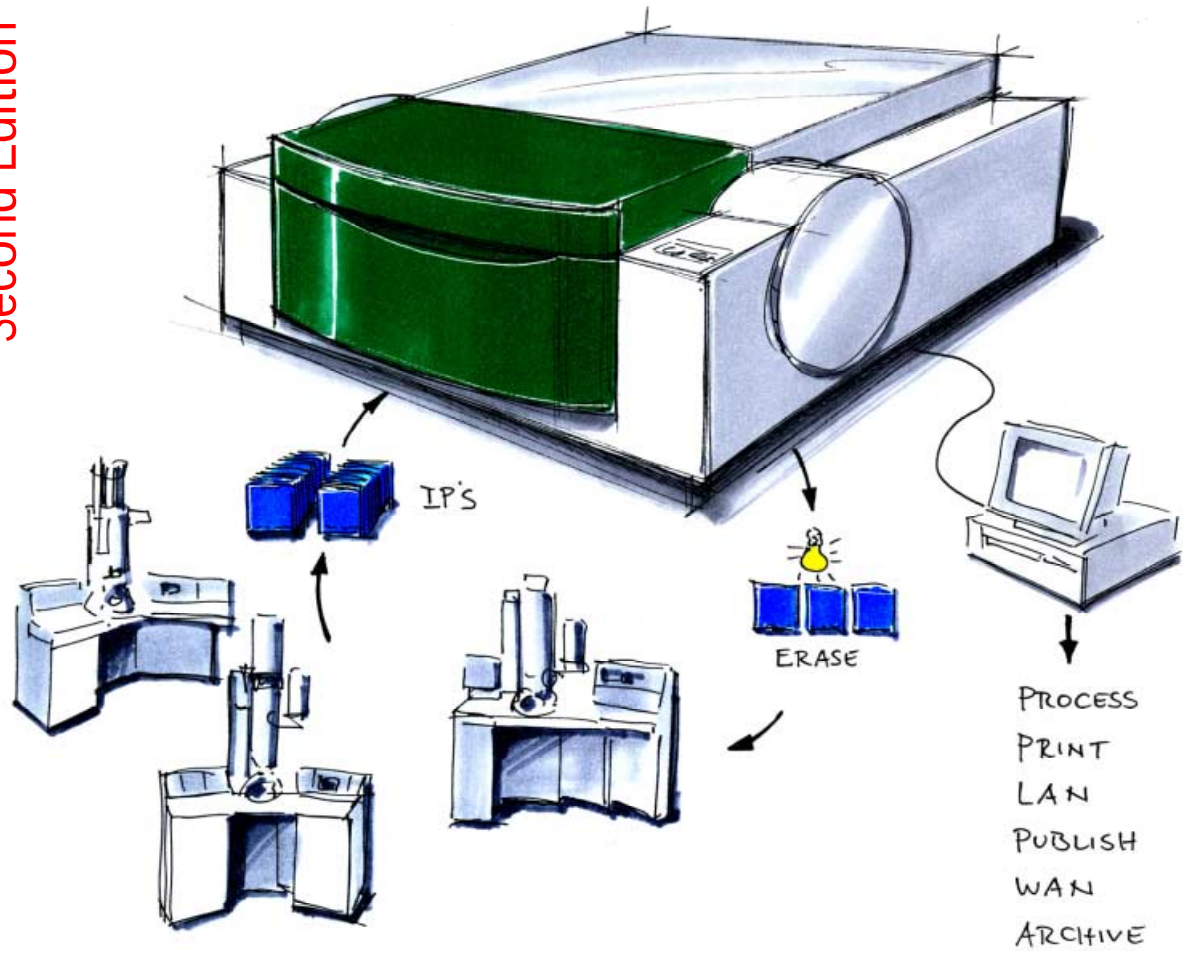
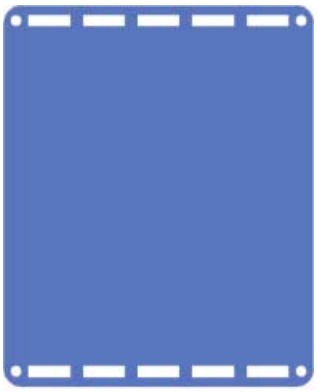
DITABIS Imaging Plate Technology for all Applications in Transmission Electron Microscopy

Second Edition



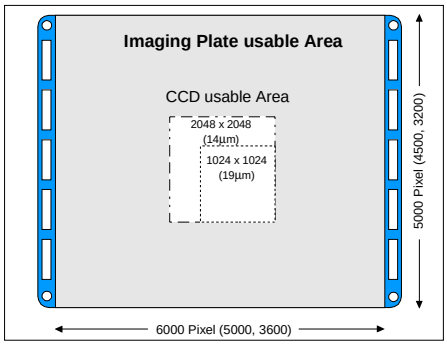
1 Introduction



Classical TEM Imaging using negative film materials has been partly replaced by CCD technologies in the past 10 years. While film still produces highest definition images on a big field of view it shows strong limitations in dynamics and linearity. CCD-cameras, which on one hand have the advantage of producing direct digital images, on the other hand only cover a limited area at moderate dynamic range. A third alternative, i.e. Digital Imaging Plate Technology, although known for some time, is now available and affordable for broad use and overcomes the limitations of both technologies: The results are high definition and digital images.

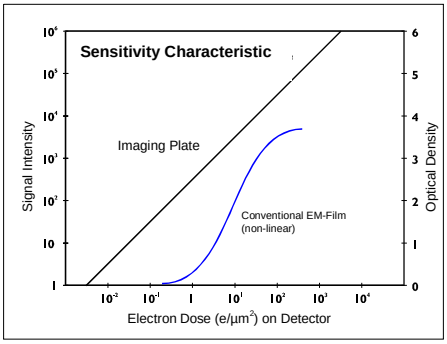
Imaging Plates are nearly ideal electron detectors that give you highest quality digital Images. DITABIS Imaging Plate Technology enhances your results with all the benefits of digital imaging. Exploring the advantages of the Imaging Plate Technology, best results are obtained in resolution, linearity, sensitivity, dynamic range and DQE.

