     | 0065A.R19                           | 3.1971                                | 3.3821                              | 185000   | 2978  |
| 9        | CA-VMP-7   | Inicio: 2019-03-13 15:17<br>Fin: 2019-03-14 14:17 | Filtro                     | 0068A.R19                           | 3.2141                                | 3.3545                              | 140400   | 2797  |
| 10       | CA-VMP-7   | Inicio: 2019-03-16 10:45<br>Fin: 2019-03-17 10:15 | Filtro                     | 0072A.R19                           | 3.2005                                | 3.3702                              | 169700   | 2913  |
| 11       | CA-VMP-7   | Inicio: 2019-03-19 11:21<br>Fin: 2019-03-20 11:21 | Filtro                     | 0076A.R19                           | 3.3902                                | 3.5547                              | 164500   | 2891  |
| 12       | CA-VMP-7   | Inicio: 2019-03-29 12:10<br>Fin: 2019-03-30 12:00 | Filtro                     | 0080A.R19                           | 3.2630                                | 3.4527                              | 189700   | 2999  |

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LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO N° ABR1066.R19

| Muestras |  | Elementos           |                     |                        |                     |                        |                     |                     |                     |                       |                     |                       |
|----------|--|---------------------|---------------------|------------------------|---------------------|------------------------|---------------------|---------------------|---------------------|-----------------------|---------------------|-----------------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | MA1510<br>Ag*       | Incertidumbre<br>Ag | MA1510<br>Al*          | Incertidumbre<br>Al | MA1510<br>As*          | Incertidumbre<br>As | MA1510<br>Ba*       | Incertidumbre<br>Ba | MA1510<br>Be*         | Incertidumbre<br>Be | MA1510<br>Bi*         |
|          |  | Plata<br>µg/Muestra | µg/Muestra          | Aluminio<br>µg/Muestra | µg/Muestra          | Arsenico<br>µg/Muestra | µg/Muestra          | Bario<br>µg/Muestra | µg/Muestra          | Berilio<br>µg/Muestra | µg/Muestra          | Bismuto<br>µg/Muestra |
|          |  | 1<br>0.3            |                     | 20<br>7                |                     | 9<br>3                 |                     | 1<br>0.3            |                     | 1<br>0.3              |                     | 350<br>117            |
| 1        | CA-VMP-6   | <1                  | --                  | 443                    | 72                  | 10                     | 0.22                | 15                  | 0.31                | <1                    | --                  | <350                  |
| 2        | CA-VMP-6   | <1                  | --                  | 1011                   | 177                 | <9                     | --                  | 30                  | 0.63                | <1                    | --                  | <350                  |
| 3        | CA-VMP-6   | <1                  | --                  | 763                    | 130                 | <9                     | --                  | 20                  | 0.42                | <1                    | --                  | <350                  |
| 4        | CA-VMP-6   | <1                  | --                  | 665                    | 112                 | <9                     | --                  | 19                  | 0.40                | <1                    | --                  | <350                  |
| 5        | CA-VMP-6   | <1                  | --                  | 631                    | 106                 | <9                     | --                  | 19                  | 0.40                | <1                    | --                  | <350                  |
| 6        | CA-VMP-6   | <1                  | --                  | 1367                   | 250                 | 13                     | 0.29                | 39                  | 0.82                | <1                    | --                  | <350                  |
| 7        | CA-VMP-7   | <1                  | --                  | 1065                   | 188                 | <9                     | --                  | 22                  | 0.46                | <1                    | --                  | <350                  |
| 8        | CA-VMP-7   | 1                   | 0.18                | 1471                   | 272                 | <9                     | --                  | 40                  | 0.84                | <1                    | --                  | <350                  |
| 9        | CA-VMP-7   | <1                  | --                  | 1002                   | 175                 | 17                     | 0.37                | 27                  | 0.56                | <1                    | --                  | <350                  |
| 10       | CA-VMP-7   | <1                  | --                  | 1114                   | 198                 | <9                     | --                  | 28                  | 0.59                | <1                    | --                  | <350                  |
| 11       | CA-VMP-7   | <1                  | --                  | 1083                   | 191                 | <9                     | --                  | 24                  | 0.50                | <1                    | --                  | <350                  |
| 12       | CA-VMP-7   | 1                   | 0.18                | 1478                   | 273                 | <9                     | --                  | 38                  | 0.80                | <1                    | --                  | <350                  |

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LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1066.R19

