

When adding imaging capabilities to the laboratory, it is important to consider your goals. Oftentimes, images are just another step in the documentation process. For example, in a failure investigation it is useful to capture the image of a complete component before the sectioning process. In quality control, an image of the microstructure might be attached to a report as an indication of a pass/fail condition. Additional functionality of an imaging system might include a scale marker overlay and point-to-point or other operator interactive measurements. Fully automated image analysis includes detection of the features of interest based on grey level or color differences as well as morphological characteristics such as size and shape. Automated imaging applications are based on a fundamental series of steps shown in the table below. Depending on your goals, some or all of these steps may be utilized.

Imaging Steps	Description
Acquisition	Capture, load, or import an image
Clarification	Develop the necessary contrast and clarity for detecting the features of interest
Thresholding	Detect the features of interest
Binary Operations	Clean-up any detection discrepancies, categorize features, and overlay grids
Measurements	Conduct field or feature measurements
Data Analysis	Evaluate statistics and relevance of the measurements
Archive	Store images, annotations, and associated measurements in a database
Distribution	Printing or electronic distribution of images and results

OmniMet® Modular Digital Imaging System & Software Solution



OmniMet® Modular Imaging System & Software Solution is a line of five digital imaging systems including, from the simplest to the most fully featured system: OmniMet® Viewer; OmniMet® Capture Basic; OmniMet® Capture Advanced; OmniMet® Express; and OmniMet® Enterprise. The OmniMet's are available as software only for your installation on an appropriate workstation and as turnkey systems preinstalled on a workstation by Buehler. The OmniMet Modular Imaging Family is a flexible platform with five logical product levels that meet the majority of customer's needs from a software, hardware, camera, number of users and materials analysis perspective. Upgrades are available to the higher level systems. Additional software modules to specific material application can be added to customer need at various product levels. Higher models retain the features of lower models. The OmniMet® Capture Basic, Capture Advanced, Express and Enterprise models provide calibrated image capture for analog or digital video, image measurement and annotation, databasing of saved images and related measurements, as well as report generation capabilities. The OmniMet Viewer Module allows local area network (LAN) users to easily view stored images, databases, and measurements completed on any of the more advanced OmniMet Systems.

All OmniMet® Modular Imaging Systems are supplied fully configured with Microsoft® Windows® XP operating system and Office Professional 2007. Contact your Buehler representative for the current workstation specifications or download the minimum requirement workstation specifications from www.buehler.com. Select system accessories (cameras, printers, and monitors) for each model from the list below. All models include OmniMet® operations manual, OmniMet Mouse pad, and Buehler® Sum-Met™ The Science Behind Materials Preparation - A Guide to Materials Preparation and Analysis. The 1390-3002 NIST traceable Stage Micrometer in imperial and metric units is included in OmniMet Capture Basic and above level software and system products. Systems are for 115-220V/50-60Hz, single phase operation.

OmniMet® Modular Digital Imaging Systems

Systems*	Software**	
86-0008	86-2200	OmniMet® Viewer Module allows networked (LAN) users to view images, databases, measurements, and print reports completed on the more advanced OmniMet imaging systems. Requires purchase of at least one higher level OmniMet imaging system to capture images and generate test results.
86-0005	86-2100	OmniMet® Capture Basic – an application that offers digital or analog image capture, calibration and a series of prepared database templates for information and images. Manual interactive measurements include length, parallel width, area, curve (string length) and text annotation and scale bars. Create routine reports in Microsoft® Word with a single mouse click or select from a series of standard report templates.
86-0006	86-4100	OmniMet® Capture Advanced expands upon the capabilities of OmniMet® Capture Basic and displays all results in a results window. It incorporates an Interactive Measurement Module that adds radius, angle and counting to the basic measurements, and easy export of data to Microsoft® Excel for further data manipulation.

