

FLATNESS & SURFACE FINISH

WHAT ARE LIGHT BANDS?

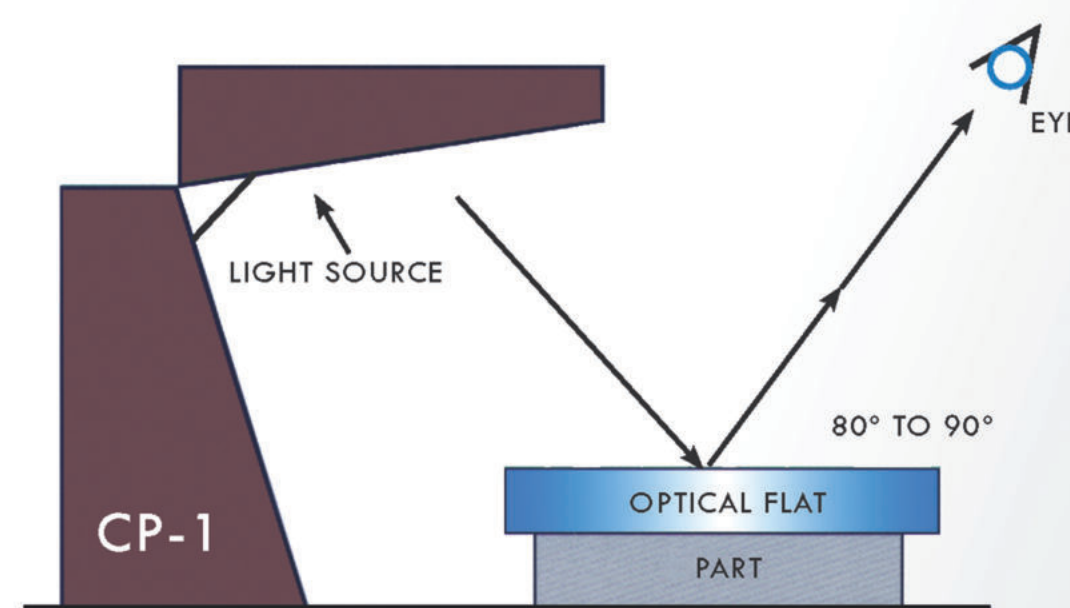
Light bands are formed by using an optical flat and a monochromatic light source for checking surface flatness. The band unit of measure is 0.00029mm (0.0000116"): that is, between the center of one dark band and the center of the next dark band.

TYPICAL LIGHT BAND PATTERNS WHICH SHOW FLATNESS ACCURACY

SURFACE GEOMETRY	1 LIGHT BAND 0.00029MM (0.0000116")	2 LIGHT BANDS 0.00058MM (0.0000232")	3 LIGHT BANDS 0.00087MM (0.0000348")	9 LIGHT BANDS 0.00261MM (0.0001044")
CONVEX OR CONCAVE				
Surface parallel to flat				
Symmetrical Pattern				
CONVEX				
With concave surface band will curve in opposite direction				
Non-Symmetrical Pattern				
CYLINDRICAL				
Convex or Concave				
Symmetrical Pattern				
SADDLE SHAPED				
Symmetrical Pattern				

