

Centre for Basic, Thermal and Length Metrology
National Physical Laboratory

MOY/SCMI/54

**SPECIFICATION OF ACCURACY FOR A
SET OF OPTICAL PARALLELS**

A set of optical parallels used for examining the flatness and parallelism of the measuring faces of external micrometers graduated in inch or metric units.

Note: Specifications previously numbered 54 (Issue 3) and 54M (Issue 3) have been reviewed and combined to form this specification.

FOREWORD

In the 1940s and 1950s, NPL was involved in drafting a special series of Specifications of Accuracy that covered a wide range of precision measuring apparatus. This series has been built on first hand experience gained in the design and construction of prototype measuring equipment at NPL and in the design and calibration of measuring equipment of British and foreign manufacture. Each specification in the series originally conformed to a general pattern and was allocated a permanent serial number which, in addition to its title, serves as its identity.

The MOY/SCMI (Metrology/Specification Certification Measuring Instruments) standards are complementary to the Standards issued by the British Standards Institute (BSI). The majority relate to measurement equipment of a proprietary kind designed either at NPL or by British manufacturers which, in the ordinary way, would not fall within BSI's terms of reference. In some cases, in which the equipment is of a more general nature, the Specification has provided a useful basis for formulating a British Standard. The specifications are to enable manufacturers to base their inspection on mutually agreed specifications of accuracy both in workmanship and performance.

MOY/SCMI/54 has been updated as part of a project financed by the DTI (MPU 8/61.3) concerned with Good Practice Guides and Equipment Specifications.

SCOPE

A set of optical parallels (metric or imperial) used for examining the flatness and parallelism of the measuring faces of external micrometers graduated in inch or metric units.



Figure 1 The left hand box contains a set of parallels (Picture courtesy of Taylor Hobson Limited)

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1 IMPERIAL

1.1 The optical parallels shall be made of quartz or hard Crown optical glass, and shall be cylindrical in form, having a diameter of approximately 1 in., with optically polished end faces.

1.2 A set of parallels shall comprise one each of the following nominal sizes:

- 0.5000 in.
- 0.5062 in.
- 0.5125 in.
- 0.5187 in.

When a fifth parallel is provided it shall be made to the following size:

0.5250 in. or 1.0000 in.

1.3 The parallels shall be housed in a case suitably lined to protect the finished surfaces.

1.4 Each parallel shall bear an identification number legibly engraved on its cylindrical surface.

1.5 The end faces of each parallel shall be flat over their whole area to within **0.000 01 in.**

1.6 The end faces of each parallel shall be parallel over their whole area to within **0.000 02 in.**

1.7 The actual size of each parallel shall agree with its nominal value to within **± 0.000 3 in.**

1.8 The actual size of the parallel, expressed to the nearest 0.0001 in., shall be engraved by the manufacturer on its cylindrical surface.

2 METRIC

2.1 The optical parallels shall be made of quartz or hard Crown optical glass, and shall be cylindrical in form, having a diameter of approximately 25 mm., with optically polished end faces.

2.2 A set of parallels shall comprise one each of the following nominal sizes:

- 12.000 mm
- 12.125 mm
- 12.250 mm
- 12.375 mm

When a fifth parallel is provided it shall be made to the following size:

12.500 mm or 25.000 mm.

2.3 The parallels shall be housed in a case suitably lined to protect the finished surfaces.

2.4 Each parallel shall bear an identification number legibly engraved on its cylindrical surface.

2.5 The end faces of each parallel shall be flat over their whole area to within **0.000 3 mm.**

2.6 The end faces of each parallel shall be parallel over their whole area to within **0.000 5 mm.**

2.7 The actual size of each parallel shall agree with its nominal value to within **± 0.01 mm.**

2.8 The actual size of the parallel, expressed to the nearest 0.001 mm, shall be engraved by the manufacturer on its cylindrical surface.

3 UNCERTAINTIES

- 3.1 It will normally be necessary to consider the uncertainty of measurement when ascertaining compliance (or non-compliance) with this specification. UKAS document M3003 '*Uncertainty and confidence in measurement*' gives guidance in Appendix J.

4 REPORTING OF COMPLIANCE

- 4.1 Certain clauses in any specifications are necessary to support manufacture and assembly but may be difficult or unnecessary to check in subsequent checks for compliance with this specification. In certain cases checking a feature may require disassembly of the item, which may be undesirable. Although it is not essential that all clauses be checked on subsequent verification, it is important that those clauses omitted do not detract from the metrological value of the test. Where applicable, a performance check should always be carried out as this may allow indirect verification of those parameters that are not easily measured individually without disassembly.
- 4.2 When making statements of compliance or non-compliance, it is recommended that this specification and the relevant clauses within it be unambiguously identified in the calibration certificate or test report.

Example wording for a set of angle gauges follows.

This set of angle gauges has been examined for compliance with the accuracy requirements of clauses 2 and 3 of NPL Specification of Accuracy MOY/SCMI/18 (Issue 5), a copy of which is attached to this certificate.

For free measurement advice and information on other specifications in this series call the NPL Help line on 020 8943 6880

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The standard reference temperature for industrial length measurements is defined in ISO 1:1975 *Standard reference temperature for industrial length measurements*.

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