



# CALIBRACIÓN DEL EQUIPO ESPECTROFOTÓMETRO DOBSON N°087

## Instructivo: IN-DMA-006

### Versión: 01

## SUBDIRECCIÓN DE EVALUACIÓN DEL AMBIENTE ATMOSFÉRICO – DIRECCIÓN DE METEOROLOGÍA Y EVALUACIÓN AMBIENTAL ATMOSFÉRICA

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	<b>INSTRUCTIVO</b>	<b>Código</b>	IN-DMA-006
	<b>CALIBRACIÓN DEL EQUIPO ESPECTROFOTÓMETRO DOBSON N° 087</b>	<b>Versión</b>	01
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## 1. OBJETIVO

Establecer las actividades para la calibración del espectrofotómetro Dobson 087, en el Observatorio de Vigilancia Atmosférica (OVA) Marcapomacocha.

## 2. DESARROLLO

### 2.1 Materiales requeridos

- 01 tabla Q<sup>1</sup> calibrada para el OVA Marcapomacocha (Anexo 1: Tabla Q calibrada para el OVA Marcapomacocha).
- 01 espectrofotómetro Dobson N° 087<sup>2</sup>, en adelante denominado espectrofotómetro Dobson
- 01 formato de calibración<sup>3</sup> (Ver Anexo 2: Formato de calibración)
- 01 lámpara de mercurio
- 03 lámparas estándar (87-Q5; 87R-63; 87-Q7)
- 01 software Dobson 4.0 para el cálculo de CTO (Columna Total de Ozono) en unidades Dobson
- 01 multímetro

### 2.2 Operaciones

Las características espectrales del espectrofotómetro Dobson pueden variar con el paso del tiempo. Para corregir estas variaciones y aplicar las correcciones o ajustes necesarios, es esencial realizar la calibración mensual al espectrofotómetro Dobson utilizando para ello dos tipos de lámparas:

- a) Una **Lámpara de mercurio (Hg)**: La calibración del espectrofotómetro Dobson comienza con el uso de una lámpara de mercurio, la cual es la que emite líneas espectrales. Estas líneas sirven para ajustar y calibrar el espectrofotómetro Dobson, asegurando que las mediciones subsiguientes sean precisas.
- b) Tres **lámparas estándar (87-Q5, 87R-63, 87-Q7)**: Una vez completada la calibración inicial con la lámpara de mercurio, se utilizan tres lámparas estándar. Estas emiten luz en longitudes de onda específicas, lo que permite realizar ajustes más precisos en los prismas, espejos y otros componentes ópticos del espectrofotómetro Dobson.

El objetivo de la calibración utilizando las lámparas antes mencionadas es corregir las posibles variaciones espectrales en el espectrofotómetro Dobson para garantizar la precisión y consistencia de las mediciones de ozono realizadas durante el mes. Esto asegura que los datos obtenidos sean confiables para el monitoreo del ozono atmosférico. La calibración se llevará a cabo en el día 1 y 3 de cada mes sin excepción, asegurando así un mantenimiento regular y preciso del espectrofotómetro Dobson.

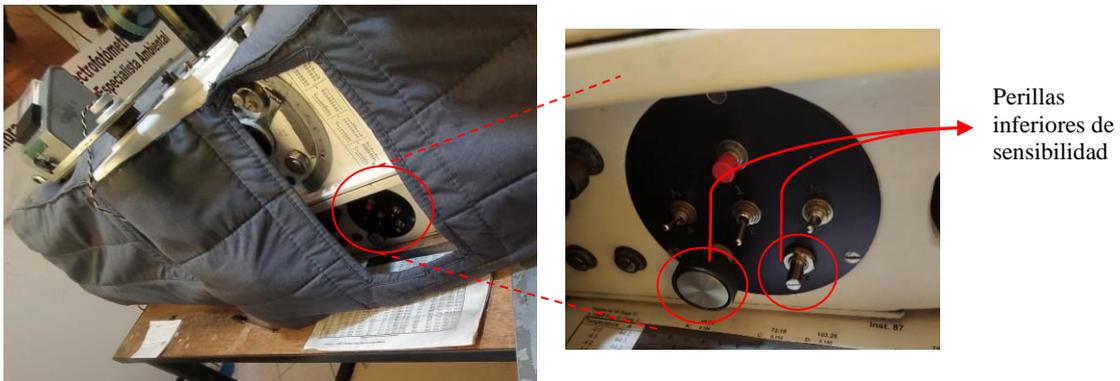
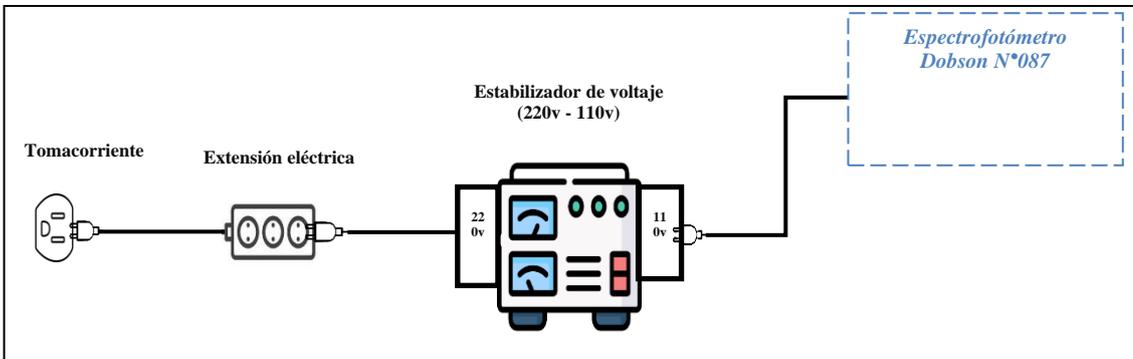
Esta calibración se realizará en el Área de Ozono, a puerta cerrada. Una vez iniciada la calibración, es importante evitar salir o entrar de la mencionada área.

A continuación, se detalla los pasos de la calibración de espectrofotómetro Dobson utilizando la lámpara de mercurio (Hg) y lámpara(s) estándar:

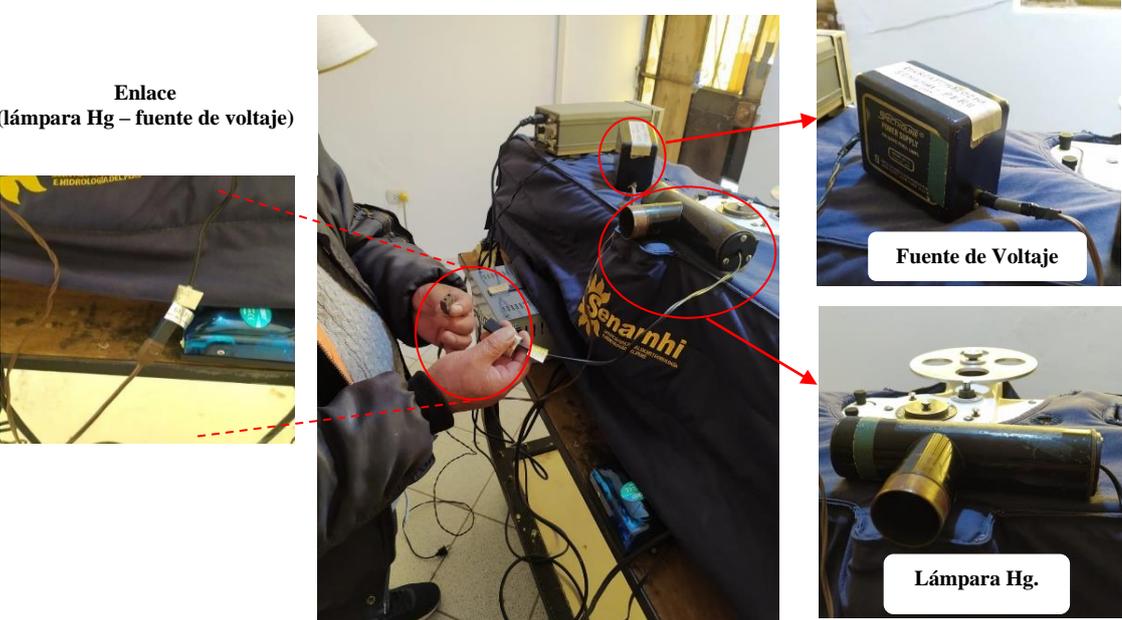
<sup>1</sup> Tabla que contiene los valores de las longitudes de onda A y D en función de la temperatura.

<sup>2</sup> Instrumento óptico que permite medir la columna total de ozono.

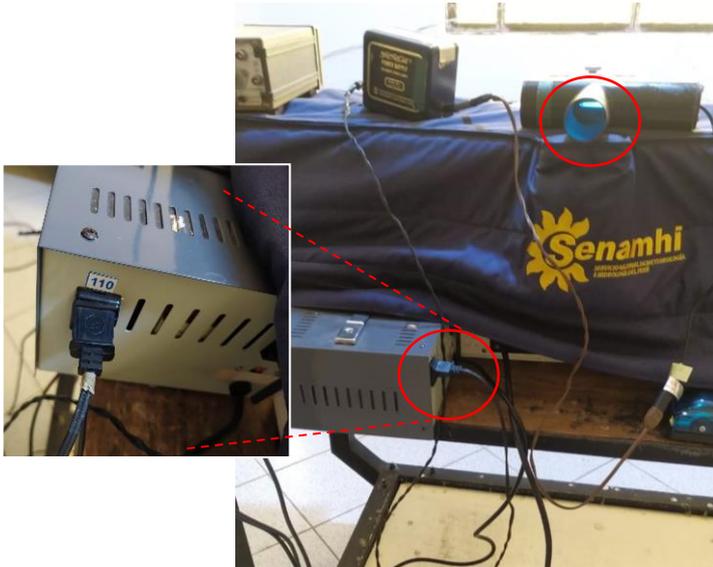
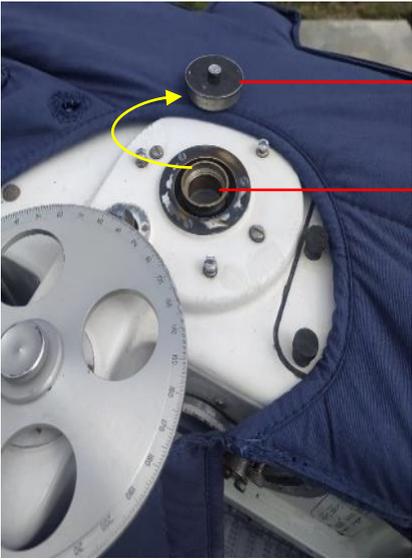
<sup>3</sup> El formato de calibración es un formulario donde se debe ingresar los datos obtenidos en la calibración del espectrofotómetro Dobson tanto con la lámpara de mercurio (Hg) y las lámparas estándar (87-Q5; 87R-63; 87-Q7).

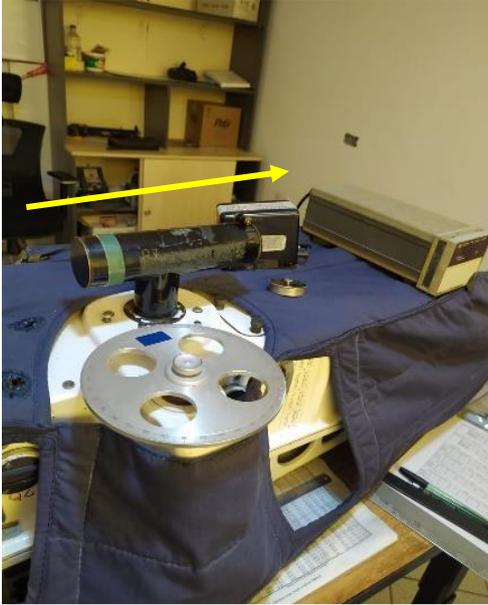
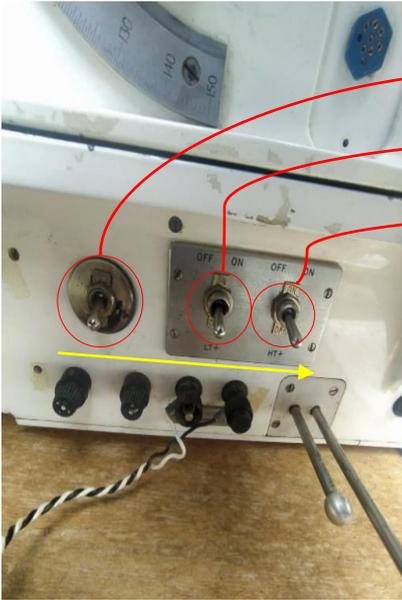
N°	Actividad
<b>Calibración del espectrofotómetro Dobson con la lámpara de mercurio (Hg)</b>	
1	<p>Antes de iniciar, verificar que las perillas inferiores de sensibilidad del espectrofotómetro estén cerradas (giro anti horario).</p> <div data-bbox="284 481 1404 862">  </div> <p align="center"><i>Figura 1: Perillas inferiores del espectrofotómetro Dobson</i></p>
2	<p>Conectar el cable de extensión eléctrica al tomacorriente del flujo eléctrico del OVA Marcapomacocha (220V). Luego, conectar el estabilizador de voltaje a la extensión eléctrica (220V) y, por último, conectar el espectrofotómetro Dobson al estabilizador de voltaje (110V).</p> <div data-bbox="290 1137 1423 1496">  </div> <p align="center"><i>Figura 2: Circuito desde el tomacorriente del flujo eléctrico del OVA hasta el Espectrofotómetro Dobson N° 087</i></p>

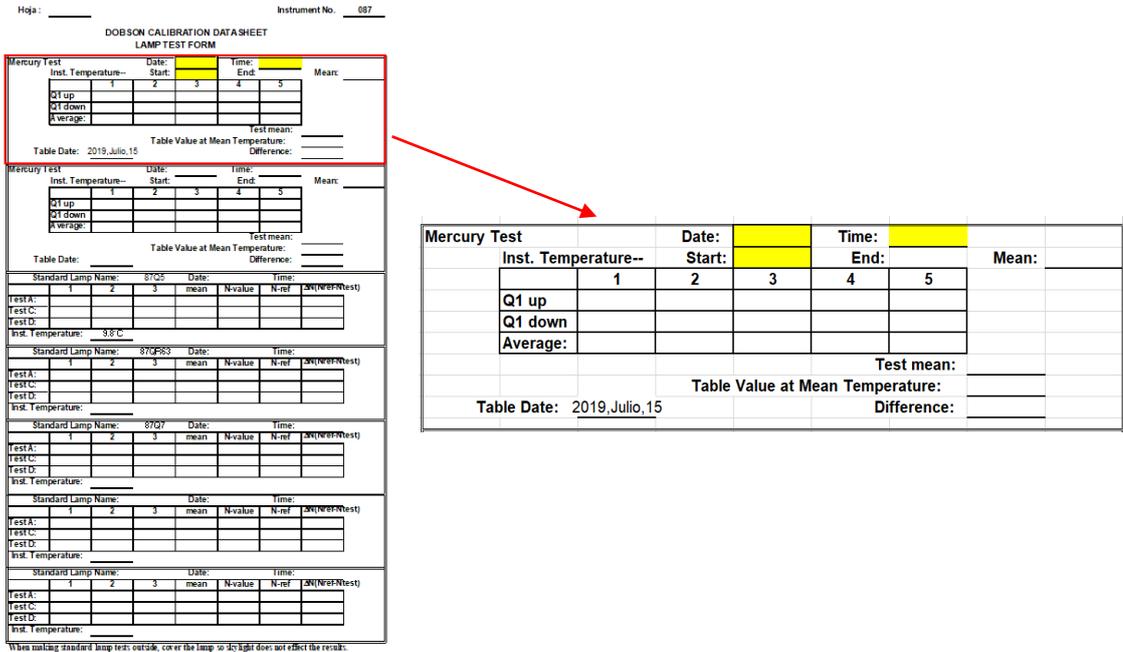
N°	Actividad
<b>3</b>	<p>Conectar el reloj digital HP-IB a la extensión eléctrica y configurar el horario.</p> <div style="text-align: center;">  </div> <p style="text-align: center;"><i>Figura 3: Reloj digital HP-IB</i></p>
<b>4</b>	<p>Conectar las puntas de prueba (+ y -) del multímetro a la extensión eléctrica y verificar que el flujo eléctrico marque 220V. Debido a caídas de tensión, se permite un valor mínimo tolerable de 217V, ya que el área de ozono, donde se realiza la calibración, está aproximadamente a 50 metros del tablero principal del OVA Marcapomacocha.</p> <p>Es crucial asegurar que la energía eléctrica sea estable; Si se detecta inestabilidad, se recomienda detener la calibración. No obstante, en este caso, se destaca que la caída de tensión es estable. Además, cabe recordar que el OVA Marcapomacocha utiliza energía solar y dispone de un sistema de alimentación ininterrumpida (UPS), lo que garantiza un suministro confiable y constante.</p> <div style="text-align: center;">  </div> <p style="text-align: center;"><i>Figura 4: Multímetro marcando 218V</i></p>

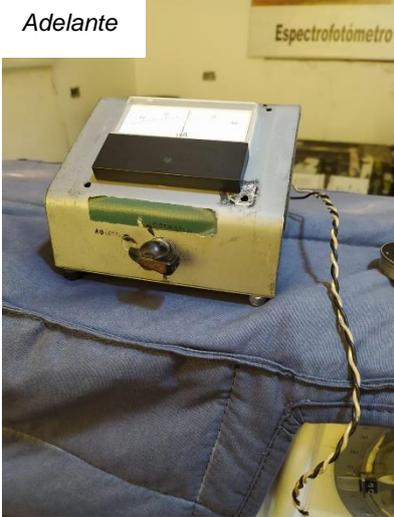
N°	Actividad
5	<p>Enlazar la lámpara de mercurio (Hg) con la fuente de voltaje.</p> <p align="center"><b>Enlace</b> (lámpara Hg – fuente de voltaje)</p>  <p align="center"><i>Figura 5: Enlace (lámpara Hg - fuente de voltaje)</i></p>
6	<p>Conectar el enlace (lámpara Hg – fuente de voltaje) a la extensión eléctrica (220V). Luego, encender la fuente de voltaje para precalentar la lámpara de Hg durante 30 segundos. Después, apagar la fuente de voltaje y desconectar el enlace de la extensión eléctrica.</p>  <p align="center"><i>Figura 6: Interruptor para el encendido y apagado de la fuente de voltaje</i></p>