| Muestras |  | Elementos     |                    |               |                      |               |                      |               |                       |               |                     |               |
|----------|--|---------------|--------------------|---------------|----------------------|---------------|----------------------|---------------|-----------------------|---------------|---------------------|---------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | Incertidumbre | MA1510             | Incertidumbre | MA1510               | Incertidumbre | MA1510               | Incertidumbre | MA1510                | Incertidumbre | MA1510              | Incertidumbre |
|          |  | Bi            | B*                 | B             | Ca*                  | Ca            | Cd*                  | Cd            | Co*                   | Co            | Cr*                 | Cr            |
|          |  | µg/Muestra    | Boro<br>µg/Muestra | µg/Muestra    | Calcio<br>µg/Muestra | µg/Muestra    | Cadmio<br>µg/Muestra | µg/Muestra    | Cobalto<br>µg/Muestra | µg/Muestra    | Cromo<br>µg/Muestra | µg/Muestra    |
|          |  |               | 10<br>3            |               | 40<br>13             |               | 2<br>1               |               | 6<br>2                |               | 4<br>1              |               |
| 1        | CA-VMP-6   | --            | 15                 | 3             | 2131                 | 107           | <2                   | --            | <6                    | --            | 57                  | 9             |
| 2        | CA-VMP-6   | --            | 47                 | 10            | 4609                 | 211           | 2                    | 0.04          | <6                    | --            | 53                  | 8             |
| 3        | CA-VMP-6   | --            | 28                 | 6             | 3069                 | 149           | <2                   | --            | <6                    | --            | 25                  | 4             |
| 4        | CA-VMP-6   | --            | 22                 | 5             | 3236                 | 156           | <2                   | --            | <6                    | --            | 25                  | 4             |
| 5        | CA-VMP-6   | --            | 46                 | 10            | 3574                 | 170           | <2                   | --            | <6                    | --            | 26                  | 4             |
| 6        | CA-VMP-6   | --            | <10                | --            | 4905                 | 222           | <2                   | --            | <6                    | --            | 16                  | 2             |
| 7        | CA-VMP-7   | --            | <10                | --            | 3088                 | 149           | 2                    | 0.04          | <6                    | --            | 35                  | 5             |
| 8        | CA-VMP-7   | --            | <10                | --            | 5859                 | 256           | 4                    | 0.09          | <6                    | --            | 31                  | 5             |
| 9        | CA-VMP-7   | --            | 11                 | 2             | 3865                 | 182           | 2                    | 0.04          | <6                    | --            | 35                  | 5             |
| 10       | CA-VMP-7   | --            | <10                | --            | 4217                 | 196           | 3                    | 0.06          | <6                    | --            | 26                  | 4             |
| 11       | CA-VMP-7   | --            | 129                | 28            | 3784                 | 179           | 3                    | 0.06          | <6                    | --            | 49                  | 8             |
| 12       | CA-VMP-7   | --            | 11                 | 2             | 5328                 | 237           | 5                    | 0.11          | <6                    | --            | 55                  | 8             |

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LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO  
DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1066.R19

| Muestras |  | Elementos  |               |            |               |            |               |            |               |            |               |            |               |
|----------|--|------------|---------------|------------|---------------|------------|---------------|------------|---------------|------------|---------------|------------|---------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | MA1510     | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre | MA1510     | Incertidumbre |
|          |  | Cu*        | Cu            | Fe*        | Fe            | K*         | K             | Hg*        | Hg            | Li*        | Li            | Mg*        | Mg            |
|          |  | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    | µg/Muestra | µg/Muestra    |
|          |  | 5          |               | 15         |               | 75         |               | 20         |               | 2          |               | 9          |               |
|          |  | 2          |               | 5          |               | 25         |               | 6.7        |               | 0.7        |               | 3          |               |
| 1        | CA-VMP-6   | 41         | 4             | 1084       | 125           | 429        | 54            | <20        | --            | <2         | --            | 877        |               |
| 2        | CA-VMP-6   | 89         | 8             | 2114       | 267           | 827        | 100           | <20        | --            | <2         | --            | 1627       |               |
| 3        | CA-VMP-6   | 94         | 9             | 1485       | 178           | 636        | 78            | <20        | --            | <2         | --            | 1378       |               |
| 4        | CA-VMP-6   | 61         | 6             | 1282       | 151           | 703        | 86            | <20        | --            | <2         | --            | 1606       |               |
| 5        | CA-VMP-6   | 71         | 7             | 1237       | 145           | 679        | 83            | <20        | --            | <2         | --            | 1543       |               |
| 6        | CA-VMP-6   | 99         | 9             | 2380       | 308           | 865        | 105           | <20        | --            | <2         | --            | 1693       |               |
| 7        | CA-VMP-7   | 88         | 8             | 1854       | 229           | 588        | 73            | <20        | --            | <2         | --            | 1216       |               |
| 8        | CA-VMP-7   | 231        | 22            | 2865       | 385           | 831        | 101           | <20        | --            | <2         | --            | 1886       |               |
| 9        | CA-VMP-7   | 172        | 16            | 1915       | 238           | 618        | 76            | <20        | --            | <2         | --            | 1464       |               |
| 10       | CA-VMP-7   | 108        | 10            | 2159       | 274           | 782        | 95            | <20        | --            | <2         | --            | 1856       |               |
| 11       | CA-VMP-7   | 168        | 16            | 2109       | 267           | 663        | 82            | <20        | --            | <2         | --            | 1575       |               |
| 12       | CA-VMP-7   | 280        | 27            | 2907       | 392           | 875        | 106           | <20        | --            | <2         | --            | 1780       |               |