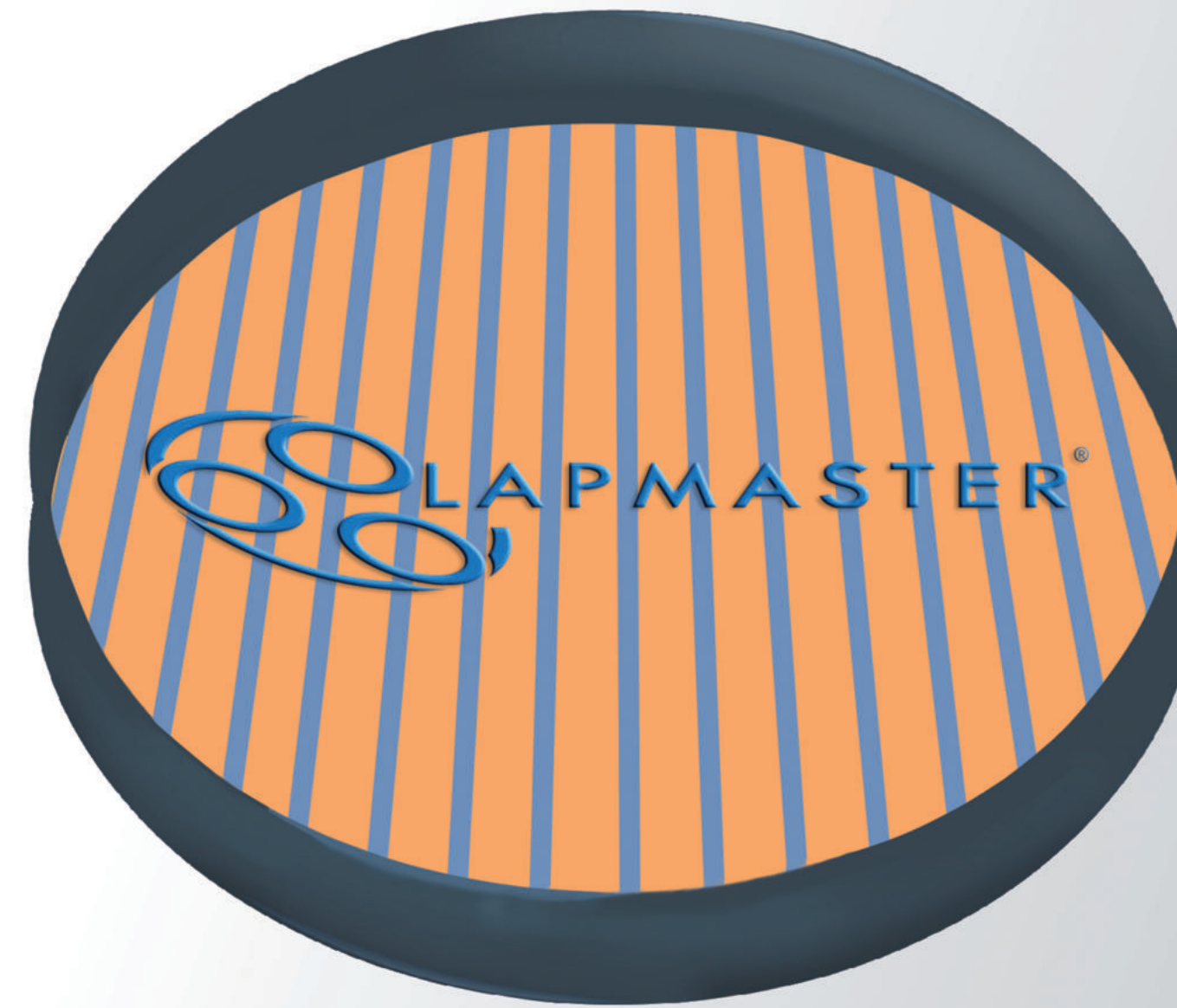
HOW TO READ LIGHT BANDS

- First clean the surfaces of the component and optical flat with a lens tissue or soft lint-free cloth. Both faces must be absolutely clean.
- Place the optical flat carefully on top of the component. Do not slide it across.
- As the optical flat and component come together lines will appear through the flat. Manipulate it to obtain a line pattern, as illustrated. The lines are interference fringes or bands and are an indication of the level the component's surface has risen or fallen in relation to the optical flat.



LIGHT BAND READING SHOWING PERFECT FLATNESS

The straight parallel bands, and not the width of light band indicates the flatness.