OmniMet® Modular Digital Imaging Systems

Systems* Software**

86-3001	87-3005	OmniMet® Express – is a simple “push button”, affordable image analysis solution for laboratories that need a variety of imaging capabilities but not the full functionality and flexibility of the OmniMet® Enterprise. A variety of metallographic analysis applications are available for purchase. Quantitative measurements are generated for the chosen application with professional report generation in a few mouse clicks.
86-1005	87-1002	OmniMet® Enterprise – is a full featured image analysis system at it’s highest capability and flexibility. The powerful operations builder is used by the operator to generate custom solutions to most metallographic measurement requirements. If the laboratory applications are complex or change often, this is the recommended solution. Full automated analysis can be achieved with accessory motorized stages and automated focusing options.

*All systems include workstation, keyboard and mouse. Camera, monitors, printers and microscopes sold separately. OmniMet Viewer cannot capture images or make measurements on images in the database therefore monitors and printers are compatible accessory purchases, not cameras or microscopes.

**Minimum computer specifications are listed on Buehler website <http://www.buehler.com>

Buehler Individual Software Modules & Features

Catalog Number	Description	Viewer†	Basic	Advanced	Express	Enterprise
DATABASE FUNCTIONALITY						
	Database Creation	●	●	●	●	●
	Database Interface	●	●	●	●	●
	Database Administration		●	●	●	●
IMAGE CONTROL						
	Load and Save	●	●	●	●	●
	Image Control (Brightness, Auto-White Balance, Rotate, Color Correction)	●	●	●	●	●
	Image Capture and Storage		●	●	●	●
	Image Presentation, Calibration & Annotation	●	●	●	●	●
	Digital Zoom	●	●	●	●	●
86-4140	Mosaic Multiple Image View	○	○	○	○	○
86-4130	3D Multi-Focal Images	○	○	○	○	○
DATA PRESENTATION						
	Report Data	○	○	●	●	●
	Report Generator (MS Office Programs)	●	●	●	●	●
	16 Report and Measure Bit planes				●	●
	Color Threshold (size, intensity)				●	●
HARDWARE						
	Motorized Stage Controller††		●	●	●	●
	Camera Interface (Twain, USB, EEE I394, Capture Cards, Direct X etc.)		●	●	●	●
BASIC MEASUREMENTS						
	Length	●	●	●	●	●
	Parallel Width	●	●	●	●	●
	Area	●	●	●	●	●
	Exterior Curve Length	●	●	●	●	●
	Circle Radius	○		●	●	●
	Angles	○		●	●	●
	Object Counting	○		●	●	●

● Included with package

○ Add on module (purchased separately)

† OmniMet® Viewer requires purchase of at least one higher level OmniMet® Imaging System

†† Automatic stages compatible only with OmniMet® version 9.0 Capture Basic level and above.

Buehler Individual Software Modules & Features

Catalog Number	Description	Viewer'	Basic	Advanced	Express	Enterprise
PREMIUM MODULES						
	Premium Measurement Modules	O		O	O	O
86-4110	OmniMet® Object Measurements					
86-4115	OmniMet® Weld Module					
86-4120	OmniMet® Hardness Module					
86-4125	OmniMet® Grain Size Module					
	Premium Analysis Modules				O	O
86-3310	Surface Roughness Assessment Module					
86-3350	Decarburization Depth					
86-3525	Cleanliness Assessment Module					
86-3600	E384 Indentation Measurement					
86-3700	Banding in Structures					
86-3850	Inclusion Rating					
ADVANCED MEASUREMENTS (consists of)						
86-4110	Area Fraction			O	O	O
	Perimeter			O	O	O
	Compactness			O	O	O
	Feret Diameter & Length			O	O	O
	Center of Gravity			O	O	O
	Number of Objects, Position, and Inclusion & Exclusion of Objects by Size			O	O	O
86-3200	Phase Area & Area Percent				O	●
86-3300	Coating Layer Thickness				O	●
86-3400	Nodularity in Cast Iron				O	●
86-3500	Particle Size Analysis				O	●
86-3550	Porosity Assessment				O	●
86-3750	Dendritic Arm Assessment				O	●
86-3100	Grain Size				O	●
ADVANCED FUNCTIONS						
	Preprogrammed Routines				●	●
86-3010	Custom Routines				O	O
	Routine Builder					●
OMNIMET WAN **						
86-3950	OmniMet WAN compatible (purchased separately) Available only in the USA and Canada at this time.	O	O	O	O	O