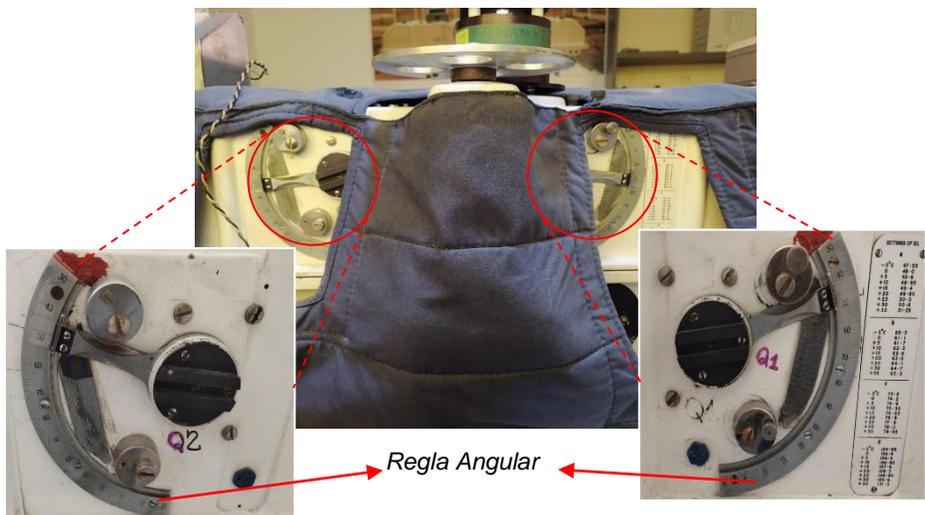
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N°	Actividad
7	<p>Conectar el enlace (lámpara Hg – fuente de voltaje) al estabilizador de voltaje (110V). Luego, encender la fuente de voltaje para que la lámpara de Hg alcance un color azulado estable. <b>No desconectar el enlace del estabilizador de voltaje.</b></p> <div style="text-align: center;">  </div> <p style="text-align: center;"><i>Figura 7: Lámpara de Hg alcanzando un color azulado estable</i></p>
8	<p>Retirar la tapa protectora del difusor (S-1). No quitar el filtro difusor de cuarzo.</p> <div style="text-align: center;">  </div> <p style="text-align: center;"><i>Figura 8: Se retira la tapa protectora</i></p>

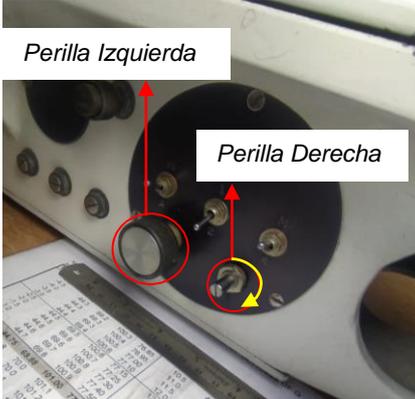
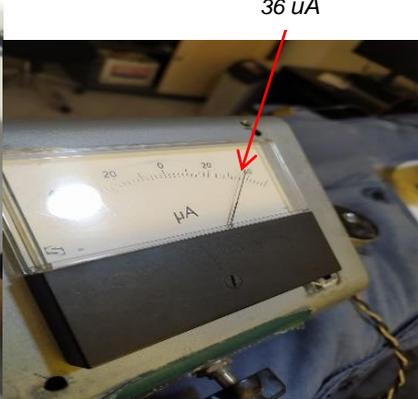
N°	Actividad
9	<p>Teniendo en cuenta que el enlace (lámpara Hg – fuente de voltaje) sigue conectado al estabilizador de voltaje, instalar la lámpara Hg en la ventana del difusor (S-1), posicionándola sobre la entrada de luz, con el extremo largo apuntando hacia el termómetro del Espectrómetro Dobson.  1</p> <div style="text-align: center;">  </div> <p style="text-align: center;"><i>Figura 9: Dirección hacia el termómetro</i></p>
10	<p>Encender el motor del espectrofotómetro Dobson (interruptor de alimentación). Luego, encender el interruptor de bajo voltaje (LT+1) y finalmente el interruptor de alto voltaje (HT+).</p> <div style="text-align: center;">  </div> <p style="text-align: center;"><i>Figura 10: Interruptores del espectrofotómetro Dobson</i></p>

N°	Actividad
11	Esperar 20 minutos aproximadamente para que la emisión de la lámpara de Hg y la temperatura del Espectrofotómetro Dobson se estabilicen.
12	<p>Una vez transcurrido el tiempo especificado, leer la temperatura con la ayuda del termómetro del espectrofotómetro Dobson y proceda a registrar la <b>temperatura inicial</b> (Start), <b>la fecha</b> (Date) y <b>la hora de inicio</b> (Time) en el formato de calibración Dobson, en la sección del Mercury Test.</p> <div style="text-align: center;">  </div> <p style="text-align: center;"><b>Figura 11: Lectura de T° con el termómetro del espectrofotómetro Dobson</b></p> <div style="text-align: center;">  </div> <p style="text-align: center;"><b>Figura 12: Registro de la temperatura, fecha y hora de inicio en el Formato de calibración Dobson</b></p>

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13	<p>Para iniciar la calibración, invertir la polaridad (Shutter) hacia abajo, mediante el interruptor ubicado en la parte posterior del microamperímetro.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Adelante</p>  </div> <div style="text-align: center;"> <p>Detrás</p>  </div> </div> <p style="text-align: center;"><b>Figura 13: Microamperímetro</b></p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
14	<p>Buscar en la tabla Q' la temperatura obtenida en el paso 12, y obtener el valor correspondiente de Hg (en la columna "Hg") para dicha temperatura. Por ejemplo, si la T°=11.0, entonces Hg=79.25, este último dato se coloca en la palanca "Q1".</p> <div style="text-align: center;"> <p><b>Tabla Q'</b></p> <table border="1"> <thead> <tr> <th colspan="4">Values at 15 Degs C:</th> <th colspan="4">46.31</th> <th colspan="4">72.18</th> <th colspan="4">103.25</th> <th colspan="4">79.88</th> </tr> <tr> <th colspan="4">Coef. Deg. Q / Deg. C:</th> <th colspan="4">A: 0.194</th> <th colspan="4">C: 0.183</th> <th colspan="4">D: 0.159</th> <th colspan="4">Hg3129: 0.155</th> </tr> <tr> <th>Temperature</th><th>A</th><th>C</th><th>D</th><th>HG</th> <th>Temperature</th><th>A</th><th>C</th><th>D</th><th>HG</th> <th>Temperature</th><th>A</th><th>C</th><th>D</th><th>HG</th> <th>Temperature</th><th>A</th><th>C</th><th>D</th><th>HG</th> </tr> </thead> <tbody> <tr><td>-5.0</td><td>44.2</td><td>69.1</td><td>100.3</td><td>76.80</td><td>10.0</td><td>45.8</td><td>71.4</td><td>102.5</td><td>79.10</td><td>25.0</td><td>47.3</td><td>73.7</td><td>104.8</td><td>81.45</td><td>40.0</td><td>48.8</td><td>76.0</td><td>107.1</td><td>83.80</td></tr> <tr><td>-4.5</td><td>44.3</td><td>69.2</td><td>100.3</td><td>76.85</td><td>10.5</td><td>45.8</td><td>71.5</td><td>102.6</td><td>79.20</td><td>25.5</td><td>47.4</td><td>73.8</td><td>104.8</td><td>81.50</td><td>40.5</td><td>48.8</td><td>76.0</td><td>107.1</td><td>83.85</td></tr> 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<tr><td>0.5</td><td>44.8</td><td>70.0</td><td>101.1</td><td>77.65</td><td>15.5</td><td>46.4</td><td>72.3</td><td>103.3</td><td>79.95</td><td>30.5</td><td>47.9</td><td>74.6</td><td>105.6</td><td>82.30</td><td>45.5</td><td>49.3</td><td>76.5</td><td>107.6</td><td>84.35</td></tr> <tr><td>1.0</td><td>44.9</td><td>70.0</td><td>101.2</td><td>77.70</td><td>16.0</td><td>46.4</td><td>72.3</td><td>103.4</td><td>80.05</td><td>31.0</td><td>48.0</td><td>74.6</td><td>105.7</td><td>82.35</td><td>46.0</td><td>49.4</td><td>76.6</td><td>107.7</td><td>84.40</td></tr> <tr><td>1.5</td><td>44.9</td><td>70.1</td><td>101.2</td><td>77.80</td><td>16.5</td><td>46.5</td><td>72.4</td><td>103.5</td><td>80.10</td><td>31.5</td><td>48.0</td><td>74.7</td><td>105.7</td><td>82.45</td><td>46.5</td><td>49.4</td><td>76.6</td><td>107.7</td><td>84.45</td></tr> <tr><td>2.0</td><td>45.0</td><td>70.2</td><td>101.3</td><td>77.85</td><td>17.0</td><td>46.5</td><td>72.5</td><td>103.5</td><td>80.20</td><td>32.0</td><td>48.1</td><td>74.8</td><td>105.8</td><td>82.50</td><td>47.0</td><td>49.5</td><td>76.7</td><td>107.8</td><td>84.50</td></tr> <tr><td>2.5</td><td>45.0</td><td>70.3</td><td>101.4</td><td>77.95</td><td>17.5</td><td>46.6</td><td>72.6</td><td>103.6</td><td>80.25</td><td>32.5</td><td>48.1</td><td>74.9</td><td>105.9</td><td>82.60</td><td>47.5</td><td>49.5</td><td>76.7</td><td>107.8</td><td>84.55</td></tr> <tr><td>3.0</td><td>45.1</td><td>70.3</td><td>101.5</td><td>78.00</td><td>18.0</td><td>46.6</td><td>72.6</td><td>103.7</td><td>80.35</td><td>33.0</td><td>48.2</td><td>74.9</td><td>106.0</td><td>82.65</td><td>48.0</td><td>49.6</td><td>76.8</td><td>107.9</td><td>84.60</td></tr> <tr><td>3.5</td><td>45.1</td><td>70.4</td><td>101.5</td><td>78.10</td><td>18.5</td><td>46.7</td><td>72.7</td><td>103.8</td><td>80.40</td><td>33.5</td><td>48.2</td><td>75.0</td><td>106.0</td><td>82.75</td><td>48.5</td><td>49.6</td><td>76.8</td><td>107.9</td><td>84.65</td></tr> <tr><td>4.0</td><td>45.2</td><td>70.5</td><td>101.6</td><td>78.20</td><td>19.0</td><td>46.7</td><td>72.8</td><td>103.9</td><td>80.50</td><td>34.0</td><td>48.3</td><td>75.1</td><td>106.1</td><td>82.85</td><td>49.0</td><td>49.7</td><td>76.9</td><td>108.0</td><td>84.70</td></tr> <tr><td>4.5</td><td>45.2</td><td>70.6</td><td>101.7</td><td>78.25</td><td>19.5</td><td>46.8</td><td>72.9</td><td>103.9</td><td>80.60</td><td>34.5</td><td>48.3</td><td>75.2</td><td>106.2</td><td>82.90</td><td>49.5</td><td>49.7</td><td>76.9</td><td>108.0</td><td>84.75</td></tr> <tr><td>5.0</td><td>45.3</td><td>70.6</td><td>101.8</td><td>78.35</td><td>20.0</td><td>46.8</td><td>72.9</td><td>104.0</td><td>80.65</td><td>35.0</td><td>48.4</td><td>75.2</td><td>106.3</td><td>83.00</td><td>50.0</td><td>49.8</td><td>77.0</td><td>108.1</td><td>84.80</td></tr> <tr><td>5.5</td><td>45.3</td><td>70.7</td><td>101.8</td><td>78.40</td><td>20.5</td><td>46.9</td><td>73.0</td><td>104.1</td><td>80.75</td><td>35.5</td><td>48.4</td><td>75.3</td><td>106.3</td><td>83.05</td><td>50.5</td><td>49.8</td><td>77.0</td><td>108.1</td><td>84.85</td></tr> <tr><td>6.0</td><td>45.4</td><td>70.8</td><td>101.9</td><td>78.50</td><td>21.0</td><td>46.9</td><td>73.1</td><td>104.2</td><td>80.80</td><td>36.0</td><td>48.5</td><td>75.4</td><td>106.4</td><td>83.15</td><td>51.0</td><td>49.9</td><td>77.1</td><td>108.2</td><td>84.90</td></tr> <tr><td>6.5</td><td>45.4</td><td>70.9</td><td>102.0</td><td>78.55</td><td>21.5</td><td>47.0</td><td>73.2</td><td>104.2</td><td>80.90</td><td>36.5</td><td>48.5</td><td>75.5</td><td>106.5</td><td>83.20</td><td>51.5</td><td>49.9</td><td>77.1</td><td>108.2</td><td>84.95</td></tr> <tr><td>7.0</td><td>45.5</td><td>71.0</td><td>102.1</td><td>78.65</td><td>22.0</td><td>47.0</td><td>73.3</td><td>104.3</td><td>80.95</td><td>37.0</td><td>48.6</td><td>75.6</td><td>106.6</td><td>83.30</td><td>52.0</td><td>50.0</td><td>77.2</td><td>108.3</td><td>85.00</td></tr> <tr><td>7.5</td><td>45.5</td><td>71.0</td><td>102.1</td><td>78.70</td><td>22.5</td><td>47.1</td><td>73.3</td><td>104.4</td><td>81.05</td><td>37.5</td><td>48.6</td><td>75.6</td><td>106.6</td><td>83.35</td><td>52.5</td><td>50.0</td><td>77.2</td><td>108.3</td><td>85.05</td></tr> <tr><td>8.0</td><td>45.6</td><td>71.1</td><td>102.2</td><td>78.80</td><td>23.0</td><td>47.1</td><td>73.4</td><td>104.5</td><td>81.10</td><td>38.0</td><td>48.7</td><td>75.7</td><td>106.7</td><td>83.45</td><td>53.0</td><td>50.1</td><td>77.3</td><td>108.4</td><td>85.10</td></tr> <tr><td>8.5</td><td>45.6</td><td>71.2</td><td>102.3</td><td>78.85</td><td>23.5</td><td>47.2</td><td>73.5</td><td>104.5</td><td>81.20</td><td>38.5</td><td>48.7</td><td>75.8</td><td>106.8</td><td>83.50</td><td>53.5</td><td>50.1</td><td>77.3</td><td>108.4</td><td>85.15</td></tr> <tr><td>9.0</td><td>45.7</td><td>71.3</td><td>102.4</td><td>78.95</td><td>24.0</td><td>47.2</td><td>73.6</td><td>104.6</td><td>81.30</td><td>39.0</td><td>48.8</td><td>75.9</td><td>106.9</td><td>83.60</td><td>54.0</td><td>50.2</td><td>77.4</td><td>108.5</td><td>85.20</td></tr> <tr><td>9.5</td><td>45.7</td><td>71.3</td><td>102.4</td><td>79.05</td><td>24.5</td><td>47.3</td><td>73.6</td><td>104.7</td><td>81.35</td><td>39.5</td><td>48.9</td><td>75.9</td><td>106.9</td><td>83.70</td><td>54.5</td><td>50.2</td><td>77.4</td><td>108.5</td><td>85.25</td></tr> </tbody> </table> </div>	Values at 15 Degs C:				46.31				72.18				103.25				79.88				Coef. Deg. Q / Deg. C:				A: 0.194				C: 0.183				D: 0.159				Hg3129: 0.155				Temperature	A	C	D	HG	Temperature	A	C	D	HG	Temperature	A	C	D	HG	Temperature	A	C	D	HG	-5.0	44.2	69.1	100.3	76.80	10.0	45.8	71.4	102.5	79.10	25.0	47.3	73.7	104.8	81.45	40.0	48.8	76.0	107.1	83.80	-4.5	44.3	69.2	100.3	76.85	10.5	45.8	71.5	102.6	79.20	25.5	47.4	73.8	104.8	81.50	40.5	48.8	76.0	107.1	83.85	-4.0	44.3	69.3	100.4	76.95	11.0	45.9	71.6	102.7	79.25	26.0	47.5	73.9	104.9	81.60	41.0	48.9	76.1	107.2	83.90	-3.5	44.4	69.3	100.5	77.00	11.5	45.9	71.6	102.7	79.35	26.5	47.5	73.9	105.0	81.65	41.5	48.9	76.1	107.2	83.95	-3.0	44.4	69.4	100.6	77.10	12.0	46.0	71.7	102.8	79.40	27.0	47.6	74.0	105.1	81.75	42.0	49.0	76.2	107.3	84.00	-2.5	44.5	69.5	100.6	77.15	12.5	46.0	71.8	102.9	79.50	27.5	47.6	74.1	105.1	81.80	42.5	49.0	76.2	107.3	84.05	-2.0	44.5	69.6	100.7	77.25	13.0	46.1	71.9	103.0	79.55	28.0	47.7	74.2	105.2	81.90	43.0	49.1	76.3	107.4	84.10	-1.5	44.6	69.6	100.8	77.30	13.5	46.2	71.9	103.0	79.65	28.5	47.7	74.2	105.3	81.95	43.5	49.1	76.3	107.4	84.15	-1.0	44.6	69.7	100.9	77.40	14.0	46.2	72.0	103.1	79.75	29.0	47.8	74.3	105.4	82.05	44.0	49.2	76.4	107.5	84.20	-0.5	44.7	69.8	100.9	77.50	14.5	46.3	72.1	103.2	79.80	29.5	47.8	74.4	105.4	82.15	44.5	49.2	76.4	107.5	84.25	0.0	44.75	69.88	101.00	77.56	15.0	46.3	72.2	103.3	79.90	30.0	47.9	74.5	105.5	82.20	45.0	49.3	76.5	107.6	84.30	0.5	44.8	70.0	101.1	77.65	15.5	46.4	72.3	103.3	79.95	30.5	47.9	74.6	105.6	82.30	45.5	49.3	76.5	107.6	84.35	1.0	44.9	70.0	101.2	77.70	16.0	46.4	72.3	103.4	80.05	31.0	48.0	74.6	105.7	82.35	46.0	49.4	76.6	107.7	84.40	1.5	44.9	70.1	101.2	77.80	16.5	46.5	72.4	103.5	80.10	31.5	48.0	74.7	105.7	82.45	46.5	49.4	76.6	107.7	84.45	2.0	45.0	70.2	101.3	77.85	17.0	46.5	72.5	103.5	80.20	32.0	48.1	74.8	105.8	82.50	47.0	49.5	76.7	107.8	84.50	2.5	45.0	70.3	101.4	77.95	17.5	46.6	72.6	103.6	80.25	32.5	48.1	74.9	105.9	82.60	47.5	49.5	76.7	107.8	84.55	3.0	45.1	70.3	101.5	78.00	18.0	46.6	72.6	103.7	80.35	33.0	48.2	74.9	106.0	82.65	48.0	49.6	76.8	107.9	84.60	3.5	45.1	70.4	101.5	78.10	18.5	46.7	72.7	103.8	80.40	33.5	48.2	75.0	106.0	82.75	48.5	49.6	76.8	107.9	84.65	4.0	45.2	70.5	101.6	78.20	19.0	46.7	72.8	103.9	80.50	34.0	48.3	75.1	106.1	82.85	49.0	49.7	76.9	108.0	84.70	4.5	45.2	70.6	101.7	78.25	19.5	46.8	72.9	103.9	80.60	34.5	48.3	75.2	106.2	82.90	49.5	49.7	76.9	108.0	84.75	5.0	45.3	70.6	101.8	78.35	20.0	46.8	72.9	104.0	80.65	35.0	48.4	75.2	106.3	83.00	50.0	49.8	77.0	108.1	84.80	5.5	45.3	70.7	101.8	78.40	20.5	46.9	73.0	104.1	80.75	35.5	48.4	75.3	106.3	83.05	50.5	49.8	77.0	108.1	84.85	6.0	45.4	70.8	101.9	78.50	21.0	46.9	73.1	104.2	80.80	36.0	48.5	75.4	106.4	83.15	51.0	49.9	77.1	108.2	84.90	6.5	45.4	70.9	102.0	78.55	21.5	47.0	73.2	104.2	80.90	36.5	48.5	75.5	106.5	83.20	51.5	49.9	77.1	108.2	84.95	7.0	45.5	71.0	102.1	78.65	22.0	47.0	73.3	104.3	80.95	37.0	48.6	75.6	106.6	83.30	52.0	50.0	77.2	108.3	85.00	7.5	45.5	71.0	102.1	78.70	22.5	47.1	73.3	104.4	81.05	37.5	48.6	75.6	106.6	83.35	52.5	50.0	77.2	108.3	85.05	8.0	45.6	71.1	102.2	78.80	23.0	47.1	73.4	104.5	81.10	38.0	48.7	75.7	106.7	83.45	53.0	50.1	77.3	108.4	85.10	8.5	45.6	71.2	102.3	78.85	23.5	47.2	73.5	104.5	81.20	38.5	48.7	75.8	106.8	83.50	53.5	50.1	77.3	108.4	85.15	9.0	45.7	71.3	102.4	78.95	24.0	47.2	73.6	104.6	81.30	39.0	48.8	75.9	106.9	83.60	54.0	50.2	77.4	108.5	85.20	9.5	45.7	71.3	102.4	79.05	24.5	47.3	73.6	104.7	81.35	39.5	48.9	75.9	106.9	83.70	54.5	50.2	77.4	108.5	85.25
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0.5	44.8	70.0	101.1	77.65	15.5	46.4	72.3	103.3	79.95	30.5	47.9	74.6	105.6	82.30	45.5	49.3	76.5	107.6	84.35																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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1.5	44.9	70.1	101.2	77.80	16.5	46.5	72.4	103.5	80.10	31.5	48.0	74.7	105.7	82.45	46.5	49.4	76.6	107.7	84.45																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
2.0	45.0	70.2	101.3	77.85	17.0	46.5	72.5	103.5	80.20	32.0	48.1	74.8	105.8	82.50	47.0	49.5	76.7	107.8	84.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
2.5	45.0	70.3	101.4	77.95	17.5	46.6	72.6	103.6	80.25	32.5	48.1	74.9	105.9	82.60	47.5	49.5	76.7	107.8	84.55																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
3.0	45.1	70.3	101.5	78.00	18.0	46.6	72.6	103.7	80.35	33.0	48.2	74.9	106.0	82.65	48.0	49.6	76.8	107.9	84.60																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
3.5	45.1	70.4	101.5	78.10	18.5	46.7	72.7	103.8	80.40	33.5	48.2	75.0	106.0	82.75	48.5	49.6	76.8	107.9	84.65																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
4.0	45.2	70.5	101.6	78.20	19.0	46.7	72.8	103.9	80.50	34.0	48.3	75.1	106.1	82.85	49.0	49.7	76.9	108.0	84.70																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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5.0	45.3	70.6	101.8	78.35	20.0	46.8	72.9	104.0	80.65	35.0	48.4	75.2	106.3	83.00	50.0	49.8	77.0	108.1	84.80																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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6.0	45.4	70.8	101.9	78.50	21.0	46.9	73.1	104.2	80.80	36.0	48.5	75.4	106.4	83.15	51.0	49.9	77.1	108.2	84.90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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7.0	45.5	71.0	102.1	78.65	22.0	47.0	73.3	104.3	80.95	37.0	48.6	75.6	106.6	83.30	52.0	50.0	77.2	108.3	85.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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15	<p>Tener en cuenta que los datos para la palanca "Q2" ya están estipulados en la tabla Q'. Por ejemplo, para una T° = 15, el valor de Hg = 79.90.</p> <p align="center"><i>Tabla Q'</i></p> <table border="1"> <caption>Values at 15 Degs C: a. Coeff Deg. Q / Deg. C:</caption> <tr> <td>A: 46.31</td> <td>C: 72.18</td> <td>D: 103.26</td> <td>Hg: 79.88</td> </tr> <tr> <td>0.164</td> <td>0.183</td> <td>0.150</td> <td>Hg3129: 0.155</td> </tr> </table> <table border="1"> <thead> <tr> <th>Temperature</th> <th>A</th> <th>C</th> <th>D</th> <th>HG</th> </tr> </thead> <tbody> <tr><td>-5.0</td><td>44.2</td><td>69.1</td><td>100.3</td><td>76.80</td></tr> <tr><td>-4.5</td><td>44.3</td><td>69.2</td><td>100.3</td><td>76.85</td></tr> <tr><td>-4.0</td><td>44.3</td><td>69.3</td><td>100.4</td><td>76.95</td></tr> <tr><td>-3.5</td><td>44.4</td><td>69.3</td><td>100.5</td><td>77.00</td></tr> <tr><td>-3.0</td><td>44.4</td><td>69.4</td><td>100.6</td><td>77.10</td></tr> <tr><td>-2.5</td><td>44.5</td><td>69.5</td><td>100.6</td><td>77.15</td></tr> <tr><td>-2.0</td><td>44.5</td><td>69.6</td><td>100.7</td><td>77.25</td></tr> <tr><td>-1.5</td><td>44.6</td><td>69.6</td><td>100.8</td><td>77.30</td></tr> <tr><td>-1.0</td><td>44.6</td><td>69.7</td><td>100.9</td><td>77.40</td></tr> <tr><td>-0.5</td><td>44.7</td><td>69.8</td><td>100.9</td><td>77.50</td></tr> <tr><td>0.0</td><td>44.75</td><td>69.88</td><td>101.00</td><td>77.56</td></tr> <tr><td>0.5</td><td>44.8</td><td>70.0</td><td>101.1</td><td>77.65</td></tr> <tr><td>1.0</td><td>44.9</td><td>70.0</td><td>101.2</td><td>77.70</td></tr> <tr><td>1.5</td><td>44.9</td><td>70.1</td><td>101.2</td><td>77.80</td></tr> <tr><td>2.0</td><td>45.0</td><td>70.2</td><td>101.3</td><td>77.85</td></tr> <tr><td>2.5</td><td>45.0</td><td>70.3</td><td>101.4</td><td>77.95</td></tr> <tr><td>3.0</td><td>45.1</td><td>70.3</td><td>101.5</td><td>78.00</td></tr> <tr><td>3.5</td><td>45.1</td><td>70.4</td><td>101.5</td><td>78.10</td></tr> <tr><td>4.0</td><td>45.2</td><td>70.5</td><td>101.6</td><td>78.20</td></tr> <tr><td>4.5</td><td>45.2</td><td>70.6</td><td>101.7</td><td>78.25</td></tr> <tr><td>5.0</td><td>45.3</td><td>70.6</td><td>101.8</td><td>78.35</td></tr> <tr><td>5.5</td><td>45.3</td><td>70.7</td><td>101.8</td><td>78.40</td></tr> 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<tr><td>11.5</td><td>45.9</td><td>71.6</td><td>102.7</td><td>79.35</td></tr> <tr><td>12.0</td><td>46.0</td><td>71.7</td><td>102.8</td><td>79.40</td></tr> <tr><td>12.5</td><td>46.0</td><td>71.8</td><td>102.9</td><td>79.50</td></tr> <tr><td>13.0</td><td>46.1</td><td>71.9</td><td>103.0</td><td>79.55</td></tr> <tr><td>13.5</td><td>46.2</td><td>71.9</td><td>103.0</td><td>79.65</td></tr> <tr><td>14.0</td><td>46.2</td><td>72.0</td><td>103.1</td><td>79.75</td></tr> <tr><td>14.5</td><td>46.3</td><td>72.1</td><td>103.2</td><td>79.80</td></tr> <tr><td>15.0</td><td>46.3</td><td>72.2</td><td>103.3</td><td>79.90</td></tr> <tr><td>15.5</td><td>46.4</td><td>72.3</td><td>103.3</td><td>79.95</td></tr> <tr><td>16.0</td><td>46.4</td><td>72.3</td><td>103.4</td><td>80.05</td></tr> <tr><td>16.5</td><td>46.5</td><td>72.4</td><td>103.5</td><td>80.10</td></tr> <tr><td>17.0</td><td>46.5</td><td>72.5</td><td>103.6</td><td>80.20</td></tr> </tbody> </table> <p align="center"><i>Figura 15: Datos (Hg) para la palanca Q2</i></p>	A: 46.31	C: 72.18	D: 103.26	Hg: 79.88	0.164	0.183	0.150	Hg3129: 0.155	Temperature	A	C	D	HG	-5.0	44.2	69.1	100.3	76.80	-4.5	44.3	69.2	100.3	76.85	-4.0	44.3	69.3	100.4	76.95	-3.5	44.4	69.3	100.5	77.00	-3.0	44.4	69.4	100.6	77.10	-2.5	44.5	69.5	100.6	77.15	-2.0	44.5	69.6	100.7	77.25	-1.5	44.6	69.6	100.8	77.30	-1.0	44.6	69.7	100.9	77.40	-0.5	44.7	69.8	100.9	77.50	0.0	44.75	69.88	101.00	77.56	0.5	44.8	70.0	101.1	77.65	1.0	44.9	70.0	101.2	77.70	1.5	44.9	70.1	101.2	77.80	2.0	45.0	70.2	101.3	77.85	2.5	45.0	70.3	101.4	77.95	3.0	45.1	70.3	101.5	78.00	3.5	45.1	70.4	101.5	78.10	4.0	45.2	70.5	101.6	78.20	4.5	45.2	70.6	101.7	78.25	5.0	45.3	70.6	101.8	78.35	5.5	45.3	70.7	101.8	78.40	6.0	45.4	70.8	101.9	78.50	6.5	45.4	70.9	102.0	78.55	7.0	45.5	71.0	102.1	78.65	7.5	45.5	71.0	102.1	78.70	8.0	45.6	71.1	102.2	78.80	8.5	45.6	71.2	102.3	78.85	9.0	45.7	71.3	102.4	78.95	9.5	45.7	71.3	102.4	79.05	Temperature	A	C	D	HG	10.0	45.8	71.4	102.5	79.10	10.5	45.8	71.5	102.6	79.20	11.0	45.9	71.6	102.7	79.25	11.5	45.9	71.6	102.7	79.35	12.0	46.0	71.7	102.8	79.40	12.5	46.0	71.8	102.9	79.50	13.0	46.1	71.9	103.0	79.55	13.5	46.2	71.9	103.0	79.65	14.0	46.2	72.0	103.1	79.75	14.5	46.3	72.1	103.2	79.80	15.0	46.3	72.2	103.3	79.90	15.5	46.4	72.3	103.3	79.95	16.0	46.4	72.3	103.4	80.05	16.5	46.5	72.4	103.5	80.10	17.0	46.5	72.5	103.6	80.20
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Temperature	A	C	D	HG																																																																																																																																																																																																																																																
10.0	45.8	71.4	102.5	79.10																																																																																																																																																																																																																																																
10.5	45.8	71.5	102.6	79.20																																																																																																																																																																																																																																																
11.0	45.9	71.6	102.7	79.25																																																																																																																																																																																																																																																
11.5	45.9	71.6	102.7	79.35																																																																																																																																																																																																																																																
12.0	46.0	71.7	102.8	79.40																																																																																																																																																																																																																																																
12.5	46.0	71.8	102.9	79.50																																																																																																																																																																																																																																																
13.0	46.1	71.9	103.0	79.55																																																																																																																																																																																																																																																
13.5	46.2	71.9	103.0	79.65																																																																																																																																																																																																																																																
14.0	46.2	72.0	103.1	79.75																																																																																																																																																																																																																																																
14.5	46.3	72.1	103.2	79.80																																																																																																																																																																																																																																																
15.0	46.3	72.2	103.3	79.90																																																																																																																																																																																																																																																
15.5	46.4	72.3	103.3	79.95																																																																																																																																																																																																																																																
16.0	46.4	72.3	103.4	80.05																																																																																																																																																																																																																																																
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17.0	46.5	72.5	103.6	80.20																																																																																																																																																																																																																																																
16	<p>Una vez obtenidos los datos (Hg) para las palancas Q1 y Q2, ajustar las palancas en la regla angular en el valor obtenido para cada una. Por ejemplo, colocar Q1=79.25 y Q2=79.90.</p>  <p align="center"><i>Figura 16: Ajuste de las palancas Q1 y Q2 (foto referencial)</i></p>																																																																																																																																																																																																																																																			

