Universal Microphotometer with a Rotating Slit

A two-coordinate universal microphotometer (UMF) is now operating at the Astronomical Institute of the Ondrejov Observatory. In addition to ordinary scanning functions, this device may for convenience also be used in some unique modes of work to solve special astronomical and astrophysical tasks. The uniqueness of the UMF consists in the possibility of independent rotation of the measuring slit around its optical axis. In addition, the UMF table with the scanned transparent image can follow a general curve defined either analytically or experimentally by at most 30 points selected at the picture. Together with classical tasks like scanning of spectrograms in rectangular coordinates X and Y, this device allows the effective digitisation of various non-standard transparent images.

The UMF was used e.g. for measuring of the spectrograms from slitless spectrographs even in cases when the angle between the dispersion vector and spectral lines was a general function of coordinates X and Y in the plane of spectrogram (e.g. meteoric spectra). Another special application is e.g. scanning of solar eclipse pictures along solar disc concentric circles with the slit rotating in such a way as to be always perpendicular to the solar radius direction.

Other principal parameters of the UMF are as follows: the size of a measured transparent plate or a film frame to be measured is to be up to 115 x 230 mm; the precision of keeping a sampling position in a rectangular raster is 0.001 mm, while for sampling along a general curve this precision

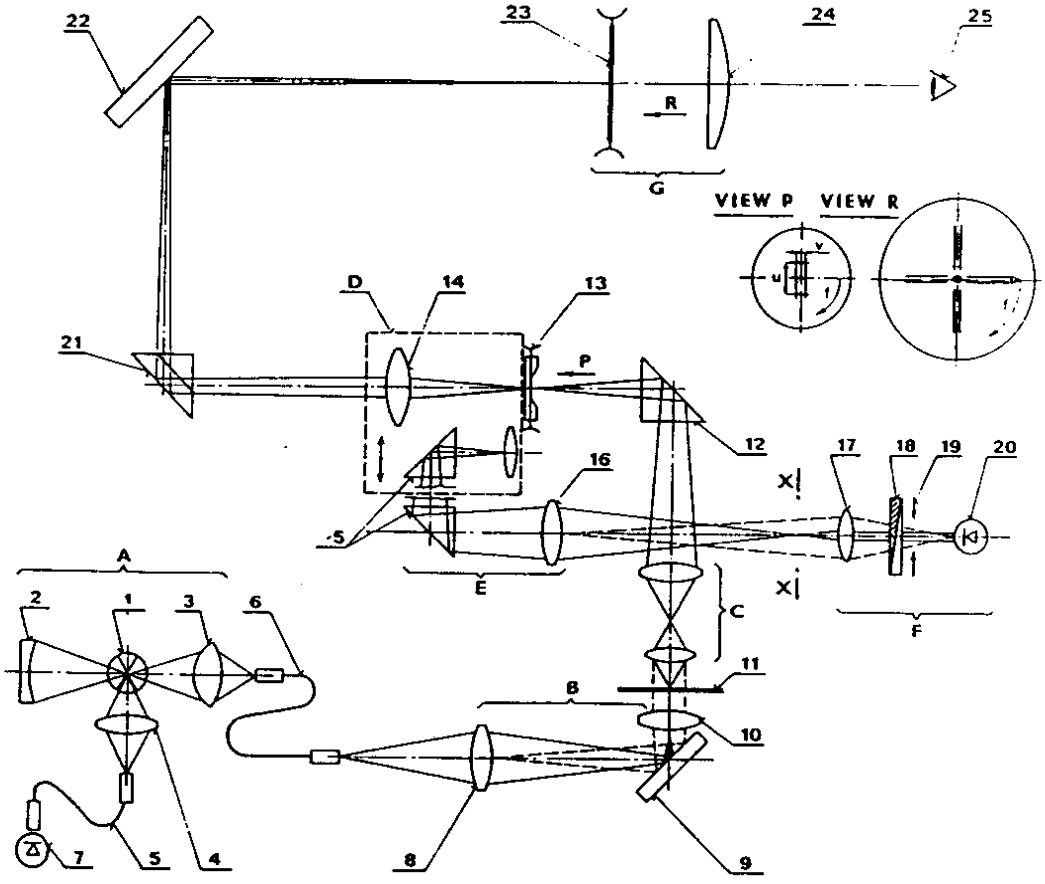

Figure 1. Description of the UMF optical system.
Part A - light source. 1 — halogen incandescent lamp, 2 — dichroic spherical mirror, 3 — condenser, 4 — condenser, 5 — fibre optics, 6 — fibre optics, 7 — reference measuring photodiode.
Part B — illumination optics. 8 — objective, 9 — plane mirror, 10 — objective, 11 — research sample (transparent frame).
Part C — projection objective. 12 — prism system, 13 — three-parametric slit.
Part D — optical way changer. 14 — objective, 15 — prism system, 16 — objective.
Part F — photometric head. 17 — eyepiece, 18 — neutral wedge, 19 — electromagnetic shutter, 20 — measuring photodiode.
Part G — rotating focusing screen for observation of field of view. 23 — rotating focusing screen, 24 — condenser, 25 — observer's eye.

