

NATIONAL PHYSICAL LABORATORY

METROLOGY CENTRE

Ref: **MOY/SCMI/87** **SPECIFICATION OF ACCURACY**
(Issue 5)

for

A STEEL PRECISION POLYGON

Type: A steel precision polygon of regular form designed for use with an autocollimator in measuring angular displacements.

LIMITING VALUE OR
MAXIMUM
PERMISSIBLE ERROR

1. **GENERAL**

- 1.1 The polygon shall be of a design approved by the NPL.
- 1.2 The workmanship and finish shall be in keeping with precision standards of this class.
- 1.3 The polygon shall be made of steel, hardened and subjected to a recognized heat treatment for dimensional stabilization. The maker shall provide with each polygon a written statement that it has been stabilized.
- 1.4 The polygon shall be marked: -
 - (i) with an identification number.
 - (ii) with the maker's name or trade mark.
 - (iii) "Based on NPL Design".
 - (iv) "Reference", "Calibration" or "Inspection" depending on the grade of accuracy.
 - (v) a. If the exterior angle of the polygon * contains an exact number of degrees, the cumulative angular values shall be engraved adjacent to the reflecting faces, the datum face being 0°.
 - b. Otherwise, the successive reflecting faces shall be identified by numbering them adjacent to the reflecting face serially from 1 upwards; the nominal value of the exterior angle shall also be marked on the polygon in a suitable position.

Note: It is recommended that a small recess is formed in the upper surface of the polygon for the purpose of engraving the NPL monogram.

* The acute angle between the normals to adjacent reflecting faces.

- 1.5 The polygon shall be supplied in a suitable protective case for storage purposes.

2. **TOP AND BOTTOM SUPPORTING SURFACES**

- 2.1 The top and bottom surfaces shall be flat 0.000 5 mm per 25 mm of dia. maximum 0.005 mm.
- Notes: (i) It is recommended that the top and bottom surfaces are lightly lapped.
- (ii) Any general departure from flatness must be of a concave nature.
- 2.2 The top and bottom surfaces shall be parallel 0.001 mm per 25 mm of dia. maximum 0.010 mm.

3. **PERIPHERAL REFLECTING FACES**

- 3.1 The reflecting faces shall have a highly lapped finish and an adequate reflectivity. It is recommended that the lapping shall be non-directional. If the lapping is directional, it must be parallel and NOT perpendicular to the top and bottom supporting surfaces.
- 3.2 The minimum size of reflecting face shall be 12 mm x 12 mm or 15 mm dia.
- 3.3 Each reflecting face, disregarding 1 mm wide margin shall be flat. Reference and Calibration grade $\frac{1}{4}$ fringe. Inspection grade $\frac{1}{2}$ fringe.
- 3.4 Each reflecting face shall be square to the bottom supporting surface 20 seconds of arc.

4. **ANGULAR ACCURACY**

- 4.1 When measured in a plane parallel with the bottom supporting surface
- (a) The angle between any reflecting face and the datum face shall agree with its nominal value Reference grade : 5 seconds of arc. Calibration grade : 10 seconds of arc.
- (b) The angle between any two adjacent reflecting faces shall agree with its nominal value Inspection grade : 15 seconds of arc.

(Signed) *R. W. Nichols*
for Director

