

Certificate of calibration

No. 113-3476

Object

1 ring gauge made of steel, \varnothing 40 mm
Identification: SIP 43067

Order

Calibration of diameter and roundness deviation

Applicant

SIP, Société Genevoise d'Instruments de Physique
rue Pré - de - la - Fontaine
CH-1217 Meyrin

Traceability

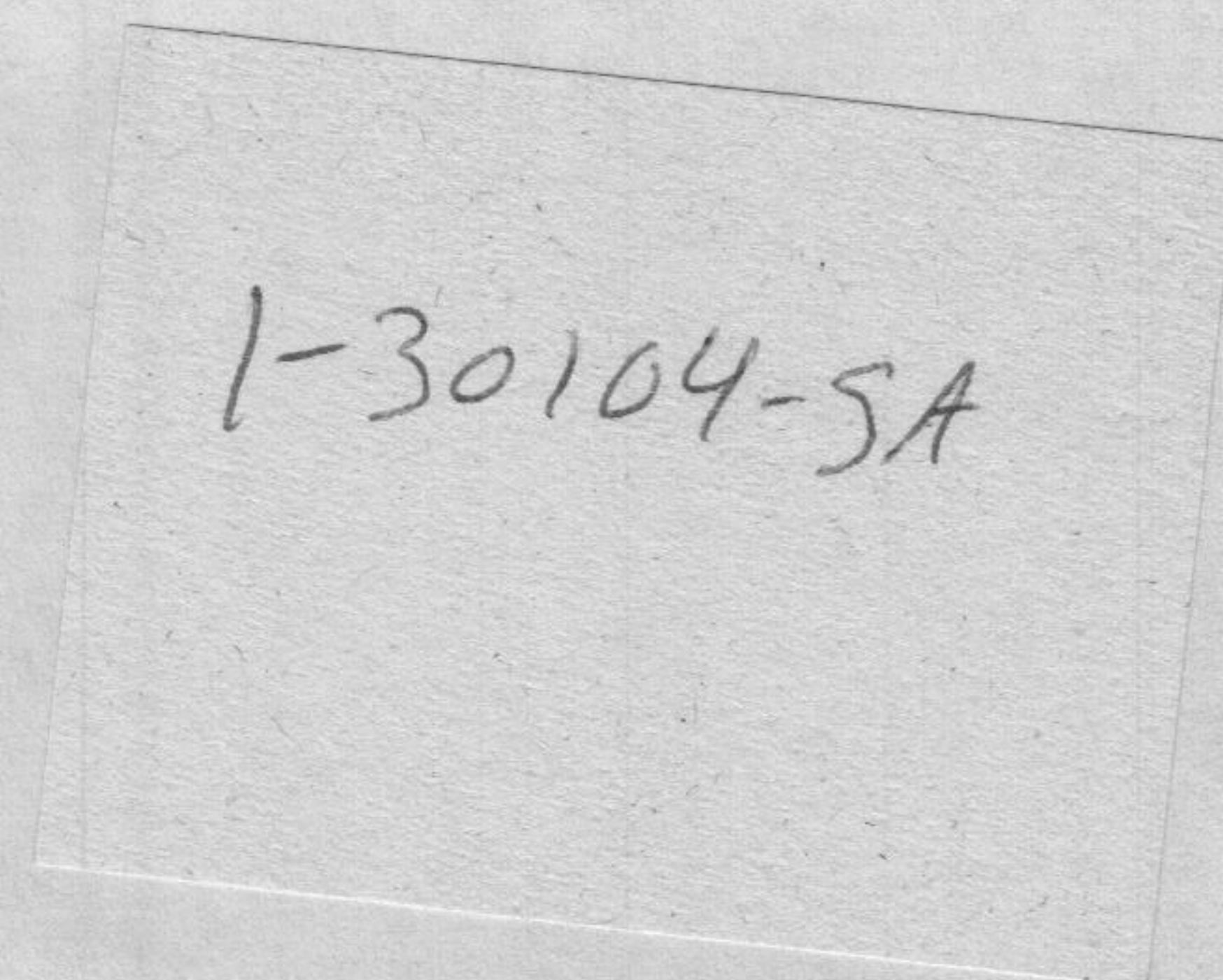
The reported measurement values are traceable to national standards and thus to internationally supported realizations of the SI-units.

