



HEXAGON

ERDAS IMAGINE

Product Description

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Product Summary

ERDAS IMAGINE®, the world's leading geospatial data authoring system, incorporates geospatial image processing and analysis, remote sensing, and GIS capabilities into a single powerful, convenient package. ERDAS IMAGINE enables you to easily create value-added products such as 2D and 3D images, 3D flythrough movies, and cartographic-quality map compositions from geospatial data.

Running natively in 64-bit and featuring a ribbon interface and custom workflow tabs so you can consolidate your favorite tools, ERDAS IMAGINE makes it fast and easy to access what you need to work efficiently and productively. ERDAS IMAGINE provides advanced tools for parallel batch processing, spatial modeling, map production, mosaicking, change detection, and machine learning. In addition, ERDAS IMAGINE incorporates the ERDAS ER Mapper algorithms, includes many GeoMedia utilities, and implements OGC standards.

Available in three different product tiers, ERDAS IMAGINE provides an ideal solution for a broad range of organizations and projects so anyone can achieve superior results.

Click on a link below for quick navigation:

- [Feature Comparison Chart](#)
- [IMAGINE Essentials](#)
- [IMAGINE Advantage](#)
- [IMAGINE Professional](#)
- [IMAGINE Photogrammetry](#)
- [IMAGINE Photogrammetry Add-Ons](#)

Feature Comparison Chart

Functionality	Essentials	Advantage	Professional
Geographically connect files across Views	•	•	•
SIPS Image Chain display	•	•	•
Compress imagery into MrSID, ECW and JPEG2000 formats	•	•	•
Compatible with more than 200 image and GIS data formats	•	•	•
Rapidly display and roam web services, WMS, WCS, ECWP	•	•	•
Rapidly display and roam through imagery, features and LiDAR	•	•	•
Create and edit shapefiles	•	•	•
Create and print maps in more than 1000 different projected coordinate systems	•	•	•
Display and analyze data directly from Esri Geodatabases, Oracle®, and online services	•	•	•
2D, 3D, and profile viewing of point clouds	•	•	•
Virtual mosaic of imagery	•	•	•

Polynomial-based rectification and reprojection of images	•	•	•
Batch processing	•	•	•
Easytrace ribbon, centerline, and boundary feature capture	•	•	•
Simple unsupervised image classification	•	•	•
Execute existing spatial models	•	•	•
Parallel batch processing		•	•
Point cloud editing in 2D and profile view		•	•
RGB encode, filter, merge and split point cloud data		•	•
Orthorectify imagery		•	•
Advanced image mosaic into a single image or image tiles		•	•
Interpolate surfaces with more than 50 million points		•	•
Spatial, radiometric and spectral enhancement, including pan sharpening		•	•
Additional unsupervised image classification methods		•	•
Raster to Vector and Vector to Raster Conversion		•	•
Analyze information in radar (SAR) images		•	•
Classification of point cloud data			•
Advanced multispectral image classification and segmentation			•
Graphical spatial model editing			•
Extract information from hyperspectral imagery			•
Perform machine and deep learning classification			•
Execute ArcPy scripts			•

IMAGINE Essentials

The culmination of more than 40 years of geospatial research and software development, the ERDAS IMAGINE suite of software is the most powerful and carefully designed product for creating, visualizing, geocorrecting, reprojecting, and compressing geospatial data.

IMAGINE Essentials®, the entry-level tier of ERDAS IMAGINE, offers the basic tools for image analysis, geospatial mapping, visualization, enhancement, and geocorrection, including enterprise-enabled access to OGC® web services and relational databases such as ArcGIS for Server and Oracle Spatial.

At the heart of IMAGINE Essentials is the 2D View, which provides 64-bit multi-threaded, high-performance interactive display and processing. The 2D View displays, combines, geographically links, analyzes, and presents imagery, point cloud, and feature data from files or OGC web services in multiple geographic views and maps to facilitate understanding of geographic phenomena.

