

Certificate of calibration**No. 113-3072****Object****1 ring gauge made of steel, \varnothing 12 mm**
Identification: CARY 1015**Order**

Diameter and roundness deviation at three heights of the cylinder

Applicant**SIP, Société Genevoise d'Instruments de Physique**
1217 Meyrin**Traceability**

The reported measurement values are traceable to national standards and thus to the SI-units.

Date of calibration

8. and 11. January 2001

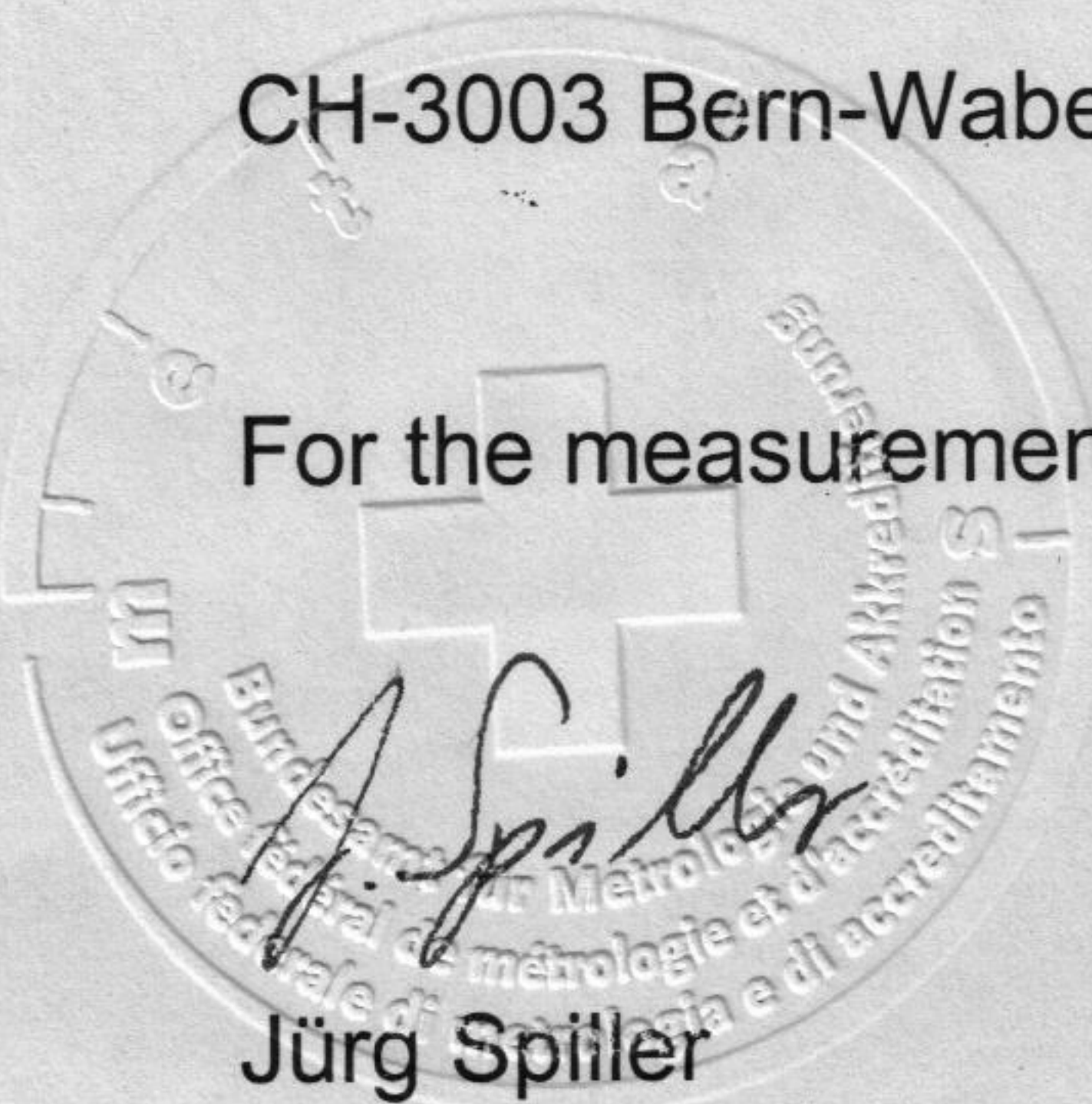
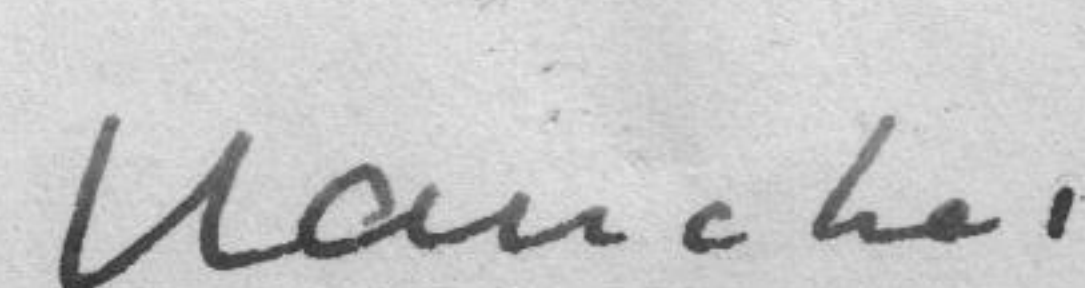
Marking

