

Resultado de la Calibración

(Calibration Result)

| Prueba de exactitud eje X                      |              |              |              |              |              |              |                                                 |                 |                            |
|------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------------------|-----------------|----------------------------|
| (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                                         | 1.002        | 1.000        | 1.000        | 1.002        | 0.999        | 1.001        | 1.001                                           | 0.0007          | 0.0030                     |
| 5.0001                                         | 5.002        | 5.001        | 5.002        | 5.003        | 5.002        | 5.000        | 5.002                                           | 0.0016          | 0.0025                     |
| 10.0002                                        | 10.001       | 10.000       | 10.001       | 10.003       | 10.002       | 10.000       | 10.001                                          | 0.0010          | 0.0029                     |
| 20.0003                                        | 20.003       | 20.000       | 20.002       | 20.000       | 20.001       | 20.001       | 20.001                                          | 0.0009          | 0.0029                     |
| 40.0001                                        | 40.003       | 40.002       | 40.002       | 40.000       | 40.002       | 40.001       | 40.002                                          | 0.0016          | 0.0026                     |
| 60.0002                                        | 60.000       | 59.999       | 59.999       | 59.999       | 60.001       | 60.001       | 60.000                                          | -0.0004         | 0.0025                     |
| 80.0002                                        | 79.999       | 80.000       | 80.001       | 80.001       | 79.999       | 80.000       | 80.000                                          | -0.0002         | 0.0024                     |
| 100.0002                                       | 100.002      | 99.999       | 100.000      | 100.002      | 100.002      | 100.001      | 100.001                                         | 0.0008          | 0.0033                     |
| 120.0000                                       | 120.001      | 120.000      | 120.002      | 120.001      | 119.999      | 120.000      | 120.001                                         | 0.0005          | 0.0030                     |
| 140.0000                                       | 139.999      | 140.002      | 140.001      | 140.002      | 140.000      | 139.999      | 140.001                                         | 0.0005          | 0.0037                     |
| 160.0000                                       | 160.001      | 160.000      | 160.001      | 160.003      | 160.002      | 160.002      | 160.002                                         | 0.0015          | 0.0032                     |
| 179.9999                                       | 180.000      | 179.999      | 179.999      | 179.999      | 180.001      | 179.999      | 180.000                                         | -0.0004         | 0.0031                     |
| 199.9998                                       | 200.002      | 200.000      | 200.001      | 199.999      | 200.001      | 200.000      | 200.001                                         | 0.0007          | 0.0036                     |
| Condiciones de la medición                     |              |              |              |              |              |              |                                                 |                 |                            |
| (Measurement condition)                        |              |              |              |              |              |              |                                                 |                 |                            |
| Lente de ampliación (Amplification lens):      |              | 20X          |              |              |              |              |                                                 |                 |                            |
| Alcance (Range):                               |              | 259.39 mm    |              |              |              |              |                                                 |                 |                            |
| Resolución (Resolution):                       |              | 0.001 mm     |              |              |              |              |                                                 |                 |                            |