Key Features

Data Types and Integration

- Use over 100 data types in their native format without conversion
- Import / export to hundreds of satellite, GIS, point data, and image file formats

Easy to Learn and Use

- Intuitive ribbon user interface
- Extensive use of context sensitive galleries for styling, template selection and image enhancement
- Common interface used throughout the ERDAS IMAGINE suite and GeoMedia®
- Context-sensitive menu display
- Dock, undock, and collapse elements in the user interface, including Views
- Customize the layout and style, create custom workflows, and add quick access buttons
- Bubble help and hypertext-linked help options
- Extensive Help, including access to the Producer Field Guide (formerly the *ERDAS Field Guide*), and various user and workflow guides searchable by keyword or by common workflow
- Hundreds of user definable preferences with keyword search and tracking of changes to defaults
- Optional support for the familiar Windows® file chooser as well as the ability to drag-and-drop from Windows Explorer
- Manage and access project data through the Retriever
- Save and share sessions, layouts, and shoeboxes
- AutoSave

Data Visualization

The ERDAS IMAGINE 2D View efficiently displays, combines, analyzes, and presents geographic data:

- Drag-and-drop data loading to the View
- International 2-byte fonts supported
- Overlay multiple feature, point cloud and image data types

- Turn layers, files, or classes on or off
- Treat multiple image layers as
 - Discrete, independent files
 - Virtual mosaic
 - Virtual layer stack
- Arrange layers index
- Multi-view linking methods
 - Geographical
 - Spectral
 - Real-time roam and rotation locking
- User-defined projection system for data display
- Base map as aerial maps or hybrid layer available from Bing® (license key required), OpenStreetMap, Hexagon Content Program (licensing required) or user-defined
- Dynamic roam using horizontal, vertical, or user-defined paths
- Snail Trail to track roam activity
- Fractional zoom, rectangle zoom, pyramid level zoom, continuous zoom and continuous rotate
- Zoom to a specific scale
- Zoom to layer extent
- Drive to user-defined location
- Font-to-symbol utility
- User-selectable resampling techniques
 - Nearest Neighbor
 - Bilinear Interpolation
 - Cubic Convolution
 - Bicubic Spline
 - LaGrange
- Rotation of data to user-defined, pre-defined, sensor look angle (Up is Up), Grid or True North
- Interactive north arrow and scale bar
- On-the-fly reprojection of optical imagery, RADAR, feature, and point cloud data
- Print using Map Composer templates
- Area of Interest (AOI) definition
- Use AOI layers for masking
- Image histogram modification
 - Automatic statistics calculation option
 - Simple brightness/contrast tools
 - Piecewise linear adjustments
 - Photography enhancements

- Standard, statistically based automatic lookup tables (LUTs) / dynamic range adjustment
- SIPS-based Image Chain display and manipulation, including Tonal Transfer Curves (TTC) and MTFC
- Full graphical histogram contrast adjustment tool
- Save and reload multiple LUTs
- Window extent statistics
 - Optimize available screen contrast
 - Quickly calculate statistics for current viewer extent
- Pseudo color table editing for thematic layers
 - Define new attribute fields
 - Toggle thematic layer classes on or off individually
 - Apply color patches
 - Statistical report generation
 - Attribute-based criteria selection and display
 - Point-and-click attribute selection
- Recode class values
- Filtering for thematic images (Neighborhood Analysis)
- Filtering for continuous images
 - Standard smoothing, edge enhancement, and edge detection filters
 - Custom filter editor and librarian
 - SIPS Sharpness libraries (MTFC)
- Interpolation methods for editing image regions
- General raster editing tools
- Visual change detection between any data types
 - Ribbonized for ease of use
 - Swipe
 - Blend
 - Flicker
 - Interactive direction swipe
 - Automatic blend and swipe with fine controls over direction and speed
 - Detailed layer control
 - Multi-layer “play through” temporal animation
- Inquire cursor and inquire box
 - MGRS (and USNG), Lat/Lon, file and map coordinate display and entry
 - Support for an elevation source
 - Drive-to capability
 - Dockable at cursor location
 - Display neighborhood of pixel values
 - Display values from multiple layers