OFMET-calibration label

CH-3003 Bern-Wabern, 23.01.2001 Sp

For the measurements

Division of Mechanics, Radiation and Legal Metrology


Jürg Spiller
Dr. Bruno Vaucher, Deputy Director

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Certificate of calibration (ctd.)**No. 113-3072****Extent of calibration**

The diameter and roundness deviation at three heights of the cylinder were measured.

Measurement procedure and conditions

The diameter of the ring gauge was calibrated on a length measurement machine using a laser interferometer and mechanical probing, according to the internal calibration procedure 11370K02.

Measurement probe: ruby sphere, \varnothing 4 mm

Measurement force: extrapolated to zero

Measurement direction: between the reference marks, perpendicular to the cylinder axis

The roundness measurement was carried out on a form measurement machine.

Measurement probe: ruby sphere, \varnothing 4 mm

Measurement force: < 0.05 N

Filter: 2-50 upr, 2RC, phase corrected

The roundness deviation was measured according to ISO 6318. It is defined as the peak to valley deviation from the least squares (LS) circle fitted to the measured profile.

The ambient temperature during the measurements was (20 ± 0.2) °C. The temperature of the ring gauge was 19.88 °C. The diameter results were corrected to the reference temperature of 20 °C assuming a linear coefficient of thermal expansion of $11.6 \cdot 10^{-6}$ K⁻¹.

