EM 10 C

High-Resolution
Electron
Microscope

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Zeiss High-Resolution Electron Microscope with new accessories

scanning attachment
ion-getter pump system
and other new specifications

The Zeiss EM 10 C is the further development of the EM 10 A/B High-Resolution Electron Microscope System, proven all over the world for years. When designing the new accessories and extensions of the instrument system, we strictly adhered to the goal set by ourselves of maintaining high resolution, unrestricted magnification range, and simple operation. Above all, we took into account the protection of the specimen from contamination and attached great importance to the possibility of analysis extension.

The **ion-getter pumps** (accessories) together with a differential pumping system guarantee practically contamination-free specimen conditions in the 10^{-7} Torr range.

The **scanning attachment** allows examination of thick specimens using Scanning Transmission Electron Microscopy (STEM) and surface imaging by secondary electrons (SE) as well as X-ray microanalyses and element distribution micrographs with the EDX accessory.

Specifications of EM 10 C

Resolution	Guaranteed crystal lattice resolution 2.04 Å (=0.204 nm). Guaranteed point-to-point resolution 3 Å (=0.3 nm) (as before).
Magnification	Extended range 30x to 500 000x (EM 10 C). 20x to 200 000x (EM 10 CR).
Specimen airlock housing	in microscope column with connection ports for the following accessories: 2 ion-getter pumps providing oil-free vacuum conditions for the specimen, EDX detector (mounting angle 45°) for energy dispersive X-ray microanalysis, SE detector for SEM imaging with scanning attachment.
Focusing	Focus automatically retained upon magnification change, digital focusing with endless rotary control, focusing step width adjustable from 40 to 10 000 Å (4 to 1 000 nm) according to selected magnification.
Objective lens stigmator	with two separate pairs of controls for normal and long (high-contrast) objective focal length, automatic switch-over.
Sheet film camera	Magazine capacity 60 sheet films 3¼″ x 4″.
Pump system	Adsorption trap in pre-vacuum line, simple connection of ion-getter pump accessory.

New optional accessories

Scanning attachment	see p. 3.	Cat. Nr. 34 07 90
Ion-getter pumps	to produce different pressures (differential pumping system), obtainable vacuum in specimen zone 4.5 x 10^{-7} Torr (6 x 10^{-7} mbar), contamination rate 0.018 Å/s (0.0018 nm/s) **without** } anticontaminator 0.0004 Å/s (0.00004 nm/s) **with** } (measuring time 4 h).	Cat. Nr. 34 07 91-9903
Focusing aid/beam tilt system	with increased tilt angle, for use also with scanning attachment.	Cat. Nr. 34 07 51-9903
Anticontaminator	Standing time up to 7 h.	Cat. Nr. 34 09 55

Scanning attachment

Even with the scanning attachment installed, all characteristics of the basic instrument, especially high resolution, are fully maintained. The very simple change-over from high resolution TEM to scanning operation (STEM, SEM, EDX) is effected by introducing the corresponding special specimen cartridge into the airlock and switching over to the scanning attachment.

Special advantages of the scanning attachment

- Examination of unstained, low-contrast biological specimens by electronically enhancing contrast (STEM).
- Improved specimen transmission and image quality of thick specimens without increase in accelerating voltage (STEM).
- Element distribution micrographs and X-ray microanalysis in connection with EDX equipment.
- Possibility of specimen surface imaging (SEM).