- Measurement tool
 - Point locations
 - Lengths, bearings, and angles
 - Polygonal areas and perimeters
 - Cylinder lying on ground
 - Ellipse
 - Region grow
 - Height from layover, shadow tip, or shadow base
 - Zenith and elevation
 - Control of units and coordinate systems for reporting
 - Write measurements directly to vector attribute or on-screen annotation
- Profile tools
 - Spectral profile for hyperspectral analysis
 - Spectral reference libraries
 - Spatial profile for cross-section, surface distance, and line-of-sight analysis
 - Surface profile for rapid isometric surface views
 - Point cloud profile and measurement
 - Point Cloud Tools
 - Direct read of LAS in planimetric, 3D, and profile
 - Auto-roam along a profile
 - Measure in 2D and profile view
 - View by classification, elevation, return, RGBN, and intensity
 - Define colors and gradients
 - Link 2D and 3D views, clip to 2D extent and follow 2D
 - 3D terrain offset
 - Change z-scale and point size
 - 3D views in Perspective Mode or as a TIN surface
- Preview and Open Raster as Image Chain
 - Full control over the display properties of spatial model previews
 - Images default to an appropriate display mode (e.g. Relief for DEM data)
 - Switch seamlessly between display modes for an open image / preview
 - Multispectral
 - SIPS Multispectral
 - Panchromatic
 - SIPS Panchromatic
 - Pseudo Color
 - SIPS Pseudo Color
 - Thematic
 - Relief
 - Radar (requires IMAGINE SAR Feature license)



- Integrated Stretch Panel for defining radiometric enhancements
- DRA (Live Update) works with all Stretch types
- Gallery of pre-defined color ramps for quickly colorizing imagery
- Assists in visual interpretation of thermal imagery, SAR, relief shading, etc.
- Instantaneous preview of the effects of each color ramp in the Gallery
- Preserve color balance option
- Save results of Image Chain styling to an output image file
- Add Image Chains to Map Views and print Map Compositions, Send to PowerPoint, Word and JPEG
- Annotation layers
 - Manually digitize objects
 - Objects include text, polylines, rectangles, ellipses, polygons, symbols, arcs, and points
 - Style editor
 - Freehand (streaming) polyline editor
 - Lock annotation rotation angle
 - Text annotation can be defined in Map or Paper units
 - Assisted digitizing of boundaries, ribbons and center-lines using radiometric boundaries with hotkeys to switch between collection modes
 - GeoPoint labeling
- Vector layers
 - Esri Geodatabase, Shapefile, and ArcSDE® vector data models
 - GeoPackage, PostGIS and SQL Server read and query access
 - Display and present as points, polygons, polylines, tics, or in combination
 - Select features by point-and-click, regional selection, or attribute-based criteria
 - Style editor, including attribute-based symbolization
 - Display and print all or selected features only
 - Zoom to selected feature(s)
- Smart Control
 - Provides View controls embedded within the View itself. Useful if Views have been undocked and moved to other screens
 - Hides when the mouse cursor moves away from it
 - Built-in controls provide
 - Zoom in / out buttons
 - Scale slider
 - Rotate
 - Pan North/South and East/West by half a screen
 - Other buttons are customizable
 - Defaults are provided for common actions such as Pan Hand, Fit to Frame, Inquire Cursor, etc. Customize the list from any of the standard Ribbon interface commands

Image Analyst Features

- Multiple Views embedded into a single dialog for easy screen management
- Dedicated “overview” linked window, ideal for dual monitor configurations
- Multi-threaded for multi-CPU support
- Thumbwheels for brightness, contrast, zoom, and rotation control
- Galleries for radiometric enhancement and filtering with real-time whole image preview
- Percentage lookup table (ideal for 16-bit data such as Sentinel-2, Landsat 8, QuickBird, WorldView, etc.)
- Dynamic Range Adjustment (DRA) with user-definable clipping parameters
- Snail Trails
- Flicker-free raster and vector auto-roaming with regular or user-defined search paths
- Contextual magnifier (lens magnifier) and in-set viewer with in-view independent file selection
- Auto-rotate images
 - Grid north
 - True north
 - Sensor look angle (up is up)
 - Common rotation angles (45°, 90°, etc.)
- Lock rotation angles with overviews
- Image chipping, including retaining NITF metadata (requires additional licensing)
- Snapshot view content to standard image format
- Copy view content to Microsoft® Windows clipboard
- Feature Counting Tool with user-customizable categories and icons
- MSP integration (via optional Defense Productivity Module)
- Intelligent (sensor-specific) band combination selectors
- Session saving and loading
- Jump roam to a user-selected location from overview
- Research and negation tools for multi-image change detection
- Automatic application of MTFC kernels
- SIPS Image Chains automatically apply sensor-appropriate DRA, Sharpness, TTC, etc.
- Spectral Mixer tool for predefined weighted-band combinations
- Metadata insertion tool for map reports (NITF)
- Advanced text layout including text wrapping and in-place editing
- Option to keep text horizontal to screen
- Support for recent items in the Style gallery
- Use Microsoft Windows fonts
- Manipulate all map template elements
- Automatically insert country map
- Multiple views in a map report template
- Automatically update scale bars, north arrow, etc.