● Included with package

O Add on module (purchased separately)

* OmniMet® Viewer requires purchase of at least one higher level OmniMet® Imaging System

** Requires separate purchase of a standard SQL server by customer's IT personnel prior to installing the OmniMet® WAN software. OmniMet WAN software also requires a minimum purchase of one or more of the following products: OmniMet Capture Basic, Capture Advanced, Express or Enterprise.

Add On Modules:**Image Control Modules:**

86-4130 OmniMet® 3D Multi-Focal Images - This module is used to create an image with extended focus, out of several images on the same specimen that have different focal points. This is beneficial to remove edge rounding, or if the sample is uneven, to obtain a single focused image for analysis.

86-4140 OmniMet® Mosaic Multiple Image View - This module is used to stitch groups of images into one large, calibrated image on which it is possible to conduct measurements. This function is beneficial when the specimen does not fit into one field of view. Typical examples are of a long crack in metals or histological specimens where the zone of interest is greater than one field of view. This feature is useful for documenting the entire shape of parts and for putting the constructed image in reports to illustrate the area of interest and where measurements were taken with annotations. A motorized stage is not required.

Advanced Measurement Modules:

86-3050 Manual Interactive Line Draw - Automated determination of the length of lines for distance and thickness measurement. Operator superimposes lines over distances to be measured and OmniMet automatically detects and measures the lines.

86-3100 Grain Sizing - Provides automated grain size determination to give average grain size per field by the intercept method, and individual grain size by equivalent circular diameter method per ASTM E112. Additional processing identifies ALA grain size and duplex populations of grain size where appropriate to ASTM E930 and ASTM E1181 methodologies respectively. Meets ISO 643.

86-3200 Phase Area & Area Percent - Generates measurements of phase area and area percentage versus field of measurement for multiple phases per ASTM E562-89.

86-3300 Coating Layer Thickness - Automated measurement of the thickness of cross-sectioned coating and plating layers to ASTM B487-85. Statistics on the minimum, maximum and average thickness with standard deviation are given.

86-3400 Nodularity in Cast Iron - Automated analysis of graphite in cast iron to ASTM A247-98. Provides nodularity assessment for the degree of nodularization and size class count of graphite nodules in ductile cast iron as well as area percentage measurements of ferrite graphite and pearlite. For gray iron grades, graphite length is provided.

Advanced Measurement Modules:

86-3500 Particle Size Analysis - Automated detection and measurement of particles in the field of view to provide statistics on the size distribution and quantity of particles present. Can be used to quantify non-agglomerated particulates, precipitates, and powders.

86-3550 Porosity Assessment - Provides measurements of fine holes or pores in a material.

86-3750 Dendritic Arm Spacing - Provides measurements on the distance between dendrite arms in cast aluminum alloys following manual interactive drawing of measure lines across and perpendicular to the dendrite arms.

Advanced Functions:

86-3010 Custom Routine - One Buehler built routine specifically for the customer's sample. Customer supplies sample for design of routine specific to the required application.

Premium Modules:**Premium Measurement Modules (For Capture Advanced to Enterprise):**

86-4110 OmniMet® Object Measurements - Automated "single phase" image analysis for field of view measurements for image features and field characteristics: Area Fraction Area Position, Number of Objects, Perimeter, Compactness, Length, Feret Diameter, Center of Gravity, Inclusion and Exclusion Objects by Size.