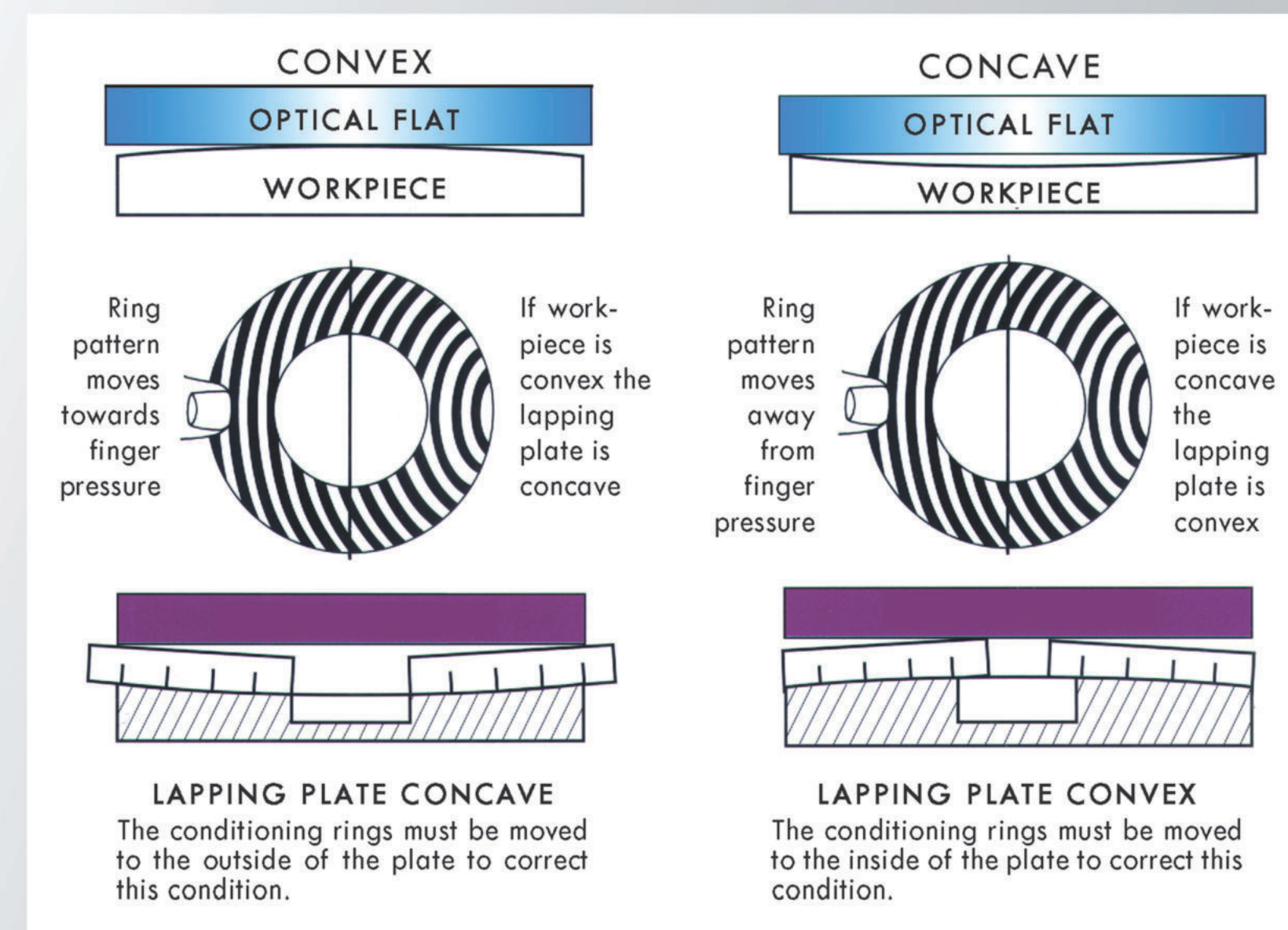
USE AND MAINTENANCE MONOCHROMATIC LIGHT

The Lapmaster Monochromatic Light contains a sodium light tube which is protected by an opalescent plate. As the tube ages the light will start to dim. Eventually the light will become inadequate and the tube should be replaced.

OPTICAL FLATS

As with all precision contact inspection devices, Lapmaster optical flats should be sent in for annual certification. Should Lapmaster Optical Flats become scratched they can be reconditioned by Lapmaster International's optical department, and a new Certificate of Conformity issued. Please call Lapmaster for these services. If an optical flat is accidentally dropped and chipped, the flatness of both surfaces may be impaired. Any damaged flat should immediately be checked with another flat before using.