2 Benefits of Imaging Plate Technology



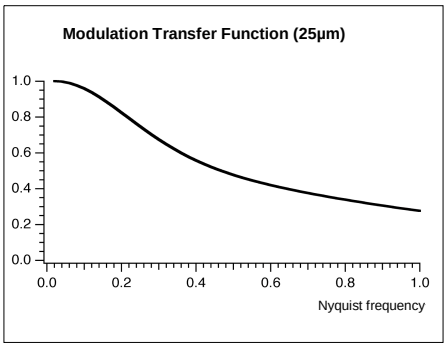
✓ Highest definition images on a big usable area

The Imaging Plate reader micron reads with a pixel size of 15µm up to 50µm, (different instrument versions available) and can use the full area of 80x90mm resulting in images with up to 6000x5000 Pixel. Compared with CCD cameras that have pixel sizes in the same range, the detected area of the Imaging Plate is about the tenfold of the CCD. The definition of the images is excellent. This is shown with the Point Spread Function (PSF), that shows the coupling of neighboring pixels. With the Imaging Plate, the information is highly localized within the pixel. This results in a high Modulation Transfer Function (MTF). At highest transmission frequency (one pixel bright, next dark) the modulation is still as high as 38% (25µm reader device).



✓ High dynamic range

The response of the Imaging Plate is linear to the applied electron dose in a broad dynamic range. The Imaging Plate reader micron digitizes the image data with 16 bit or 20 bit allowing a contrast of over $6*10^4$ or 10^6. Negative-film in comparison has only $1*10^2$ linear range. Thus more information can be extracted from one exposure, there is no need for multiple exposures.
Diffraction patterns of a widely varying range of intensities can be observed in a single exposure and displayed in one image.

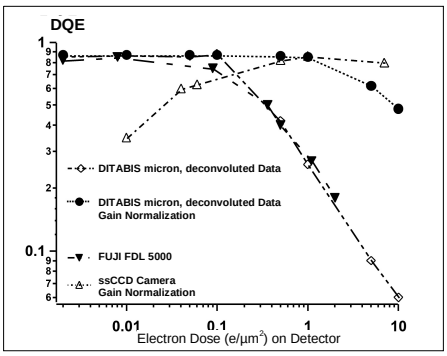


✓ Unrivalled sensitivity

Imaging Plates do not need a minimum dose like negative-film, nor is there a significant readout noise like with CCDs. This makes the Imaging Plate the ideal detector for low dose imaging applications. Observing most beam sensitive specimens the electron dose can be far reduced, compared with negative-film (IP is about ten times more sensitive than negative-film). At even lower doses usable images can be obtained, only the quantum noise increases. So you expand the usable dose range for sensitive samples.

✓ High DQE

The inherent amplification of the Imaging Plate and a newly designed detector system guarantees a high Detection Quantum Efficiency (DQE) for electrons, even at lowest signals. This means, that a high percentage of the electrons that hit the plate are detected, resulting in high sensitivity and low noise of the Imaging Plate detection system.



✓ Variable Pixel size

The latest member of DITABIS' Imaging Plate reader family, the micron vario features a selectable pixel size from 15 to 50µm in 8 steps. Besides the enhanced resolution, this allows to optimize the readout to your application, generating only as much data as you need and gives you flexibility for all your applications. There are also fixed pixel size instruments available for 17.5 and 25µm.

✓ True Linearity

The luminescence signal emitted from the plate while reading is directly proportional to the exciting electron dose. Therefore the data are directly numerically quantifiable. For comparison: The EM negative-film has a sigmoid nonlinear characteristic that makes quantification difficult. Due to the linear signal intensity of micron, quantifying the electron dose for diffraction patterns (EELS spectra and HREM images) is far more accurate than with negative-film.

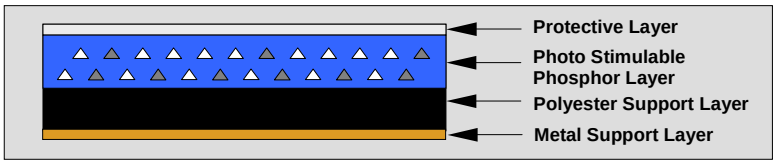
✓ Digital image data is instantly available

The DITABIS Imaging Technology is digital with no intermediate stages like chemical development. The data are digitized during the reading process and are available directly after readout. This gives you all advantages of the modern digital world: Visualization with zooming and contrast setting at the screen, printing on any PC printer, quantification and archiving on various media.

✓ Economy

Imaging Plate Technology is an economical way to produce high quality images. As the plate is reusable for up to 1000 times the cost per shot is very low. No chemicals or other darkroom equipment is needed, reducing waste and labor. The proprietary Imaging Plate Technology eliminates time needed for film processing and enlargement, freeing more productive time for your research. The images are instantly digitally available on your computer for evaluation and further processing of the data.
As the reader is not directly linked to the TEM, one micron instrument can serve multiple different TEMs. Regardless of which TEM you use the Imaging Plate fits to every microscope. In a typical lab with 100 shots per day the prime costs of a DITABIS reader are paid off in a year.

3 Imaging Plate Physics



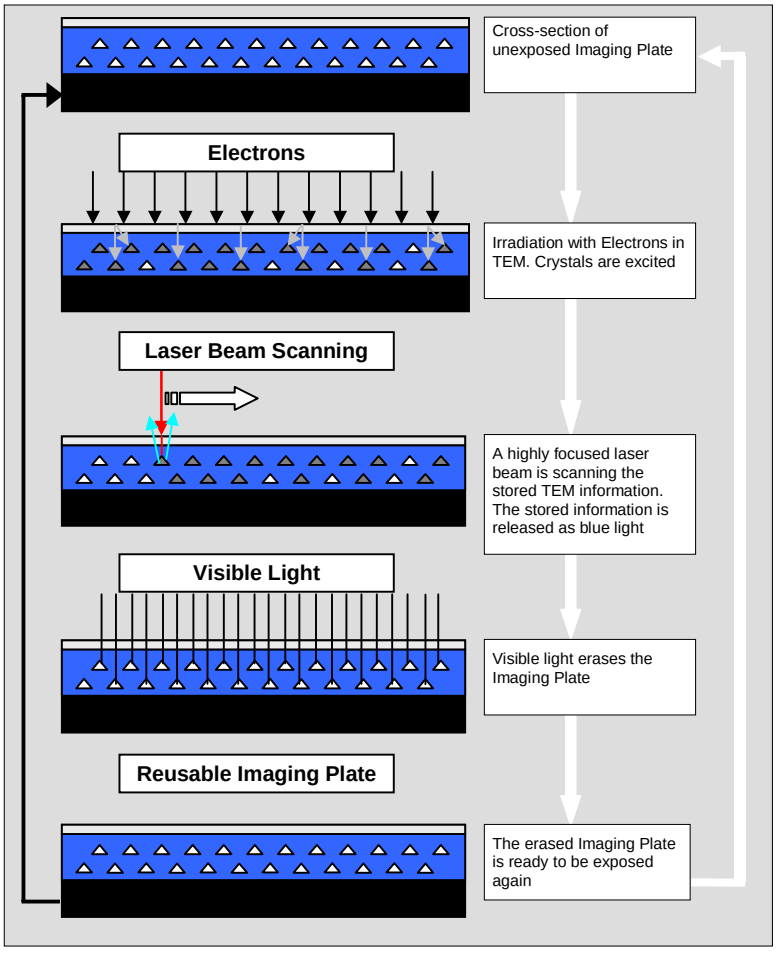
The Imaging Plate is a flexible electron detector, where an active layer of tiny crystals locally store high energetic radiation. The storage crystals are made from doted barium fluoro-bromide embedded in some blue colored resin. The electron irradiation excites the crystals in their luminescence center to a semi-stable state. The image information, formed by this excitation is stable for many hours and decays within days. By an illumination with red laser light, the crystals are excited again and stimulated to release the stored information as blue luminescence signal. The amount of blue light released depends on the first excitation with electrons and is a direct measure of the electron dose. As this is a physical process it is fully reversible without degradation, so the Imaging Plate can be reused many times. By exposing to white light for a period of 10 to 15 minutes all excitation is released and the plate is ready to be exposed again.