86-4115 OmniMet® Weld Module - Includes three measurement tools used to determine effective weld depth with a circle radius or use the full measure method for effective weld depth, weld penetration, weld area and the angle between the main axis and the weld area.

86-4120 OmniMet® Hardness Module - Interactive Hardness Measurement Tool: Measure Vickers and Knoop indentations quickly and easily. Set the load force in gf or kgf and align the measure lines. Accurate HV/HK values are reported along with the diagonals.

86-4125 OmniMet® Grain Size Module - Interactive ASTM E112 Grain Size Measurements Tools: Measure grain size interactively using ASTM-E112 methodology. Linear intercept and circle intercept methods are both included.

Premium Analysis Modules (For Express to Enterprise):

86-3310 Surface Roughness Assessment Module - provides analysis of the roughness of surfaces according to the requirements of ASME N46.1-95.

Premium Modules (cont):

86-3350 Decarburization Depth - provides guidance on the determination of the depth of both total and partial decarburization according to the relative amount of free ferrite present in the microstructure according to the requirements of ASTM E1077-07.

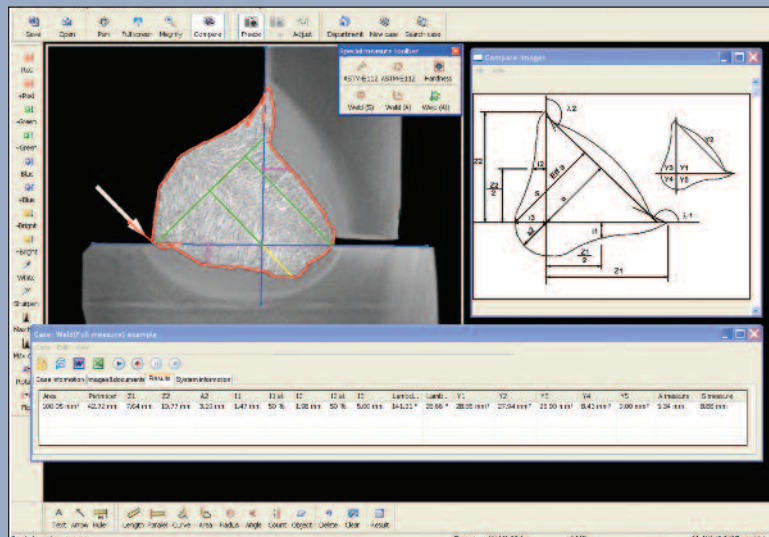
86-3525 Cleanliness Assessment Module - provides automatic cleanliness assessment of particles on filter paper according to the requirements of ISO 4406.

86-3600 E384-99 Indentation Measurement - Provides the capability to capture, detect, analyze and measure Knoop or Vickers indentations with built-in export to Microsoft® Excel for reporting of the hardness in HK, HV HRC and HRB as appropriate, data tables, hardness graphs and effective case depth.

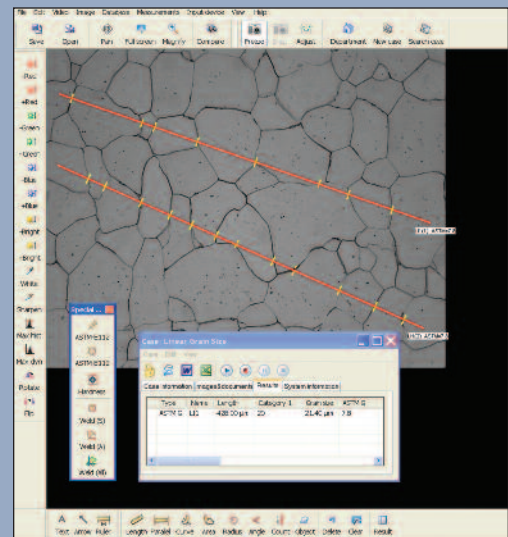
86-3700 Banding in Structures - Automated determination of the degree of microstructural banding to ASTM E1268-99. Provides information on the degree of orientation, the anisotropy index and mean feature spacing.