- Advanced GeoPoint labelling tool
- Send view or map report to Microsoft PowerPoint®, Word, JPEG or Geospatial PDF
- IMAGINE Photogrammetry Block File read

Raster Data Handling

- Direct-write everywhere using raster DLLs for IMG, ECW, JPEG2000, ERS, PNG, NITF and TIFF (including GeoTIFF and TIFF World).
- Create an unlimited number of ECW and JPEG2000 compressed images from input images up to 250 gigapixels with either export or direct-write; increase size limits with IMAGINE Advantage and IMAGINE Professional
- Create an unlimited number of MrSID images up to 50 MB with export; increase MrSID compression capabilities with the IMAGINE MrSID Encoders
- Enhanced TIFF, BigTIFF and JPEG file reading and creation
- Support for terabyte-sized images
- DLL extendible
- Default format filtering including “All file-based Rasters” option
- Multi-threaded pyramid layer and statistics generation for rapid and visually accurate image zooming
- Extensive read/write raster format support

Vector Data Handling

Extensive tools for shapefile and coverage data rapid viewing, creation, and editing in the viewer.

- ArcSDE and Enterprise Geodatabase vector clients
- PostGIS and SQL Server database vector client
- GeoPackage database vector client
- Esri shapefile and simple personal geodatabase read/write/create
- Create points, arcs, polygons, and tics
- Digitize and split existing polygons with shared boundaries
- Reshape existing feature
- Create and enter attribute data
- Cut, copy, paste, and delete
- Unlimited undo levels
- User-defined symbolization
- Simple Windows context-based style galleries
- Node and arc snapping
- Split and recombine arcs
- Specify weed and grain tolerance
- Arc reshaping
- Drag and drop individual arc vertices or arc segments
- Continuous, “hands-free” roam while editing
- Automatic feature extraction

- Heads-up digitizing in viewer
- Data reprojection
- Add hyperlinks to Microsoft Windows applications or web pages from vector features
- Subset shapefile
- Default format filtering including “All file-based Vector formats” option

OGC Data Handling

Consume OGC services.

- WMS 1.1.1, WMS 1.3.0, WCS 1.0.0, WCS 1.1.0, WCS 1.1.1, WMTS 1.0.0, LTS 1.1.1

Point Cloud Data Handling

Rapidly view and import point cloud data.

- Direct read of LAS and LAZ point clouds
- Direct read MrSID compressed point clouds
- Direct read of compressed HPC and UDS point clouds
- Direct read of BPF point clouds
- Streaming HPCP and UDSP from data servers
- Uses pyramid layers and spatial indexing for rapid viewing
- Import from multiple point formats
- Measure in 2D and profile view
- Measure in 3D
 - Point
 - Line
 - To Surface
- Style by Classification, elevation, return, RGBN, and intensity
- Define colors and gradients using the style gallery
- Link 2D and 3D views, clip to 2D extent and follow 2D
- 3D terrain offset
- Change z-scale and point size
- Box and polyline profile
- Auto roam along a profile
- Define roam profile from a vector file (shapefile or AOI)
- Select stretching options when displaying by RGBN or Intensity
- Use Elevation color ramp for RGBN encoding
- View metadata of points

File Management

- Retriever provides quick drag and drop access to data in project

- XML based; easy to create and modify
- Can open quickly with a saved session or close quickly to open more viewing space
- Access ERDAS APOLLO Catalog and other OGC-compliant web services
- Access raster data in S3 buckets
- Launch spatial models
- Automatically add names of newly created result files
- Geocoding services available with a Bing key

Batch Wizard Processing

- Serial processing of many thousands of files (parallel processing available in IMAGINE Advantage)
- Record and repeat common functions
- Automation to provide multi-file input/output support
- Wildcard selection of files
- Drag-and-drop data loading
- Image Command tool for changing projection, map information and other image metadata in batch while maintaining each image's geographic extents

Geometric Correction

Intuitive tools for georeferencing raw image data.

