NATIONAL PHYSICAL LABORATORY

METROLOGY CENTRE

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SPECIFICATION OF ACCURACY

for

A GAUGE MEASURING INTERFEROMETER

Description: An NPL-Hilger type TN 190 gauge interferometer developed by the manufacturer from a prototype designed by the NPL for the direct measurement of batches of steel slip gauges up to a size of 100 mm (4 in); the reference standards of measurement are the wave-lengths of cadmium and mercury-198 radiations known in terms of the metre and yard.

		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: -	
	(i) NPL-Hilger (ii) With identification numbers on the instrument, platens and slide rules.	
2.	**LAMPHOUSE**	
2.1	Both the cadmium and mercury –198 sources shall operate satisfactorily when the power pack supplied is adjusted to give the correct conditions specified in the manufacturer's Instruction Manual.	
2.2	The light from each source shall adequately illuminate the entrance slit aperture.	
3.	**CONSTANT DEVIATION PRISM**	
3.1	The graduated wavelength drum which controls the rotation of the prism shall function satisfactorily.	
3.2	The prism shall satisfactorily space the yellow lines in the spectrum of the mercury-198 source.	
4.	**EYEPIECE UNIT**	
4.1	The width of the viewing aperture shall be such as to allow the two yellow radiations from the mercury-198 source to be viewed separately.	
4.2	The width of the entrance slit aperture shall be	equal or up to 0.01 mm (0.000 4 in) greater than the width of viewing aperture.

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	Note: The sizes of these slit apertures, together with the deduced obliquity correction are given by the manufacturer in the Instruction Manual.	
4.3	The field of view shall be symmetrical and free from blemishes.	
4.4	The two lenses for focusing the field of view and the slit apertures respectively shall function satisfactorily.	
4.5	The glass index plate shall be a sliding fit in the slot provided.	

5. OPTICAL FLAT

5.1	The lower surface of the optical flat shall be suitably coated with a dielectric film to increase reflectivity.	
5.2	The lower surface of the optical flat shall be flat.	0.000 05 mm (0.000 002 in)
5.3	The upper surface of the optical flat shall be inclined to its lower surface	5 minutes of arc (minimum inclination)

6. PLATENS

6.1	The upper and lower surfaces shall be hard	800 HV minimum.
6.2	The quality of finish of the lapped upper surface shall permit the satisfactory wringing of high quality slip gauges to the platen.	
6.3	The upper surface shall be flat	
	(i) overall	0.0003 mm (0.000 01 in) (any error shall be of convex configuration).
	(ii) over the area viewed when the platen is located in the instrument	0.000 05 m (0.000 002 in)
6.4	The upper working surface shall be parallel with its lower annular surface	0.0008 mm (0.000 03 in)

7. THERMOMETER

7.1	The scale shall be graduated to enable readings to be made direct to 0.01 °C and by estimation to 0.005 °C. When the thermometer is inserted in the instrument with the bulb resting in the small dummy gauge provided, the 19.5 °C graduation shall be visible outside the measuring enclosure. The thermometer shall satisfy the conditions for certification listed in NPL Test Leaflet TH 16 and be accompanied by an NPL certificate giving values of corrections to the thermometer readings to an accuracy of ±0.005 °C.	

8. **SLIDE RULES**

8.1 The relationship between the wavelength scales and the metric and inch scales shall be accurate to — 0.000 002 mm (0.1 micro-inch) in scale reading.

8.2 It shall be possible to read the error of a gauge in terms of the metric and inch scales to — 0.000 002 mm (0.1 micro-inch)

9. **TABLES OF WAVELENGTH DATA**

9.1 The tables of wavelength values, wavelength corrections and nominal excess fractions shall agree with those in current use at the NPL.

10. **ACCURACY OF MEASUREMENT**

10.1 The interferometer with its associated equipment shall measure high quality slip gauges up to 100 mm (4 in) in length to the following accuracies: -

Gauges up to and including 50 mm (2 in) in length	±0.000 03 mm (±0.000 001 in)
Above 50 mm (2 in) and up to 100 mm (4 in)	±0.000 05 mm (±0.000 002 in)

(Signed) L.W. Nichols

for Director