KATOPTARON®

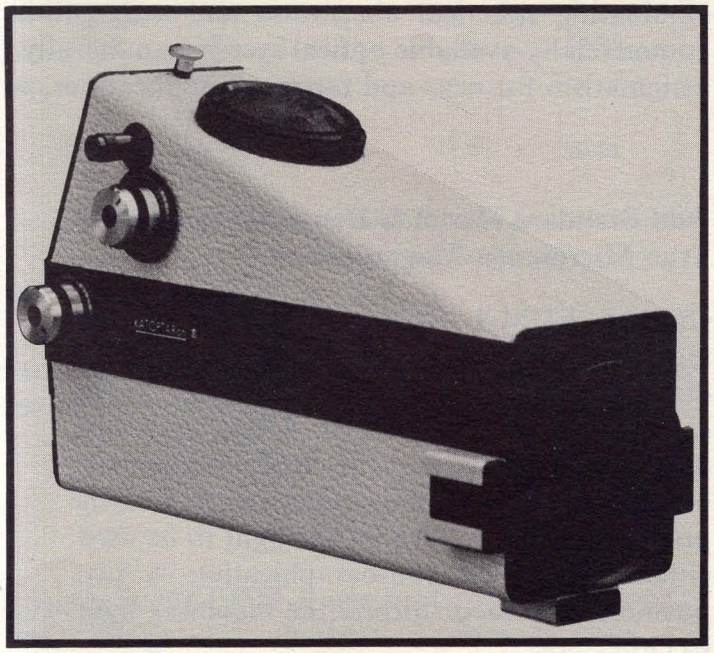
Model LDM-1 **Long Distance Microscope**

THE WORLD'S FINEST "SYSTEM" LONG DISTANCE MICROSCOPE

Designed by world-famous optical innovator, H. Makowsky of Cologne, West Germany, the KATOPTARON LDM-1 opens up a new dimension in long distance observation and microscopy. The LDM-1 is the first *catoptric* (all-mirror) optic to use standard microscope accessories. Depending on the choice of accessories, it can focus from infinity to 70 cm (27.6 inches) and provide true microscope magnification of up to 90.6x. Standard equipment from the Hertel & Reuss line, such as eyepieces, camera fittings, intermediary polarizing and vertical illuminators, tubes and observation heads, has been designed to attach directly to the LDM-1. It is, therefore, even possible to do long distance polarizing microscopy simply by interfacing a Hertel & Reuss intermediary polarizing tube.

Thus, important tests for stress in plastics, glass and ceramics may be made at relatively long distances. The LDM-1 has been employed in atomic, explosive and industrial research. Exceptionally well-suited for use in forensics, it is possible to bring an LDM-1 to the scene of a crime and do on-the-spot photography for use as evidence. Art studies and forgery detection may be done and photographed *in situ* at magnifications only previously possible in the laboratory. Wildlife and biological research can be greatly aided through the use of the LDM-1. Insects and other small forms of life can be observed without disturbing their environment.

In the electronics industry, circuit boards and components may be inspected when close access is impossible. In aerospace and related fields involving sophisticated technology, assemblies can be observed and critically checked as they are being made in a sterile environment. In general, the LDM-1 can be used wherever and whenever observations at high magnification must be made of inaccessible or potentially dangerous subjects from a remote vantage point.



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Unique Depth-of-Field and Focus Controls

Using the LDM-1 is indeed simple. All focusing and aperture adjustments may be done conveniently with one hand by rotating the controls located near the rear of the unit. The LDM-1 has a variable f/stop control (f/8 to f/32) which enables the user to adjust depth-of-field precisely. Even under high magnifications, the LDM-1 is easily targeted onto a subject. Unique to the LDM-1, the Hertel & Reuss AZ vertical illuminator (or AZ-POG with rotatable flip-in analyzer) may be used to project a spot of light. This spot may then be moved onto the subject which aligns the LDM-1 precisely for ease in focusing.

The KATOPTARON System

The essence of the LDM-1 is the famous KATOPTARON optical system, weighing a mere 2.2 pounds. This all-mirror optic has absolutely perfect color reproduction. Furthermore, the KATOPTARON system's all-mirror design guarantees that all light wavelengths — from UV, through the visual spectrum, and on into the infrared — are faithfully reproduced.

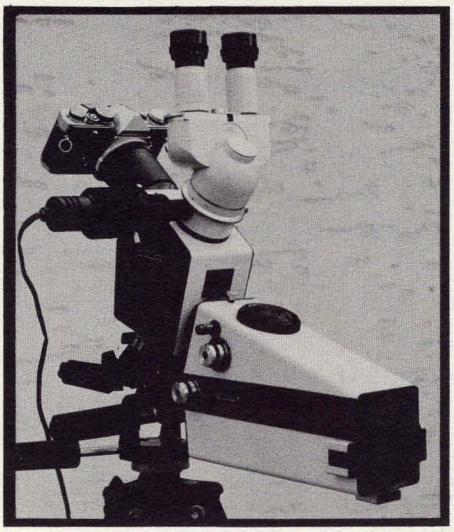
The KATOPTARON system utilizes mirrors made of Schott (Division of Carl Zeiss) Zerodur®, a completely temperature-stable ceramic material. Zerodur will remain dimensionally stable under virtually all conditions in which an LDM-1 might be used.