- Automatic geometric correction from valid ephemeris information
- Manual georeferencing can be applied to any raster data
 - Affine
 - Polynomial (first to tenth order)
 - Rubber sheeting (linear and non-linear)
 - Reprojection
- Edit Ground Control Points (GCPs)
 - Intuitive graphical user interface
 - GCP selection from map, image, vector, or keyboard
 - Automatic coordinate conversion
 - Automatic error reporting
 - Independent verification of accuracy with check points
 - Chip extraction (magnifier) viewers
 - Automatic drive-to-point
 - Automatic point prediction
 - Automatically position a predicted GCP
- Drop-point geocoding for fast and simple shift correction
- Image resampling to coordinate system
 - Nearest Neighbor, Bilinear, Cubic Convolution, Bicubic Spline, or LaGrange resampling
 - User-defined pixel sizes and geographic subsets

- DLL extendible
- Over 1000 projected coordinate systems included
- Over 65 spheroids and 500 datums included
- Add custom spheroids and datums
- Vertical datums, including vertical datum transformations
- Support for both standard and user-defined projection libraries, allowing thousands of projection systems to be defined
- 2D View geographic link by reproject
- 2D View reproject images on the fly
- Mapmaker reproject images on the fly
- Reproject rasters or vectors, including via batch
- Read/create Esri world files and projection files (.prj)

Simple Classification

- Easy-to-use unsupervised classification routine (K Means) requiring minimal inputs
- Number of iterations
- Number of classes
- Skip factors
- Initial class means on diagonal or principal axis
- Scaling of class ranges
- Color scheme initialization options
- Convergence threshold

Map Composer

Quick and easy custom map creation and editing.

- Copy and paste into any product using Microsoft clipboard (PowerPoint, Word, etc.)
- Multiple data frames containing one or more data layers each
- Automatically generated grid ticks, lines, and graticules
- Customizable template gallery
- Titles
- Lines, bounding boxes, and symbols
- Annotation
- Logos
- North arrows
- Scale bars
- Automatically generated legends
- User-definable styles
 - Build customized map templates
 - Automatically generate USGS maps at standard scales

- Automatically generate international map series at any scale
- Industry-standard printer languages and devices
- Automatically populate dynamic elements in the map view
- Automatically provide a map location overview

Google Earth™ Integration

- Displays a Google Earth tab if Google Earth Pro (v7.3.x) is detected on the computer
- Match the Google Earth view to the ERDAS IMAGINE 2D View
- Synchronize the views
- Export image footprints to KML files
- Export annotation layers to KML files

General Tools and Utilities

- File chooser mechanism
 - File system and network navigation
 - Connection mechanism for database access
 - Recent list of files accessed
 - “Go to” list of directories accessed
 - Select multiple files at once
 - Select sub-images within a single file
 - Preview thumbnail
 - Rename/delete/set permissions on files
 - “All Rasters”, “All Vectors” and “All Point Clouds” filters
 - Optional Windows file chooser
 - File format association to automatically load data when double-clicked
- Quickly customize ERDAS IMAGINE to the production environment through the Preference Editor
- Access to peripherals and networks
- Text editor
- Layer information tools
- View binary data
- Coordinate calculator
- Subset tool
- Spreadsheet functionality via the CellArray™
- Convert fonts to symbol libraries
- IMAGINE Photogrammetry Block File read

Extensibility

- ERDAS Macro Language (EML)
- Font manager

- Create customized Ribbon layouts to simplify and streamline workflows
 - Save custom Layouts to the Layout Gallery
 - Start ERDAS IMAGINE using customized Layout
 - Turn on/off existing Tabs
 - Rename Tabs
 - Re-order, reorganize and remove existing Groups, buttons and controls
 - Control display properties of command buttons and controls
 - Add (and name) new Tabs and Groups
 - Populate new Groups by dragging and dropping Commands
 - Add new buttons to launch spatial models
 - Set Keyboard Shortcuts for Commands

IMAGINE Advantage

IMAGINE Advantage®, the mid-level tier of ERDAS IMAGINE, builds upon the geospatial capabilities of IMAGINE Essentials to offer more advanced and precise mapping, point cloud, and image processing capabilities. IMAGINE Advantage gives GIS professionals, image analysts, and photogrammetrists more analysis capabilities to make better, more informed decisions. IMAGINE Advantage can provide strategic value to a variety of industries, including data providers, agriculture, forestry, natural resource management, telecommunications, environmental engineering, and the extractive industries.

