

| Resultado de la Calibración<br>(Calibration Result)   |              |              |              |              |              |              |                                                 |                 |                            |
|-------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------------------|-----------------|----------------------------|
| Prueba de exactitud eje X<br>(X axis accuracy test)   |              |              |              |              |              |              |                                                 |                 |                            |
| Valor del Patrón<br>(Standard Value)<br>( mm )        | 1a<br>( mm ) | 2a<br>( mm ) | 3a<br>( mm ) | 4a<br>( mm ) | 5a<br>( mm ) | 6a<br>( mm ) | Valor del promedio<br>(Average Value)<br>( mm ) | Error<br>( mm ) | U <sub>exp</sub><br>( mm ) |
| 1.0000                                                | 1.0000       | 1.0000       | 1.0000       | 1.0000       | 1.0000       | 1.0000       | 1.0000                                          | 0.0001          | 0.0012                     |
| 3.0000                                                | 2.9990       | 3.0000       | 2.9990       | 3.0000       | 3.0000       | 3.0000       | 2.9997                                          | -0.0001         | 0.0014                     |
| 5.0000                                                | 4.9990       | 4.9990       | 4.9990       | 5.0000       | 5.0000       | 4.9990       | 4.9993                                          | -0.0008         | 0.0015                     |
| 10.0000                                               | 9.9990       | 10.0000      | 10.0010      | 10.0000      | 10.0000      | 9.9990       | 9.9998                                          | -0.0002         | 0.0019                     |
| 15.0000                                               | 14.9990      | 14.9990      | 14.9990      | 15.0000      | 15.0000      | 14.9990      | 14.9993                                         | -0.0007         | 0.0015                     |
| 30.0000                                               | 30.0010      | 30.0010      | 30.0010      | 30.0000      | 30.0000      | 30.0010      | 30.0007                                         | 0.0009          | 0.0015                     |
| 60.0000                                               | 59.9990      | 59.9990      | 59.9990      | 59.9990      | 60.0000      | 60.0000      | 59.9993                                         | -0.0004         | 0.0017                     |
| 90.0000                                               | 90.0010      | 90.0000      | 90.0000      | 90.0000      | 90.0000      | 90.0010      | 90.0003                                         | 0.0007          | 0.0020                     |
| 120.0000                                              | 119.9990     | 119.9990     | 119.9990     | 120.0000     | 120.0000     | 119.9990     | 119.9993                                        | -0.0001         | 0.0024                     |
| 150.0000                                              | 149.9990     | 149.9990     | 149.9990     | 150.0000     | 149.9990     | 150.0000     | 149.9993                                        | 0.0001          | 0.0028                     |
| 180.0000                                              | 179.9990     | 179.9990     | 180.0000     | 179.9990     | 179.9990     | 179.9990     | 179.9992                                        | 0.0001          | 0.0031                     |
| 210.0000                                              | 209.9990     | 209.9990     | 210.0000     | 209.9990     | 209.9990     | 210.0000     | 209.9993                                        | 0.0004          | 0.0036                     |
| 240.0000                                              | 239.9990     | 239.9990     | 239.9990     | 240.0000     | 240.0000     | 240.0000     | 239.9995                                        | 0.0006          | 0.0040                     |
| Condiciones de la medición<br>(Measurement condition) |              |              |              |              |              |              |                                                 |                 |                            |
| Lente de ampliación (Amplification lens):             |              | 39 X         |              |              |              |              |                                                 |                 |                            |
| Alcance (Range):                                      |              | 250 mm       |              |              |              |              |                                                 |                 |                            |
| Resolución (Resolution):                              |              | 0.001 mm     |              |              |              |              |                                                 |                 |                            |