\*EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE\*



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1066.R19

Registro N°LE -022

| Muestras |  | Elementos     |                                     |               |                                   |               |                                 |               |                                  |               |                                     |               |
|----------|--|---------------|-------------------------------------|---------------|-----------------------------------|---------------|---------------------------------|---------------|----------------------------------|---------------|-------------------------------------|---------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | Incertidumbre | MA1510                              | Incertidumbre | MA1510                            | Incertidumbre | MA1510                          | Incertidumbre | MA1510                           | Incertidumbre | MA1510                              | Incertidumbre |
|          |  | Mg            | Mn*                                 | Mn            | Mo*                               | Mo            | Na*                             | Na            | Ni*                              | Ni            | P*                                  | P             |
|          |  | µg/Muestra    | Manganeso<br>µg/Muestra<br>2<br>0.7 | µg/Muestra    | Molibdeno<br>µg/Muestra<br>3<br>1 | µg/Muestra    | Sodio<br>µg/Muestra<br>8<br>2.7 | µg/Muestra    | Niquel<br>µg/Muestra<br>5<br>1.7 | µg/Muestra    | Fósforo<br>µg/Muestra<br>35<br>11.7 | µg/Muestra    |
| 1        | CA-VMP-6   | 56            | 22                                  | 1             | 19                                | 0.54          | 5002                            | 368           | 6                                | 0.49          | 128                                 | 7             |
| 2        | CA-VMP-6   | 126           | 53                                  | 2             | <3                                | --            | 8846                            | 414           | <5                               | --            | 254                                 | 13            |
| 3        | CA-VMP-6   | 100           | 34                                  | 1             | 153                               | 4.26          | 8236                            | 420           | 13                               | 1.06          | 152                                 | 8             |
| 4        | CA-VMP-6   | 124           | 32                                  | 1             | <3                                | --            | 10312                           | 378           | <5                               | --            | 222                                 | 12            |
| 5        | CA-VMP-6   | 117           | 31                                  | 1             | <3                                | --            | 10065                           | 386           | 15                               | 1.22          | 135                                 | 7             |
| 6        | CA-VMP-6   | 133           | 54                                  | 2             | 3                                 | 0.09          | 8703                            | 416           | 8                                | 0.65          | 285                                 | 15            |
| 7        | CA-VMP-7   | 85            | 43                                  | 2             | 71                                | 2.01          | 5752                            | 393           | 26                               | 2.11          | 193                                 | 10            |
| 8        | CA-VMP-7   | 155           | 79                                  | 3             | 102                               | 2.87          | 8519                            | 418           | 7                                | 0.57          | 402                                 | 21            |
| 9        | CA-VMP-7   | 109           | 44                                  | 2             | 15                                | 0.43          | 7747                            | 422           | 23                               | 1.87          | 276                                 | 14            |
| 10       | CA-VMP-7   | 151           | 55                                  | 2             | <3                                | --            | 10346                           | 377           | 17                               | 1.38          | 274                                 | 14            |
| 11       | CA-VMP-7   | 120           | 55                                  | 2             | <3                                | --            | 8841                            | 414           | 13                               | 1.06          | 185                                 | 10            |
| 12       | CA-VMP-7   | 143           | 66                                  | 3             | 32                                | 0.91          | 8625                            | 417           | <5                               | --            | 441                                 | 23            |

\*EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE\*



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO  
DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1066.R19

| Muestras |  | Elementos           |                     |                         |                     |                       |                     |                       |                     |                      |                     |                         |
|----------|--|---------------------|---------------------|-------------------------|---------------------|-----------------------|---------------------|-----------------------|---------------------|----------------------|---------------------|-------------------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | MA1510<br>Pb*       | Incertidumbre<br>Pb | MA1510<br>Sb*           | Incertidumbre<br>Sb | MA1510<br>Se*         | Incertidumbre<br>Se | MA1510<br>Si*         | Incertidumbre<br>Si | MA1510<br>Sn*        | Incertidumbre<br>Sn | MA1510<br>Sr*           |
|          |  | Plomo<br>µg/Muestra | µg/Muestra          | Antimonio<br>µg/Muestra | µg/Muestra          | Selenio<br>µg/Muestra | µg/Muestra          | Silicio<br>µg/Muestra | µg/Muestra          | Estaño<br>µg/Muestra | µg/Muestra          | Estroncio<br>µg/Muestra |
|          |  | 12                  |                     | 9                       |                     | 55                    |                     | 60                    |                     | 15                   |                     | 0.3                     |
|          |  | 4                   |                     | 3                       |                     | 18                    |                     | 20                    |                     | 5                    |                     | 0.1                     |
| 1        | CA-VMP-6   | 53                  | 1                   | <9                      | --                  | <55                   | --                  | 967                   | 143                 | 52                   | 7                   | 11.1                    |
| 2        | CA-VMP-6   | 150                 | 3                   | <9                      | --                  | <55                   | --                  | 1904                  | 244                 | 16                   | 2                   | 22.2                    |
| 3        | CA-VMP-6   | 108                 | 2                   | <9                      | --                  | <55                   | --                  | 1813                  | 236                 | <15                  | --                  | 17.0                    |
| 4        | CA-VMP-6   | 114                 | 2                   | <9                      | --                  | <55                   | --                  | 1355                  | 190                 | <15                  | --                  | 18.5                    |
| 5        | CA-VMP-6   | 64                  | 1                   | <9                      | --                  | <55                   | --                  | 1289                  | 182                 | <15                  | --                  | 19.3                    |
| 6        | CA-VMP-6   | 118                 | 2                   | <9                      | --                  | <55                   | --                  | 3168                  | 319                 | <15                  | --                  | 23.1                    |
| 7        | CA-VMP-7   | 75                  | 1                   | <9                      | --                  | <55                   | --                  | 2526                  | 289                 | 23                   | 3                   | 14.8                    |
| 8        | CA-VMP-7   | 313                 | 9                   | <9                      | --                  | <55                   | --                  | 2568                  | 292                 | 37                   | 5                   | 25.0                    |
| 9        | CA-VMP-7   | 218                 | 5                   | <9                      | --                  | <55                   | --                  | 2089                  | 259                 | <15                  | --                  | 18.6                    |
| 10       | CA-VMP-7   | 168                 | 3                   | <9                      | --                  | <55                   | --                  | 2198                  | 267                 | <15                  | --                  | 20.6                    |
| 11       | CA-VMP-7   | 151                 | 3                   | <9                      | --                  | <55                   | --                  | 2330                  | 277                 | 25                   | 3                   | 18.5                    |
| 12       | CA-VMP-7   | 521                 | 20                  | <9                      | --                  | <55                   | --                  | 2944                  | 310                 | 25                   | 3                   | 23.3                    |

