NATIONAL PHYSICAL LABORATORY

METROLOGY CENTRE

Ref: MOY/SCMI/48 (Issue 3) **SPECIFICATION OF ACCURACY**

for

A TAPER DIAMETER MEASURING MACHINE

Type: 0 - 100 mm (0/4 in) Floating micrometer machine for measuring the diameters of plain taper plugs, based on NPL. Drawing No. 1579.

NOTE: All measurements refer to the basic temperature of 20º C.

		LIMITING VALUE OR MAXIMUM PERMISSIBLE ERROR
1.	**GENERAL**	
1.1	The workmanship and finish shall be in keeping with a precision instrument of this class.	
1.2	The instrument shall be marked with: -	
	(i) An identification number. (To ensure correct assembly ALL the machine castings should bear this common identification number).	
	(ii) The maker's name or trade mark.	
	(iii) Based on NPL Design.	
1.3	The machine shall have a mesuring range from 0 to 10 mm (0 to 4 in).	
1.4	The feel of the micrometer shall be smooth and uniform over its measuring range.	
1.5	The micrometer spindle shall have an overrun of at least one revolution lat each end of its measuring range.	
2.	**WORK-TABLE**	
2.1	The working surface shall be hardened.	Minimum 800 HV.
2.2	The working surface shall have a good lapped finish.	
2.3	The working surface shall be flat.	0.0015 mm (0.000 06 in) over its diameter.
3.	**AUXILIARY WORK-TABLES**	
3.1	The working surfaces shall be hardened.	Minimum 800 HV.
3.2	The working surfaces shall have a good lapped finish.	
3.3	The working surfaces shall be flat and parallel.	0.0015 mm (0.000 06 in) over the working area.

4. FIDUCIAL INDICATOR

4.1	When the indicator is clamped in the measuring carriage its action shall be free from any "stickiness".	
4.2	The indicator pointer shall not make contact with the casing when the measuring plunger is fully depressed.	
4.3	The pointer shall have a free movement of at least 5 mm (3/16 in) on each side of the fiducial mark.	2 N and 5 N (8 and 16 ozf)
4.4	The force required to operate the indicator shall lie between	150 times
4.5	The magnification of the indicator shall be not less than	0.005 mm (0.0002 in)
4.6	The bearing shank shall be straight and uniform in diameter.	Minimum 800 HV.
4.7	The measuring face shall be satisfactorily hardened	0.0005 mm (0.000 02 in)
4.8	The face shall have a good lapped finish and shall be flat.	
4.9	The face shall be square to the bearing shank.	0.0008 mm (0.000 03 in) over the diameter of the face.

5. MICROMETER

NOTE The micrometer shall read directly to 0.002 mm or 0.0001 in and shall preferably be of the non-rotatable spindle type.

5.1	The measuring face shall be satisfactorily hardened.	Minimum 800 HV.
5.2	The face shall have a good lapped finish and shall be flat.	0.0005 mm (0.000 02 in)
5.3	If the micrometer has a rotatable spindle the measuring face shall be square with the spindle axis.	0.0008 mm (0.000 03 in) over the diameter of the face.
5.4	The measuring face shall also be square to the axis of the micrometer bearing shank to the same accuracy. Alternatively, the angular location of the bearing shank which provided parallelism between the measuring faces of the micrometer and fiducial indicator (see 7.1 below) shall be identified by marks on the shank and machine casting.	
5.5	The bearing shank of the micrometer shall be straight and uniform in diameter.	0.005 mm (0.0002 in)
5.6	It is recommended that, for ease of reading, the surfaces of the thimble and barrel shall have a dull finish and that the graduation lines shall be blackened.	
5.7	The graduation lines on the thimble and barrel shall be clearly cut and uniform in thickness to	0.05 mm (0.002 in)
5.8	It is recommended that the thickness of the graduation lines shall be approximately $l/5^{th}$ of the distance between the centres of adjacent lines, with a minimum thickness of 0.10 mm (0.004 in)	

6. ALIGNMENT OF MEASURING AXIS

6.1	The axis of the micrometer and indicator shall be collinear.	0.25 mm (0.01 in)

7. **MEASURING FACES**

7.1	The measuring faces of the micrometer and indicator shall be parallel for all relative positions.	0.0015 mm (0.000 06 in) over the diameter of the face.
7.2	The measuring faces shall be square to the work-table at all heights of the measuring carriage.	0.0015 mm (0.000 06 in) over the diameter of the faces.

8. **CALIBRATION OF MICROMETER SCREW**

8.1	It shall be possible to obtain repetition of readings to within	0.0005 mm (0.000 02 in)
8.2	Progressive error, if present, shall be of a uniform nature and shall not exceed	0.0025 mm (0.0001 in) over the 25 mm (1 in) 0.005 mm (0.0002 in) over 50 mm (2 in).
8.3	Periodic error, if present, shall not exceed	±0.0005 mm (±0.0002 in).

(Signed)

for Director

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