The active layer is protected by a thin polymer layer on top. It is supported by a polymer layer and a thin metal (antimagnetic) base that gives its mechanical stability. (see figure top right)

As the excitation is stored within the crystal luminescence centers the number of available storage cells is virtually unlimited. For this reason the plate is not saturated in a TEM. Only the readout device limits the dynamic range. During exposure the electron enters the plate and deposits its energy by exciting a large number of crystal centers. The lateral electron scattering is limited to a few micron so the information is highly localized. The blue color of the resin absorbs the red laser light while perfectly transmitting the blue luminescence signal so lateral scattering of the readout light is greatly reduced.

These features make the Imaging Plate an ideal electron detector:

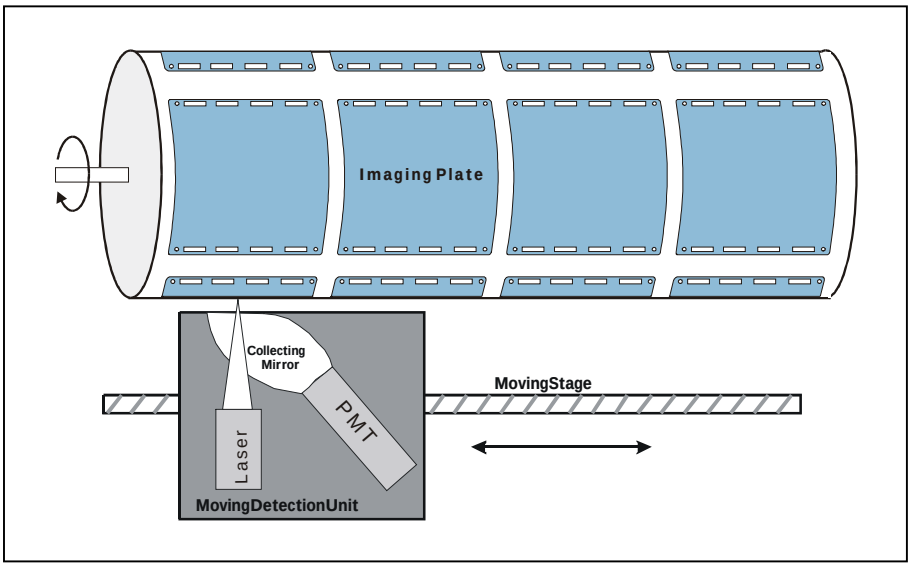
- ✓ High Sensitivity as one electron produces a number of photons. So virtually every single electron can be detected.
- ✓ High dynamic range as there is no saturation.
- ✓ Sharp Images as the information is highly localized (low crosstalk)
- ✓ Large detection area (80x90 mm).
- ✓ Reusable



4 DITABIS micron Operation Principle

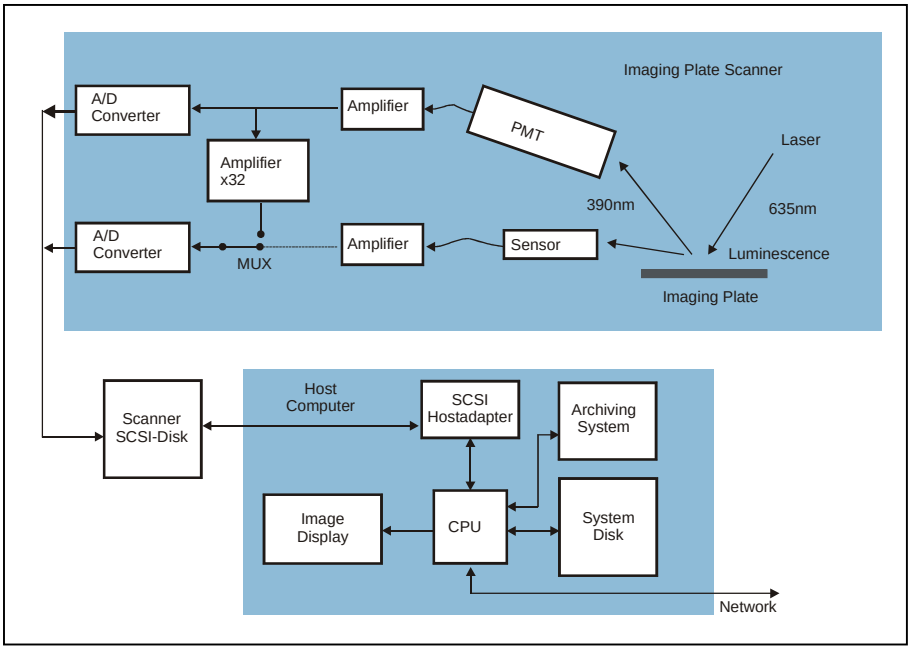
The DITABIS micron is an high-performance Imaging Plate readout system dedicated for TEM use. Unlike medical and biological applications where Imaging Plates are used too, TEM imaging requires small pixels, highest image quality and a high dynamic range.

The instrument employs a drum scanner layout. The Imaging Plates are fixed to the surface of a spinning drum and read out by a laser beam that moves along-side the drum. Up to 5 plates are scanned simultaneously along one slot around the drum surface in a continuos line (see figure right).