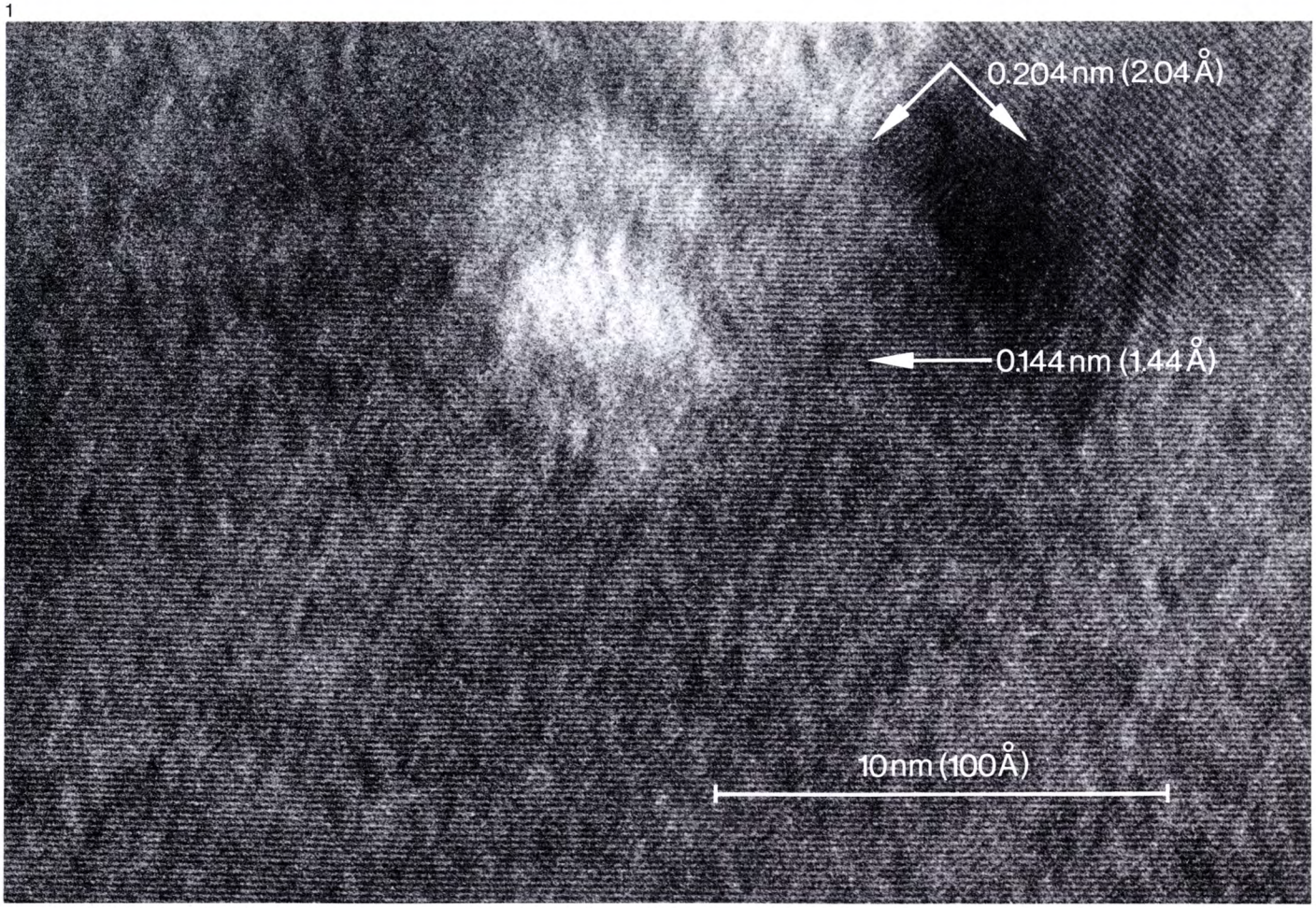
Specifications

Accelerating voltage	20 - 40 - 60 - 80 - 100 kV.	
Operating modes	TEM	EM 10 specifications unrestricted.
	STEM	Guaranteed resolution 20 Å (2 nm), using hairpin filament.
	EDX	Element distribution and X-ray microanalysis, using EDX equipment.
	SEM	Scanning micrographs of surfaces, using SE detector.
Magnification	independent of accelerating voltage. High-resolution STEM, Element distribution, SEM: 1 000x to 500 000x in 9 steps. Low magnification SEM down to approx. 10x. 3-digit magnification display including decimal point.	
Detectors	STEM	Detector with light guide, photomultiplier, and preamplifier mounted underneath final image screen.
	SEM	SE detector with collector, light guide, photomultiplier, and preamplifier mounted above objective lens.
Video system	Low-noise, wide-band video amplifier. Gamma adjustable: 0.3 / 0.5 / 1.0 / 1.5 / 3.0. Visual CRT 127 mm x 102 mm (5″ x 4″).	
Scan system	Picture frequency on visual CRT 0.5 / 1.0 / 2.0 sec/frame, on recording CRT 40 / 80 / 160 sec/frame. Reduced frame, line, and point scanning. y-modulation (except with reduced frame and point scanning). Scan shift $\pm 2\ \mu$m each in x and y. Scan rotation 90°.	
Recording system	Separate unit (mobile) with high-resolution CRT, optical system, and Polaroid cassette.	