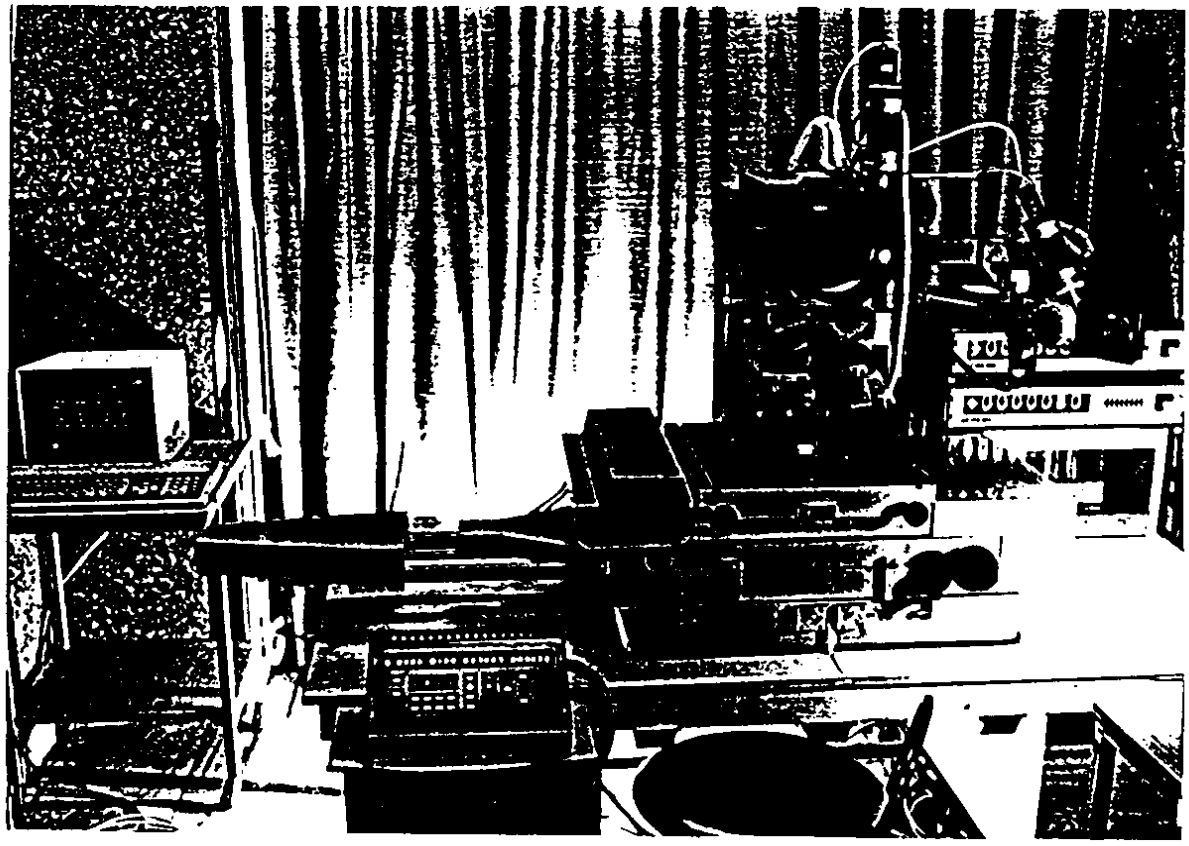

Figure 2. General view of the UMF.

is 0.0025 mm; the slit can be set up independently in both dimensions starting with the size of 0.003 x 0.003 mm up to 15 x 15 mm with the precision of about 5%; the angle of the slit can be set up with the precision of 5 arcmin; a halogen incandescent lamp 24V/150W with a stabilized flux is used as a source of light; the digitizer uses 12 bit A/D converter; the size of a non-interrupted measured field is limited by the 450 kB RAM capacity of the real time processor unit.

The universal microphotometer was adapted from the ordinary ZKM 250-05D measuring microscope made by Carl Zeiss Jena. Development, construction and mechanical works were performed at the Astronomical Institute Ondrejov. Electronic control demands were suggested and prepared at the Astronomical Institute Ondrejov. The electronics were developed and realized by Vilati, Budapest.

J. Zicha
Czech Technical University in Prague
Faculty of Mechanical Engineering
Department of Precision Mechanics and Optics
Horska 3, CS 128 00
Praha 2

P. Kotrc, M. Klvana and M. Knizek
Astronomical Institute
251 65 Ondrejov
Czechoslovakia