See the [IMAGINE Essentials](#) product description above for the capabilities and features available to all levels of the ERDAS IMAGINE suite.

Key Features

Parallel Batch Processing

- Run up to four processes simultaneously for each IMAGINE Advantage license
- Use floating ERDAS Engine licenses to expand beyond four simultaneous parallel processes
- Distribute parallel processes to multiple cores on a single system
- Distribute processes to multiple systems using HTCondor

Orthorectification

Expands the standard techniques available in IMAGINE Essentials to include sensor-based modeling and single-frame orthorectification.

- Multiple sensor models for orthorectifying data
 - Frame camera
 - Digital camera
 - ALOS AVNIR Rigorous Orbital model
 - ALOS PRISM Rigorous Orbital model

- ALOS PRISM with RPC
- ASTER Rigorous Orbital model
- CARTOSAT RPC
- CSM (community sensor model) version 3.0.1
- DEIMOS RPC
- DMC-3 RPC
- DPPDB
- EROS 1A & 1B Rigorous Orbital model
- EROS RPC
- FORMOSAT 2 and 5 Rigorous Orbital model
- FORMOSAT RPC
- GeoEye-1 Rigorous Orbital model
- GeoEye RPC
- Göktürk-1 Rigorous Orbital model
- Göktürk / RASAT RPC
- IKONOS NITF
- IKONOS RPC
- IND High Res RPC
- IRS-1C/1D
- KazEOSat-1 Rigorous Orbital model
- KazEOSat-1 RPC
- KazEOSat-2 Rigorous Orbital model
- KOMPSAT RPC
- KOMPSAT-III RPC
- Landsat TM, MSS, ETM+
- MODIS
- NITF RPC
- ORBIMAGE Rigorous Orbital model
- PeruSat RPC
- Planet Labs RPC
- Pleiades RPC
- Pleiades Rigorous Orbital model
- QuickBird RPC
- QuickBird/WorldView (including NCDRD format) Rigorous Orbital model
- RADARSAT
- RapidEye RPC
- RESOURCESAT RPC
- Sentinel-1

- SICD SAR
- SkySat RPC
- SPOT 5 Rigorous Orbital model
- SPOT Pan, XS, XI
- SPOT 6 RPC
- SPOT 6 Rigorous Orbital model
- SPOT 7 RPC
- SPOT 7 Rigorous Orbital model
- TH-01 (TianHui-01) RPC
- THEOS1 – Rigorous Orbital model
- TripleSat RPC
- UK-DMC SLIM-6-22 RPC
- VNREDSAT-1 – Rigorous Orbital model
- WorldView-4 – Rigorous Orbital model
- WorldView RPC
- ZY-3 RPC
- Orthorectification models for solving when ephemeris information is lacking
 - Direct Linear Transform (DLT)
 - Projective Transform
- Specify principal point and focal length for the camera
- Select fiducial layout type and record film location template
- Measure fiducial image locations
- Specify/calculate rotation angles for Omega, Phi, Kappa
- Specify/calculate perspective center position for X, Y, Z
- Account for the Earth's curvature
- User-specified number of iterations
- Specify output projection system
- Select GCP reference coordinates from map, image, vector, or keyboard
- Standard GCP editor extended to allow the definition of Z values

Raster Product Format (RPF) production

- Controlled Image Base (CIB)
- Compressed Arc Digital Raster Graphics (CADRG)
- Enhanced Compressed Image Base (ECIB)
- Enhanced Compressed Raster Graphic (ECRG)

Increase in ECW / JPEG2000 Capability above IMAGINE Essentials

- Create an unlimited number of ECW and JPEG2000 compressed images from input images up to 500 gigapixels with export, direct-write, and MosaicPro.

Radar Capabilities

- Real-time georeferencing for most commercial sensors including RADARSAT-2, TerraSAR-X, TanDEM-X, COSMO-SkyMed, RISAT-2, KOMPSAT-5, ALOS PALSAR-2, Sentinel-1, PAZ and SICD formatted data
- On-the-fly
 - Despeckle
 - Auto Enhance
 - “Blue is New” change detection
 - Contrast Reverse
 - Contrast Inverse
- Select display mode
 - Magnitude
 - Edge enhance with interactive illumination setting
 - Interactive level slice
- Show look direction and incidence angle
- Radar Incoherence & Inverse Coherence
- Radiometric Terrain Correction
- Polarimetric Classification
- Sentinel-1 Swath to Burst
- Magnitude Change Detection
- SAR Ortho Resampling
- Sensor merge
 - Principal components
 - Intensity Hue Saturation (IHS)
 - Multiplicative, radar data re-map options, etc.
- Texture enhancement
 - Variance
 - Skewness
 - Kurtosis
 - Mean Euclidean distance
- Speckle suppression
 - Mean
 - Median
 - Lee-Sigma
 - Local region
 - Lee
 - Frost
 - Gamma-MAP
- Edge enhancement