N°	Actividad
17	<p>Luego, posicionar el disco R-dial en el punto de 300° (todo a la izquierda).</p>  <p align="center"><b>Figura 17:</b> Disco R-dial en 300°</p>
18	<p>Abrir la llave del microamperímetro (freno) girando suavemente en sentido horario hasta el tope.</p>  <p align="center"><b>Figura 18:</b> Girado en sentido horario para abrir la llave del microamperímetro</p>
19	<p>Abrir (giro horario) lentamente la llave de sensibilidad de la perilla derecha, asegurándose de que la lectura del microamperímetro no supere los 36 <math>\mu</math>A (Ver figura 19). Luego, mover la palanca "Q1" hacia abajo hasta alcanzar su punto máximo, observando que la aguja del microamperímetro retroceda y marque 20 <math>\mu</math>A. (Ver figura 20)</p>

N°	Actividad
	<div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center;"><b>Figura 19:</b> Giro horario de la perrilla derecha, sin sobrepasar los 36 <math>\mu</math>A</p>
	<div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center;"><b>Figura 20:</b> Baje la palanca Q1, viendo que el micro amperímetro retroceda hasta 20 <math>\mu</math>A.</p>
<b>20</b>	<p>Nuevamente abrir (giro horario) la sensibilidad de la perilla derecha hasta que la aguja del microamperímetro marque cercano a 40 <math>\mu</math>A.</p> <div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center;"><b>Figura 21:</b> Abra la perrilla derecha, sin pasar los 40 <math>\mu</math>A.</p>

N°	Actividad
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**21** Cuando el microamperímetro marque 40  $\mu\text{A}$ , mover la palanca Q1 hacia arriba hasta que la aguja del microamperímetro retroceda y marque 20  $\mu\text{A}$ . Registrar la primera lectura que marque la posición de la palanca Q1, en el formato de calibración Dobson, en la sección Mercury Test, específicamente en la primera lectura de (Q1 up).



**Figura 22:** Suba la palanca Q1, viendo que el micro amperímetro retroceda hasta 20  $\mu\text{A}$ .

Hoja: \_\_\_\_\_ Instrument No. 087

DOBSON CALIBRATION DATA SHEET  
LAMP TEST FORM

Inst. Temperature--	Start	End	Mean:	
Q1 up	1	2	3	4
Q1 down				
Average:				
Table Date: 2019-Julio-15			Test mean:	
			Table Value at Mean Temperature:	
			Difference:	

Inst. Temperature--	Start	End	Mean:	
Q1 up	1	2	3	4
Q1 down				
Average:				
Table Date: _____			Test mean:	
			Table Value at Mean Temperature:	
			Difference:	

Standard Lamp Name	Date	Time	mean	N-raise	N-ref	N-low(N-ref)
Test A:	1	2	3	4	5	
Test C:						
Test D:						
Inst. Temperature: 23°C						

Standard Lamp Name	Date	Time	mean	N-raise	N-ref	N-low(N-ref)
Test A:	1	2	3	4	5	
Test C:						
Test D:						
Inst. Temperature:						

Standard Lamp Name	Date	Time	mean	N-raise	N-ref	N-low(N-ref)
Test A:	1	2	3	4	5	
Test C:						
Test D:						
Inst. Temperature:						

Standard Lamp Name	Date	Time	mean	N-raise	N-ref	N-low(N-ref)
Test A:	1	2	3	4	5	
Test C:						
Test D:						
Inst. Temperature:						

Standard Lamp Name	Date	Time	mean	N-raise	N-ref	N-low(N-ref)
Test A:	1	2	3	4	5	
Test C:						
Test D:						
Inst. Temperature:						

When making standard lamp test: outside, cover the lamp so light does not effect the result.

<b>Mercury Test</b>	Date:	Time:	Mean:	
Inst. Temperature--	Start	End		
Q1 up	1	2	3	4
Q1 down				
Average:				
			Test mean:	
			Table Value at Mean Temperature:	
			Difference:	
Table Date: 2019-Julio-15				

**Figura 23:** Toma de la lectura de la palanca Q1 y registro en (Q1-Up).

N°	Actividad
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**22** Mover hacia abajo la palanca "Q1". La aguja del microamperímetro aumentará hasta cierto punto y luego alcanza un **punto de inflexión donde descenderá**. Soltar la palanca cuando la aguja del microamperímetro **no tenga una lectura menor a los 20 µA**. Registrar la lectura que indique la nueva posición de la palanca Q1 en el formato de calibración, en la sección Mercury Test, específicamente en la primera lectura de (Q1 down).

Hoja : \_\_\_\_\_ Instrument No. 087

**DOBSON CALIBRATION DATASHEET  
LAMP TEST FORM**

<b>Mercury Test</b>		Date:	Time:	Mean:
Inst. Temperature--	Start:	End:		
Q1 up	1	2	3	4
Q1 down				
Average:				
		Table Value at Mean Temperature:	Test mean:	
		Difference:		
Table Date: 2019, Julio, 15				

<b>Mercury Test</b>		Date:	Time:	Mean:
Inst. Temperature--	Start:	End:		
Q1 up	1	2	3	4
Q1 down				
Average:				
		Table Value at Mean Temperature:	Test mean:	
		Difference:		
Table Date: 2019, Julio, 15				

**Figura 24:** Toma de la lectura de la palanca Q1 y registrar en (Q1-down).

**23** Luego, subir nuevamente la palanca "Q1" observando que la aguja del microamperímetro aumenta, alcanzando un punto de inflexión y descenderá, soltar la palanca cuando la aguja del microamperímetro no tenga una lectura menor a los 20 µA y luego registrar la lectura. A continuación, bajar la palanca "Q1" observando el mismo comportamiento de la aguja. Repetir este paso con 5 pares (Q1 up y Q1 down), hasta completar los demás casilleros del formato de **calibración**, en la sección Mercury Test.