\*EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE\*



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1066.R19

Registro N°LE -022

| Muestras |  | Elementos     |                                   |               |                                 |               |                                     |               |                                |               |
|----------|--|---------------|-----------------------------------|---------------|---------------------------------|---------------|-------------------------------------|---------------|--------------------------------|---------------|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Cuantificación LC<br>Limite de Detección LD | Incertidumbre | MA1510                            | Incertidumbre | MA1510                          | Incertidumbre | MA1510                              | Incertidumbre | MA1510                         | Incertidumbre |
|          |  | Sr            | Ti*                               | Ti            | Tl*                             | Tl            | V*                                  | V             | Zn*                            | Zn            |
|          |  | µg/Muestra    | Titanio<br>µg/Muestra<br>1<br>0.3 | µg/Muestra    | Talio<br>µg/Muestra<br>60<br>20 | µg/Muestra    | Vanadio<br>µg/Muestra<br>2.5<br>0.8 | µg/Muestra    | Zinc<br>µg/Muestra<br>45<br>15 | µg/Muestra    |
| 1        | CA-VMP-6   | 2.1           | 19                                | 0.40          | <60                             | --            | 51.4                                | 10.7          | 113                            | 12            |
| 2        | CA-VMP-6   | 4.2           | 42                                | 0.89          | <60                             | --            | 39.1                                | 8.1           | 244                            | 28            |
| 3        | CA-VMP-6   | 3.2           | 32                                | 0.68          | <60                             | --            | 70.0                                | 14.6          | 290                            | 35            |
| 4        | CA-VMP-6   | 3.5           | 28                                | 0.59          | <60                             | --            | 37.7                                | 7.8           | 178                            | 20            |
| 5        | CA-VMP-6   | 3.7           | 25                                | 0.53          | <60                             | --            | 66.1                                | 13.7          | 182                            | 20            |
| 6        | CA-VMP-6   | 4.4           | 68                                | 1.45          | <60                             | --            | 31.4                                | 6.5           | 354                            | 45            |
| 7        | CA-VMP-7   | 2.8           | 54                                | 1.15          | <60                             | --            | 69.6                                | 14.5          | 168                            | 18            |
| 8        | CA-VMP-7   | 4.8           | 58                                | 1.24          | <60                             | --            | 63.2                                | 13.1          | 394                            | 51            |
| 9        | CA-VMP-7   | 3.5           | 42                                | 0.89          | <60                             | --            | 85.8                                | 17.9          | 327                            | 41            |
| 10       | CA-VMP-7   | 3.9           | 46                                | 0.98          | <60                             | --            | 50.8                                | 10.5          | 225                            | 26            |
| 11       | CA-VMP-7   | 3.5           | 49                                | 1.04          | <60                             | --            | 68.5                                | 14.2          | 191                            | 21            |
| 12       | CA-VMP-7   | 4.4           | 66                                | 1.41          | <60                             | --            | 48.2                                | 10            | 496                            | 69            |

\*EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE\*



**CONTROL DE CALIDAD**

| Muestras QC |   | Elementos           |                   |  |                        |                         |                        |                        |                        |                          |                        |
|-------------|---|---------------------|-------------------|--|------------------------|-------------------------|------------------------|------------------------|------------------------|--------------------------|------------------------|
| N°          | Codigo de Servicio<br>Elemento<br>Unidad<br>Limite de Cuantificación LC | MA0216              | MA0216            | MA0216   | MA1510                 | MA1510                  | MA1510                 | MA1510                 | MA1510                 | MA1510                   | MA1510                 |
|             |   | Peso. Inicial*<br>g | Peso. Final*<br>g | Determinación de Peso: PM10_AV<br>µg/Muestra<br>5582 | Ag*<br>µg/Muestra<br>1 | Al*<br>µg/Muestra<br>20 | As*<br>µg/Muestra<br>9 | Ba*<br>µg/Muestra<br>1 | Be*<br>µg/Muestra<br>1 | Bi*<br>µg/Muestra<br>350 | B*<br>µg/Muestra<br>10 |
| 1           | Adición (% Recup.)  | --                  | --                | --   | 124.9                  | 116.4                   | 97.8                   | 100.9                  | 104.4                  | --                       | 96.4                   |
| 2           | Adición Rango (%)   | --                  | --                | --   | 75.0 - 125.0           | 75.0 - 125.0            | 75.0 - 125.0           | 75.0 - 125.0           | 75.0 - 125.0           | --                       | 75.0 - 125.0           |
| 3           | STD - Recuperación Obtenido (%)   | --                  | --                | --   | 112.8                  | 108.1                   | 105.6                  | 101.7                  | 104.2                  | 105.3                    | 101.1                  |
| 4           | STD - Rango (%)   | --                  | --                | --   | 80.0-120.0             | 80.0-120.0              | 80.0-120.0             | 80.0-120.0             | 80.0-120.0             | 80.0-120.0               | 80.0-120.0             |
| 5           | CA-VMP-6 (Original)   | --                  | --                | --   | <1                     | 763                     | <9                     | 20                     | <1                     | <350                     | 28                     |
| 6           | CA-VMP-6 (Dup)  | --                  | --                | --   | <1                     | 788                     | <9                     | 21                     | <1                     | <350                     | 29                     |
| 7           | CA-VMP-6 (Original)   | 3.2534              | 3.4221            | 168700   | --                     | --                      | --                     | --                     | --                     | --                       | --                     |
| 8           | CA-VMP-6 (Dup)  | 3.2534              | 3.4220            | 168600   | --                     | --                      | --                     | --                     | --                     | --                       | --                     |
| 9           | Blanco  | --                  | --                | --   | <1                     | <20                     | <9                     | <1                     | <1                     | <350                     | <10                    |

"EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE"



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1066.R19

| Muestras QC |                                 | Elementos    |              |              |              |              |              |              |              |              |              |              |              |              |
|-------------|---------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| N°          | Codigo de Servicio              | MA1510       | MA1510       | MA1510       | MA1510       | MA1510       | MA1510       | MA1510       | MA1510       | MA1510       | MA1510       | MA1510       | MA1510       | MA1510       |
|             | Elemento                        | Ca*          | Cd*          | Co*          | Cr*          | Cu*          | Fe*          | K*           | Hg*          | Li*          | Mg*          | Mn*          | Mo*          | Na*          |
|             | Unidad                          | µg/Muestra   | µg/Muestra   | µg/Muestra   | µg/Muestra   | µg/Muestra   | µg/Muestra   | µg/Muestra   | µg/Muestra   | µg/Muestra   | µg/Muestra   | µg/Muestra   | µg/Muestra   | µg/Muestra   |
|             | Limite de Cuantificación LC     | 40           | 2            | 6            | 4            | 5            | 15           | 75           | 20           | 2            | 9            | 2            | 3            | 8            |
| 1           | Adición (% Recup.)              | 104.0        | 103.6        | 100.4        | 89.3         | 102.7        | 119.1        | 86.7         | 93.8         | 102.7        | 113.3        | 100.0        | 105.8        | 101.3        |
| 2           | Adición Rango (%)               | 75.0 - 125.0 | 75.0 - 125.0 | 75.0 - 125.0 | 75.0 - 125.0 | 75.0 - 125.0 | 75.0 - 125.0 | 75.0 - 125.0 | 75.0 - 125.0 | 75.0 - 125.0 | 75.0 - 125.0 | 75.0 - 125.0 | 75.0 - 125.0 | 75.0 - 125.0 |
| 3           | STD - Recuperación Obtenido (%) | 111.4        | 103.9        | 102.8        | 102.8        | 102.5        | 103.9        | 113.1        | 102.8        | 95.0         | 101.9        | 101.1        | 102.5        | 107.5        |
| 4           | STD - Rango (%)                 | 80.0-120.0   | 80.0-120.0   | 80.0-120.0   | 80.0-120.0   | 80.0-120.0   | 80.0-120.0   | 80.0-120.0   | 80.0-120.0   | 80.0-120.0   | 80.0-120.0   | 80.0-120.0   | 80.0-120.0   | 80.0-120.0   |
| 5           | CA-VMP-6 (Original)             | 3069         | <2           | <6           | 25           | 94           | 1485         | 636          | <20          | <2           | 1378         | 34           | 153          | 8236         |
| 6           | CA-VMP-6 (Dup)                  | 3166         | <2           | <6           | 26           | 98           | 1542         | 656          | <20          | <2           | 1423         | 35           | 158          | 8514         |
| 7           | CA-VMP-6 (Original)             | --           | --           | --           | --           | --           | --           | --           | --           | --           | --           | --           | --           | --           |
| 8           | CA-VMP-6 (Dup)                  | --           | --           | --           | --           | --           | --           | --           | --           | --           | --           | --           | --           | --           |
| 9           | Blanco                          | <40          | <2           | <6           | <4           | <5           | <15          | <75          | <20          | <2           | <9           | <2           | <3           | <8           |

"EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE"



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1066.R19

| Muestras QC |   | Elementos       |                  |                  |                 |                  |                  |                  |                   |                 |                  |                   |                  |
|-------------|---|-----------------|------------------|------------------|-----------------|------------------|------------------|------------------|-------------------|-----------------|------------------|-------------------|------------------|
| N°          | Codigo de Servicio<br>Elemento<br>Unidad<br>Limite de Cuantificación LC | MA1510          | MA1510           | MA1510           | MA1510          | MA1510           | MA1510           | MA1510           | MA1510            | MA1510          | MA1510           | MA1510            | MA1510           |
|             |   | Ni*             | P*               | Pb*              | Sb*             | Se*              | Si*              | Sn*              | Sr*               | Ti*             | Tl*              | V*                | Zn*              |
|             |   | µg/Muestra<br>5 | µg/Muestra<br>35 | µg/Muestra<br>12 | µg/Muestra<br>9 | µg/Muestra<br>55 | µg/Muestra<br>60 | µg/Muestra<br>15 | µg/Muestra<br>0.3 | µg/Muestra<br>1 | µg/Muestra<br>60 | µg/Muestra<br>2.5 | µg/Muestra<br>45 |
| 1           | Adición (% Recup.)  | 108.0           | 106.2            | 104.9            | 99.1            | 104.9            | 124.9            | 93.3             | 100.9             | 104.9           | 98.2             | 99.6              | 96.9             |
| 2           | Adición Rango (%)   | 75.0 - 125.0    | 75.0 - 125.0     | 75.0 - 125.0     | 75.0 - 125.0    | 75.0 - 125.0     | 75.0 - 125.0     | 75.0 - 125.0     | 75.0 - 125.0      | 75.0 - 125.0    | 75.0 - 125.0     | 75.0 - 125.0      | 75.0 - 125.0     |
| 3           | STD - Recuperación Obtenido (%)   | 104.7           | 100.6            | 106.4            | 106.1           | 100.3            | 115.6            | 99.7             | 103.8             | 101.9           | 98.9             | 101.4             | 103.3            |
| 4           | STD - Rango (%)   | 80.0-120.0      | 80.0-120.0       | 80.0-120.0       | 80.0-120.0      | 80.0-120.0       | 80.0-120.0       | 80.0-120.0       | 80.0-120.0        | 80.0-120.0      | 80.0-120.0       | 80.0-120.0        | 80.0-120.0       |
| 5           | CA-VMP-6 (Original)   | 13              | 152              | 108              | <9              | <55              | 1813             | <15              | 17.0              | 32              | <60              | 70.0              | 290              |
| 6           | CA-VMP-6 (Dup)  | 14              | 166              | 107              | <9              | <55              | 1877             | <15              | 17.4              | 34              | <60              | 72.4              | 299              |
| 7           | CA-VMP-6 (Original)   | --              | --               | --               | --              | --               | --               | --               | --                | --              | --               | --                | --               |
| 8           | CA-VMP-6 (Dup)  | --              | --               | --               | --              | --               | --               | --               | --                | --              | --               | --                | --               |
| 9           | Blanco  | <5              | <35              | <12              | <9              | <55              | <60              | <15              | <0.3              | <1              | <60              | <2.5              | <45              |

"EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE"



**METODOS DE ENSAYO Y CODIGOS DE SERVICIO**

| N° | Descripción  |  |               |  |
|----|--|--|---------------|--|
|    | Analito  | Denominación                                       | Cod.Serv      | (1) Norma o Referencia   |
| 1  | Determinación de Peso: PM10_AV                       | Determinación de Peso: Filtro PM10 Alto Volumen    | MA0216        | IC-MA-95 Rev.02 (Validado) 2017. Determinación de Peso: Filtro M10 y PM2.5 Alto Volumen  |
| 2  | <b>Metales por ICP OES Filro PM10 Alto Volumen *</b> | <b>Metales por ICP OES Filro PM10 Alto Volumen</b> | <b>MA1510</b> | <b>EPA Compendium Method IO-3 4. 1999. Determination of Metals in Ambient Particulate Matter using Inductively Coupled Plasma(ICP) Spectroscopy. Excepto Muestreo.</b> |

(\*) Los métodos indicados no han sido acreditados por el INACAL-DA.

- (1) SMEWW: Standard Methods for the Examination of Water and Wastewater.  
 APHA : American Public Health Association.  
 AWWA: American Water Works Association.  
 WEF : Water Environment Federation.  
 EPA : Environmental Protection Agency.  
 ASTM: American Society for Testing and Materials.  
 ISO: International Organization for Standardization.  
 NTP: Norma Técnica Peruana.  
 NIOSH: The National Institute for Occupational Safety and Health.

"EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE"



## INFORME DE ENSAYO N° ABR1067.R19

|  |  |
|--|--|
| <b>SOLICITANTE :</b>                                 | ORGANISMO DE EVALUACIÓN Y FISCALIZACIÓN AMBIENTAL  |
| <b>DOMICILIO LEGAL :</b>                             | Av. Faustino Sánchez Carrión N° 603<br>Jesús María, Lima   |
| <b>SOLICITADO POR :</b>                              | Dirección de Evaluación Ambiental  |
| <b>SOLICITUD DE SERVICIO AMBIENTAL:</b>              | SSA N° 104-19  |
| <b>REFERENCIA :</b>                                  | CUC: 0001-3-2019-401<br>RS N°: 363-2019<br>Ventanilla y Mi Perú / Callao<br>Monitoreo de Calidad de Aire |
| <b>FECHA DE MUESTREO :</b>                           | 2019/03/04 al 2019/03/30   |
| <b>MUESTRA TOMADA POR :</b>                          | EL CLIENTE   |
| <b>PROTOCOLO :</b>                                   | --   |
| <b>TIPO DE MUESTRA:</b>                              | Filtro   |
| <b>NÚMERO DE MUESTRAS :</b>                          | 6  |
| <b>PRESENTACIÓN DE LAS MUESTRAS :</b>                | Filtro de Teflón de 46.2 mm de diámetro  |
| <b>CONDICIÓN DE LAS MUESTRAS :<br/>RECEPCIONADAS</b> | Muestras en buenas condiciones para los análisis solicitados.  |
| <b>FECHA DE RECEPCIÓN :</b>                          | miércoles, 03 de Abril de 2019   |
| <b>IDENTIFICACIÓN DE LAS MUESTRAS :</b>              | Según se indica  |
| <b>FECHA DE EJECUCIÓN DE ENSAYO :</b>                | 2019-04-03 al 2019-04-10   |
| <b>FECHA DE REPORTE :</b>                            | miércoles, 10 de Abril de 2019   |
| <b>PERIODO DE CUSTODIA :</b>                         | Hasta un mes. De acuerdo a las recomendaciones de la metodología o norma empleada.                       |

**EDGAR NINA VELÁSQUEZ**  
**Jefe Ambiental**  
**CQP. 729**

Lima, 10 de Abril de 2019

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El laboratorio no es responsable de la información proporcionada por el cliente.  
Los resultados se aplican a la muestra cómo se recibió por parte del cliente.