Accessories

Recording equipment for sheet film and 70/35 mm roll film.
Scanning lift cartridge.
EDX scanning cartridge.
SE detector.

1



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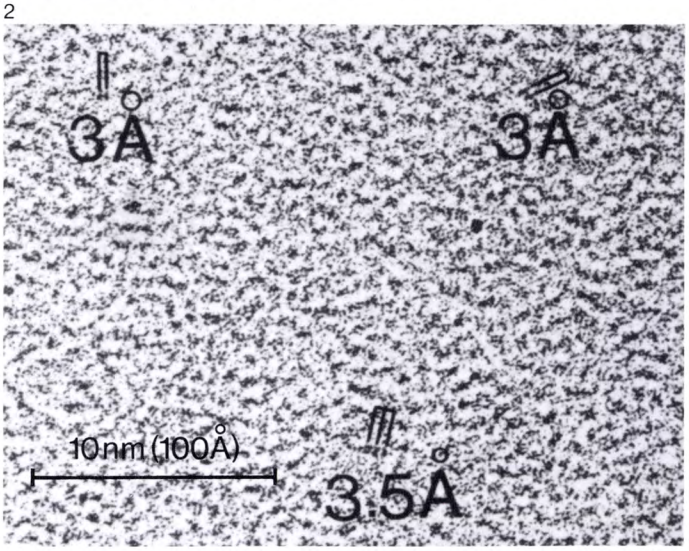

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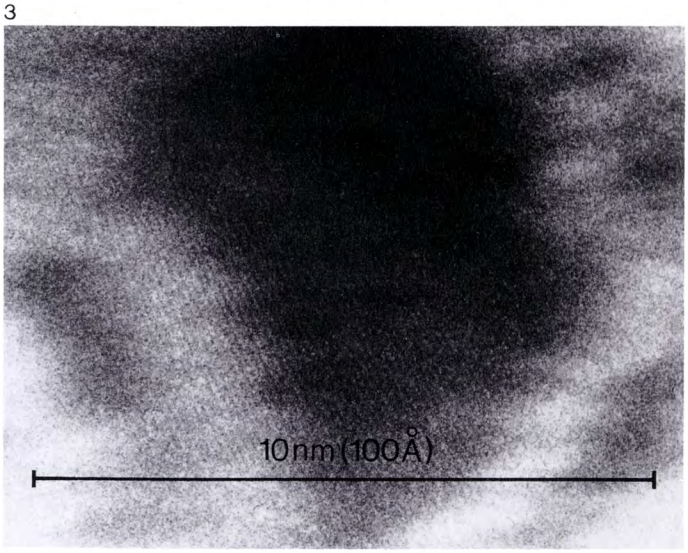

Fig. 1 **Gold monocrystal**
Lattice planes (220)*, 0.144 nm (1.44 Å) distances
Lattice planes (200)*, 0.204 nm (2.04 Å) distances
Electron-optical magnification 400 000 x
Total magnification 6 200 000 x
EM 10 C with ± 45° goniometer,
EDX equipment and hairpin filament, 100 kV.
Specimen: R. Wessicken, ETH Zürich.
Electron micrograph: R. Bauer, Carl Zeiss, Oberkochen.

* In parentheses: Miller's Indices of lattice planes

Fig. 2: **Carbon foil**
0.3 nm (3 Å) point-to-point resolution
Electron-optical magnification 200 000 x
Total magnification 3 200 000 x
Electron micrograph: Dr. E. Gütter, Carl Zeiss, Oberkochen.

Fig. 3: **Gold monocrystal**
Lattice planes (311)*, 0.123 nm (1.23 Å) distances
Electron-optical magnification 546 000 x
Total magnification 8 190 000 x
Electron micrograph: Dr. M. Menzel, Carl Zeiss, Oberkochen.