Hoja : \_\_\_\_\_ Instrument No. 087

**DOBSON CALIBRATION DATASHEET  
LAMP TEST FORM**

<b>Mercury Test</b>		Date:	Time:	Mean:
Inst. Temperature--	Start:	End:		
Q1 up	1	2	3	4
Q1 down				
Average:				
		Table Value at Mean Temperature:	Test mean:	
		Difference:		
Table Date: 2019, Julio, 15				

**Figura 25:** Llenado del formato

	<b>INSTRUCTIVO</b>	<b>Código</b>	IN-DMA-006
	<b>CALIBRACIÓN DEL EQUIPO</b>	<b>Versión</b>	01
	<b>ESPECTROFOTÓMETRO DOBSON N° 087</b>	<b>Página</b>	15 de 33

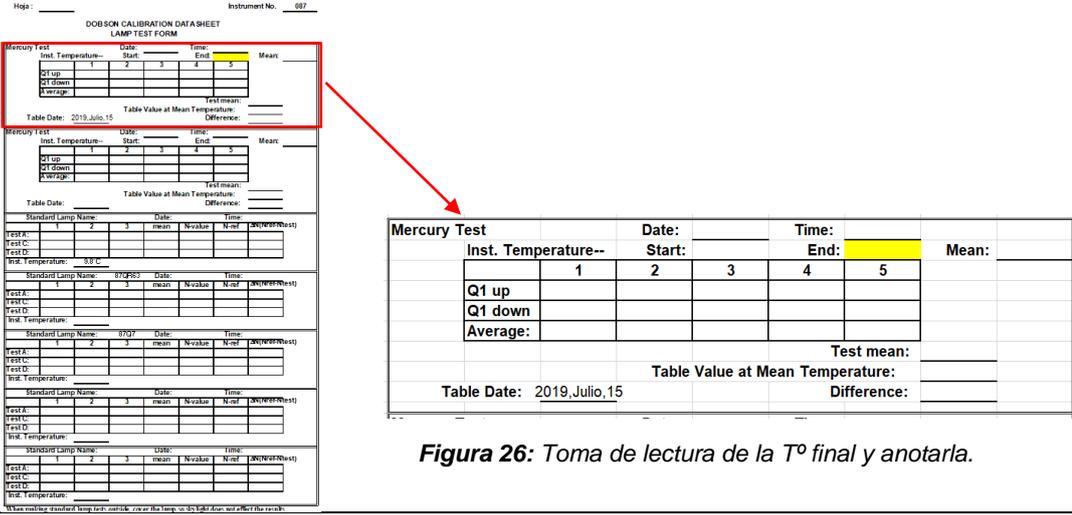
N°	Actividad
24	<p>Una vez finalizado, leer la Temperatura Final del espectrofotómetro Dobson. Y, registrar esta temperatura en el campo de <b>hora final (End)</b> del formato de Calibración Dobson, en la sección Mercury Test,</p>  <p>The image shows a 'Mercury Test' table with columns for 'Inst. Temperature--', 'Start', 'End', and 'Mean'. The 'End' column is highlighted in yellow. Below the table, there are fields for 'Table Date: 2019, Julio, 15', 'Table Value at Mean Temperature', and 'Difference:'. A red arrow points from the highlighted 'End' cell in the table to a larger, clearer version of the same table shown to the right.</p>
25	Mover las palancas “Q1” y “Q2” hacia arriba llegando al tope máximo
26	Cerrar completamente (giro antihorario) la sensibilidad de la perilla derecha a cero.
27	Colocar en cero el disco R-dial.
28	Cerrar la llave del microamperímetro (freno), girando suavemente de forma antihoraria hasta el tope.
29	Invertir la polaridad (Shutter hacia arriba), esta es la llave que se ubica en la parte posterior del microamperímetro (ver figura 13).
30	No apagar el espectrofotómetro Dobson, porque a continuación se realizará la calibración con la(s) lámpara(s) estándar.
31	Apagar la fuente de voltaje utilizando el interruptor que se ubica en la parte trasera del misma.
32	Retirar con sumo cuidado la lámpara de mercurio del difusor (S-1)
33	Desenlazar (lámpara de Hg – fuente de voltaje) y almacenarlos en su lugar correspondiente.
34	Desconectar las puntas de prueba (+; -) del multímetro de la extensión eléctrica y apagar el multímetro.
35	Colocar la tapa protectora del difusor (S-1). Y con ello finaliza la calibración del espectrofotómetro Dobson utilizando la lámpara de Mercurio (Hg.).

Figura 26: Toma de lectura de la T° final y anotarla.

N°	Actividad																																												
36	<p>El llenado completo de los datos obtenidos en el instructivo de calibración, en la sección "Mercury Test" del formato de calibración Dobson, deberá realizarse conforme al ejemplo de la figura 27.</p> <div style="text-align: center;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Hoja :</td> <td style="width: 30%;"></td> <td style="width: 10%; text-align: right;">Instrument No.</td> <td style="width: 10%; text-align: center;">087</td> </tr> <tr> <td colspan="4" style="text-align: center;"><b>DOBSON CALIBRATION DATASHEET LAMP TEST FORM</b></td> </tr> <tr> <td colspan="2"><b>Mercury Test</b></td> <td>Date: 01-09-2023</td> <td>Time: 09:57:00</td> </tr> <tr> <td style="text-align: center;">Inst. Temperature--</td> <td style="text-align: center;">Start:</td> <td style="text-align: center;">10.00</td> <td style="text-align: center;">End: 10.20</td> </tr> <tr> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">Q1 up</td> <td style="text-align: center;">75.60</td> <td style="text-align: center;">75.60</td> <td style="text-align: center;">75.60</td> </tr> <tr> <td style="text-align: center;">Q1 down</td> <td style="text-align: center;">82.20</td> <td style="text-align: center;">82.20</td> <td style="text-align: center;">82.20</td> </tr> <tr> <td style="text-align: center;">Average:</td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="3"></td> <td style="text-align: right;">Test mean:</td> </tr> <tr> <td colspan="3"></td> <td style="text-align: right;">Table Value at Mean Temperature:</td> </tr> <tr> <td colspan="2">Table Date: 2019,Julio,15</td> <td colspan="2" style="text-align: right;">Difference:</td> </tr> </table> <p style="text-align: center;"><i>Figura 27: Datos obtenidos.</i></p> </div>	Hoja :		Instrument No.	087	<b>DOBSON CALIBRATION DATASHEET LAMP TEST FORM</b>				<b>Mercury Test</b>		Date: 01-09-2023	Time: 09:57:00	Inst. Temperature--	Start:	10.00	End: 10.20		1	2	3	Q1 up	75.60	75.60	75.60	Q1 down	82.20	82.20	82.20	Average:							Test mean:				Table Value at Mean Temperature:	Table Date: 2019,Julio,15		Difference:	
Hoja :		Instrument No.	087																																										
<b>DOBSON CALIBRATION DATASHEET LAMP TEST FORM</b>																																													
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Inst. Temperature--	Start:	10.00	End: 10.20																																										
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Q1 up	75.60	75.60	75.60																																										
Q1 down	82.20	82.20	82.20																																										
Average:																																													
			Test mean:																																										
			Table Value at Mean Temperature:																																										
Table Date: 2019,Julio,15		Difference:																																											
37	<p>Luego, calcular <b>la media (Mean) de las dos temperaturas</b> (inicio y final) obtenidas durante la calibración y registrarla en el formato de Calibración Dobson.</p> <div style="text-align: center;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Hoja :</td> <td style="width: 30%;"></td> <td style="width: 10%; text-align: right;">Instrument No.</td> <td style="width: 10%; text-align: center;">087</td> </tr> <tr> <td colspan="4" style="text-align: center;"><b>DOBSON CALIBRATION DATASHEET LAMP TEST FORM</b></td> </tr> <tr> <td colspan="2"><b>Mercury Test</b></td> <td>Date: 01-09-2023</td> <td>Time: 09:57:00</td> </tr> <tr> <td style="text-align: center;">Inst. Temperature--</td> <td style="text-align: center;">Start:</td> <td style="text-align: center;">10.00</td> <td style="text-align: center;">End: 10.20</td> </tr> <tr> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">Q1 up</td> <td style="text-align: center;">75.60</td> <td style="text-align: center;">75.60</td> <td style="text-align: center;">75.60</td> </tr> <tr> <td style="text-align: center;">Q1 down</td> <td style="text-align: center;">82.20</td> <td style="text-align: center;">82.20</td> <td style="text-align: center;">82.20</td> </tr> <tr> <td style="text-align: center;">Average:</td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="3"></td> <td style="text-align: right;">Test mean:</td> </tr> <tr> <td colspan="3"></td> <td style="text-align: right;">Table Value at Mean Temperature:</td> </tr> <tr> <td colspan="2">Table Date: 2019,Julio,15</td> <td colspan="2" style="text-align: right;">Difference:</td> </tr> </table> <p style="text-align: center;"><i>Figura 28: Cálculo de la media de las temperaturas.</i></p> </div>	Hoja :		Instrument No.	087	<b>DOBSON CALIBRATION DATASHEET LAMP TEST FORM</b>				<b>Mercury Test</b>		Date: 01-09-2023	Time: 09:57:00	Inst. Temperature--	Start:	10.00	End: 10.20		1	2	3	Q1 up	75.60	75.60	75.60	Q1 down	82.20	82.20	82.20	Average:							Test mean:				Table Value at Mean Temperature:	Table Date: 2019,Julio,15		Difference:	
Hoja :		Instrument No.	087																																										
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Inst. Temperature--	Start:	10.00	End: 10.20																																										
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Q1 down	82.20	82.20	82.20																																										
Average:																																													
			Test mean:																																										
			Table Value at Mean Temperature:																																										
Table Date: 2019,Julio,15		Difference:																																											
38	<p>Calcular y registrar <b>el promedio (average)</b> de los datos (Q1 up; Q1 down) para cada una de las columnas (1, 2, 3, 4, 5).</p> <div style="text-align: center;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Hoja :</td> <td style="width: 30%;"></td> <td style="width: 10%; text-align: right;">Instrument No.</td> <td style="width: 10%; text-align: center;">087</td> </tr> <tr> <td colspan="4" style="text-align: center;"><b>DOBSON CALIBRATION DATASHEET LAMP TEST FORM</b></td> </tr> <tr> <td colspan="2"><b>Mercury Test</b></td> <td>Date: 01-09-2023</td> <td>Time: 09:57:00</td> </tr> <tr> <td style="text-align: center;">Inst. Temperature--</td> <td style="text-align: center;">Start:</td> <td style="text-align: center;">10.00</td> <td style="text-align: center;">End: 10.20</td> </tr> <tr> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">Q1 up</td> <td style="text-align: center;">75.60</td> <td style="text-align: center;">75.60</td> <td style="text-align: center;">75.60</td> </tr> <tr> <td style="text-align: center;">Q1 down</td> <td style="text-align: center;">82.20</td> <td style="text-align: center;">82.20</td> <td style="text-align: center;">82.20</td> </tr> <tr> <td style="text-align: center;">Average:</td> <td style="text-align: center;">78.90</td> <td style="text-align: center;">78.90</td> <td style="text-align: center;">78.90</td> </tr> <tr> <td colspan="3"></td> <td style="text-align: right;">Test mean:</td> </tr> <tr> <td colspan="3"></td> <td style="text-align: right;">Table Value at Mean Temperature:</td> </tr> <tr> <td colspan="2">Table Date: 2019,Julio,15</td> <td colspan="2" style="text-align: right;">Difference:</td> </tr> </table> <p style="text-align: center;"><i>Figura 29: Cálculo del promedio (Q1 up; Q1 down)</i></p> </div>	Hoja :		Instrument No.	087	<b>DOBSON CALIBRATION DATASHEET LAMP TEST FORM</b>				<b>Mercury Test</b>		Date: 01-09-2023	Time: 09:57:00	Inst. Temperature--	Start:	10.00	End: 10.20		1	2	3	Q1 up	75.60	75.60	75.60	Q1 down	82.20	82.20	82.20	Average:	78.90	78.90	78.90				Test mean:				Table Value at Mean Temperature:	Table Date: 2019,Julio,15		Difference:	
Hoja :		Instrument No.	087																																										
<b>DOBSON CALIBRATION DATASHEET LAMP TEST FORM</b>																																													
<b>Mercury Test</b>		Date: 01-09-2023	Time: 09:57:00																																										
Inst. Temperature--	Start:	10.00	End: 10.20																																										
	1	2	3																																										
Q1 up	75.60	75.60	75.60																																										
Q1 down	82.20	82.20	82.20																																										
Average:	78.90	78.90	78.90																																										
			Test mean:																																										
			Table Value at Mean Temperature:																																										
Table Date: 2019,Julio,15		Difference:																																											

N°	Actividad
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**39** Luego, calcular y registrar la **media (Test Mean)** de los promedios obtenidos anteriormente.

Hoja :						Instrument No.	087
<b>DOBSON CALIBRATION DATASHEET LAMP TEST FORM</b>							
<b>Mercury Test</b>		<b>Date:</b> 01-09-2023		<b>Time:</b> 09:57:00			
<b>Inst. Temperature--</b>		<b>Start:</b> 10.00	<b>End:</b> 10.20		<b>Mean:</b> 10.10		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>		
<b>Q1 up</b>	75.60	75.60	75.60	75.60	75.60		
<b>Q1 down</b>	82.20	82.20	82.20	82.20	82.20		
<b>Average:</b>	78.90	78.90	78.90	78.90	78.90		
						<b>Test mean:</b>	78.90
<b>Table Value at Mean Temperature:</b>							
<b>Table Date:</b> 2019,Julio,15						<b>Difference:</b>	

**Figura 30:** Calculo de la media de los promedios de (Q1 up; Q1 down)

**40** Determinar el **Valor de la Tabla a la Temperatura Media** (Table Value at Mean Temperature), que sería **Hg**, buscar en la tabla Q' el **valor más próximo** a la Temperatura Media obtenida en el paso 37, y en la misma fila localizar el valor asociado a Hg y regístrelo en el formato de calibración.

- Ejemplo: Si el valor de la Temperatura Media (Mean) obtenido en el **paso 37** fue 10.1, el valor más próximo en la tabla Q' es 10.0. Con este valor, localice en la misma el valor asociado a Hg, que en este caso es 79.10.

**Tabla Q'**

Values at 15 Degs C: Coeff Deg. Q / Deg. C:				48.31 A: 6.104				72.18 C: 6.143				103.38 D: 6.136				78.88 Hg3128: 6.155			
Temperature	A	C	D	Hg	Temperature	A	C	D	Hg	Temperature	A	C	D	Hg	Temperature	A	C	D	Hg
-5.0	44.2	69.1	100.3	76.80	10.0	45.8	71.4	102.6	79.10	25.0	47.3	73.7	104.8	81.45	45.0	44.8	70.0	101.1	77.65
-4.5	44.3	69.3	100.4	76.95	10.5	45.8	71.5	102.6	79.20	25.5	47.4	73.8	104.8	81.50	45.5	44.9	70.1	101.2	77.80
-4.0	44.3	69.3	100.4	76.95	11.0	45.9	71.6	102.7	79.25	26.0	47.5	73.9	104.9	81.60	46.0	45.0	70.2	101.3	77.85
-3.5	44.4	69.3	100.5	77.00	11.5	45.9	71.6	102.7	79.35	26.5	47.5	73.9	105.0	81.65	46.5	45.0	70.2	101.3	77.85
-3.0	44.4	69.4	100.6	77.10	12.0	46.0	71.7	102.8	79.40	27.0	47.6	74.0	105.1	81.75	47.0	45.0	70.2	101.3	77.85
-2.5	44.5	69.5	100.6	77.15	12.5	46.0	71.8	102.9	79.50	27.5	47.6	74.1	105.1	81.80	47.5	45.0	70.2	101.3	77.85
-2.0	44.5	69.6	100.7	77.25	13.0	46.1	71.9	103.0	79.55	28.0	47.7	74.2	105.2	81.90	48.0	45.0	70.2	101.3	77.85
-1.5	44.6	69.6	100.8	77.30	13.5	46.2	72.0	103.1	79.65	28.5	47.7	74.2	105.4	81.95	48.5	45.0	70.2	101.3	77.85
-1.0	44.6	69.7	100.9	77.40	14.0	46.2	72.0	103.1	79.75	29.0	47.8	74.3	105.4	82.00	49.0	45.0	70.2	101.3	77.85
-0.5	44.7	69.8	100.9	77.50	14.5	46.3	72.1	103.2	79.80	29.5	47.8	74.4	105.4	82.10	49.5	45.0	70.2	101.3	77.85
0.0	44.7	69.8	101.0	77.55	15.0	46.3	72.2	103.3	79.90	30.0	47.9	74.5	105.5	82.20	50.0	45.0	70.2	101.3	77.85
0.5	44.8	70.0	101.1	77.65	15.5	46.4	72.3	103.3	79.95	30.5	47.9	74.6	105.6	82.30	50.5	45.0	70.2	101.3	77.85
1.0	44.9	70.0	101.2	77.70	16.0	46.4	72.3	103.4	80.05	31.0	48.0	74.6	105.7	82.35	51.0	45.0	70.2	101.3	77.85
1.5	44.9	70.1	101.2	77.80	16.5	46.5	72.4	103.4	80.10	31.5	48.0	74.7	105.7	82.45	51.5	45.0	70.2	101.3	77.85
2.0	45.0	70.2	101.3	77.85	17.0	46.5	72.5	103.6	80.20	32.0	48.1	74.8	105.8	82.50	52.0	45.0	70.2	101.3	77.85
2.5	45.0	70.3	101.4	77.95	17.5	46.6	72.6	103.6	80.25	32.5	48.1	74.9	105.9	82.60	52.5	45.0	70.2	101.3	77.85
3.0	45.1	70.3	101.5	78.00	18.0	46.6	72.6	103.7	80.35	33.0	48.2	74.9	106.0	82.65	53.0	45.0	70.2	101.3	77.85
3.5	45.1	70.4	101.5	78.10	18.5	46.7	72.7	103.8	80.40	33.5	48.2	75.0	106.0	82.75	53.5	45.0	70.2	101.3	77.85
4.0	45.2	70.5	101.6	78.20	19.0	46.7	72.8	103.9	80.50	34.0	48.3	75.1	106.1	82.85	54.0	45.0	70.2	101.3	77.85
4.5	45.2	70.6	101.7	78.25	19.5	46.8	72.9	103.9	80.60	34.5	48.3	75.2	106.2	82.90	54.5	45.0	70.2	101.3	77.85
5.0	45.3	70.6	101.8	78.35	20.0	46.8	72.9	104.0	80.65	35.0	48.4	75.2	106.3	83.00	55.0	45.0	70.2	101.3	77.85
5.5	45.3	70.7	101.8	78.40	20.5	46.9	73.0	104.1	80.75	35.5	48.4	75.3	106.3	83.05	55.5	45.0	70.2	101.3	77.85
6.0	45.4	70.8	101.9	78.50	21.0	46.9	73.1	104.2	80.80	36.0	48.5	75.4	106.4	83.15	56.0	45.0	70.2	101.3	77.85
6.5	45.4	70.9	102.0	78.55	21.5	47.0	73.2	104.2	80.90	36.5	48.5	75.5	106.6	83.20	56.5	45.0	70.2	101.3	77.85
7.0	45.5	71.0	102.1	78.65	22.0	47.0	73.3	104.3	80.95	37.0	48.6	75.6	106.6	83.30	57.0	45.0	70.2	101.3	77.85
7.5	45.5	71.0	102.1	78.70	22.5	47.1	73.4	104.4	81.05	37.5	48.6	75.6	106.7	83.35	57.5	45.0	70.2	101.3	77.85
8.0	45.6	71.1	102.2	78.80	23.0	47.1	73.4	104.5	81.10	38.0	48.7	75.7	106.7	83.45	58.0	45.0	70.2	101.3	77.85
8.5	45.6	71.2	102.3	78.85	23.5	47.2	73.5	104.6	81.20	38.5	48.7	75.8	106.8	83.50	58.5	45.0	70.2	101.3	77.85
9.0	45.7	71.3	102.4	78.95	24.0	47.2	73.5	104.6	81.30	39.0	48.8	75.9	106.9	83.60	59.0	45.0	70.2	101.3	77.85
9.5	45.7	71.3	102.4	79.05	24.5	47.3	73.6	104.7	81.35	39.5	48.9	75.9	106.9	83.70	59.5	45.0	70.2	101.3	77.85

**Figura 31:** Localización del valor para Hg

Hoja :						Instrument No.	001
<b>DOBSON CALIBRATION DATASHEET LAMP TEST FORM</b>							
<b>Mercury Test</b>		<b>Date:</b> 01-09-2023		<b>Time:</b> 09:57:00			
<b>Inst. Temperature--</b>		<b>Start:</b> 10.00	<b>End:</b> 10.20		<b>Mean:</b> 10.10		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>		
<b>Q1 up</b>	75.60	75.60	75.60	75.60	75.60		
<b>Q1 down</b>	82.20	82.20	82.20	82.20	82.20		
<b>Average:</b>	78.90	78.90	78.90	78.90	78.90		
						<b>Test mean:</b>	78.90
<b>Table Value at Mean Temperature:</b>						79.10	
<b>Table Date:</b> 2019,Julio,15						<b>Difference:</b>	

**Figura 32:** Registro del Valor de la Tabla a la Temperatura Media

N°	Actividad
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**41** Con el resultado anterior, calcular la **diferencia (difference)** entre el Promedio de la Prueba (**Test Mean**) y el Valor de la Tabla a la Temperatura Media (**Table Value at Mean Temperature**).