**INFORME DE ENSAYO**  
**N° ABR1067.R19**

**RESULTADOS**

| Muestras |   | Elementos   |                            |                                      |   |                                       |   |  |
|----------|---|---|----------------------------|--------------------------------------|---|---------------------------------------|---|--|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Detección LD | MON0000<br>Fecha<br>Monitoreo                     | MON0000<br>Tipo<br>Muestra | MA1000<br>Codigo de Filtro*<br>PM2.5 | MA1343<br>Peso. Inicial*<br>PM2.5<br>ug | MA1343<br>Peso. Final*<br>PM2.5<br>ug | MA1343<br>Determinación de Peso: PM2.5_BV<br>µg/Muestra<br>60<br>20 | Incertidumbre<br>Determinación de Peso: PM2.5_BV<br>µg/Muestra |
| 1        | CA-VMP-2  | Inicio: 2019-03-04 15:28<br>Fin: 2019-03-05 14:58 | Filtro                     | <b>0039T.R19</b>                     | <b>139471</b>                           | <b>140059</b>                         | 588   | 16   |
| 2        | CA-VMP-2  | Inicio: 2019-03-07 11:48<br>Fin: 2019-03-08 11:18 | Filtro                     | <b>0040T.R19</b>                     | <b>139255</b>                           | <b>140028</b>                         | 773   | 16   |
| 3        | CA-VMP-2  | Inicio: 2019-03-13 15:47<br>Fin: 2019-03-14 14:47 | Filtro                     | <b>0041T.R19</b>                     | <b>140620</b>                           | <b>141262</b>                         | 642   | 16   |
| 4        | CA-VMP-2  | Inicio: 2019-03-16 11:53<br>Fin: 2019-03-17 11:23 | Filtro                     | <b>0042T.R19</b>                     | <b>140864</b>                           | <b>141447</b>                         | 583   | 16   |
| 5        | CA-VMP-2  | Inicio: 2019-03-19 11:44<br>Fin: 2019-03-20 11:44 | Filtro                     | <b>0043T.R19</b>                     | <b>140300</b>                           | <b>140934</b>                         | 634   | 16   |
| 6        | CA-VMP-2  | Inicio: 2019-03-29 13:36<br>Fin: 2019-03-30 13:06 | Filtro                     | <b>0044T.R19</b>                     | <b>143109</b>                           | <b>143923</b>                         | 814   | 16   |



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1067.R19

Registro N°LE -022

### CONTROL DE CALIDAD

| Muestras QC |   | Elementos                      |                              |   |
|-------------|---|--------------------------------|------------------------------|---|
| N°          | Codigo de Servicio<br>Elemento<br>Unidad<br>Limite de Cuantificación LC | MA1343<br>Peso. Inicial*<br>ug | MA1343<br>Peso. Final*<br>ug | MA1343<br>Determinación de Peso: PM2.5_BV<br>µg/Muestra<br>60 |
| 1           | CA-VMP-2 (Original)   | 140620                         | 141262                       | 642   |
| 2           | CA-VMP-2 (Dup)  | 140620                         | 141268                       | 648   |

\*EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE\*



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO  
DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1067.R19

## METODOS DE ENSAYO Y CODIGOS DE SERVICIO

| N° | Descripción                     |  |          |   |
|----|---------------------------------|--|----------|---|
|    | Analito                         | Denominación                                     | Cod.Serv | (1) Norma o Referencia  |
| 1  | Determinación de Peso: PM2.5_BV | Determinación de Peso: Filtro PM2.5_Bajo Volumen | MA1343   | EPA CFR 40 Part 50 Appendix L (Validado). 2017. Reference Method for the Determination of the Fine Particulate Matter as PM 2.5 in the Atmosphere.Excepto Muestreo. |

(\*) Los métodos indicados no han sido acreditados por el INACAL-DA.

- (1) SMEWW: Standard Methods for the Examination of Water and Wastewater.  
 APHA : American Public Health Association.  
 AWWA: American Water Works Association.  
 WEF : Water Environment Federation.  
 EPA : Environmental Protection Agency.  
 ASTM: American Society for Testing and Materials.  
 ISO: International Organization for Standardization.  
 NTP: Norma Técnica Peruana.  
 NIOSH: The National Institute for Occupational Safety and Health.



## INFORME DE ENSAYO N° ABR1068.R19

|  |  |
|--|--|
| <b>SOLICITANTE :</b>                                 | ORGANISMO DE EVALUACIÓN Y FISCALIZACIÓN AMBIENTAL  |
| <b>DOMICILIO LEGAL :</b>                             | Av. Faustino Sánchez Carrión N° 603<br>Jesús María, Lima   |
| <b>SOLICITADO POR :</b>                              | Dirección de Evaluación Ambiental  |
| <b>SOLICITUD DE SERVICIO AMBIENTAL:</b>              | SSA N° 104-19  |
| <b>REFERENCIA :</b>                                  | CUC: 0001-3-2019-401<br>RS N°: 363-2019<br>Ventanilla y Mi Perú / Callao<br>Monitoreo de Calidad de Aire |
| <b>FECHA DE MUESTREO :</b>                           | 2019/03/29   |
| <b>MUESTRA TOMADA POR :</b>                          | EL CLIENTE   |
| <b>PROTOCOLO :</b>                                   | --   |
| <b>TIPO DE MUESTRA:</b>                              | Filtro   |
| <b>NÚMERO DE MUESTRAS :</b>                          | 4  |
| <b>PRESENTACIÓN DE LAS MUESTRAS :</b>                | Filtro de Cuarzo de 8"x10" / Filtro de Teflón de 46.2 mm de diámetro                                     |
| <b>CONDICIÓN DE LAS MUESTRAS :<br/>RECEPCIONADAS</b> | Muestras en buenas condiciones para los análisis solicitados.  |
| <b>FECHA DE RECEPCIÓN :</b>                          | miércoles, 03 de Abril de 2019   |
| <b>IDENTIFICACIÓN DE LAS MUESTRAS :</b>              | Según se indica  |
| <b>FECHA DE EJECUCIÓN DE ENSAYO :</b>                | 2019-04-03 al 2019-04-10   |
| <b>FECHA DE REPORTE :</b>                            | miércoles, 10 de Abril de 2019   |
| <b>PERIODO DE CUSTODIA :</b>                         | Hasta un mes. De acuerdo a las recomendaciones de la metodología o norma empleada.                       |