The released luminescence signal from the plates is collected with special high aperture mirror optics and detected with a Photo Multiplier Tube (PMT). The signal is amplified and converted to digital values with an analog to digital converter (ADC). The data are sent to a hard disk within the reader that collects the complete data of one scan. After that the image data are transmitted to the computer system and displayed on the monitor (see figure below).

The collected luminescence signals are converted to digital signals of 16 bits. This allows for 65000 shades of grey which is quite enough for normal TEM images. Optionally a second data channel can be used to expand the dynamic range to 1 million shades of grey.

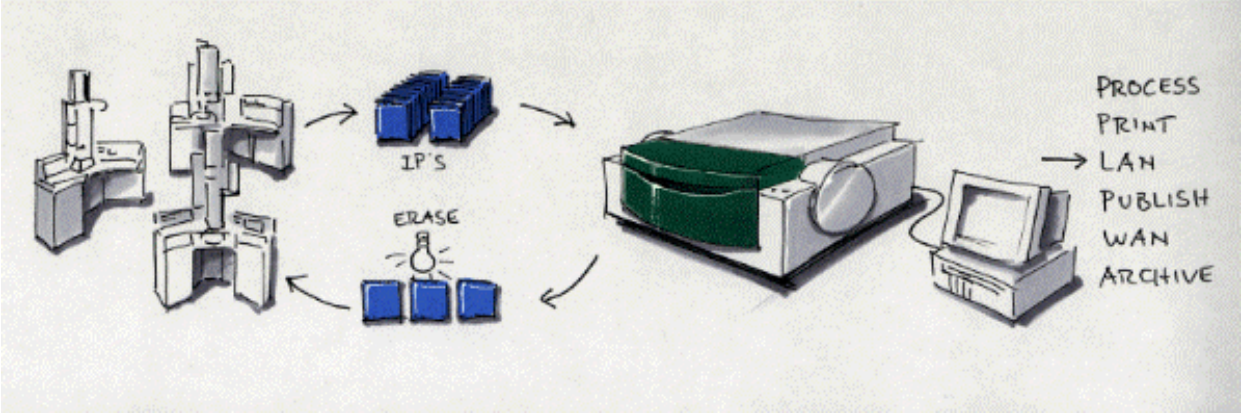


The instrument is built to meet the demanding needs of TEM imaging:

- ✓ The readout laser is highly focused to a spot diameter of about 5µm. The pixel-to-pixel distanceis 15µm to 50µm (see variable pixel size). Thus the high focus reduces the cross-talk between neighboring pixels to get maximum sharpness and a good MTF (Modulation Transfer Function, up to 38% at Nyquist for 25.0µm pixel).
- ✓ The collecting mirror has a high aperture so it is collecting a great portion of the light emitted. In combination with the sensitive Photo Multiplier detector an enormous sensitivity and DQE (Detection Quantum Efficiency, about 80%) is reached.
- ✓ The instrument has two synchronous data channels of 16 bit each. When operating in the High Dynamic mode the second channel converts an amplified version of the PMT signal. So two images are obtained one with high and one with lower gain (factor set to 32). The two images can be numerically combined to form an image with at least 20 bit data dynamic range (1:1 million).

5 How to Use Imaging Plates

Imaging Plates are used in TEM like negative film material. The plate is inserted into the TEM film holder and loaded to the TEM film camera. Unlike sheet film the unexposed Imaging Plate is not sensitive to light so it can be handled at ambient light. Imaging Plates are not hygroscopic so there is no need for desiccation.
Exposing in the TEM is straightforward. You can use the emulsion setting you are using for your films. But unlike film the Imaging Plate can also be exposed with much lower or much higher dose. When performing Low Dose applications the electron dose can be lowered to one tenth of the dose needed on film thus preserving beam sensitive specimens. For stable samples the dose can be increased to lower the electron noise.
When recording diffraction patterns the dose typically cannot be determined exactly but has to be estimated. Due to the high dynamics of the Imaging Plate it is very forgiving and nearly always will create perfect images on first trial.



After exposure, the Imaging Plate is unloaded from the TEM and transferred to the micron reader. This step has to be done in the dark because the exposed plate is light sensitive now. Unlike negative film, the plate is not very sensitive to light so a bright yellow save-light can be used.

For reading the Imaging Plates have to be fixed flatly onto the surface of the drum. This is done by a plate loading mechanism. Up to 20 plates can be loaded to the drum and scanned in one batch.
To load the imaging plates to the reader the plates are taken out of the TEM film holder and fed to the reader loading slots, four at a time. The automatic loading mechanism drags the plates into the instrument and clamps them to the drum. This is repeated until all twenty plates are loaded. It is possible to load any number of plates from 1 to 20.

Next the plates are scanned. The read-out process can be parameterized to optimize for special applications. Reading time depends on the number of plates loaded and is about 45 minutes for 20 plates (25.0µm instrument).
After reading the plates are unloaded again. This step can be done at ambient light. Before using the plates again they have to be erased. Erasing is performed on a light box that illuminates the plate with bright white light. The plates are put on top of the DITABIS eraser for about 15 minutes. Then the plates can be put back to the TEM film holders and camera for new exposure.

6 Handling Imaging Plates

The Imaging Plate has a very thin protective layer as the electrons must be able to penetrate it. Therefore the plate surface is vulnerable to damage. Only touch the plate at the edges, avoid to touch the surface even with gloves. Scratches on the surface will be visible in the images.
The lifetime of the plates is mainly limited by the mechanical degradation of the surface. By treating carefully plates can be re-used 1000 times.
The plates are flexible and relatively stable. Do not bend the plates strongly, however gentle bending to insert the plate in the film holder is allowed.