- Wallis adaptive filter
 - Bandwise, IHS, or Principal Component
 - User-defined scene contrast multiplier
- Radar conversions
 - Domain
 - Magnitude and Phase (MP)
 - Intensity and Phase
 - Real and Imaginary (IQ)
 - Magnitude Only (M)
 - Intensity Only
 - Phase Only (P)
 - Radiometric
 - Media DN to Beta-Naught (Linear)
 - Media DN to Beta-Naught (Decibels)
 - Linear to Decibels and Decibels to Linear
 - Radiometric Terrain Correction, producing
 - Radar backscatter coefficient Sigma-Naught
- Incidence angle mask

Terrain Preparation Tools

Create and manipulate terrain datasets

- Read LAS, ASCII, raster, vector, breakline data, and output terrain files in various formats
- Split or merge terrain files
- Additional preprocessing options such as terrain point thinning and filtering
- Generate contours with options such as smoothing contours

Point Clouds

- Encode LAS files with raster pixel values such as RGBN
- Edit (constant Z, Offset, Reclassify, Delete)
- Subset, filter, split, merge, reproject
- LiDAR command tool for batch update of pyramids and projection information

Metric Accuracy Assessment (MAA) Tool

- Calculate of the accuracy of mono or stereo pair imagery (stereo analysis restricted to RPC models) using photo-identifiable ground control points.
- Control (or Test & Evaluation – T&E) points can be manually entered or read from file
- Calculation of error statistics
- Individual point error and statistics report
- Error computations are based on MIL-STD-600001, with bias taken into account
- CE is computed using horizontal error as input to the LE formula with bias

Mosaicking

MosaicPro, the geospatial industry's most robust mosaicking tool, provides cutline creation and editing, color balancing, illumination correction, feathering, dodging, and more for the creation of seamless mosaics and image tiles. From a pair of images to over 16,000 images, MosaicPro handles it all.

- User interface to manage all aspects of the mosaic process including graphics and image display options
- Mosaic Express for easy learning and rapid setup
- Command line interface for production batch processing
- Mosaic multiple images with:
 - Differing and same pixel resolution
 - Differing and same projection systems
 - Geometric calibration and resampled orthorectification
- Multiple image selection methods:
 - Select individual files
 - Select all the files in a directory using wildcards
 - Select using a file list
- Use relatively positioned images and images with just map information in addition to fully georeferenced images.
- Load images directly from an IMAGINE Photogrammetry block file
- Select elevation sources in any supported raster format
- Control the image area considered for mosaicking
 - Use the entire image
 - Compute an active area
 - Use a template AOI
 - Use an individual AOI
 - Crop edges by percentages (provides for automatic clipping of fiducials from scanned frame imagery)
- Automatic image loading and unloading based on user setting for large product efficiency
- Multiple options for ordering and sorting imagery
 - Promote and demote individual images or selected groups
 - Order by source date
 - Write source date and image name metadata to output seamline shapefile
 - Sort images to minimize overlap areas
- For overlap areas, seamlines can be defined automatically or by the user
 - Save to / load from shapefile
 - Automatic geometry-based seamlines
 - Automatic weighted seamlines
 - Automatic graph cut energy minimization framework seamlines
- Additional Seamline options for triangulated data
 - Most Nadir
 - Most Nadir Narrow

