

Certificate of calibration

No. 113-3335

Object

1 plug gauge made of steel, \varnothing 50 mm
Identification: SIP 43015

Order

Calibration of diameter and roundness deviation

Applicant

SIP, Société Genevoise d'Instruments de Physique
19, rue Pré - de - la - Fontaine
CH-1217 Meyrin 1 / Genève

Traceability

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

Date of calibration

30 July and 20 August 2001

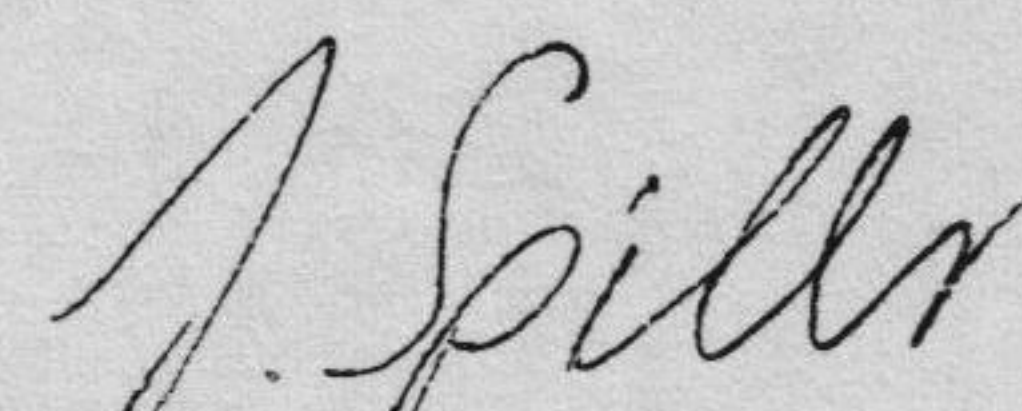
Marking

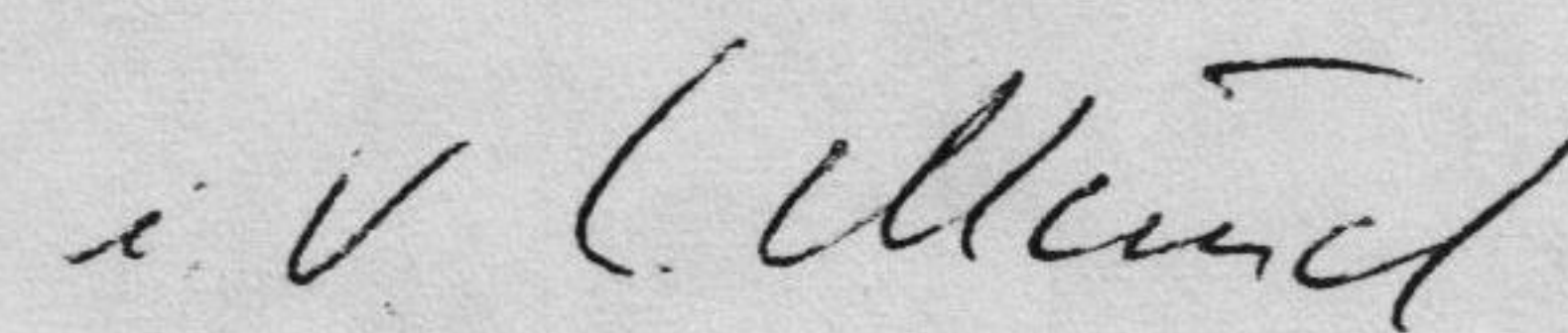
metas-calibration label

Wabern, 22 August 2001 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 plug 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, parallel to the marking, 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 19.94 °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 front face of cylinder	Measured diameter	Roundness
SIP 43015	5.0 mm	50.002'46 mm	0.21 μ m
	12.5 mm	50.002'44 mm	0.17 μm
	20.0 mm	50.002'36 mm	0.17 μ m