| Prueba de exactitud eje Y                      |              |              |              |              |              |              |                                                 |                 |                            |
|------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------------------------------|-----------------|----------------------------|
| (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                                         | 0.999        | 1.000        | 1.001        | 1.001        | 1.002        | 1.000        | 1.001                                           | 0.0005          | 0.0026                     |
| 2.0001                                         | 2.000        | 2.001        | 1.999        | 2.002        | 2.001        | 1.999        | 2.000                                           | 0.0002          | 0.0029                     |
| 4.0002                                         | 4.000        | 4.001        | 4.001        | 4.002        | 4.000        | 3.999        | 4.001                                           | 0.0003          | 0.0026                     |
| 6.0001                                         | 5.998        | 5.999        | 6.000        | 5.999        | 6.000        | 6.001        | 6.000                                           | -0.0006         | 0.0026                     |
| 8.0003                                         | 7.999        | 7.998        | 7.999        | 8.001        | 7.999        | 8.000        | 7.999                                           | -0.0010         | 0.0025                     |
| 10.0002                                        | 9.998        | 9.999        | 10.001       | 10.002       | 9.999        | 10.000       | 10.000                                          | -0.0004         | 0.0035                     |
| 20.0003                                        | 20.000       | 19.999       | 19.999       | 20.002       | 20.001       | 20.001       | 20.000                                          | 0.0000          | 0.0030                     |
| 40.0001                                        | 39.999       | 40.001       | 40.000       | 39.999       | 40.000       | 39.999       | 40.000                                          | -0.0004         | 0.0021                     |
| 60.0002                                        | 59.998       | 60.000       | 59.999       | 59.999       | 59.999       | 59.998       | 59.999                                          | -0.0014         | 0.0020                     |
| 80.0002                                        | 80.002       | 80.000       | 80.000       | 79.999       | 80.001       | 80.002       | 80.001                                          | 0.0005          | 0.0031                     |
| 100.0002                                       | 100.002      | 100.001      | 100.003      | 100.000      | 100.002      | 100.001      | 100.002                                         | 0.0013          | 0.0028                     |
| 120.0000                                       | 120.003      | 120.002      | 120.002      | 120.000      | 120.001      | 120.001      | 120.002                                         | 0.0015          | 0.0029                     |
| 140.0000                                       | 140.003      | 140.003      | 140.001      | 140.002      | 140.003      | 140.002      | 140.002                                         | 0.0023          | 0.0026                     |
| Condiciones de la medición                     |              |              |              |              |              |              |                                                 |                 |                            |
| (Measurement condition)                        |              |              |              |              |              |              |                                                 |                 |                            |
| Lente de ampliación (Amplification lens):      |              | 20X          |              |              |              |              |                                                 |                 |                            |
| Alcance (Range):                               |              | 163.194 mm   |              |              |              |              |                                                 |                 |                            |
| Resolución (Resolution):                       |              | 0.001 mm     |              |              |              |              |                                                 |                 |                            |

| Prueba de exactitud angular               |        |        |        |        |        |                                              |              |                         |
|-------------------------------------------|--------|--------|--------|--------|--------|----------------------------------------------|--------------|-------------------------|
| (Angular accuracy test)                   |        |        |        |        |        |                                              |              |                         |
| Valor del Ángulo<br>(Angle Value)<br>(°)  | 1a     | 2a     | 3a     | 4a     | 5a     | Valor del promedio<br>(Average Value)<br>(°) | Error<br>(°) | U <sub>exp</sub><br>(°) |
| 19.999                                    | 20.01  | 20.02  | 19.95  | 20.01  | 20.00  | 20.00                                        | -0.001       | 0.072                   |
| 60.000                                    | 60.02  | 59.93  | 60.04  | 60.01  | 60.02  | 60.00                                        | 0.004        | 0.11                    |
| 89.999                                    | 90.01  | 90.00  | 90.08  | 89.96  | 89.88  | 89.99                                        | -0.013       | 0.19                    |
| 119.997                                   | 119.80 | 119.85 | 119.84 | 119.95 | 119.82 | 119.85                                       | -0.145       | 0.15                    |
| 180.000                                   | 179.70 | 179.68 | 179.80 | 179.68 | 179.90 | 179.75                                       | -0.248       | 0.25                    |
| Condiciones de la medición                |        |        |        |        |        |                                              |              |                         |
| (Measurement condition)                   |        |        |        |        |        |                                              |              |                         |
| Lente de ampliación (Amplification lens): |        | 20X    |        |        |        |                                              |              |                         |
| Alcance (Range):                          |        | 180°   |        |        |        |                                              |              |                         |
| Resolución (Resolution):                  |        | 0.01°  |        |        |        |                                              |              |                         |

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.**

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

Then the scale is placed perpendicularly and makes the comparison of displacement readings of the Y axis against the value of the lines of the scale.

- **La prueba de exactitud angular se determina comparando contra las líneas de una retícula angular.**

The angular accuracy test is determined by comparing against the lines of an angular grid.

- **Calibración realizada en referencia a la norma JIS B 7184; las pruebas corresponden a las descritas en el procedimiento indicado en la hoja 1.**

Calibration in reference to the JIS B 7184 standard; tests correspond to those described in the procedure indicated on sheet 1.