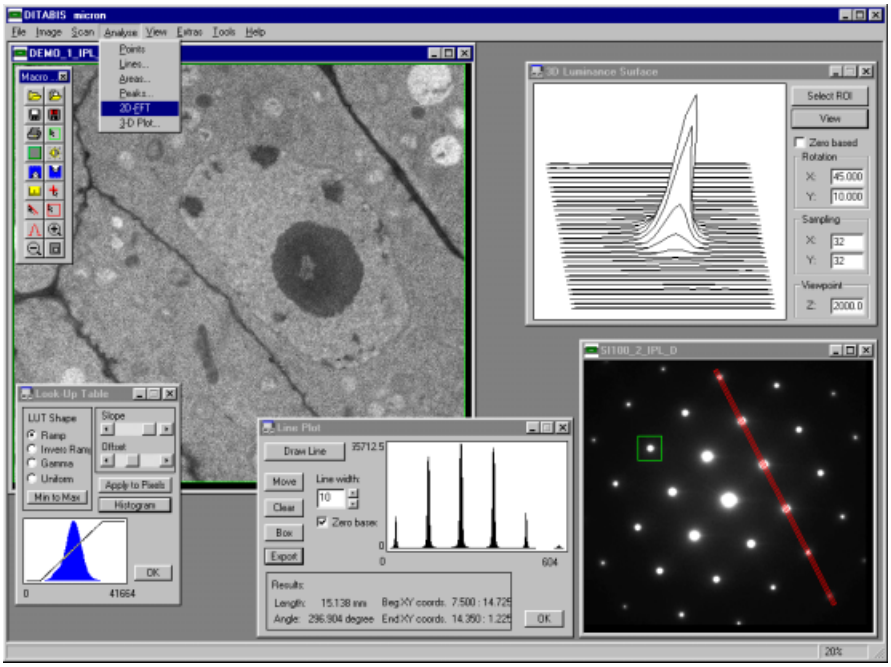
7 TEM Film Holders

The Imaging Plate comes in a format of 81x100mm (3,25"x4"; standard film dimensions). The reader is fixed to that format so no other plate format can be used. There are holders available for this format from all TEM manufacturers that fit to virtually every instrument type. For some rare older TEMs, DITABIS engineered own Imaging Plate holders.
Depending on the film holders you are using there are three variants of Imaging Plates available that fit your holders.

8 Software

The DITABIS micron Imaging Plate Reader is controlled by a PC. It comes with a software package for device control and image viewing and analysis.

The software runs on Windows 95/98/NT/2000/XP platforms.
The reader is directly linked to the computer which controls all functions. After readout the image files are available on the computer or network drive.



Reader control functions

- ✓ Loading and unloading plates
- ✓ Scan parameters in pre-defined and user definable parameter sets
- ✓ Full control of all scanning parameters: gain, pixel size, data channels
- ✓ User defined scanning area to restrict readout on the actual exposed area (reduce amount of data)
- ✓ Unique filename and comment for every image, based on common filename and comment input
- ✓ Import of microscope log files or text file to the header of each image

Viewing and handling images

- ✓ Preview of images allows quick handling of large images
- ✓ Comment and scanning parameters in header of image file for file identification
- ✓ Database function for quick search of images
- ✓ Look-Up Table to adjust contrast and brightness to view details in image
- ✓ Zoom functions
- ✓ Saving in proprietary format and export to standard and DTP formats
- ✓ Printing on PC printer

Image Processing

- ✓ Various filter functions, custom convolution filters
- ✓ Rotation of images
- ✓ Image Arithmetic between several images
- ✓ All functions can be restricted to a Region Of Interest
- ✓ Merge Files with different gain to high dynamic data set
- ✓ Change pixel size (binning) and average macro pixels
- ✓ Undo function for all image processing functions

Analyze functions

- ✓ Point measurements: intensity, distance and location
- ✓ Line measurements: line profile with lateral average, data export
- ✓ Area measurements: intensity, deviation, geometric data
- ✓ 2-dimensional FFT
- ✓ 3D-Plot of intensities
- ✓ Peak find function: Magnitude / Angle / Position / Shape

Interactive Help system

9 Data Format and Exports

The DITABIS software has a multitude of image analysis functions as described above. The functions provided are common image analysis functions that are general purpose and not dedicated to special TEM applications. The philosophy is to use the micron software to extract the data numerically (positions, magnitude, profiles, areas etc.), to export these data to a text file and finally to do the application specific processing by a spreadsheet program or proprietary software. In cases where this is not feasible, our image data format can be directly accessed by other special software either third party or self-written.

The DITABIS micron software uses a proprietary image data format. The format is capable of handling 16, 24 and 32 bit greyscale per pixel. DITABIS has chosen a proprietary format as there are no standard formats beyond 16 bit. The data format is open so there is a detailed description of the format available. This allows to import the files to several third party software packages (for example the analySIS software package from Soft Imaging System reads our format) as well as to access the files by special self-written software.

micron images are easily converted to 16 bit TIFF that can be read by most common image software packages. The DITABIS software also allows export to several 8 bit formats for publishing and printing. The High Dynamic images with 24 or 32 bit however cannot be converted without losses to standard formats as these formats are limited to 16 bit. Converting to 16 bit will reduce the dynamic range, which in most cases can be compensated by applying look-up-table functions.