Date of calibration

7 and 10 January 2002

Marking

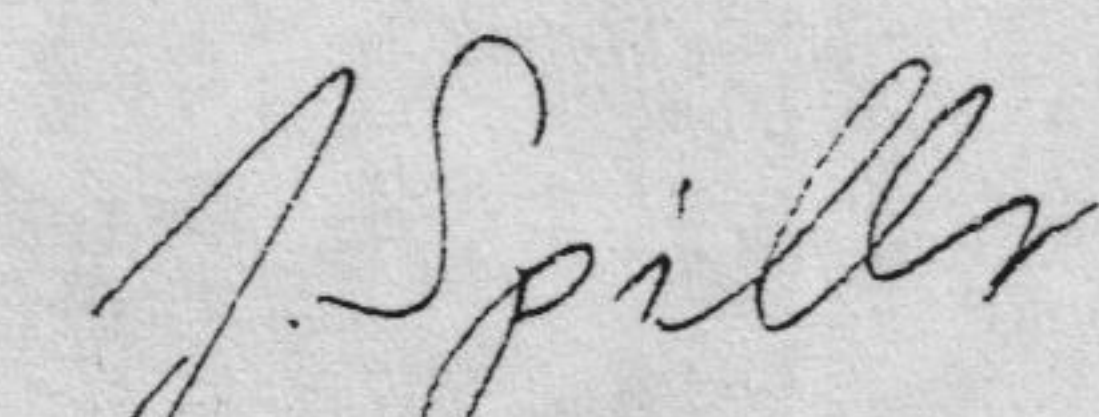
metas-calibration label

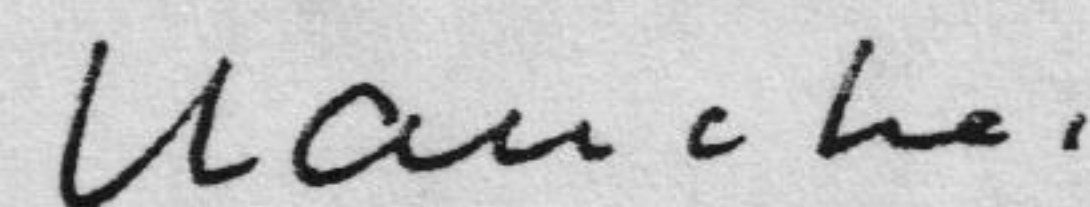


Wabern, 10 January 2002 Sp

For the measurements

Division of Mechanics, Radiation and Legal Metrology


Jürg Spiller


Dr. Bruno Vaucher, Deputy Director

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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 19.85 °C. The diameter results were corrected to the reference temperature of 20 °C assuming a linear coefficient of thermal expansion of $11.5 \cdot 10^{-6}$ K⁻¹.

Measurement results

Identification	Measurement position from mid height	Measured diameter	Roundness
SIP 43067	+7.0 mm	39.999'28 mm	0.07 μ m
	0	39.999'26 mm	0.05 μm
	-7.0 mm	39.999'24 mm	0.04 μ m

Measurement uncertainty

diameter: $U = 0.10$ μ m

roundness: $U = 0.10$ μ m

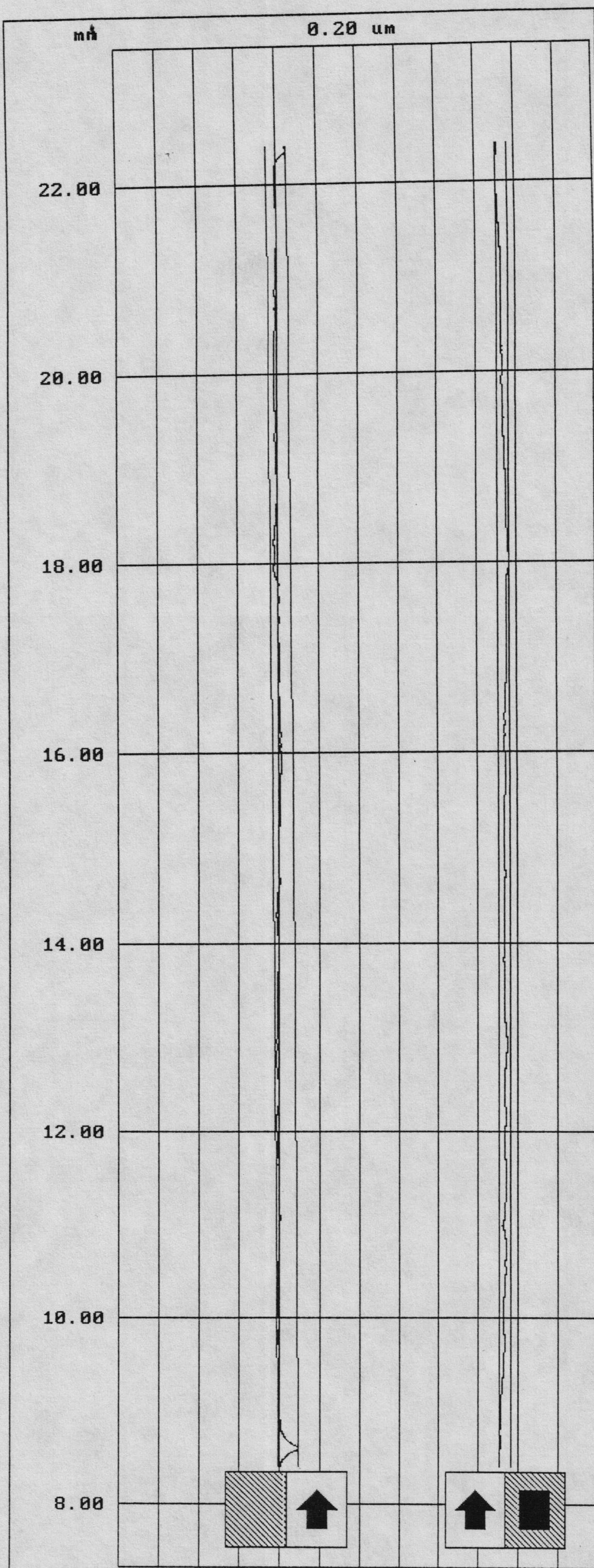
The reported uncertainty of measurement is stated as the combined standard uncertainty multiplied by a coverage factor $k = 2$. The measured value (y) and the associated expanded uncertainty (U) represent the interval ($y \pm U$) which contains the value of the measured quantity with a probability of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

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Page 2 of 2



RTH TR300 V04.00 S0

metas, Bern-Wabern

MZ VERT PARALLELISM

Featurename	EAM
Measurement no.	04
Par.	0.11 um
P-V	0.10 um
Par Angle	-0.7 sec
Trav. Lth.	14.0 mm
Trav. Start	8.4 mm
Trav. End	22.4 mm
Spindle ang.	359.9 deg
Datum	EAM 03
Filter	0.80 mm
Profile	100.0 %
Meas. Mode	Vert. Up
Meas. date	
Meas. time	14:58:53

SIP

Ring gauge, SIP ; D = 40 mm

1217 Meyrin

Ident. No:43067