Measurement uncertainty

diameter: $U = 0.10$ μ m

roundness: $U = 0.10$ μ m

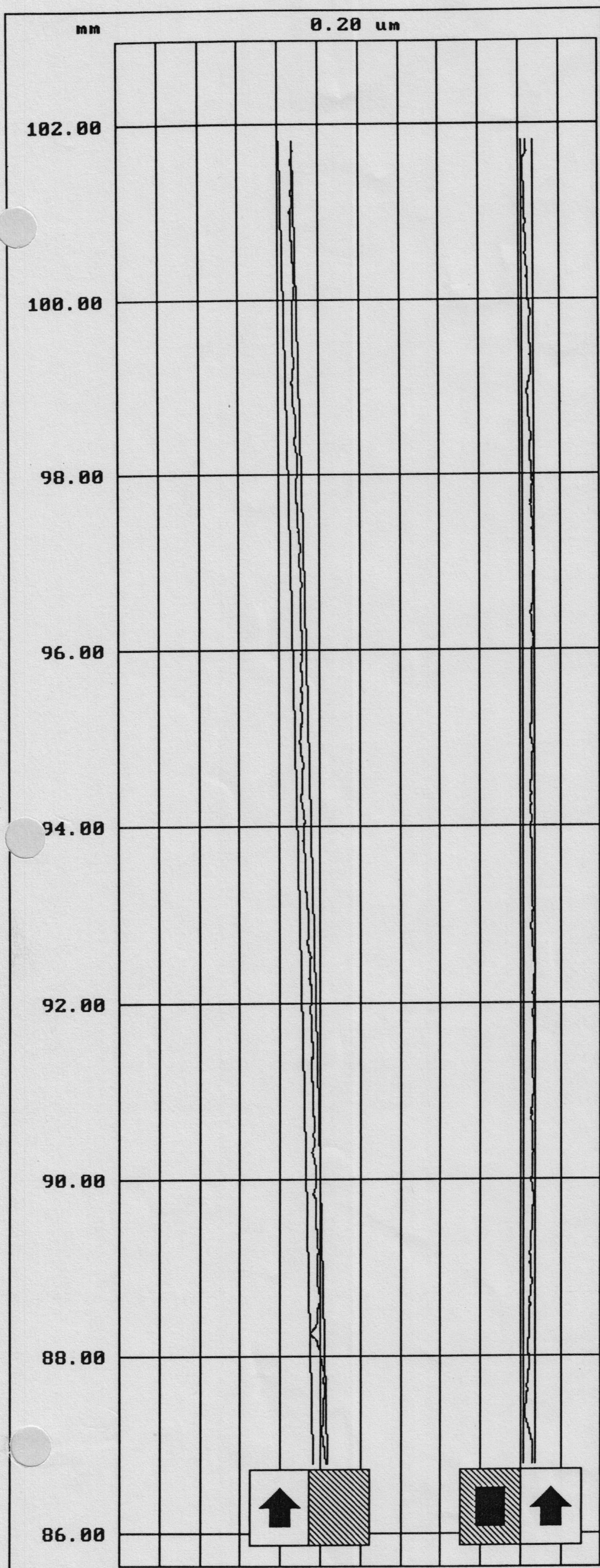
The reported uncertainty of measurement is stated as the combined standard uncertainty multiplied by a coverage factor $k = 2$. The measured value (y) and the associated expanded uncertainty (U) represent the interval ($y \pm U$) which contains the value of the measured quantity with a probability of 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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RTH TR300 V04.00 S0

metas, Bern-Wabern

MZ VERT PARALLELISM

Featurename	EAMD
Measurement no.	04
Par.	0.17 um
P-V	0.07 um
Par Angle	-2.1 sec
Trav. Lth.	15.0 mm
Trav. Start	86.8 mm
Trav. End	101.8 mm
Spindle ang.	360.0 deg
Datum	EAMD 03
Filter	0.80 mm
Profile	100.0 %
Meas. Mode	Vert. Up
Meas. date	
Meas. time	10:24:48

SIP

Pflug gauge , SIP , D = 50 mm

1217 Meyrin

Ident. No:43015