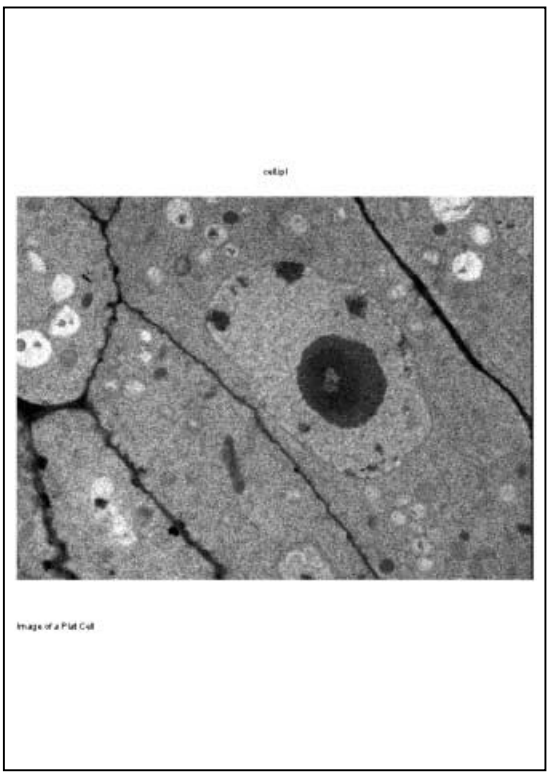
Plug-In for Adobe® PhotoShop

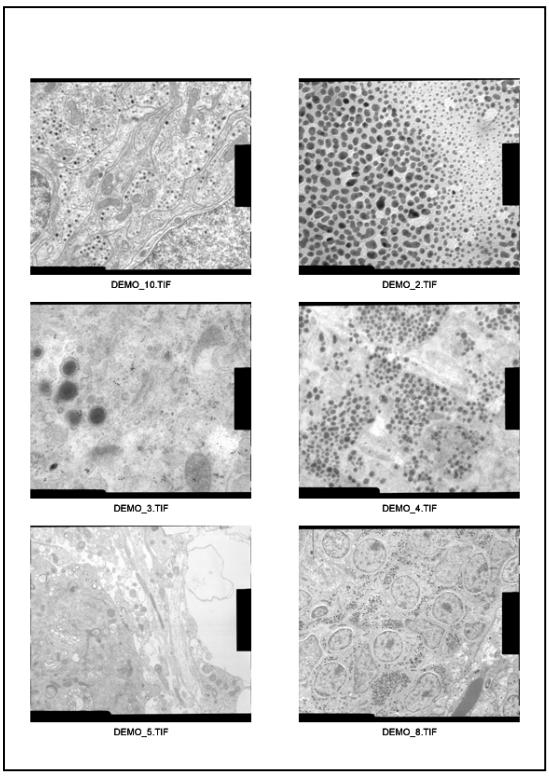
In order to allow professional publishing of your TEM images obtained with micron we now provide a Plug-In for Adobe® PhotoShop. With this plug-in the micron images can be opened directly as a 16 bit grey image. This allows to handle the micron images on every computer PhotoShop is installed on. When opening these in PhotoShop the 24 and 32 bit micron images are converted to 16 bit. The information from the file header is copied to the PhotoShop file info fields. From Photoshop the images can be saved as TIFF (8 or 16 bit) or JPEG (after conversion to 8 bit). The header information will be transfered to these formats.

PhotoShop as a sophisticated and user friendly software offers a wide variety of functions for processing and publishing images that exceed the functionality of the micron software.

- ✓ Various interactive contrast setting (Level, Auto-Level, Curves)
- ✓ Printing with interactive setting of print size
- ✓ Printout of image along with filename and comments.
- ✓ Annotation of the image with overlay of text and graphics with optional color.
- ✓ Printout of image galleries

The Plug-In operates with PhotoShop PC versions 5 to 7 and with the Mac versions 4 to 7.
It can be downloaded free of charge from www.ditabis.de.





10 Plate Tracing

Due to the physical circumstances that the TEM exposure number can not be imprinted to the imaging plate directly, both exposure number and TEM settings have to be transferred on an independent way to the corresponding image file.

'Plate Tracing' is a software-controlled method providing you with almost the same security as you are used from classic negative film or from CCD cameras – thus preventing any mismatch of TEM settings with the corresponding exposures.

Imaging plates are marked with a unique small barcode label permanently fixed on the edge of the imaging plate's active layer, just inside the usable area. This barcode is used to trace - under software control - the respective imaging plate through the complete imaging process, from loading to the TEM until reading it in the micron. Depending on your TEM there are different ways how the plates are traced during the process. For further information please contact us.

11 System Overview

The DITABIS micron System comprises the Imaging Plates, the device with the controlling computer and the DITABIS eraser. The PC runs the DITABIS operating software. For computer requirements please see chapter 12. Technical Information on the DITABIS eraser can be found in chapter 13.

As you can see in the figure above, the system does not require a great deal of space in a room that can be darkened.

12 DITABIS micron Readout Device

The Imaging Plate reader micron is a compact desktop device. The instrument comes with connection equipment to the computer (SCSI-adapter and cables). There are three instrument versions available: micron vario with selectable resolution from 15µm to 50µm, and two fixed-resolution devices with 25.0µm pixel size (micron 25µm) for general purpose applications and 17.5µm for higher resolution applications (micron 17.5µm).

Specifications

Data format	16 / 24 / 32 bit data format with comment and setting information in header							
Imaging Plate size	81x100 mm							
Effective area	80 x 90 mm							
Plates to read	1 to 20 plates per run							
A/D-conversion	2 channels of 16 bit at different gains, 20 bit combined							
Dynamic range	6 orders of magnitude at one scan, higher for multiple scans							
Pixel sizes (depending on instrument)	15µm (1)	17.5µm (1; 2)	20µm (1)	25µm (1; 3)	30µm (1)	35µm (1)	40µm (1)	50µm (1)
Number of pixels (X by Y)	6000 5333	5142 4571	4500 4000	3600 3200	3000 2666	2571 2285	2250 2000	1800 1600
File size per image	64MB	47MB	36MB	20MB	16MB	12MB	9MB	6MB
Readout time (per plate)	3min	2:70min	2:20min	2min	1:50min	1:30min	1:20min	1min
Power requirements	230V-50Hz; 120V-60Hz, 100W							
Dimensions	675 x 580 x 305 mm (W/D/H)							
Weight	60 kg							

(1) … 'micron vario' (2) … 'micron 17.5µm' (3) … 'micron 25µm'

Computer

All functions of the Imaging Plate reader micron are controlled by a computer running on Windows 98/NT/2000/XP and the DITABIS micron software. The computer usually is not included in the package but supplied locally (on request we also can supply a computer). Depending on the local computer environment the computer also may serve as the image server, archiving station and print server. It is not recommended to use the computer for multiple devices (third party devices).

For the computer any state of the art Windows PC will do. For interfacing with the instrument a free PCI slot for the SCSI-interface card (included) and one COM port is required. For storing and archiving images a big hard disk and a CD or DVD writer is recommended.

13 DITABIS Eraser

The DITABIS eraser was designed to erase the latent image information in the Imaging Plate that remains after reading. The plates are put face down on the trackage system that is designed to protect the plate surface.

The DITABIS eraser completes the system and ensures that the Imaging Plates are erased within 15 min and can be reused without damages.

If desk space is rare the eraser can be placed on top of the micron reader device.

Specifications

Surface	Acrylic glass pane with mounted trackage system
Phosphor surface	ca. 590 x 350 mm (max. 20 Imaging Plates)
Illumination	2 x 18 Watt, 5400 Kelvin (neon tubes)
Overall size	ca. 650 x 430 x 90 mm
Erasing time	10-15 min.

14 Digital Imaging Environment

If the computer is not in a network but operating as a stand alone system, the image files have to be stored on its local disk. As the hard disk will be filled soon you will need an archiving device. Most convenient is a CD Writer that also allows you to carry the data to any desktop computer for evaluation. It is also possible to use a tape streamer or a DVD writer. It is recommended to use an image database to keep track of the images.

If the computer is part of a network the data usually are placed directly on a network server. Also archiving and printing may be performed by the network servers. All desktop computers connected to the network have instant access to the image data as soon as the readout is completed.