Hoja :						Instrument No.	087
<b>DOBSON CALIBRATION DATASHEET</b>							
<b>LAMP TEST FORM</b>							
Mercury Test	Date:	01-09-2023	Time:	09:57:00			
Inst. Temperature--	Start:	10.00	End:	10.20	Mean:	10.10	
	1	2	3	4	5		
Q1 up	75.60	75.60	75.60	75.60	75.60		
Q1 down	82.20	82.20	82.20	82.20	82.20		
Average:	78.90	78.90	78.90	78.90	78.90		
						Test mean:	78.90
						Table Value at Mean Temperature:	79.10
Table Date: 2019,Julio,15						Difference:	-0.20

**Figura 33: Registro de la difference**

**42** El llenado en la sección "Mercury Test" del formato de calibración del espectrofotómetro Dobson se realizan los días 01 y 03 de cada mes; para ello, se utilizan los datos obtenidos de la calibración del espectrofotómetro Dobson con la lámpara de mercurio, Teniendo como resultado las figuras 34 y 35.

Hoja :						Instrument No.	087
<b>DOBSON CALIBRATION DATASHEET</b>							
<b>LAMP TEST FORM</b>							
Mercury Test	Date:	01-09-2023	Time:	09:57:00			
Inst. Temperature--	Start:	10.00	End:	10.20	Mean:	10.10	
	1	2	3	4	5		
Q1 up	75.60	75.60	75.60	75.60	75.60		
Q1 down	82.20	82.20	82.20	82.20	82.20		
Average:	78.90	78.90	78.90	78.90	78.90		
						Test mean:	78.90
						Table Value at Mean Temperature:	79.10
Table Date: 2019,Julio,15						Difference:	-0.20

**Figura 34: Registro de la difference del día 01**

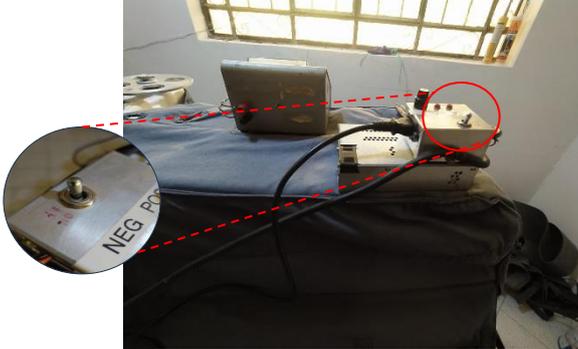
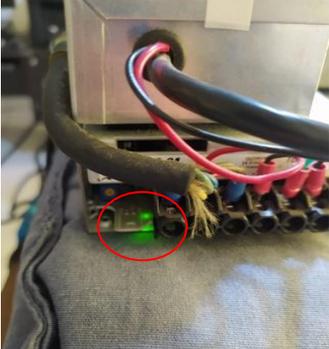
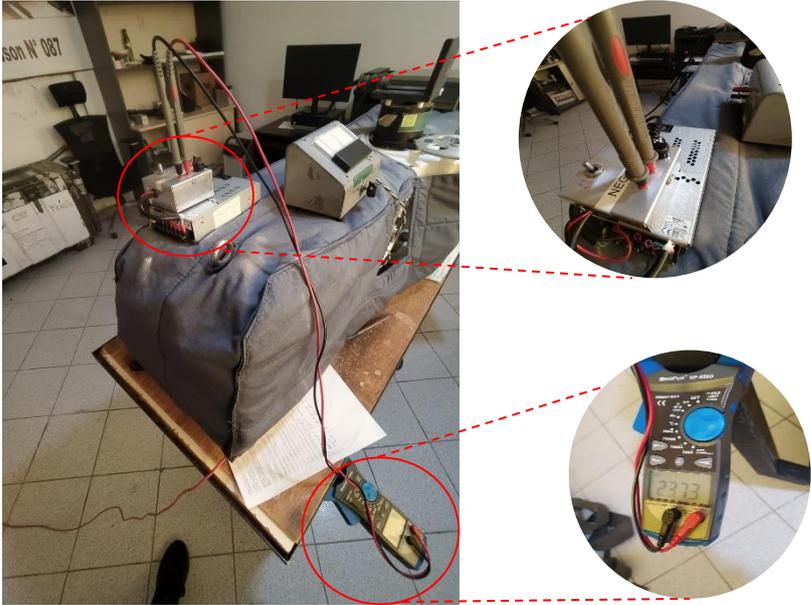
Hoja :						Instrument No.	087
<b>DOBSON CALIBRATION DATASHEET</b>							
<b>LAMP TEST FORM</b>							
Mercury Test	Date:	03-09-2023	Time:	09:34:00			
Inst. Temperature--	Start:	8.10	End:	8.30	Mean:	8.20	
	1	2	3	4	5		
Q1 up	75.50	75.50	75.50	75.50	75.50		
Q1 down	82.20	82.20	82.20	82.20	82.30		
Average:	78.85	78.85	78.85	78.85	78.90		
						Test mean:	78.86
						Table Value at Mean Temperature:	78.80
Table Date: 2019,Julio,15						Difference:	0.06

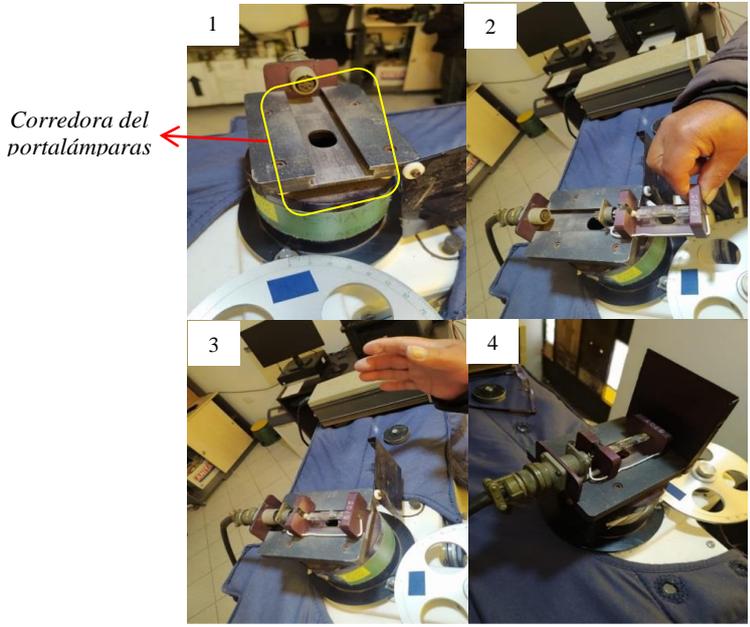
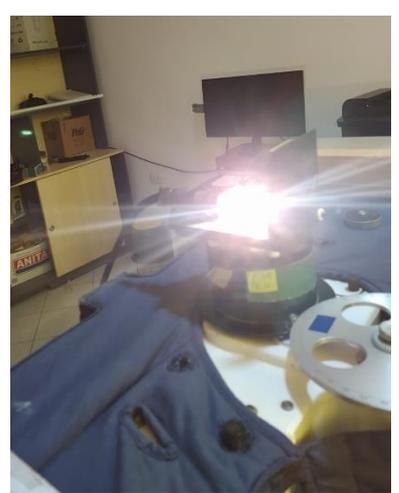
**Figura 35: Registro de la difference del día 03**

Una vez completada la calibración espectrofotómetro Dobson con la lámpara de Mercurio, (paso 35), se continúa con la calibración del mismo equipo empleando la(s) lámpara(s) estándar.

	<b>INSTRUCTIVO</b>	<b>Código</b>	IN-DMA-006
	<b>CALIBRACIÓN DEL EQUIPO ESPECTROFOTÓMETRO DOBSON N° 087</b>	<b>Versión</b>	01
		<b>Página</b>	19 de 33

N°	Actividad																																																																	
<b>Calibración del espectrofotómetro Dobson con lámparas estándar</b>																																																																		
Esta calibración se realiza luego de haber culminado con la calibración de lámpara de mercurio.																																																																		
<b>43</b>	<p>Determinar qué lámpara(s) estándar se utilizará(n) en el mes en curso, conforme al cronograma establecido.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="13" style="text-align: center;">CRONOGRAMA DE LAMPARAS ESTANDAR</th> </tr> <tr> <th style="text-align: center;">Mes</th> <th style="text-align: center;">Ene.</th> <th style="text-align: center;">Feb.</th> <th style="text-align: center;">Mar</th> <th style="text-align: center;">Abr</th> <th style="text-align: center;">May</th> <th style="text-align: center;">Jun</th> <th style="text-align: center;">Jul</th> <th style="text-align: center;">Ago</th> <th style="text-align: center;">Set</th> <th style="text-align: center;">Oct</th> <th style="text-align: center;">Nov</th> <th style="text-align: center;">Dic</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Lamparas</td> <td style="text-align: center;">87 - Q5</td> </tr> <tr> <td style="text-align: center;">Estandar</td> <td style="text-align: center;">-</td> <td style="text-align: center;">87 - QR63</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">87 - QR63</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">87 - QR63</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">87 - QR63</td> <td style="text-align: center;">-</td> </tr> <tr> <td></td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">87 - Q7</td> <td style="text-align: center;">-</td> <td style="text-align: center;">87 - Q7</td> <td style="text-align: center;">-</td> </tr> </tbody> </table> <p style="text-align: center;"><i>Figura 36: Cronograma de las lámparas estándar</i></p>	CRONOGRAMA DE LAMPARAS ESTANDAR													Mes	Ene.	Feb.	Mar	Abr	May	Jun	Jul	Ago	Set	Oct	Nov	Dic	Lamparas	87 - Q5	Estandar	-	87 - QR63	-		-	-	-	-	87 - Q7	-	-	-	-	-	87 - Q7	-																				
CRONOGRAMA DE LAMPARAS ESTANDAR																																																																		
Mes	Ene.	Feb.	Mar	Abr	May	Jun	Jul	Ago	Set	Oct	Nov	Dic																																																						
Lamparas	87 - Q5	87 - Q5	87 - Q5	87 - Q5	87 - Q5	87 - Q5	87 - Q5	87 - Q5	87 - Q5	87 - Q5	87 - Q5	87 - Q5																																																						
Estandar	-	87 - QR63	-	-	87 - QR63	-	-	87 - QR63	-	-	87 - QR63	-																																																						
	-	-	-	-	87 - Q7	-	-	-	-	-	87 - Q7	-																																																						
<b>44</b>	Tener en cuenta que en el paso 30 se menciona que no se debe apagar el espectrofotómetro Dobson. Retirar la tapa protectora del difusor de cuarzo (S-1). No quitar el filtro difusor de cuarzo.																																																																	
<b>45</b>	<p>Colocar el portalámparas en el agujero de entrada de luz del difusor (S-1), asegurándose de que se encuentre en la única posición correcta. Ubicar la fuente de voltaje encima del espectrofotómetro Dobson. Tener en cuenta que el portalámparas y la fuente de voltaje ya están conectados por un cable.</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p><i>Figura 37: Portalámparas</i></p> </div> <div style="text-align: center;">  <p><i>Figura 38: Fuente de voltaje</i></p> </div> </div>																																																																	
<b>46</b>	Conectar el cable de la fuente de voltaje a la extensión eléctrica de 220V.																																																																	

N°	Actividad
47	<p>Encender la fuente de voltaje (ON) y verificar que se haya encendido la luz verde. Esperar que se caliente durante 5 minutos, sin colocar aún la lámpara estándar. Pasado este tiempo, apagar la fuente de voltaje (OFF).</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p><i>Figura 39: Fuente de voltaje</i></p> </div> <div style="text-align: center;">  <p><i>Figura 40: Luz verde</i></p> </div> </div>
48	<p>Encender el multímetro digital y conectar las puntas de prueba a las entradas de la fuente de voltaje. El multímetro debe marcar 24V. o un valor cercano.</p> <div style="text-align: center;">  <p><i>Figura 41: Conexión del multímetro a la fuente de voltaje</i></p> </div>

N°	Actividad
<b>49</b>	<p>Elegir la lámpara estándar correspondiente según el cronograma para realizar la de calibración y colocarla en el portalámparas, utilizando la corredora del portalámparas como guía.</p> <div style="text-align: center;">  <p style="text-align: center;"><i>Figura 42: Se coloca la Lámpara elegida en el Portalámparas. guiándonos con la corredora de esta.</i></p> </div>
<b>50</b>	<p>Encender nuevamente la fuente de voltaje (ON) y, con ello, la lámpara estándar con la que se esté calibrando se encenderá.</p> <div style="text-align: center;">  <p style="text-align: center;"><i>Figura 43: Encendido de la lámpara</i></p> </div>
<b>51</b>	Con la polaridad (Shutter) del microamperímetro hacia arriba, abrir el freno girándolo en sentido horario hasta el tope.
<b>52</b>	Aumentar la sensibilidad del microamperímetro hasta 40 (μA) utilizando la perilla derecha, girándola en sentido horario.
<b>53</b>	Retroceder la aguja del microamperímetro a cero con el disco R-dial.

N°	Actividad
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**54** A continuación, dejar calentar la lampara estándar por un periodo de 5 minutos.

**55** Una vez transcurrido ese lapso de tiempo, verificar que el multímetro marque 24V. o un valor cercano y registrar el **nombre de la lámpara estándar (Standard Lamp Name)** con la que se calibrará.

Hoja: \_\_\_\_\_ Instrument No. 087

DOBSON CALIBRATION DATASHEET  
LAMP TEST FORM

Mercury Test		Date: _____	Time: _____	Mean: _____
Inst. Temperature--	Start:	End:		
1	2	3	4	5
OT up				
OT down				
Average:				
		Test mean:		
Table Date: 2019, Julio, 15		Table Value at Mean Temperature: _____		
		Difference: _____		

Mercury Test		Date: _____	Time: _____	Mean: _____
Inst. Temperature--	Start:	End:		
1	2	3	4	5
OT up				
OT down				
Average:				
		Test mean:		
Table Date: _____		Table Value at Mean Temperature: _____		
		Difference: _____		

Standard Lamp Name:	Date:	Time:				
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$
Test A:						
Test C:						
Test D:						
Inst. Temperature:						

Standard Lamp Name:	Date:	Time:				
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$
Test A:						
Test C:						
Test D:						
Inst. Temperature:						

Standard Lamp Name:	Date:	Time:				
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$
Test A:						
Test C:						
Test D:						
Inst. Temperature:						

Standard Lamp Name:	Date:	Time:				
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$
Test A:						
Test C:						
Test D:						
Inst. Temperature:						

When making standard lamp tests outside, cover the lamp so day light does not effect the results.

Standard Lamp Name:	Date:	Time:				
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$
Test A:						
Test C:						
Test D:						
Inst. Temperature:						

**Figura 44: Registro del nombre de la lámpara estándar**

**56** Leer la temperatura del espectrofotómetro Dobson utilizando su termómetro y registrarla en el campo **"Inst. Temperature"** del formato de calibración Dobson. Asimismo, registrar la **fecha (date)** y la **hora (time)** de inicio de la calibración.

Hoja: \_\_\_\_\_ Instrument No. 087

DOBSON CALIBRATION DATASHEET  
LAMP TEST FORM

Mercury Test		Date: _____	Time: _____	Mean: _____
Inst. Temperature--	Start:	End:		
1	2	3	4	5
OT up				
OT down				
Average:				
		Test mean:		
Table Date: 2019, Julio, 15		Table Value at Mean Temperature: _____		
		Difference: _____		

Mercury Test		Date: _____	Time: _____	Mean: _____
Inst. Temperature--	Start:	End:		
1	2	3	4	5
OT up				
OT down				
Average:				
		Test mean:		
Table Date: _____		Table Value at Mean Temperature: _____		
		Difference: _____		

Standard Lamp Name:	Date:	Time:				
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$
Test A:						
Test C:						
Test D:						
Inst. Temperature:						

Standard Lamp Name:	Date:	Time:				
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$
Test A:						
Test C:						
Test D:						
Inst. Temperature:						

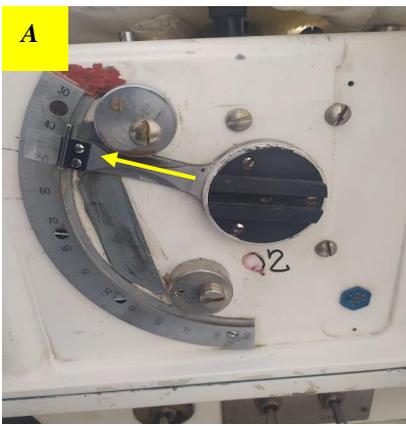
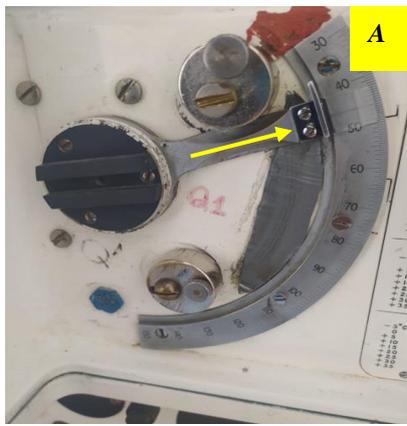
Standard Lamp Name:	Date:	Time:				
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$
Test A:						
Test C:						
Test D:						
Inst. Temperature:						

Standard Lamp Name:	Date:	Time:				
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$
Test A:						
Test C:						
Test D:						
Inst. Temperature:						

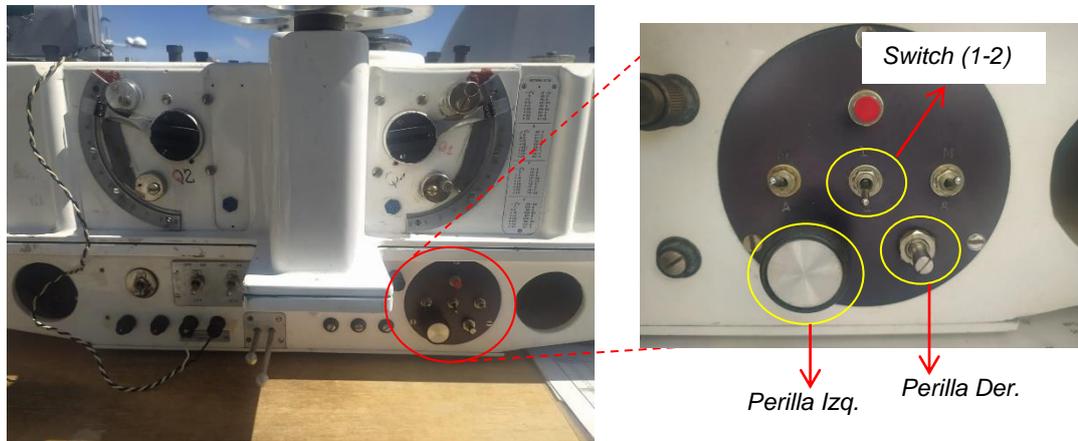
When making standard lamp tests outside, cover the lamp so day light does not effect the results.