86-3850 Inclusion Rating - Automated determination by image analysis of statistical data for oxide and sulfide stringers in ferrous metals per ASTM E1245-03. Data generated includes area percent measures, mean free path distances and the average number of intercepts.

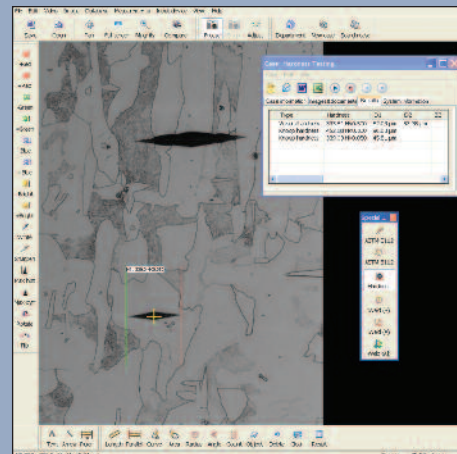
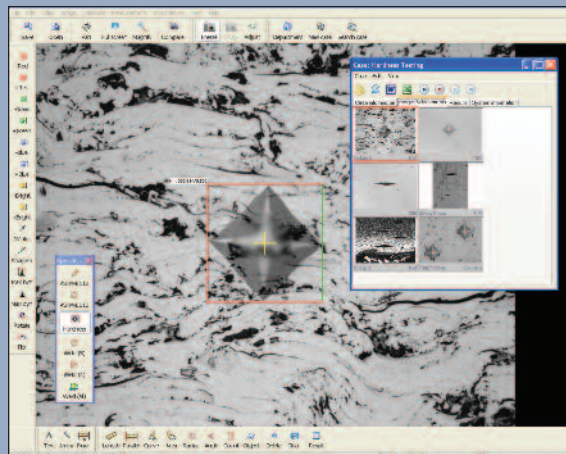
Modules:



Full Measure Method: Use the mouse to outline the weldment and draw two intersecting lines that follow the original base material. A series of measurements will be calculated as shown in the diagram above.



Linear Intercept Method: Draw a line across the image and mark each intersection. As additional lines are added to the image the grain size is recalculated.



Vickers (left) and Knoop (right) Indentations: Align the yellow crosshair and click on any of the four corners for Vickers indentations and the two longest points for Knoop indentations. The measurement box will automatically be generated. The lines can be further adjusted as needed. Any load force value (gf or kgf) can be entered in the user preferences.

Accessories

Monitors:

85-0142 Monitor, LCD with 1600 x 1200 display capability

Cameras:

86-0270 uEye 1465LE-C CMOS 1/2" color camera, 3.3 megapixel with up to 11fps at 2048 x 1536 resolution or 0.79 megapixel with up to 37fps at 1024 x 768 resolution (two by two-pixel binning), c-mount digital USB

86-0272 uEye 1450C CMOS 1/2" color camera, 1.92 megapixel with up to 18 fps at 1600 x 1200 resolution

86-0274 uEye 1460C CMOS 1/2" color camera, 3.15 megapixel with up to 11 fps at 2048 x 1024 resolution

86-0276 uEye 2230C CCD 1/3" color camera, .79 megapixel with up to 30 fps at 1024 x 768 resolution

86-0278 uEye 2240C CCD 1/2" color camera, 1.31 megapixel with up to 30 fps at 1024 x 768 resolution

86-0280 uEye 2250C CCD 0.55" color camera, 1.92 megapixel with up to 15 fps at 1280 x 1024 resolution

86-0282 Infinity X CMOS 1/2" color camera, up to 21 megapixel and 15 fps at 5120 x 4096 resolution

Full Page Data and Image Printers:

85-6020-160 Inkjet printer, color

85-6030-160 Laser printer, color

Miscellaneous Accessories:

86-5105 OmniMet® I/A Foot Pedal Switch

86-5110 OmniMet® Smart Card Reader, Internal

86-5115 OmniMet® Smart Card Reader, External

86-5120 OmniMet® Objective Bar Coding System

86-5125 OmniMet® Bar Code Scanner

1390-3002 Stage Micrometer, mm-Inch NIST Certified

48-8575 TechMet® Image Analysis Table

C-Mount Adapters:

0506-0200 0.32x – 0.8x Zoom C-mount adapter for Zeiss® Axiovert® 25CA and Axiovert® 40 MAT

0755-0200 C-mount Adapter for Buehler ViewMet® Microscope

0607-0176 C-mount Adapter for Buehler DigiMet® Microscope

1390-0302 1x C-Mount direct projection adapter for Buehler MicroMet® 5100 series microindentation hardness testers

1390-0354 Nikon 1X C-Mount adapter and projection lens for Nikon Optiphot® and Epiphot® models

1390-0355 Olympus PME3-CTV 0.6x C-Mount for PME3 microscopes

1390-0359 1x projection lens combination C-Mount adapter for Buehler MicroMet® 2100 series microindentation hardness testers

1390-0369 Nikon 1X C-Mount adapter and projection lens for Nikon Eclipse® models

1390-0385 C-Mount adapter for up to 2/3" (16.9mm) cameras on Olympus PMG3

1390-0390 Olympus U-TV 1x video port for Olympus BX-60

Video Copy Stand & Accessories

85-4000-160 Standard Illuminated Video Copy Stand

1390-0325 Zoom 7000 Macro Lens 18mm-108mm

1390-0329 TV Lens 16mm f 1.6 Iris

Motorized stage and focus packages (compatible only with OmniMet® Capture Basic version 9.0 and higher):

86-5405 Motorized stage and focus drive for Nikon Epiphot® 200/300, 100mm x 100mm stage scan size

86-5415 Motorized stage and focus drive for Olympus PMG3®, 100mm x 100mm stage scan size

86-5420 Motorized stage and focus drive for Zeiss Axiovert® 40MAT, 100mm x 100mm stage scan size

86-5435 Motorized stage and focus drive for Nikon Eclipse® ME600 and L150, 100mm x 100mm stage scan size

86-5440 Motorized stage and focus drive for Olympus BX60®, 100mm x 100mm stage scan size

86-5450 Motorized stage and focus drive for Buehler DigiMet® 2000 100mm x 100mm stage scan size

OmniMet® Model Upgrades for all version OmniMet 4.5 and higher only*:

86-1002 License Upgrade from OmniMet® Capture or Capture Basic System to OmniMet® Enterprise

86-1004 License upgrade from OmniMet® Archive or Capture Advanced System to OmniMet® Enterprise

86-1003 License upgrade from OmniMet® Express System to OmniMet® Enterprise

86-3002 License upgrade from OmniMet® Capture or Capture Basic System to OmniMet® Express

86-3004 License upgrade from OmniMet® Archive or Capture Advanced System to OmniMet® Express

86-4002 License upgrade from OmniMet® Capture or Capture Basic System to OmniMet® Capture Advanced

86-4201 License upgrade to OmniMet® Express

86-4202 License upgrade to OmniMet® Capture Basic

86-4203 License upgrade to OmniMet® Enterprise

86-4204 License upgrade to OmniMet® Capture Advanced

86-0002 Workstation Upgrade

* Customer license number and site ID MUST BE INCLUDED with purchase order. Training is not included but is a strongly recommended accessory purchase.

Training:

86-2000-000 On-site installation by Buehler representative†

86-2000-001 One day on-site training†

86-2000-002 Two day on-site training (for Enterprise System only)†

† Not available in all worldwide locations