Printing

When working with digital images image and data analysis will be done directly on the PC as the interactive representation of the images at the screen shows quite more information than a printout. But finally for documentation, posters or other publications processed images will be required to be printed out.

There are a multitude of printers available and you can use every printer that comes with a windows driver. Quality and cost of the printers varies widely and the choice of a printer is a matter of money and personal needs and taste.
For daily work we recommend to use a good laser printer (1200dpi) that is inexpensive and produces relatively good images. For scientific presentations we recommend a dye sublimation printer (expensive but highest quality) or an ink jet printer on photo paper (good quality).

Printer types

Printer type	Printer cost	Costs per print	Quality
Laser Printer 1200dpi	Moderate	Very low	Moderate, limited contrasts
Color Laser Printer	High	Low	Moderate, higher contrast
Ink Jet Printer on photo paper	Low	Moderate	Photo realistic
Dye sublimation Printer	High	High	Photo realistic (best)

15 Competitive Technologies

The Imaging Plate technology overcomes limitations of both EM negative film material and slow scan CCD-camera technology. The following table compares the characteristics of the Imaging Plate to film and CCD.

Imaging Plate versus Negative Film

	Imaging Plate	Negative Film Material
Usable Area	80 x 90 mm	80 x 95mm
Number of Pixels	Up to 6000 x 5000	The silver crystals of film are smaller than the IP pixel, but only give a digital information (black or white). Several crystals are needed for a gray pixel. Therefore the resulting resolution is comparable.
Pixel size	15µm to 50 µm variable	
Sensitivity	Over 10 times more sensitive than film	Standard negative film material needs a minimum dose to darken the crystals and at higher doses the negative-film gets saturated (sigmoid characte-ritics)
Dynamic range	6 Orders of magnitude and more, linear	10^2 linear and up to 10^3 non-linear
Quantification	Direct quantification	Complicated: needs scanning and calibration
Handling	Loading to TEM at day light No chemical development needed	Handling only in the dark. Needs wet chemical process for development and creates chemical waste
Economy	Investment comparable to darkroom equipment and optical scanner. Low running cost per shot	Moderate costs for film material and development, but heavily summarizing over years
Device concept	Off-line	Off-line

Imaging Plate versus slow scan CCD-camera

	Imaging Plate	slow scan CCD-camera
Usable Area	80 x 90 mm	About 24 x 24mm
Number of Pixels	Up to 6000 x 5000, variable	4096 x 4096 (extremely expensive) 2048 x 2048 1024 x 1024
Pricing	Price range between 1k and 2k CCD	Price depends very much on the size
Pixel size	15µm to 50µm variable	15µm to 25µm, fixed
Sharpness	Best sharpness and MTF	Cross-talk in scintillator limits MTF
Detection Quantum Efficiency (DQE)	High DQE (~90%)	DQE and MTF are linked. Systems with good MTF have poor DQE and vice versa
Sensitivity	Comparable but lower noise at low dose	High noise at low doses because of constant readout noise
Dynamic range:	6 Orders of magnitude and more, linear	4 Orders of magnitude
Quantification:	Direct quantification	Direct quantification
Handling	Easy	Simple
Economy	Investment comparable IP reader can serve multiple TEMs	Fixed to one TEM
Device concept	Off-line	On-line

16 Mail Demo Offer

The preceeding chapters describe the unrivalled advantages of DITABIS Imaging Plate technology. If you are interested in this promising technology you may want to have a test with your TEM and your specimen – as this is the best way to compare results.

We offer you a so-called Mail Demo: We send you some Imaging Plates. You do the exposures at your TEM and send the exposed plates back to us by express mail. We read out the plates on micron in our lab and send you the obtained image data on a CD.

✓ **Interested? Then contact us for the details at 'contact@ditabis.de'.**

A Demo CD is available on request that contains a demonstration version of the software along with all documentation and a library of images. This allows you to evaluate the software and obtain a live impression of how the images look on your computer or printout. Please call us or send an e-mail to contact@ditabis.de.

17 X-Ray Detection Using Imaging Plate Technology

Imaging Plates are sensitive to electrons, but also for α-, β-, and γ- as well as for X-rays. DITABIS' imaging plate reader micron is designed for electron detection in the TEM but can be used for detection of these radiations, too. Most interesting probably is the possibility to use the system for X-ray diffraction analysis.

If you intend to use the system for non-TEM imaging applications, please take the following into consideration:

- The format of our imaging plates is 80x100mm with a usable area of 80x90mm which cannot be changed.
- The Imaging Plates used are optimised for high spatial resolution needed for TEM imaging. The plates therefore have a quite thin active layer. Compared with the imaging plates generally used for X-ray these plates are somewhat less sensitive. As DITABIS' micron is a very sensitive reading device this usually is no problem. The plates are still much more sensitive than X-ray films.
- Normally other plate types can be used after proper modification for our instrument (punching). This increases the sensitivity by a factor of two but at the same time reduces the resolution to some extent.

18 Frequently Asked Questions

Q: Can Imaging Plates be used also at higher accelerating voltages?

A: Imaging Plates can be used in the range from 50 to 400kV. With accelerating Voltages above 300kV the efficiency goes down to some degree but is still useful.

Q: You state a re-use of Imaging Plates of 1000 times. Do the plates degenerate at the end of the lifetime?

A: The degeneration of the plate is mainly mechanical. This comprises possible degeneration of the plate surface (scratches) that might become visible in the image and mechanical wear out (bending of edges). The lifetime of the plate is mainly influenced by the care when handling it. The response of the plate (sensitivity, dynamic) is hardly degenerating. Finally, with routine use in the TEM the Imaging Plate could not be destroyed by electron dose.

Q: The plate is erased by reading. Is it possible to read it a second time?

A: Scanning reads out stored information of the plate but not completely. When the plate is read a second time about half of the signal intensity is read but the image looks the same. Multiple scans are useful to expand the dynamic range or to adapt the reader settings.

Q: How long may the plates be stored between exposure and readout?

A: Usually it is best to read the plates within two days. Especially Low Dose exposures shall be read within this period. High dose applications and diffraction patterns can be stored for up to one week without adverse effects.

Q: Do the plates need to be desiccated before loading to the TEM?

A: Imaging Plates are not hygroscopic and do not need to be desiccated. If desiccated however pumping time goes a little bit down.

Q: How big are the image data files?

A: This depends on the mode of reading and the pixel size. For 25µm standard images are about 20MB per image. High Dynamic Images are 30 or 40MB per image, depending on the mode of storage. For other resolutions (15/17.5/35/50µm) files sizes for standard images are 60/40/12/6MB.