Floating Mirror Elements

"Floating mirrors" are the secret of the LDM-1's extraordinary performance. By turning dials at the back of the LDM-1, the mirrors can be offset relative to any focus—at any distance—eliminating spherical aberration and astigmatism to an unprecedented degree. No other commercially-available optical system can literally "tune away" both spherical aberration and astigmatism for near and far-range applications, or any distance in between.

Add Standard Hertel & Reuss Accessories for True Microscope Magnification

On the LDM-1 there are two ports for mounting observation heads, photo-tubes or direct connectors for 35mm, cine or video cameras. Any of Hertel & Reuss' standard observation heads may be used: monocular, binocular or photo-binocular (with moving prism, permitting 100% of the light to be used either visually or photographically). A two position flip-mirror directs the incoming light to either port.



Shown with PB unit, camera and binocular.

The LDM-1 is rated at 0.35x primary objective magnification when used at 1.9 meters. Higher magnifications at closer working distances are possible simply by adding the PB accessory. The PB increases both the tube-length and objective magnification to 1.66x at a working distance of 80cm (31.5 in.) The PB itself also has two accessory ports and a two position flip-mirror. For even greater magnification, two PB units may be connected in series. The LDM-1 then has an objective magnification of 2.9x at a working distance of 70 cm. Thus, a primary objective magnification of up to 2.9x is possible without ever subjecting the incoming light to refraction. Eyepieces available for the LDM-1 multiply the primary objective magnifications by 5x, 8x, 10x, 12x, 15x, 20x and 25x. Consequently, without the PB, the LDM-1 has magnifications of 1.75x to 8.75x. With one PB, the LDM-1 has a range from 8.3x to 41.5x. With two PB's the LDM-1 can produce magnifications from 14.5x to 72.5x. When a Hertel & Reuss intermediary tube is interfaced, all the above powers are further multiplied by 1.25x. Therefore, the complete range of magnification is from 1.75x to 90.6x (see table).

TABLE NO. 1
MICROSCOPE MAGNIFICATION CONVERSION CHART

	Eyepieces						
	5x	8x	10x	12x	15x	20x	25x
Working Distance	Powers						
1.9 m w/o accessories	1.75x	2.8x	3.5x	4.2x	5.25x	7x	8.75x
80 cm w/one PB	8.3x	13.3x	16.6x	19.9x	24.9x	33.2x	41.5x
70 cm w/two PB's	14.5x	23.2x	29x	34.8x	43.5x	58x	72.5x
70 cm w/two PB's and Hertel & Reuss intermediary tube	18x	29x	36.2x	43.5x	54.4x	72.5x	90.6x

Macro Mode

Cameras, (35mm or video systems) may be attached to either or both of the LDM-1's two image viewing ports. At 1.9 meters the direct image on the film plane has a 1:3 reproduction ratio (as calculated for the 35mm format).

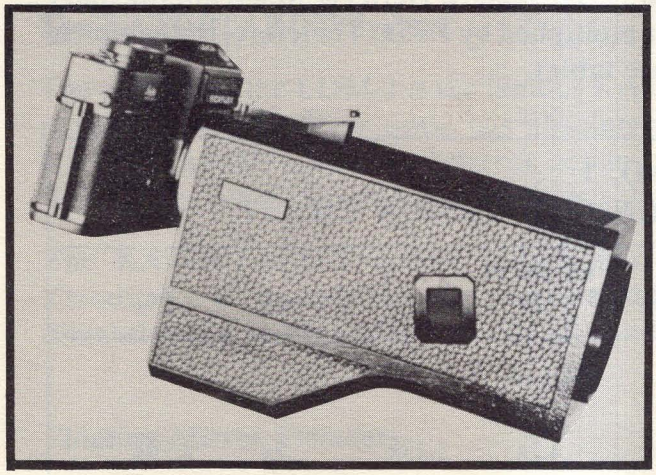
Visual Observation Mode

Visual observation is always possible; consequently, the LDM-1 may be used as a telescope or spotting scope. The top port provides an erect image when observation tubes are used.

OTHER KATOPTARON SYSTEMS

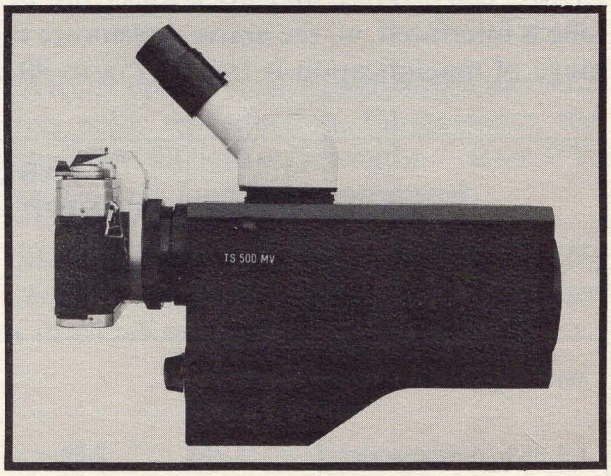
In addition to the LDM-1, the same KATOPTARON optical system has been incorporated into the TS 500 EM and MV models. Designed primarily for use as a telephoto system, the EM is also capable of varied applications as a telescope, spotting scope or low-power long distance microscope. The MV bridges the gap between the EM and LDM-1. Primarily designed as a low-power long distance microscope, the MV may also be used as a telephoto lens, spotting scope or telescope. Further information on these models is available in our telephoto system brochure.

Model TS 500 EM



Shown with 35mm SLR

Model TS 500 MV



Shown with camera and monocular

All specifications are subject to change without notice.

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