Measurement results

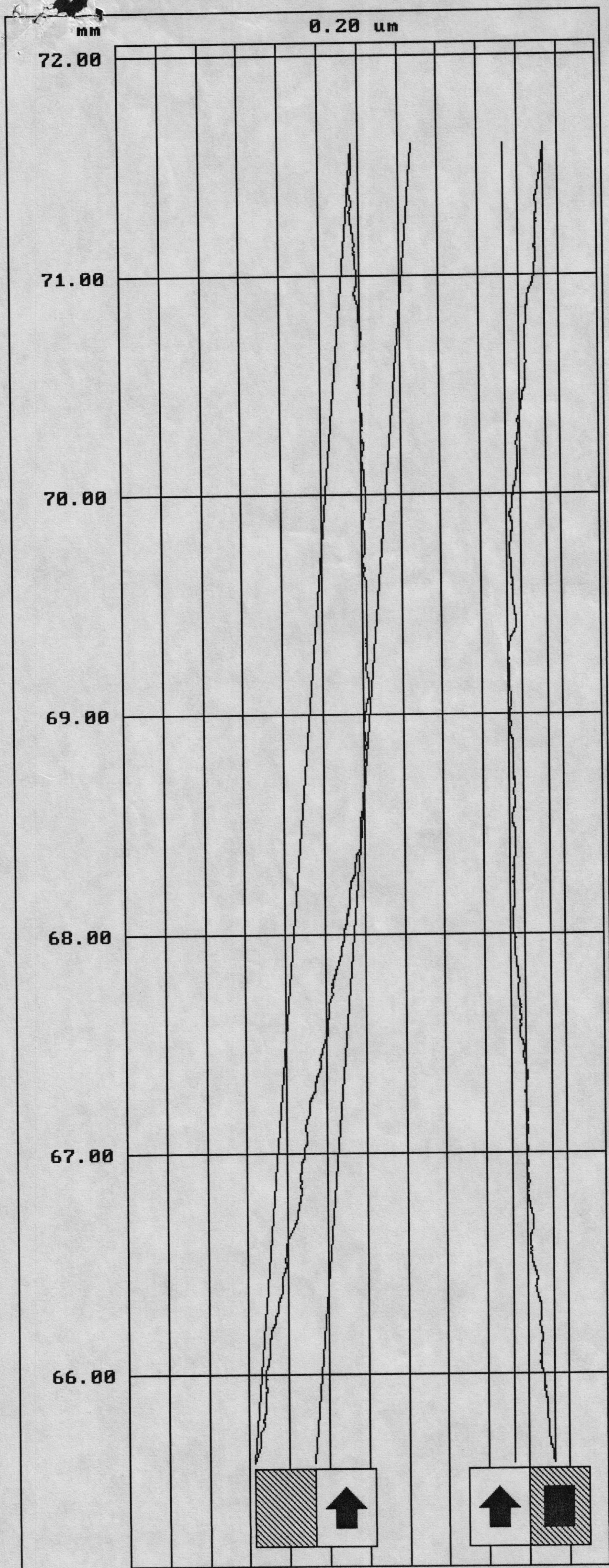
| Identification | Measurement position from mid height | Measured diameter | Roundness |
|-----------------------------------|---|----------------------|-------------------------------|
| CARY 1015 | +3.0 mm | 11.998'83 mm | 0.11 μ m |
| | 0 | 11.998'43 mm | 0.07 μm |
| | -3.0 mm | 11.999'09 mm | 0.12 μ m |
| Measurement uncertainty: diameter | | $U = 0.20$ μ m | |
| roundness | | $U = 0.10$ μ m | |

Measurement uncertainty

The reported uncertainty of measurement is stated as the combined standard uncertainty multiplied by a coverage factor $k = 2$. The measured value (y) and the associated expanded uncertainty (U) represent the interval ($y \pm U$) which contains the value of the measured quantity with a probability of approximately 95%. The uncertainty was estimated following the guidelines of the ISO.

The measurement uncertainty contains contributions originating from the measurement standard, from the calibration method, from the environmental conditions and from the object being calibrated.

- Attachment: 4 form measurement protocols



RTH TR300 V04.00 S0

MZ VERT PARALLELITAET

| | |
|--------------|-------------|
| Teilebez. | CARY |
| Messnummer | 04 |
| Par. | 0.61 um |
| P-V | 0.30 um |
| Par Wkl | 18.9 sek |
| Messlaenge | 6.0 mm |
| Mess.Start | 65.6 mm |
| Mess.Ende | 71.6 mm |
| Spindel Wkl. | 360.0 grd |
| Referenz | CARY 03 |
| Filter | 0.25 mm |
| Profil | 100.0 % |
| Mess.modus | Vert.n.oben |
| Mess.Datum | |
| Mess.Zeit | 15:39:57 |

SIP

Ring gauge , Cary , 12 mm

1217 Meyrin

Ident. No.:1015