Standard Lamp Name:	Date:	Time:				
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$
Test A:						
Test C:						
Test D:						
Inst. Temperature:						

**Figura 45: Registro del Inst. Temperature, date y time**

N°	Actividad																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
57	<p>Con la temperatura obtenida en el paso anterior, buscar en la tabla Q' los valores correspondientes para A, C y D que se ajusten a esa temperatura específica. Dichos valores se utilizarán para ajustar la palanca Q1, mientras que los datos para la palanca Q2 ya están especificados en la tabla Q'.</p> <p>Ejemplo: T°=11.0</p> <p align="center"><i>Tabla Q'</i></p> <table border="1"> <caption>Values at 15 Degs C: A: 46.31 C: 4.141 D: 0.100 Hg3129: 0.155</caption> <thead> <tr> <th>Temperature</th> <th>A</th> <th>C</th> <th>D</th> <th>HG</th> <th>Temperature</th> <th>A</th> <th>C</th> <th>D</th> <th>HG</th> <th>Temperature</th> <th>A</th> <th>C</th> <th>D</th> <th>HG</th> </tr> </thead> <tbody> <tr><td>-5.0</td><td>44.2</td><td>69.1</td><td>100.3</td><td>76.80</td><td>10.0</td><td>45.9</td><td>71.4</td><td>102.5</td><td>79.10</td><td>25.0</td><td>47.3</td><td>73.7</td><td>104.8</td><td>81.45</td></tr> <tr><td>-4.5</td><td>44.3</td><td>69.2</td><td>100.3</td><td>76.85</td><td>10.5</td><td>45.8</td><td>71.5</td><td>102.6</td><td>79.20</td><td>25.5</td><td>47.4</td><td>73.8</td><td>104.8</td><td>81.50</td></tr> 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<th>D</th> <th>HG</th> </tr> </thead> <tbody> <tr><td>10.0</td><td>45.8</td><td>71.4</td><td>102.5</td><td>79.10</td></tr> <tr><td>10.5</td><td>45.8</td><td>71.5</td><td>102.6</td><td>79.20</td></tr> <tr><td>11.0</td><td>45.9</td><td>71.6</td><td>102.7</td><td>79.25</td></tr> <tr><td>11.5</td><td>45.9</td><td>71.6</td><td>102.7</td><td>79.35</td></tr> <tr><td>12.0</td><td>46.0</td><td>71.7</td><td>102.8</td><td>79.40</td></tr> </tbody> </table> <p><b>Q2</b></p> <table border="1"> <thead> <tr> <th>Temperature</th> <th>A</th> <th>C</th> <th>D</th> <th>HG</th> </tr> </thead> <tbody> <tr><td>15.0</td><td>46.3</td><td>72.2</td><td>103.3</td><td>79.90</td></tr> </tbody> </table>	Temperature	A	C	D	HG	Temperature	A	C	D	HG	Temperature	A	C	D	HG	-5.0	44.2	69.1	100.3	76.80	10.0	45.9	71.4	102.5	79.10	25.0	47.3	73.7	104.8	81.45	-4.5	44.3	69.2	100.3	76.85	10.5	45.8	71.5	102.6	79.20	25.5	47.4	73.8	104.8	81.50	-4.0	44.3	69.3	100.4	76.95	11.0	45.9	71.6	102.7	79.25	26.0	47.5	73.9	104.9	81.60	-3.5	44.4	69.3	100.5	77.00	11.5	45.9	71.6	102.7	79.35	26.5	47.5	73.9	105.0	81.65	-3.0	44.4	69.4	100.6	77.10	12.0	46.0	71.7	102.8	79.40	27.0	47.6	74.0	105.1	81.75	-2.5	44.5	69.5	100.6	77.15	12.5	46.0	71.8	102.9	79.50	27.5	47.6	74.1	105.1	81.80	-2.0	44.5	69.6	100.7	77.25	13.0	46.1	71.9	103.0	79.55	28.0	47.7	74.2	105.2	81.90	-1.5	44.6	69.6	100.8	77.30	13.5	46.2	71.9	103.0	79.65	28.5	47.7	74.2	105.3	81.95	-1.0	44.6	69.7	100.9	77.40	14.0	46.2	72.0	103.1	79.75	29.0	47.8	74.3	105.4	82.05	-0.5	44.7	69.8	100.9	77.50	14.5	46.3	72.1	103.2	79.80	29.5	47.8	74.4	105.4	82.15	0.0	44.75	69.88	101.00	77.56	15.0	46.3	72.2	103.3	79.90	30.0	47.9	74.5	105.5	82.20	0.5	44.8	70.0	101.1	77.65	15.5	46.4	72.3	103.3	79.95	30.5	47.9	74.6	105.6	82.30	1.0	44.9	70.0	101.2	77.70	16.0	46.4	72.3	103.4	80.05	31.0	48.0	74.6	105.7	82.35	1.5	44.9	70.1	101.2	77.80	16.5	46.5	72.4	103.5	80.10	31.5	48.0	74.7	105.7	82.45	2.0	45.0	70.2	101.3	77.85	17.0	46.5	72.5	103.6	80.20	32.0	48.1	74.8	105.8	82.50	2.5	45.0	70.3	101.4	77.95	17.5	46.6	72.6	103.6	80.25	32.5	48.1	74.9	105.9	82.60	3.0	45.1	70.3	101.5	78.00	18.0	46.6	72.6	103.7	80.35	33.0	48.2	74.9	106.0	82.65	3.5	45.1	70.4	101.5	78.10	18.5	46.7	72.7	103.8	80.40	33.5	48.2	75.0	106.0	82.75	4.0	45.2	70.5	101.6	78.20	19.0	46.7	72.8	103.9	80.50	34.0	48.3	75.1	106.1	82.85	4.5	45.2	70.6	101.7	78.25	19.5	46.8	72.9	103.9	80.60	34.5	48.3	75.2	106.2	82.90	5.0	45.3	70.6	101.8	78.35	20.0	46.8	72.9	104.0	80.65	35.0	48.4	75.2	106.3	83.00	5.5	45.3	70.7	101.8	78.40	20.5	46.9	73.0	104.1	80.75	35.5	48.4	75.3	106.3	83.05	6.0	45.4	70.8	101.9	78.50	21.0	46.9	73.1	104.2	80.80	36.0	48.5	75.4	106.4	83.15	6.5	45.4	70.9	102.0	78.55	21.5	47.0	73.2	104.2	80.90	36.5	48.5	75.5	106.5	83.20	7.0	45.5	71.0	102.1	78.65	22.0	47.0	73.3	104.3	80.95	37.0	48.6	75.6	106.6	83.30	7.5	45.5	71.0	102.1	78.70	22.5	47.1	73.3	104.4	81.05	37.5	48.6	75.6	106.6	83.35	8.0	45.6	71.1	102.2	78.80	23.0	47.1	73.4	104.5	81.10	38.0	48.7	75.7	106.7	83.45	8.5	45.6	71.2	102.3	78.85	23.5	47.2	73.5	104.5	81.20	38.5	48.7	75.8	106.8	83.50	9.0	45.7	71.3	102.4	78.95	24.0	47.2	73.6	104.6	81.30	39.0	48.8	75.9	106.9	83.60	9.5	45.7	71.3	102.4	79.05	24.5	47.3	73.6	104.7	81.35	39.5	48.9	75.9	106.9	83.70	Temperature	A	C	D	HG	10.0	45.8	71.4	102.5	79.10	10.5	45.8	71.5	102.6	79.20	11.0	45.9	71.6	102.7	79.25	11.5	45.9	71.6	102.7	79.35	12.0	46.0	71.7	102.8	79.40	Temperature	A	C	D	HG	15.0	46.3	72.2	103.3	79.90
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0.0	44.75	69.88	101.00	77.56	15.0	46.3	72.2	103.3	79.90	30.0	47.9	74.5	105.5	82.20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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1.0	44.9	70.0	101.2	77.70	16.0	46.4	72.3	103.4	80.05	31.0	48.0	74.6	105.7	82.35																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
1.5	44.9	70.1	101.2	77.80	16.5	46.5	72.4	103.5	80.10	31.5	48.0	74.7	105.7	82.45																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
2.0	45.0	70.2	101.3	77.85	17.0	46.5	72.5	103.6	80.20	32.0	48.1	74.8	105.8	82.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
2.5	45.0	70.3	101.4	77.95	17.5	46.6	72.6	103.6	80.25	32.5	48.1	74.9	105.9	82.60																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
3.0	45.1	70.3	101.5	78.00	18.0	46.6	72.6	103.7	80.35	33.0	48.2	74.9	106.0	82.65																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
3.5	45.1	70.4	101.5	78.10	18.5	46.7	72.7	103.8	80.40	33.5	48.2	75.0	106.0	82.75																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
4.0	45.2	70.5	101.6	78.20	19.0	46.7	72.8	103.9	80.50	34.0	48.3	75.1	106.1	82.85																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
4.5	45.2	70.6	101.7	78.25	19.5	46.8	72.9	103.9	80.60	34.5	48.3	75.2	106.2	82.90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
5.0	45.3	70.6	101.8	78.35	20.0	46.8	72.9	104.0	80.65	35.0	48.4	75.2	106.3	83.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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6.5	45.4	70.9	102.0	78.55	21.5	47.0	73.2	104.2	80.90	36.5	48.5	75.5	106.5	83.20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
7.0	45.5	71.0	102.1	78.65	22.0	47.0	73.3	104.3	80.95	37.0	48.6	75.6	106.6	83.30																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
7.5	45.5	71.0	102.1	78.70	22.5	47.1	73.3	104.4	81.05	37.5	48.6	75.6	106.6	83.35																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
8.0	45.6	71.1	102.2	78.80	23.0	47.1	73.4	104.5	81.10	38.0	48.7	75.7	106.7	83.45																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
8.5	45.6	71.2	102.3	78.85	23.5	47.2	73.5	104.5	81.20	38.5	48.7	75.8	106.8	83.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
9.0	45.7	71.3	102.4	78.95	24.0	47.2	73.6	104.6	81.30	39.0	48.8	75.9	106.9	83.60																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
9.5	45.7	71.3	102.4	79.05	24.5	47.3	73.6	104.7	81.35	39.5	48.9	75.9	106.9	83.70																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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11.5	45.9	71.6	102.7	79.35																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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58	<p>Luego, colocar la palanca Q1 y Q2 con los valores "A" obtenidos anteriormente. El <b>switch (1-2) debe estar</b> hacia abajo (Ver figura 48). Abrir (giro horario) la <b>llave del microamperímetro</b> se observará que la aguja de este oscilará bruscamente. Con la ayuda del disco R-dial, ajustar la aguja del microamperímetro para que marque cero, de ser necesario, abrir (giro horario) o cerrar (giro antihorario) la <b>perilla derecha</b>. Cerrar (giro antihorario) la llave del microamperímetro cuando se observe que el agua se estabilice y marque cero. A continuación, tomar la lectura marcada en el disco R-dial y registrarla en el campo "Test A" del formato de calibración.</p> <div style="display: flex; justify-content: space-around;">   </div> <p align="center"><i>Figura 47: Palanca Q1 y Q2 con los valores "A" para c/u</i></p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									

<b>N°</b>	<b>Actividad</b>
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**Figura 48:**

Hoja: \_\_\_\_\_ Instrument No. 087

**DOBSON CALIBRATION DATASHEET  
LAMP TEST FORM**

Mercury Test	Date: _____	Time: _____	Mean: _____
Inst. Temperature: _____	Start: _____	End: _____	
Q1 up	1	2	3
Q1 down	4	5	
Average:			
Test mean: _____			
Table Value at Mean Temperature: _____			
Difference: _____			
Table Date: 2019 Julio, 15			

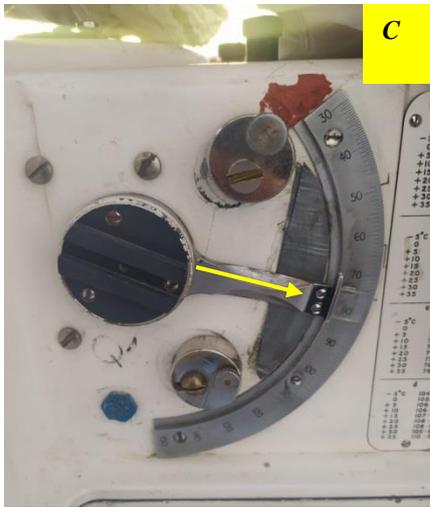
Standard Lamp Name:	Date:	Time:
Test A:	1	2
Test C:	3	mean
Test D:	N-value	N-ref
Inst. Temperature:	$\Delta N(Nref-Ntest)$	

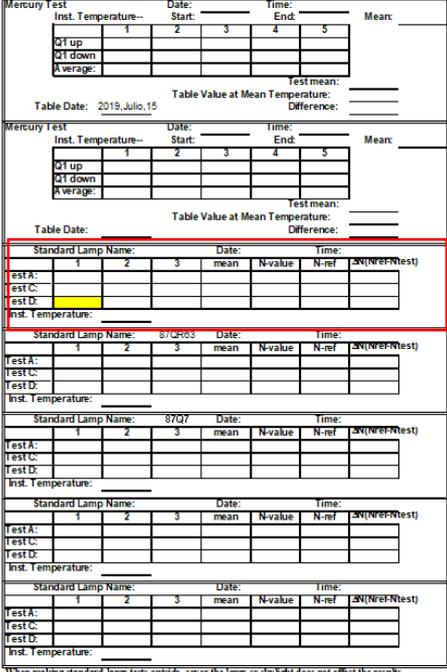
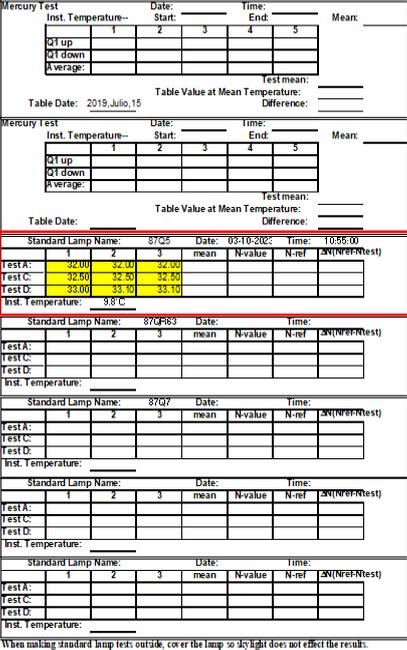
When making standard lamp tests outside, cover the lamp so sky light does not effect the results.

Standard Lamp Name:	Date:	Time:
Test A:	1	2
Test C:	3	mean
Test D:	N-value	N-ref
Inst. Temperature:	$\Delta N(Nref-Ntest)$	

**Figura 49: Registro en el Test A**

**59** Colocar la palanca Q1 y Q2 con los valores “C” obtenidos anteriormente, con el **switch (1-2)** hacia abajo. Abrir (giro horario) la **llave del microamperímetro** se observará que la aguja de este oscilará bruscamente. Si es necesario, abrir (giro horario) o cerrar (giro antihorario) la sensibilidad de la perilla derecha y con la ayuda del disco R-dial ajuste la aguja del microamperímetro hasta que marque cero. Cerrar (giro antihorario) la llave del microamperímetro cuando se observe que el agua se estabilice y marque cero. A continuación, tomar la lectura marcada en el disco R-dial y regístrela en el campo "Test C" del formato de calibración.

N°	Actividad
	<div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center;"><i>Figura 50: Palanca Q1 y Q2 con los valores "C" para c/u</i></p>
<b>60</b>	<p>Colocar la palanca Q1 y Q2 con los valores "D" obtenidos anteriormente. Poner el <b>switch (1-2)</b> hacia arriba. Abrir (giro horario) la <b>llave del microamperímetro</b> se observará que la aguja de este oscilará bruscamente. Si es necesario, abrir (giro horario) o cerrar (giro antihorario) la sensibilidad de la perilla izquierda y con la ayuda del disco R-dial ajuste la aguja del microamperímetro para que marque cero. Cerrar (giro antihorario) la llave del microamperímetro cuando se observe que el agua se estabilice y marque cero. A continuación, tomar la lectura marcada en el disco R-dial y registrar en el campo "Test D" del formato de calibración.</p> <div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center;"><i>Figura 52: Palanca Q1 y Q2 con los valores "D" para c/u</i></p>

N°	Actividad																																											
	<p>Hoja: _____ Instrument No. 087</p> <p style="text-align: center;">DOBSON CALIBRATION DATASHEET LAMP TEST FORM</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">  </div> <div style="width: 45%;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3">Standard Lamp Name:</th> <th>Date:</th> <th>Time:</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>mean</th> <th>N-value</th> <th>N-ref</th> <th><math>\Delta N(Nref-Ntest)</math></th> </tr> </thead> <tbody> <tr> <td>Test A:</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Test C:</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Test D:</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Inst. Temperature:</td> <td colspan="6"></td> </tr> </tbody> </table> </div> </div> <p style="text-align: center;"><i>Figura 53: Registro en el Test D</i></p>	Standard Lamp Name:			Date:	Time:	1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$	Test A:							Test C:							Test D:							Inst. Temperature:									
Standard Lamp Name:			Date:	Time:																																								
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$																																						
Test A:																																												
Test C:																																												
Test D:																																												
Inst. Temperature:																																												
61	<p>Repetir 3 veces los pasos 58 para el test A, 59 para el test C y 60 para el test D, hasta completar los demás casilleros de la sección del en el formato de calibración. Ver figura 54</p> <p>Hoja: _____ Instrument No. 087</p> <p style="text-align: center;">DOBSON CALIBRATION DATASHEET LAMP TEST FORM</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">  </div> <div style="width: 45%;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3">Standard Lamp Name:</th> <th>87Q5</th> <th>Date:</th> <th>03-10-2023</th> <th>Time:</th> <th>10:55:00</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>mean</th> <th>N-value</th> <th>N-ref</th> <th><math>\Delta N(Nref-Ntest)</math></th> </tr> </thead> <tbody> <tr> <td>Test A:</td> <td>32.00</td> <td>32.00</td> <td>32.00</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Test C:</td> <td>32.50</td> <td>32.50</td> <td>32.50</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Test D:</td> <td>33.00</td> <td>33.10</td> <td>33.10</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Inst. Temperature:</td> <td colspan="6">9.8°C</td> </tr> </tbody> </table> </div> </div> <p style="text-align: center;"><i>Figura 54: Registro completo de los Test A, C, y D en el formato de calibración Dobson</i></p>	Standard Lamp Name:			87Q5	Date:	03-10-2023	Time:	10:55:00	1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$	Test A:	32.00	32.00	32.00				Test C:	32.50	32.50	32.50				Test D:	33.00	33.10	33.10				Inst. Temperature:	9.8°C					
Standard Lamp Name:			87Q5	Date:	03-10-2023	Time:	10:55:00																																					
1	2	3	mean	N-value	N-ref	$\Delta N(Nref-Ntest)$																																						
Test A:	32.00	32.00	32.00																																									
Test C:	32.50	32.50	32.50																																									
Test D:	33.00	33.10	33.10																																									
Inst. Temperature:	9.8°C																																											
62	<p>Una vez finalizado, mover las palancas "Q1" y "Q2" hacia arriba.</p>																																											

	<b>INSTRUCTIVO</b>	<b>Código</b>	IN-DMA-006
	<b>CALIBRACIÓN DEL EQUIPO</b>	<b>Versión</b>	01
	<b>ESPECTROFOTÓMETRO DOBSON N° 087</b>	<b>Página</b>	27 de 33