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**CQP. 729**

Lima, 10 de Abril de 2019

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"EL USO INDEBIDO DE ESTE INFORME DE ENSAYO CONSTITUYE DELITO SANCIONADO CONFORME A LA LEY, POR LA AUTORIDAD COMPETENTE"



LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO  
DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1068.R19

Registro N°LE -022

## RESULTADOS

| Muestras |   | Elementos   |                 |                           |                             |                           |  |  |
|----------|---|---|-----------------|---------------------------|-----------------------------|---------------------------|--|--|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Detección LD | MON0000   | MON0000         | MA1000                    | MA0216                      | MA0216                    | MA0216   | Incertidumbre                                |
|          |   | Fecha<br>Monitoreo                                | Tipo<br>Muestra | Codigo de Filtro*<br>PM10 | Peso. Inicial*<br>PM10<br>g | Peso. Final*<br>PM10<br>g | Determinación de Peso: PM10_AV<br>µg/Muestra<br>5582<br>1229 | Determinación de Peso: PM10_AV<br>µg/Muestra |
| 1        | CA-VMP-1  | Inicio: 2019-03-29 12:47<br>Fin: 2019-03-29 12:52 | Filtro          | 0083A.R19                 | 3.2499                      | 3.2615                    | 11600  | 2428   |
| 2        | CA-VMP-2  | Inicio: 2019-03-29 13:19<br>Fin: 2019-03-29 13:26 | Filtro          | 0084A.R19                 | 3.2645                      | 3.2760                    | 11500  | 2428   |
| 3        | CA-VMP-7  | Inicio: 2019-03-29 11:55<br>Fin: 2019-03-29 12:00 | Filtro          | 0030A.R19                 | 3.2326                      | 3.2442                    | 11600  | 2428   |
| 4        | CA-VMP-2  | Inicio: 2019-03-29 13:22<br>Fin: 2019-03-29 13:27 | Filtro          | --                        | --                          | --                        | --   | --   |

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LABORATORIO DE ENSAYO ACREDITADO POR EL ORGANISMO PERUANO  
DE ACREDITACIÓN INACAL - DA CON REGISTRO N° LE 022



INFORME DE ENSAYO  
N° ABR1068.R19

| Muestras |   | Elementos                  |                               |                             |   |   |
|----------|---|----------------------------|-------------------------------|-----------------------------|---|---|
| N°       | Codigo de Servicio<br>Elemento<br>Nombre de Analito<br>Unidad<br>Limite de Detección LD | MA1000                     | MA1343                        | MA1343                      | MA1343  | Incertidumbre                                 |
|          |   | Codigo de Filtro*<br>PM2.5 | Peso. Inicial*<br>PM2.5<br>ug | Peso. Final*<br>PM2.5<br>ug | Determinación de Peso: PM2.5_BV<br>µg/Muestra<br>60<br>20 | Determinación de Peso: PM2.5_BV<br>µg/Muestra |
| 1        | CA-VMP-1  | --                         | --                            | --                          | --  | --  |
| 2        | CA-VMP-2  | --                         | --                            | --                          | --  | --  |
| 3        | CA-VMP-7  | --                         | --                            | --                          | --  | --  |
| 4        | CA-VMP-2  | 0045T.R19                  | 141735                        | 141742                      | <60   | --  |

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INFORME DE ENSAYO  
N° ABR1068.R19

CONTROL DE CALIDAD

| Muestras QC |   | Elementos                     |                             |  |                                |                              |   |
|-------------|---|-------------------------------|-----------------------------|--|--------------------------------|------------------------------|---|
| N°          | Codigo de Servicio<br>Elemento<br>Unidad<br>Limite de Cuantificación LC | MA0216<br>Peso. Inicial*<br>g | MA0216<br>Peso. Final*<br>g | MA0216<br>Determinación de Peso: PM10_AV<br>µg/Muestra<br>5582 | MA1343<br>Peso. Inicial*<br>ug | MA1343<br>Peso. Final*<br>ug | MA1343<br>Determinación de Peso: PM2.5_BV<br>µg/Muestra<br>60 |
| 1           | CA-VMP-7 (Original)   | 3.2326                        | 3.2442                      | 11600  | --                             | --                           | --  |
| 2           | CA-VMP-7 (Dup)  | 3.2326                        | 3.2435                      | 10900  | --                             | --                           | --  |
| 3           | CA-VMP-2 (Original)   | --                            | --                          | --   | 141735                         | 141742                       | <60   |
| 4           | CA-VMP-2 (Dup)  | --                            | --                          | --   | 141735                         | 141740                       | <60   |



**METODOS DE ENSAYO Y CODIGOS DE SERVICIO**

| N° | Descripción                     |  |          |   |
|----|---------------------------------|--|----------|---|
|    | Analito                         | Denominación                                     | Cod.Serv | (1) Norma o Referencia  |
| 1  | Determinación de Peso: PM2.5_BV | Determinación de Peso: Filtro PM2.5_Bajo Volumen | MA1343   | EPA CFR 40 Part 50 Appendix L (Validado). 2017. Reference Method for the Determination of the Fine Particulate Matter as PM 2.5 in the Atmosphere.Excepto Muestreo. |
| 2  | Determinación de Peso: PM10_AV  | Determinación de Peso: Filtro PM10 Alto Volumen  | MA0216   | IC-MA-95 Rev.02 (Validado) 2017. Determinación de Peso: Filtro M10 y PM2.5 Alto Volumen   |

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