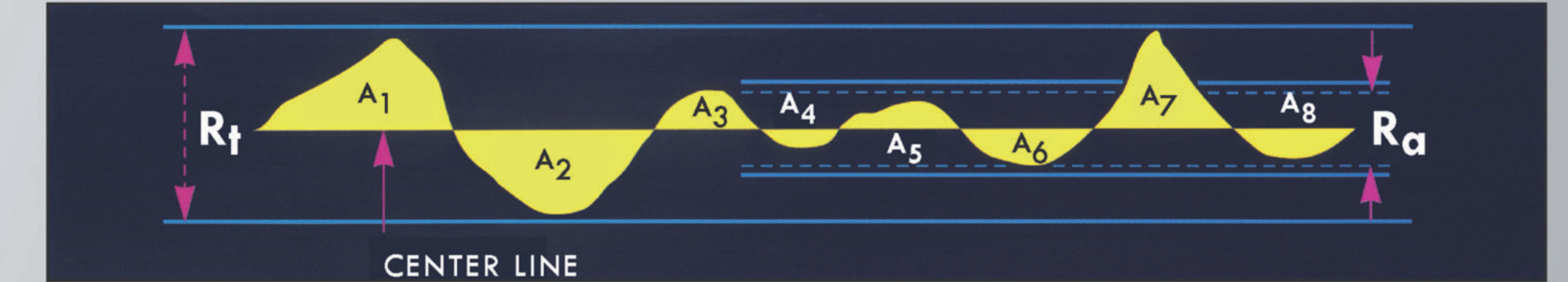
LAPPING PLATE FLATNESS



BASIC SURFACE FINISH DESCRIPTION

Surfaces are produced by a variety of material removal processes. The total geometry which results can be best considered to be split-up into three components: roughness, waviness and form.

BASIC PARAMETERS



Parameters: The various parameters R_a and R_t are illustrated. It may be seen that the center line is that line which divides the areas such that:

$$A_1 + A_3 + \dots + A_7 = A_2 + A_4 + \dots + A_8$$

The two most common surface finish measurements are R_a and R_t . These are described as follows:

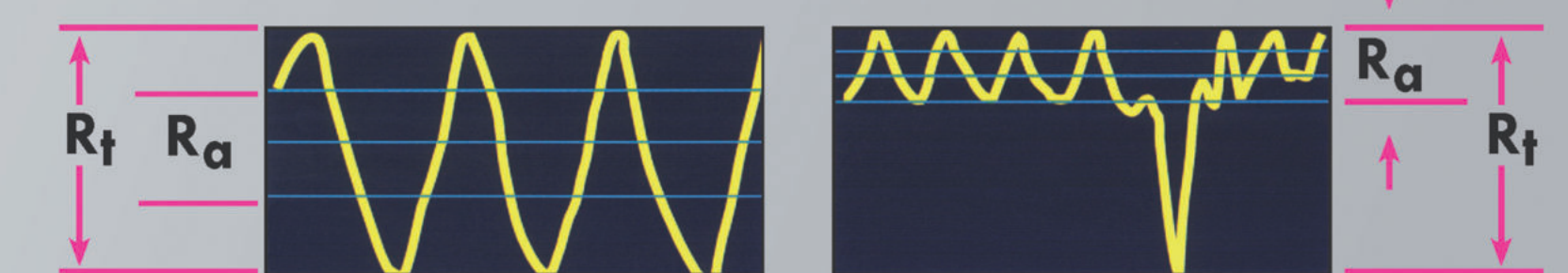
R_a is universally recognized as the most used international parameter of roughness.

It is the arithmetic mean of the departures of the roughness profile from the mean line.

R_t is the maximum peak to valley height of the profile over the measured length.

Measurements are usually quoted in microns. 1 Micron = Approx 40 Micro Inch

EXAMPLES OF R_a AND R_t



TYPICAL STATEMENTS OF SURFACE FINISH OR TEXTURE ON DRAWINGS:

	4	16	4 Lap
	A	B	C
Symbol A	How to specify maximum roughness value in R_a microns.		
Symbol B	How to specify maximum and minimum roughness values.		
Symbol C	How to specify maximum roughness and finishing process.		
Number 4	shows a typical unit. Note: Flatness is specified as		

CONVERSION TABLES

ENGLISH TO METRIC

		Millimeters (mm)	Microns (μm)	Angstroms (\AA)
1 Inch (1.00")	=	25.4	25,400	254,000,000.
1 Thous. (0.001")	=	0.0254	25.4	254,000
1 Micro Inch (μin)	=	0.0000254	0.0254	254

METRIC TO ENGLISH

		Inches	Thousandths	Micro-Inches
1 Millimeter (mm)	=	0.039 37	39.37	39,370
1 Micron (μm)	=	0.000 039 37	0.039 37	39.37
1 Angstrom (\AA)	=	0.000 000 003 937	0.000 003 937	0.003 937

Lapmaster manufactures a complete line of optical flats, which is manufactured using the finest quality quartz material and the most up to date machining techniques.