

NATIONAL PHYSICAL LABORATORY

METROLOGY CENTRE

Ref: MOY/SCMI/14 SPECIFICATION OF ACCURACY
(Issue 4)

for

AN ANGLE GAUGE DIVIDING HEAD

Type: A Coventry-Watts Dividing Head, with base-plate and back-centre, in which the settings are made with angle-gauges and an autocollimator or sensitive level.

LIMITING VALUE OR
MAXIMUM
PERMISSIBLE ERROR

1. GENERAL

- 1.1 The workmanship and finish throughout shall be in keeping with a precision instrument of this class.
- 1.2 The dividing head, tailstock, and base-plate shall be marked with the maker's name or trade mark and an identification number.

2. FLATNESS AND STRAIGHTNESS OF SURFACES

- 2.1 The surface of the base-plate shall be flat. 0.01 mm (0.0004 in)

(This flatness shall be maintained when the measuring head is in position).
- 2.2 The surface shall have a good bearing area. 30% minimum.
- 2.3 The bearing edge of the central tee-slot and the front finished edge of the base shall be straight. 0.008 mm (0.0003 in)
- 2.4 These edges shall also be parallel. 0.01 mm (0.0004 in)
- 2.5 The bases of the headstock and tailstock shall be flat so as to be quite free from rock when placed on a truly flat surface.
- 2.6 Their bearing areas shall be adequate. 30% minimum.

3. MEASURING HEAD (fitted with a meehanite face-plate)

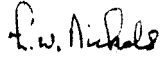
- 3.1 The face-plate shall be hard and shall have a lapped finish. 450 HV minimum.
- 3.2 The face-plate shall be flat. 0.0025 mm (0.0001 in)
- 3.3 The face-plate shall be square to the axis of rotation of the headstock spindle. 0.005 mm (0.0002 in) over the diameter of the face-plate.
- 3.4 The face-plate, when in its mean position in the vertical plane, shall be square to the surface of the base-plate. 0.008 mm (0.0003 in) over the diameter of the face-plate.

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3.5	The face-plate, when in its mean position in the horizontal plane, shall be square to the bearing edge of the central tee-slot.	0.008 mm (0.0003 in) over the diameter of the face-plate.
3.6	The face-plate centre shall be hard.	750 HV minimum.
3.7	The face-plate centre, when mounted in the taper socket of the face-plate, shall be concentric with the axis of rotation of the headstock spindle for all positions of assembly.	0.005 mm (0.0002 in) FIM.
3.8	The test mandrel shall be hard.	750 HV minimum.
3.9	The cylindrical portion of the test mandrel shall be straight and uniform in diameter.	0.0025 mm (0.0001 in)
3.10	The test mandrel, when mounted in the taper socket of the face-plate, shall be concentric with the axis of rotation of the headstock for all positions of assembly.	0.005 mm (0.0002 in) FIM. 25 mm from face-plate. 0.010 mm (0.0004 in) FIM. 150 mm from face-plate.
3.11	When so mounted the axis of the mandrel, in its mean position in the vertical plane, shall be parallel with the surface of the base-plate.	0.005 mm (0.0002 in) over 150 mm
3.12	The axis of the mandrel, in its mean position in the horizontal plane, shall be parallel with the bearing edge of the central tee-slot.	0.005 mm (0.0002 in) over 150 mm
3.13	The friction clutches shall operate satisfactorily.	
3.14	It shall be possible to operate the face-plate clamp without affecting the setting of the headstock spindle.	1 second of arc maximum variation.
4.	<u>TAILSTOCK</u>	
4.1	The tailstock centre point shall be hard.	700 HV minimum.
4.2	The movement of the tailstock slide shall be parallel with the base-plate and with the bearing edge of the central tee-slot.	0.015 mm per 25 mm (0.0006 in per in)
4.3	The adjustment for aligning the centre point shall function and clamp satisfactorily.	
5.	<u>AUTOCOLLIMATOR</u>	
5.1	The twin fiducial lines and the image of the cross-wire shall come into focus simultaneously so that there is no observable parallax.	
5.2	The image of the cross-wire shall be parallel with the twin fiducial lines.	
5.3	It shall be possible to repeat autocollimator settings.	1 second of arc.
5.4	The micrometer drum shall be free from backlash.	½ second of arc.

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- 5.5 The eyepiece scale shall be accurate with respect to the zero. Any errors present shall be of a uniform nature and shall not exceed. 2 seconds of arc over the 15 second range.
6. **LAPPED SQUARE BLOCK**
- 6.1 The faces of the square block shall be hard. 800 HV minimum.
- 6.2 The faces of the square block shall be flat. 0.0005 mm (0.000 02 in)
- 6.3 The faces of the square block shall be transversely parallel with the surface of the base-plate. 0.0025 mm (0.0001 in) over the depth of face.
- 6.4 The four included right-angles shall each be 90°. ± 2 seconds of arc.
- 6.5 The clamp for the block shall operate satisfactorily.
7. **PRECISION LEVEL (when supplied)**
- 7.1 The base of the level shall have a lapped finish and be hard. 800 HV minimum.
- 7.2 The base of the level shall be flat, any departure from flatness shall be in the nature of a concavity. 0.0008 mm (0.000 03 in)
- 7.3 The level tube shall be of suitable sensitivity and be graduated in divisions of approximately 2.5 mm (0.1 in). Approximately 5 seconds of arc per division.
- 7.4 The maximum deviation of the value of any one division from the average value shall not exceed 1/5th division.
- 7.5 The level shall be marked with an identification number.

(Signed) 
for Director