| Prueba de exactitud eje Y<br>(Y axis accuracy test)   |              |              |              |              |              |              |                                                 |                 |                            |
|-------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------------------|-----------------|----------------------------|
| Valor del Patrón<br>(Standard Value)<br>( mm )        | 1a<br>( mm ) | 2a<br>( mm ) | 3a<br>( mm ) | 4a<br>( mm ) | 5a<br>( mm ) | 6a<br>( mm ) | Valor del promedio<br>(Average Value)<br>( mm ) | Error<br>( mm ) | U <sub>exp</sub><br>( mm ) |
| 1.0000                                                | 1.0000       | 1.0000       | 1.0000       | 1.0000       | 19999.0000   | 1.0000       | 1.0000                                          | 0.0000          | 0.0012                     |
| 2.0000                                                | 1.9990       | 2.0000       | 1.9990       | 2.0000       | 1.9990       | 1.9990       | 1.9993                                          | -0.0017         | 0.0014                     |
| 4.0000                                                | 3.9990       | 3.9990       | 3.9990       | 4.0000       | 4.0000       | 3.9990       | 3.9993                                          | -0.0009         | 0.0014                     |
| 8.0000                                                | 8.0000       | 8.0000       | 8.0000       | 8.0000       | 8.0010       | 8.0010       | 8.0003                                          | 0.0000          | 0.0015                     |
| 12.0000                                               | 12.0000      | 12.0010      | 12.0010      | 12.0000      | 12.0000      | 12.0000      | 12.0003                                         | 0.0001          | 0.0015                     |
| 16.0000                                               | 16.0000      | 16.0010      | 16.0010      | 16.0000      | 16.0010      | 16.0000      | 16.0005                                         | 0.0002          | 0.0014                     |
| 20.0000                                               | 19.9980      | 19.9990      | 19.9998      | 19.9980      | 19.9990      | 19.9980      | 19.9986                                         | -0.0017         | 0.0019                     |
| 40.0000                                               | 40.0010      | 40.0010      | 40.0000      | 40.0000      | 40.0000      | 40.0010      | 40.0005                                         | 0.0004          | 0.0015                     |
| 60.0000                                               | 60.0010      | 60.0010      | 60.0010      | 60.0010      | 60.0000      | 60.0000      | 60.0007                                         | 0.0005          | 0.0018                     |
| 80.0000                                               | 80.0010      | 80.0000      | 80.0010      | 80.0010      | 80.0000      | 80.0010      | 80.0007                                         | 0.0005          | 0.0018                     |
| 100.0000                                              | 100.0010     | 100.0010     | 100.0010     | 100.0010     | 100.0010     | 100.0010     | 100.0010                                        | 0.0008          | 0.0017                     |
| 120.0000                                              | 120.0000     | 120.0000     | 120.0000     | 120.0010     | 120.0000     | 120.0010     | 120.0003                                        | 0.0003          | 0.0024                     |
| 140.0000                                              | 139.9990     | 139.9990     | 139.9990     | 139.9990     | 139.9990     | 139.9990     | 139.9990                                        | -0.0010         | 0.0023                     |
| Condiciones de la medición<br>(Measurement condition) |              |              |              |              |              |              |                                                 |                 |                            |
| Lente de ampliación (Amplification lens):             |              | 39 X         |              |              |              |              |                                                 |                 |                            |
| Alcance (Range):                                      |              | 160 mm       |              |              |              |              |                                                 |                 |                            |
| Resolución (Resolution):                              |              | 0.001 mm     |              |              |              |              |                                                 |                 |                            |

| Resultado de la Calibración<br>(Calibration Result)   |              |              |              |              |              |              |                                                 |                 |                            |
|-------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------------------|-----------------|----------------------------|
| Prueba de exactitud eje Z<br>(Y axis accuracy test)   |              |              |              |              |              |              |                                                 |                 |                            |
| Valor del Patrón<br>(Standard Value)<br>( mm )        | 1a<br>( mm ) | 2a<br>( mm ) | 3a<br>( mm ) | 4a<br>( mm ) | 5a<br>( mm ) | 6a<br>( mm ) | Valor del promedio<br>(Average Value)<br>( mm ) | Error<br>( mm ) | U <sub>exp</sub><br>( mm ) |
| 1.0001                                                | 0.9990       | 0.9980       | 0.9980       | 0.9990       | 0.9990       | 0.9980       | 0.9985                                          | -0.0016         | 0.0014                     |
| 2.0000                                                | 1.9980       | 1.9980       | 1.9970       | 1.9980       | 1.9980       | 1.9970       | 1.9977                                          | -0.0024         | 0.0014                     |
| 4.0001                                                | 3.9980       | 3.9980       | 3.9990       | 3.9970       | 3.9970       | 3.9980       | 3.9978                                          | -0.0022         | 0.0019                     |
| 5.0000                                                | 4.9950       | 4.9930       | 4.9930       | 4.9950       | 4.9940       | 4.9930       | 4.9938                                          | -0.0062         | 0.0024                     |
| 10.0000                                               | 9.9920       | 9.9910       | 9.9920       | 9.9910       | 9.9920       | 9.9930       | 9.9918                                          | -0.0082         | 0.0019                     |
| 20.0001                                               | 19.9860      | 19.9860      | 19.9880      | 19.9880      | 19.9870      | 19.9860      | 19.9868                                         | -0.0132         | 0.0024                     |
| 40.0000                                               | 39.9820      | 39.9810      | 39.9800      | 39.9820      | 39.9800      | 39.9810      | 39.9810                                         | -0.0190         | 0.0023                     |
| *****                                                 | *****        | *****        | *****        | *****        | *****        | *****        | *****                                           | *****           | *****                      |
| *****                                                 | *****        | *****        | *****        | *****        | *****        | *****        | *****                                           | *****           | *****                      |
| *****                                                 | *****        | *****        | *****        | *****        | *****        | *****        | *****                                           | *****           | *****                      |
| *****                                                 | *****        | *****        | *****        | *****        | *****        | *****        | *****                                           | *****           | *****                      |
| Condiciones de la medición<br>(Measurement condition) |              |              |              |              |              |              |                                                 |                 |                            |
| Alcance (Range):                                      |              | 160 mm       |              |              |              |              |                                                 |                 |                            |
| Resolución (Resolution):                              |              | 0.001 mm     |              |              |              |              |                                                 |                 |                            |