Q: Is the micron software also available for MAC computers or LINUX?

A: No, MAC or LINUX versions are not available. But micron images can easily be imported by MAC programs for further image processing. For DITABIS' PhotoShop-Plug In see chapter 9.

Q: Is it possible to run copies of the software on other computers?

A: The software is licence protected with a hardware key. Additional licences may be bought to run on other installations. If the software is run without the licence key it is running in a demonstration mode. In this mode the software may be used for viewing and printing. Most functions are available except data export.

Q: Is the micron-mark and exposure number of the microscope recorded on the plate?

A: As the Imaging Plate is only sensitive to high energy radiation unfortunately this information is not recorded. But there is a way to connect this information to the image file, which then is stored in the images header (see chapter 10 above). If the magnification is recorded or known it is possible to place a micron mark as an image overlay within the micron software.

Q: Are there parts in the device that need service or are wearing out?

A: There are no parts that require regular service or have a limited lifetime in the instrument. Service only is required in case of possible instrument faults.

Q: How many plates can be loaded to my TEM?

A: This depends on the microscope. Generally as many plates fit into the magazine as film sheets.

Q: What is your software upgrade policy?

A: Generally software upgrades are free and can be downloaded from our web site.

Q: What are the differences between the DITABIS micron and the Fuji FDL 5000?

A: Both instruments use the same technology and have a similar performance at 25µm. The DITABIS instrument has a variable resolution down to 15µm, is considerably cheaper and uses a much smaller footprint (desktop instrument). The main difference besides this is the layout of the detector. The DITABIS micron is recording the data linear with a dynamic resolution of 20bit. The FDL 5000 has a logarithmic response with only 14 bit ADC. The DITABIS micron is directly controlled by the computer while the FDL is an off-line device.

Q: Is it possible to clean the plate surface?

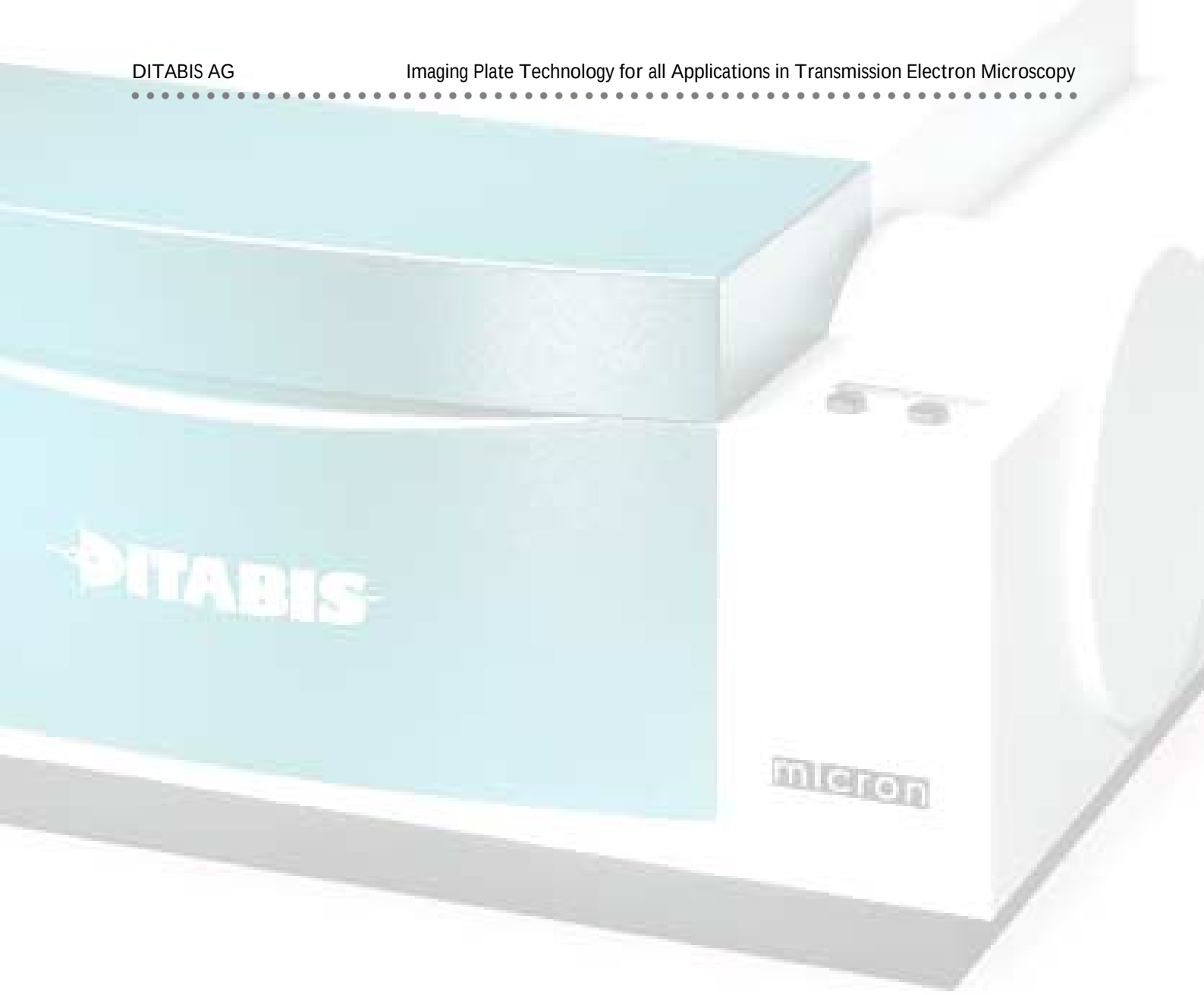
A: In case it is necessary you may clean the plate with pressurized air or a soft tissue. If this is not enough even some alcohol may be used. Be careful not to scratch the surface, even microscopic scratches may become visible in the image.

Q: What reader resolution type do you recommend for what application?

A: The micron vario is preferable if you have different applications and want the flexibility to optimize your readout. For the lower budget the 25.0µm standard device is recommended.

For the readout of diffraction patterns generally a lower resolution is sufficient. TEM images to view and printout are best scanned in a medium range (17.5 to 25µm). For high resolution applications and 3D reconstruction the highest resolution is required.
The main difference is the pixel size (resolution), but this has some impact on data output and read-out time. (See specifications table in chapter 12 above)

✓ **Do you have further questions? Do not hesitate to contact us at contact@ditabis.de.**



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