N°	Actividad
63	Cerrar completamente (giro antihorario) la sensibilidad de la perilla derecha a cero.
64	Cerrar la llave del microamperímetro (freno), girando suavemente de forma antihoraria hasta el tope.
65	Colocar en cero el disco R-dial.
66	Apagar la fuente de voltaje (OFF) y la lámpara estándar con la que se esté calibrando se apagará. Luego, con sumo cuidado utilizando guantes retirar la lámpara estándar, evitando tocar su lente. Colocar en un sitio seguro hasta que se enfríe y luego guardar.
67	No apagar el motor del Espectrofotómetro Dobson si se va a continuar con la calibración de las demás lámparas estándar. En este caso, <b>repetir los pasos del 49 al 66</b> . De lo contrario, apagar el motor del espectrofotómetro Dobson, pero esta vez de derecha a izquierda ( <b>ver figura 10</b> ).
68	Apagar el multímetro digital y desconectar las puntas de prueba de las entradas de la fuente de voltaje.
69	Desconectar el cable de la fuente de voltaje a la extensión eléctrica de 220V.
70	Retirar con sumo cuidado el portalámparas en el agujero de entrada de luz del difusor (S-1),. Y luego guarde el portalámparas y la fuente de voltaje,
71	Finalmente, colocar la tapa protectora del difusor (S-1). Y con ello finalizar la calibración del espectrofotómetro Dobson utilizando la(s) lámpara(s) de estándar y se obtienen los datos, como se muestra en la figura 54 los cuales se registrarán según se detalla en las actividades a continuación descritas.
72	Registrar digitalmente en la hoja de cálculo, obteniendo la media ( <b>Mean</b> ), <b>N-Value</b> , <b>N Ref</b> , y <b>ΔN (Nref – Ntest)</b>

Hoja: \_\_\_\_\_ Instrument No. 087

DOBSON CALIBRATION DATASHEET  
LAMP TEST FORM

Mercury Test		Date: _____	Time: _____
Inst. Temperature: _____	Start: _____	End: _____	Mean: _____
Q1 up	1	2	3
Q1 down	4	5	
Average: _____	Test mean: _____		
Table Value at Mean Temperature: _____		Difference: _____	
Table Date: 2019, Julio, 15			

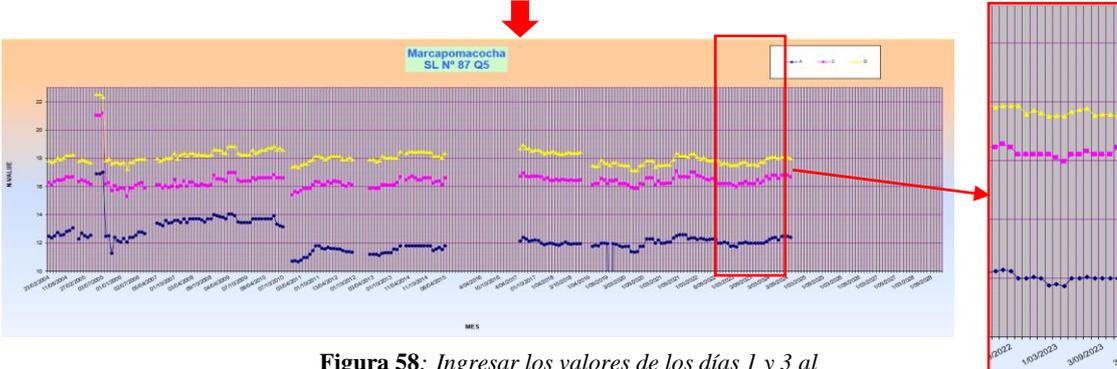
  

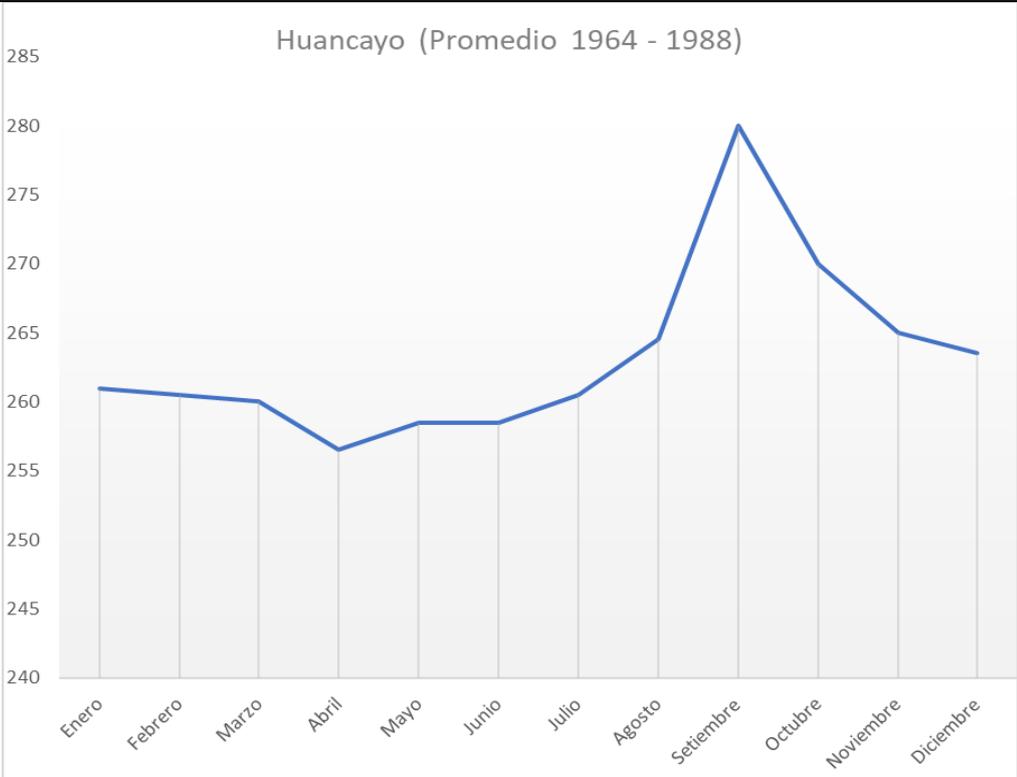
Mercury Test		Date: _____	Time: _____
Inst. Temperature: _____	Start: _____	End: _____	Mean: _____
Q1 up	1	2	3
Q1 down	4	5	
Average: _____	Test mean: _____		
Table Value at Mean Temperature: _____		Difference: _____	
Table Date: _____			

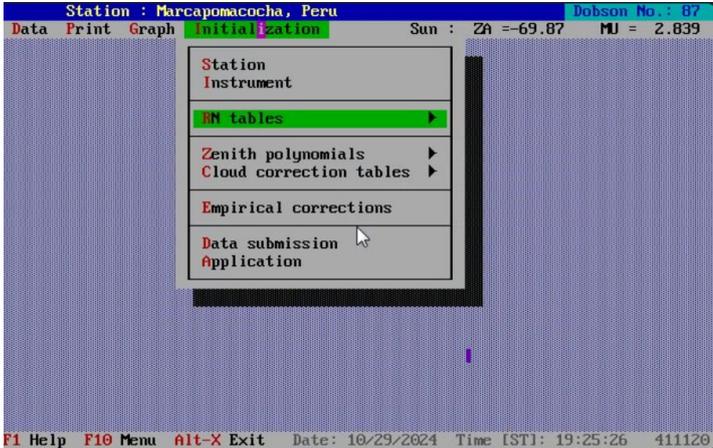
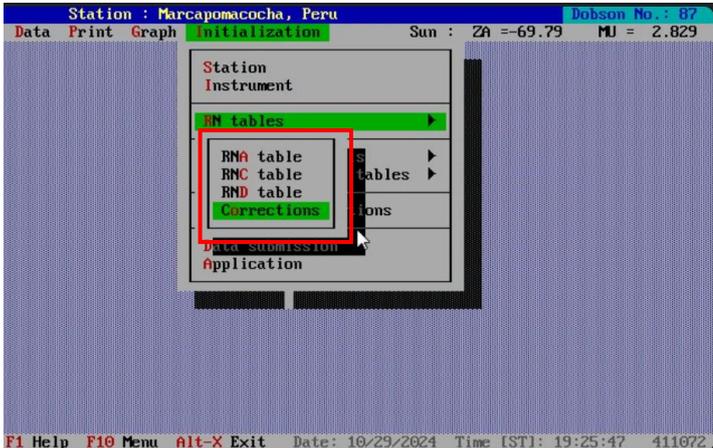
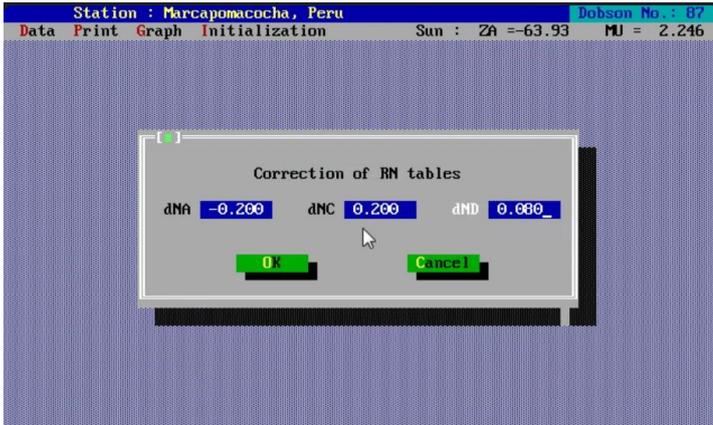
  

Standard Lamp Name:	87Q5	Date:	03-10-2023	Time:	10:55:00		
	1	2	3	mean	N-value	N-ref	ΔN(Nref-Ntest)
Test A:	32.00	32.00	32.00	32.00	12.00	11.80	-0.20
Test C:	32.50	32.50	32.50	32.50	16.20	16.40	0.20
Test D:	33.00	33.10	33.10	33.07	17.58	17.50	-0.08
Inst. Temperature:	9.8 °C						

*Figura 55: Registro completado*

N°	Actividad																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
73	<p>Tras la calibración de la(s) lámpara(s) estándar los días 1 y 3 de cada mes, se obtendrán dos resultados finales para cada lámpara en caso de calibrarse más de una. No obstante, <b>solo se empleará la lámpara 87Q5 como referencia para determinar cuál de los dos días es adecuado</b>, tomando en cuenta el valor de <math>\Delta N</math> (<math>N_{ref} - N_{test}</math>) para los valores <math>\Delta NA</math>, <math>\Delta NC</math> y <math>\Delta ND</math>, como se muestra en las figuras 56 y 57.</p> <p>Los datos obtenidos se ingresarán en una hoja de cálculo automatizada que generará una gráfica (Figura 58) para su comparación con la gráfica matriz de referencia (Figura 59). La selección final se realizará eligiendo el resultado que mejor se asemeje a dicha gráfica de referencia.</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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Temperature:</td> <td colspan="3">10.4 °C</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p align="center"><b>Figura 56:</b> Registro completo de la calibración con la lámpara 87Q5 realizada el día 1.</p> <table border="1"> <thead> <tr> <th colspan="2">Standard Lamp Name:</th> <th colspan="3">87Q5</th> <th>Date:</th> <th>03-09-2023</th> <th>Time:</th> <th>10:12:00</th> </tr> <tr> <th></th> <th>1</th> <th>2</th> <th>3</th> <th>mean</th> <th>N-value</th> <th>N-ref</th> <th><math>\Delta N(N_{ref}-N_{test})</math></th> </tr> </thead> <tbody> <tr> <td>Test A:</td> <td>32.00</td> <td>32.00</td> <td>32.00</td> <td>32.00</td> <td>12.00</td> <td>11.80</td> <td>-0.20</td> </tr> <tr> <td>Test C:</td> <td>32.50</td> <td>32.50</td> <td>32.50</td> <td>32.50</td> <td>16.20</td> <td>16.40</td> <td>0.20</td> </tr> <tr> <td>Test D:</td> <td>33.10</td> <td>33.00</td> <td>33.10</td> <td>33.07</td> <td>17.58</td> <td>17.50</td> <td>-0.08</td> </tr> <tr> <td>Inst. 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(A-C)</th> <th rowspan="2"><math>\Delta N(N_{ref}-N_{test})</math></th> </tr> <tr> <th>A</th> <th>C</th> <th>D</th> </tr> </thead> <tbody> <tr><td>03</td><td>3/01/2023</td><td>12</td><td>16.2</td><td>17.62</td><td>-5.62</td><td>-0.2</td><td>0.2</td><td>-0.12</td><td>-0.08</td><td>01</td><td>1/01/2023</td><td>12</td><td>16.2</td><td>17.5</td><td>-5.5</td><td>-0.2</td><td>0.2</td><td>0</td><td>03</td><td>3/01/2023</td><td>12</td><td>16.2</td><td>17.62</td><td>-5.62</td><td>-0.2</td><td>0.2</td><td>-0.12</td><td>01</td><td>1/02/2023</td><td>11.76</td><td>16.2</td><td>17.5</td><td>-5.74</td><td>0.04</td><td>0.2</td><td>0</td><td>03</td><td>1/02/2023</td><td>11.16</td><td>16.2</td><td>17.5</td><td>-6.34</td><td>0.2</td><td>0.2</td><td>0</td><td>01</td><td>1/02/2023</td><td>11.76</td><td>16.2</td><td>17.5</td><td>-5.74</td><td>0.04</td><td>0.2</td><td>0</td></tr> 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Temperature:	10.4 °C							Standard Lamp Name:		87Q5			Date:	03-09-2023	Time:	10:12:00		1	2	3	mean	N-value	N-ref	$\Delta N(N_{ref}-N_{test})$	Test A:	32.00	32.00	32.00	32.00	12.00	11.80	-0.20	Test C:	32.50	32.50	32.50	32.50	16.20	16.40	0.20	Test D:	33.10	33.00	33.10	33.07	17.58	17.50	-0.08	Inst. Temperature:	8.6 °C							FINAL												Lampara N° 87 Q 5				1° TEST				Lampara N° 87 Q 5				2° TEST				Lampara N° 87 Q 5				DIA	MES	N-Value			Dif. (A-C)			$\Delta N(N_{ref}-N_{test})$			DIA	MES	N-Value			Dif. (A-C)			$\Delta N(N_{ref}-N_{test})$	DIA	MES	N-Value			Dif. (A-C)			$\Delta N(N_{ref}-N_{test})$	DIA	MES	N-Value			Dif. (A-C)			$\Delta N(N_{ref}-N_{test})$	A	C	D	A	C	D	A	C	D	A	C	D	A	C	D	A	C	D	A	C	D	A	C	D	03	3/01/2023	12	16.2	17.62	-5.62	-0.2	0.2	-0.12	-0.08	01	1/01/2023	12	16.2	17.5	-5.5	-0.2	0.2	0	03	3/01/2023	12	16.2	17.62	-5.62	-0.2	0.2	-0.12	01	1/02/2023	11.76	16.2	17.5	-5.74	0.04	0.2	0	03	1/02/2023	11.16	16.2	17.5	-6.34	0.2	0.2	0	01	1/02/2023	11.76	16.2	17.5	-5.74	0.04	0.2	0	01	1/02/2023	11.76	16.2	17.5	-5.74	0.04	0.2	0	0.04	01	1/02/2023	11.76	16.2	17.5	-5.74	0.04	0.2	0	03	1/03/2023	11.8	16.08	17.54	-5.74	0	0.32	-0.04	0.04	01	1/03/2023	11.92	16.2	17.54	-5.62	-0.12	0.2	-0.04	03	1/03/2023	11.8	16.08	17.54	-5.74	0	0.32	-0.04	01	1/04/2023	11.72	15.96	17.5	-5.78	0.08	0.44	0	08	01	1/04/2023	11.72	15.96	17.5	-5.78	0.08	0.44	0	03	3/04/2023	11.96	16.2	17.5	-5.54	-0.16	0.2	0	03	1/03/2023	11.8	16.08	17.54	-5.74	0	0.32	-0.04	0.04	01	1/04/2023	11.72	15.96	17.5	-5.78	0.08	0.44	0	03	3/05/2023	12	16.2	17.66	-5.66	-0.2	0.2	-0.16	-0.04	01	1/05/2023	12	16.2	17.74	-5.74	-0.2	0.2	-0.24	0.04	03	3/05/2023	12	16.2	17.66	-5.66	-0.2	0.2	-0.16	01	1/06/2023	12	16.2	17.74	-5.74	-0.2	0.2	-0.24	0.04	03	3/06/2023	11.52	15.84	17.17	-5.65	0.28	0.56	0.33	01	1/06/2023	12	16.2	17.74	-5.74	-0.2	0.2	-0.24	0.04	03	3/07/2023	12	16.2	17.58	-5.58	-0.2	0.2	-0.08	0.04	01	1/07/2023	12.04	16.32	17.78	-5.74	-0.24	0.08	-0.28	0.08	03	3/07/2023	12	16.2	17.58	-5.58	-0.2	0.2	-0.08	0.04	01	1/07/2023	12.04	16.32	17.78	-5.74	-0.24	0.08	-0.28	0.08	03	3/08/2023	12	16.2	17.54	-5.54	-0.2	0.2	-0.04	-0.16	01	1/08/2023	12	16.2	17.54	-5.54	-0.2	0.2	-0.04	-0.16	03	3/08/2023	12	16.2	17.54	-5.54	-0.2	0.2	-0.04	-0.16	01	1/09/2023	12	16.32	17.54	-5.54	-0.2	0.08	-0.04	0.08	03	3/09/2023	12	16.2	17.58	-5.58	-0.2	0.2	-0.08	-0.12	01	1/10/2023	12	16.2	17.54	-5.54	-0.2	0.2	-0.04	-0.12	03	3/10/2023	12	16.2	17.58	-5.58	-0.2	0.2	-0.08	-0.12	01	1/10/2023	12	16.2	17.54	-5.54	-0.2	0.2	-0.04	-0.12	03	3/11/2023	12	16.44	17.5	-5.5	-0.2	-0.04	-0.2	0	01	1/11/2023	12.04	16.4	17.74	-5.7	-0.24	0	-0.24	0	03	3/11/2023	12	16.44	17.5	-5.5	-0.2	-0.04	-0.2	0	01	1/12/2023	12	16.24	17.78	-5.78	-0.2	0.16	-0.28	0.08	03	3/12/2023	12.12	16.44	17.82	-5.7	-0.32	-0.04	-0.32	0.08	01	1/12/2023	12	16.24	17.78	-5.78	-0.2	0.16	-0.28	0.08	03	3/12/2023	12.12	16.44	17.82	-5.7	-0.32	-0.04	-0.32	0.08
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Standard Lamp Name:		87Q5			Date:	03-09-2023	Time:	10:12:00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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Test A:	32.00	32.00	32.00	32.00	12.00	11.80	-0.20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
Test C:	32.50	32.50	32.50	32.50	16.20	16.40	0.20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
Test D:	33.10	33.00	33.10	33.07	17.58	17.50	-0.08																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
Inst. Temperature:	8.6 °C																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
FINAL												Lampara N° 87 Q 5				1° TEST				Lampara N° 87 Q 5				2° TEST				Lampara N° 87 Q 5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
DIA	MES	N-Value			Dif. (A-C)			$\Delta N(N_{ref}-N_{test})$			DIA	MES	N-Value			Dif. (A-C)			$\Delta N(N_{ref}-N_{test})$	DIA	MES	N-Value			Dif. (A-C)			$\Delta N(N_{ref}-N_{test})$	DIA	MES	N-Value			Dif. (A-C)			$\Delta N(N_{ref}-N_{test})$																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
		A	C	D	A	C	D	A	C	D			A	C	D	A	C	D				A	C	D	A	C	D				A	C	D																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
03	3/01/2023	12	16.2	17.62	-5.62	-0.2	0.2	-0.12	-0.08	01	1/01/2023	12	16.2	17.5	-5.5	-0.2	0.2	0	03	3/01/2023	12	16.2	17.62	-5.62	-0.2	0.2	-0.12	01	1/02/2023	11.76	16.2	17.5	-5.74	0.04	0.2	0	03	1/02/2023	11.16	16.2	17.5	-6.34	0.2	0.2	0	01	1/02/2023	11.76	16.2	17.5	-5.74	0.04	0.2	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
01	1/02/2023	11.76	16.2	17.5	-5.74	0.04	0.2	0	0.04	01	1/02/2023	11.76	16.2	17.5	-5.74	0.04	0.2	0	03	1/03/2023	11.8	16.08	17.54	-5.74	0	0.32	-0.04	0.04	01	1/03/2023	11.92	16.2	17.54	-5.62	-0.12	0.2	-0.04	03	1/03/2023	11.8	16.08	17.54	-5.74	0	0.32	-0.04	01	1/04/2023	11.72	15.96	17.5	-5.78	0.08	0.44	0	08	01	1/04/2023	11.72	15.96	17.5	-5.78	0.08	0.44	0	03	3/04/2023	11.96	16.2	17.5	-5.54	-0.16	0.2	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
03	1/03/2023	11.8	16.08	17.54	-5.74	0	0.32	-0.04	0.04	01	1/04/2023	11.72	15.96	17.5	-5.78	0.08	0.44	0	03	3/05/2023	12	16.2	17.66	-5.66	-0.2	0.2	-0.16	-0.04	01	1/05/2023	12	16.2	17.74	-5.74	-0.2	0.2	-0.24	0.04	03	3/05/2023	12	16.2	17.66	-5.66	-0.2	0.2	-0.16	01	1/06/2023	12	16.2	17.74	-5.74	-0.2	0.2	-0.24	0.04	03	3/06/2023	11.52	15.84	17.17	-5.65	0.28	0.56	0.33	01	1/06/2023	12	16.2	17.74	-5.74	-0.2	0.2	-0.24	0.04	03	3/07/2023	12	16.2	17.58	-5.58	-0.2	0.2	-0.08	0.04	01	1/07/2023	12.04	16.32	17.78	-5.74	-0.24	0.08	-0.28	0.08	03	3/07/2023	12	16.2	17.58	-5.58	-0.2	0.2	-0.08	0.04	01	1/07/2023	12.04	16.32	17.78	-5.74	-0.24	0.08	-0.28	0.08	03	3/08/2023	12	16.2	17.54	-5.54	-0.2	0.2	-0.04	-0.16	01	1/08/2023	12	16.2	17.54	-5.54	-0.2	0.2	-0.04	-0.16	03	3/08/2023	12	16.2	17.54	-5.54	-0.2	0.2	-0.04	-0.16	01	1/09/2023	12	16.32	17.54	-5.54	-0.2	0.08	-0.04	0.08	03	3/09/2023	12	16.2	17.58	-5.58	-0.2	0.2	-0.08	-0.12	01	1/10/2023	12	16.2	17.54	-5.54	-0.2	0.2	-0.04	-0.12	03	3/10/2023	12	16.2	17.58	-5.58	-0.2	0.2	-0.08	-0.12	01	1/10/2023	12	16.2	17.54	-5.54	-0.2	0.2	-0.04	-0.12	03	3/11/2023	12	16.44	17.5	-5.5	-0.2	-0.04	-0.2	0	01	1/11/2023	12.04	16.4	17.74	-5.7	-0.24	0	-0.24	0	03	3/11/2023	12	16.44	17.5	-5.5	-0.2	-0.04	-0.2	0	01	1/12/2023	12	16.24	17.78	-5.78	-0.2	0.16	-0.28	0.08	03	3/12/2023	12.12	16.44	17.82	-5.7	-0.32	-0.04	-0.32	0.08	01	1/12/2023	12	16.24	17.78	-5.78	-0.2	0.16	-0.28	0.08	03	3/12/2023	12.12	16.44	17.82	-5.7	-0.32	-0.04	-0.32	0.08																																																																																																																																																																																																																																																																																																																																				
	 <p align="center"><b>Figura 58:</b> Ingresar los valores de los días 1 y 3 al Excel automatizado, elegir el que se asemeje a la gráfica matriz</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													