Condiciones del instrumento:  
(Instrument conditions)

Sin comentarios.

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## Observaciones generales

*(General observations)*

- Es responsabilidad del usuario establecer la fecha de recalibración de su equipo. El tiempo y validez de los resultados informados en este documento depende de las características propias del equipo, de las condiciones de operación y de las buenas prácticas de uso y cuidado.

It is the responsibility of the user to set the recalibration date of his/her equipment. The time and validity of the results reported in this document depends on the characteristics of the equipment, the operating conditions and good use and care practices.

- El uso de los resultados de la calibración queda a consideración del usuario.

The use of calibration results is the responsibility of the user.

- Los resultados y los niveles de incertidumbres declarados en este certificado corresponden exclusivamente al instrumento descrito en la hoja 1.

The results and the level of uncertainties declared in this certificate correspond exclusively to the instrument described at the moment of the calibration.

- Los resultados que se presentan en este certificado tienen trazabilidad a patrones nacionales.

The results that appear in this certificate have traceability to national standards.

- La incertidumbre expandida se expresa con un factor de cobertura de  $k=2$ , que asegura un nivel de confianza de al menos el 95% aproximadamente.

The expanded uncertainty is expressed by a coverage factor of  $k = 2$ , which assures the confidence level of less than about 95%.

- La incertidumbre de medida fue estimada según la NMX-CH-140-IMNC-2002 "Guía para la expresión de la incertidumbre en las mediciones".

The uncertainty of the measurement was estimated according to the NMX-CH-140-IMNC-2002 "Guide for the expression of uncertainty in the measurements"

## Descripción del método:

*(Description of Method)*

- La calibración se realiza bajo condiciones donde el equipo opere correctamente llevando a cabo verificaciones contra patrón, validando condiciones de iluminación y movimiento de los ejes X, Y y Z.

The calibration is carried out under conditions where the equipment operates correctly carrying out checks against the pattern, validating lighting and movement conditions of the X, Y and Z axes.

- Se lleva a cabo la comparación de lecturas del equipo en cuanto al desplazamiento del eje X contra el valor de las líneas de la escala.

The comparison of readings of the equipment in terms of the displacement of the X axis against the value of the scale lines is carried out.

- Posteriormente se coloca la escala en sentido perpendicular y hace la comparación de lecturas de desplazamiento del eje Y contra el valor de las líneas de la escala.

Subsequently, the scale is placed perpendicularly and compares the displacement readings of the Y axis against the value of the scale lines.

- En cuanto a la prueba de exactitud del eje Z se realiza una comparación entre dos bloques donde la diferencia entre ambos determina la medición.

As for the Z axis accuracy test, a comparison is made between two blocks where the difference between the two determines the measurement.

-Calibración realizada en referencia a la norma ISO 10360-7; las pruebas corresponden a las descritas en el procedimiento indicado en la hoja 1.

Calibration in reference to the ISO 10360-7 standard; tests correspond to those described in the procedure indicated on sheet 1.