N°	Actividad																																																
	<p align="center">Huancayo (Promedio 1964 - 1988)</p>  <p align="center"><b>Figura 59: Gráfica Matriz de referencia</b></p>																																																
<b>74</b>	<p>Al inicio de cada mes, se deben ingresar en el software Dobson 4.0 los datos de <math>\Delta N</math> (<math>N_{ref} - N_{test}</math>) obtenidos del <b>día seleccionado</b>, en este caso el <b>día 3</b> que se seleccionó en el <b>paso anterior</b>. Estos valores servirán como corrección para garantizar la precisión de las observaciones diarias registradas en el <b>software Dobson 4.0</b>.</p> <table border="1" data-bbox="303 1366 917 1489"> <thead> <tr> <th>Standard Lamp Name:</th> <th colspan="3">87Q5</th> <th>Date:</th> <th>03-09-2023</th> <th>Time:</th> <th>10:12:00</th> </tr> <tr> <th></th> <th>1</th> <th>2</th> <th>3</th> <th>mean</th> <th>N-value</th> <th>N-ref</th> <th><math>\Delta N(N_{ref}-N_{test})</math></th> </tr> </thead> <tbody> <tr> <td>Test A:</td> <td>32.00</td> <td>32.00</td> <td>32.00</td> <td>32.00</td> <td>12.00</td> <td>11.80</td> <td>-0.20</td> </tr> <tr> <td>Test C:</td> <td>32.50</td> <td>32.50</td> <td>32.50</td> <td>32.50</td> <td>16.20</td> <td>16.40</td> <td>0.20</td> </tr> <tr> <td>Test D:</td> <td>33.10</td> <td>33.00</td> <td>33.10</td> <td>33.07</td> <td>17.58</td> <td>17.50</td> <td>-0.08</td> </tr> <tr> <td>Inst. Temperature:</td> <td colspan="7">8.6 °C</td> </tr> </tbody> </table> <p align="right"><b>Figura 60: Día seleccionado en este caso es el día 3</b></p>	Standard Lamp Name:	87Q5			Date:	03-09-2023	Time:	10:12:00		1	2	3	mean	N-value	N-ref	$\Delta N(N_{ref}-N_{test})$	Test A:	32.00	32.00	32.00	32.00	12.00	11.80	-0.20	Test C:	32.50	32.50	32.50	32.50	16.20	16.40	0.20	Test D:	33.10	33.00	33.10	33.07	17.58	17.50	-0.08	Inst. Temperature:	8.6 °C						
Standard Lamp Name:	87Q5			Date:	03-09-2023	Time:	10:12:00																																										
	1	2	3	mean	N-value	N-ref	$\Delta N(N_{ref}-N_{test})$																																										
Test A:	32.00	32.00	32.00	32.00	12.00	11.80	-0.20																																										
Test C:	32.50	32.50	32.50	32.50	16.20	16.40	0.20																																										
Test D:	33.10	33.00	33.10	33.07	17.58	17.50	-0.08																																										
Inst. Temperature:	8.6 °C																																																
<b>75</b>	<p>Para ingresar los valores de <math>\Delta NA</math> , <math>\Delta NC</math> y <math>\Delta ND</math> correspondientes al día 3 en el <b>software Dobson 4.0</b>, se debe seguirlos siguientes pasos:</p> <ol style="list-style-type: none"> <li>1. Ir a la sección "<b>Inicialization</b>" y seleccione "<b>Tablas RM</b>" (Ver figura 61).</li> <li>2. seleccionar "<b>Corrections</b>" (Ver figura 62).</li> <li>3. Ingresar los valores obtenidos: <ul style="list-style-type: none"> <li>○ <math>\Delta NA = -0,200</math></li> <li>○ <math>\Delta NC = 0,200</math></li> <li>○ <math>\Delta ND = -0,080</math></li> </ul>                     Para este último, Ver figura 63.                 </li> </ol>																																																

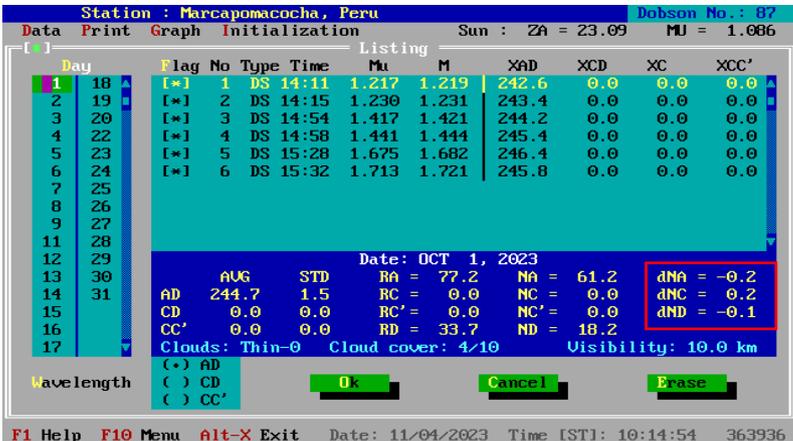
N°	Actividad
	 <p>Station : Marcapomacocha, Peru Dobson No. : 87 Data Print Graph Initialization Sun : ZA = -69.87 MU = 2.839</p> <ul style="list-style-type: none"> <li>Station</li> <li>Instrument</li> <li><b>RN tables</b></li> <li>Zenith polynomials</li> <li>Cloud correction tables</li> <li>Empirical corrections</li> <li>Data submission</li> <li>Application</li> </ul> <p>F1 Help F10 Menu Alt-X Exit Date: 10/29/2024 Time [ST]: 19:25:26 411120</p>
	 <p>Station : Marcapomacocha, Peru Dobson No. : 87 Data Print Graph Initialization Sun : ZA = -69.79 MU = 2.829</p> <ul style="list-style-type: none"> <li>Station</li> <li>Instrument</li> <li><b>RN tables</b> <ul style="list-style-type: none"> <li>RNA table</li> <li>RNC table</li> <li>RND table</li> <li><b>Corrections</b></li> </ul> </li> <li>Data submission</li> <li>Application</li> </ul> <p>F1 Help F10 Menu Alt-X Exit Date: 10/29/2024 Time [ST]: 19:25:47 411072</p>
	 <p>Station : Marcapomacocha, Peru Dobson No. : 87 Data Print Graph Initialization Sun : ZA = -63.93 MU = 2.246</p> <p>Correction of RN tables</p> <p>dNA <input type="text" value="-0.200"/> dNC <input type="text" value="0.200"/> dND <input type="text" value="0.000"/></p> <p><input type="button" value="OK"/> <input type="button" value="Cancel"/></p>

**Figura 61:** Ir a la sección "Initialization" y seleccione "RM Tables"

**Figura 62:** Ingrese en "Corrections"

**Figura 63:** Luego de ingresar los datos para A, C, y D, seleccione OK

	<b>INSTRUCTIVO</b>	<b>Código</b>	IN-DMA-006
	<b>CALIBRACIÓN DEL EQUIPO ESPECTROFOTÓMETRO DOBSON N° 087</b>	<b>Versión</b>	01
		<b>Página</b>	31 de 33

N°	Actividad
	<p>Por último, se observa que en la figura 64 cómo se presenta finalmente un mes completo de observaciones registrado en el Software Dobson 4.0, respaldado por los resultados de las calibraciones. En el cuadro rojo, los valores <math>\Delta NA</math>, <math>\Delta NC</math> y <math>\Delta ND</math> indican las correcciones aplicadas a las mediciones de cada canal (A, C y D) del espectrofotómetro Dobson. Estas correcciones ajustan las lecturas del instrumento para mejorar su precisión. Los valores negativos indican que la medición fue ligeramente inferior al valor esperado, y estos ajustes aseguran que las observaciones diarias reflejen con mayor exactitud la realidad.</p> <p><b>NOTA:</b> El mismo software Dobson 4.0 redondea las mediciones, por ejemplo el <math>\Delta ND = -0.08</math> se redondea a <math>-0.1</math></p> <div style="text-align: center;">  </div> <p><b>Figura 64:</b> Valores <math>\Delta NA</math>, <math>\Delta NC</math> y <math>\Delta ND</math> registradas en el Software Dobson 4.0, la cual también incluye las observaciones diarias con el espectrofotómetro Dobson durante 1 mes completo (octubre 2023)</p>

### 3. TABLA HISTÓRICA DE CAMBIOS

Versión	Sección del instructivo	Detalle de cambios
01	Todas	Versión inicial

### 4. ANEXOS

Anexo N°1: Tabla Q calibrada para el OVA Marcapomacocha

Anexo N°2: Formato de calibración

**Anexo N°1:**  
**Tabla Q calibrada para el OVA Marcapomacocha**

Temperature A	46.31 A: 0.104			72.18 C: 0.153			103.26 D: 0.150			79.88 Hg3129: 0.155				
	Temperature A	C	D	Temperature A	C	D	Temperature A	C	D	Temperature A	C	D		
-5.0	44.2	69.1	100.3	76.80	10.0	45.8	71.4	102.5	79.10	25.0	47.3	73.7	104.8	81.45
-4.5	44.3	69.2	100.3	76.85	10.5	45.8	71.5	102.6	79.20	25.5	47.4	73.8	104.8	81.50
-4.0	44.3	69.3	100.4	76.95	11.0	45.9	71.6	102.7	79.25	26.0	47.5	73.9	104.9	81.60
-3.5	44.4	69.3	100.5	77.00	11.5	45.9	71.6	102.7	79.35	26.5	47.5	73.9	105.0	81.65
-3.0	44.4	69.4	100.6	77.10	12.0	46.0	71.7	102.8	79.40	27.0	47.6	74.0	105.1	81.75
-2.5	44.5	69.5	100.6	77.15	12.5	46.0	71.8	102.9	79.50	27.5	47.6	74.1	105.1	81.80
-2.0	44.5	69.6	100.7	77.25	13.0	46.1	71.9	103.0	79.55	28.0	47.7	74.2	105.2	81.90
-1.5	44.6	69.6	100.8	77.30	13.5	46.2	71.9	103.0	79.65	28.5	47.7	74.2	105.3	81.95
-1.0	44.6	69.7	100.9	77.40	14.0	46.2	72.0	103.1	79.75	29.0	47.8	74.3	105.4	82.05
-0.5	44.7	69.8	100.9	77.50	14.5	46.3	72.1	103.2	79.80	29.5	47.8	74.4	105.4	82.15
0.0	44.75	69.88	101.00	77.56	15.0	46.3	72.2	103.3	79.90	30.0	47.9	74.5	105.5	82.20
0.5	44.8	70.0	101.1	77.65	15.5	46.4	72.3	103.3	79.95	30.5	47.9	74.6	105.6	82.30
1.0	44.9	70.0	101.2	77.70	16.0	46.4	72.3	103.4	80.05	31.0	48.0	74.6	105.7	82.35
1.5	44.9	70.1	101.2	77.80	16.5	46.5	72.4	103.5	80.10	31.5	48.0	74.7	105.7	82.45
2.0	45.0	70.2	101.3	77.85	17.0	46.5	72.5	103.6	80.20	32.0	48.1	74.8	105.8	82.50
2.5	45.0	70.3	101.4	77.95	17.5	46.6	72.6	103.6	80.25	32.5	48.1	74.9	105.9	82.60
3.0	45.1	70.3	101.5	78.00	18.0	46.6	72.6	103.7	80.35	33.0	48.2	74.9	106.0	82.65
3.5	45.1	70.4	101.5	78.10	18.5	46.7	72.7	103.8	80.40	33.5	48.2	75.0	106.0	82.75
4.0	45.2	70.5	101.6	78.20	19.0	46.7	72.8	103.9	80.50	34.0	48.3	75.1	106.1	82.85
4.5	45.2	70.6	101.7	78.25	19.5	46.8	72.9	103.9	80.60	34.5	48.3	75.2	106.2	82.90
5.0	45.3	70.6	101.8	78.35	20.0	46.8	72.9	104.0	80.65	35.0	48.4	75.2	106.3	83.00
5.5	45.3	70.7	101.8	78.40	20.5	46.9	73.0	104.1	80.75	35.5	48.4	75.3	106.3	83.05
6.0	45.4	70.8	101.9	78.50	21.0	46.9	73.1	104.2	80.80	36.0	48.5	75.4	106.4	83.15
6.5	45.4	70.9	102.0	78.55	21.5	47.0	73.2	104.2	80.90	36.5	48.5	75.5	106.5	83.20
7.0	45.5	71.0	102.1	78.65	22.0	47.0	73.3	104.3	80.95	37.0	48.6	75.6	106.6	83.30
7.5	45.5	71.0	102.1	78.70	22.5	47.1	73.3	104.4	81.05	37.5	48.6	75.6	106.6	83.35
8.0	45.6	71.1	102.2	78.80	23.0	47.1	73.4	104.5	81.10	38.0	48.7	75.7	106.7	83.45
8.5	45.6	71.2	102.3	78.85	23.5	47.2	73.5	104.5	81.20	38.5	48.7	75.8	106.8	83.50
9.0	45.7	71.3	102.4	78.95	24.0	47.2	73.6	104.6	81.30	39.0	48.8	75.9	106.9	83.60
9.5	45.7	71.3	102.4	79.05	24.5	47.3	73.6	104.7	81.35	39.5	48.9	75.9	106.9	83.70

Always set Q2 to the values at 15 Degrees C



<b>INSTRUCTIVO</b> <b>CALIBRACIÓN DEL EQUIPO</b> <b>ESPECTROFOTÓMETRO DOBSON N° 087</b>	<b>Código</b>	IN-DMA-006
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**Anexo N°2:**  
**Formato de calibración**

Hoja : \_\_\_\_\_ Instrument No. 087

**DOBSON CALIBRATION DATASHEET**  
**LAMP TEST FORM**

<b>Mercury Test</b>		Date: _____		Time: _____		Mean: _____	
Inst. Temperature--		Start: _____		End: _____			
	1	2	3	4	5		
Q1 up							
Q1 down							
Average:							
Test mean: _____							
Table Value at Mean Temperature: _____							
Difference: _____							
Table Date: <u>2019, Julio, 15</u>							
<b>Mercury Test</b>		Date: _____		Time: _____		Mean: _____	
Inst. Temperature--		Start: _____		End: _____			
	1	2	3	4	5		
Q1 up							
Q1 down							
Average:							
Test mean: _____							
Table Value at Mean Temperature: _____							
Difference: _____							
Table Date: _____							
<b>Standard Lamp Name:</b>		Date:		Time:			
	1	2	3	mean	N-value	N-ref	$\Delta N(N_{ref}-N_{test})$
Test A:							
Test C:							
Test D:							
Inst. Temperature: _____							
<b>Standard Lamp Name:</b> 87QR63		Date:		Time:			
	1	2	3	mean	N-value	N-ref	$\Delta N(N_{ref}-N_{test})$
Test A:							
Test C:							
Test D:							
Inst. Temperature: _____							
<b>Standard Lamp Name:</b> 87Q7		Date:		Time:			
	1	2	3	mean	N-value	N-ref	$\Delta N(N_{ref}-N_{test})$
Test A:							
Test C:							
Test D:							
Inst. Temperature: _____							
<b>Standard Lamp Name:</b>		Date:		Time:			
	1	2	3	mean	N-value	N-ref	$\Delta N(N_{ref}-N_{test})$
Test A:							
Test C:							
Test D:							
Inst. Temperature: _____							
<b>Standard Lamp Name:</b>		Date:		Time:			
	1	2	3	mean	N-value	N-ref	$\Delta N(N_{ref}-N_{test})$
Test A:							
Test C:							
Test D:							
Inst. Temperature: _____							

When making standard lamp tests outside, cover the lamp so skylight does not effect the results.