- Most Nadir by DTM
- Real-time display of seamline edits
- View reference seam polygons for working on geographically adjacent products
- Color Corrections
 - Exclude Areas
 - Manual or semi-automated
 - Define abnormal areas for exclusion from processing
 - Dodging
 - User definable grid size
 - Band dependent or independent
 - Dodge across images or individually
 - Manually editable correction settings
 - Preview
 - Color Balancing
 - Adjustable or manual
 - Surface-fitting removes spatially varying illumination effects such as hot spots
 - Optionally use existing lookup tables
 - Preview color balancing effects
 - Histogram matching based on:
 - Image to image
 - Overlap areas only
 - Ideal target histogram
 - Illumination equalization to adjust illumination variations (from sun glint, etc.)
- Full control over the algorithm applied at each image overlap region
- Radiometric seam smoothing and feathering
- Preview finished mosaic results in a user-defined area before running a full mosaic job
- Output a single file or multiple project files
 - Union of all inputs to single file
 - User-defined AOI to single file
 - Multiple AOIs to separate files
 - User-defined polygon vectors to single file
 - User-defined polygon vectors to multiple files
 - Append attribute value to file name
 - Use Map Series file to output to multiple files on user defined grid pattern
 - ASCII sheet file definition
 - Rotated output sheets
 - Global clip boundary
- Specify output projection cell size and data type
- Specify output file type: IMG, ECW, ERS, JFIF, JPEG 2000, NITF, PNG, GeoTIFF, BigTIFF and MrSID
- Support alpha channel (mask layer) for ECW and JPEG 2000

Image Processing & Spatial Analysis

Access over 100 standard image processing and GIS techniques for enhancing and analyzing data.

- Radiometric enhancement
 - Look-Up table stretch
 - Rescale data
 - Rapid Atmospheric Correction
 - Noise reduction
 - Periodic noise removal
 - Landsat 7 reflectance and radiance conversion
 - Destripe Landsat
 - Replace bad lines
 - Histogram match
 - Brightness inversion
 - Histogram equalization
 - Topographic normalize
- Spatial enhancement
 - Resample/reproject
 - Degrade
 - Convolution filters
 - Non-directional edge detection
 - Texture analysis
 - Wallis adaptive filter
 - Crisp
 - Statistical filter
 - Homomorphic filter
 - Morphological operators
 - Open
 - Close
 - Erode
 - Dilate
 - Focal (neighborhood) analysis
 - Wallis adaptive filter
- Pan sharpen
 - NNDiffuse Pan Sharpening
 - Projective Resolution Merge
 - Hyperspherical Color Space resolution merge
 - Developed specifically for WorldView-2 and -3
 - Subtractive resolution merge



- High Pass Filter (HPF) resolution merge
 - Trade color for sharpness, or vice versa
 - Two-pass processing for images with high spatial disparity
- Modified IHS resolution merge
 - Tailored to be sensor-specific
 - Maintains spectral radiometry
 - Merge multiple bands, not just three
- Wavelet resolution merge
- Ehlers Fusion
 - Wavelet-based pan sharpening
 - Automatic or manual filtering schemes
- Resolution merge
 - Principal Component
 - Multiplicative
 - Brovey Transform
- Spectral enhancement
 - Layer stack
 - Principal component
 - Inverse principal component
 - Independent component
 - Tasseled cap transformation
 - Decorrelation stretch
 - Natural Color conversion
 - RGB to IHS
 - IHS to RGB
 - RGBI Shaded Relief
 - Spectral mixer
- Image Equalizer
 - Correct variations and flaws in imagery due to hot spots, vignetting, atmospheric effects and film processing
 - Create balanced and even radiometrically corrected images
 - Dynamic preview of correction results
- Hyperspectral tools
 - Normalize spectrum
 - Internal Average Relative Reflectance (IARR)
 - Log residuals
 - 3D Rescale
 - Spectrum Average
 - Signal-to-noise ratio
 - Mean per pixel

- Profile tools
- Thematic (GIS, many applicable for vector as well as raster)
 - Thematic to RGB
 - Random class colors
 - Recode
 - Neighborhood functions
 - Morphological
 - Search (buffer)
 - Clump, sieve and eliminate classes
 - Perimeter of clumps
 - Aggregation of thematic classes
 - Zonal attributes (parcel statistics)
 - Matrix union
 - Summary (report of matrix union)
 - Overlay (minimum or maximum)
 - Index (weighted summation)
- Fourier analysis
 - Fourier transform
 - Graphical Fourier transform editor
 - Inverse Fourier transform
 - Fourier magnitude
- Classification
 - Indices (Band Algebra)
 - Vegetation indices (VI, NDVI, TNDVI, MSAVI2, WorldView-specific Indices, etc.)
 - Other indices (iron oxide, clay minerals, ferrous minerals, mineral composite, water/snow/ice, normalized burn ratio, etc.)
 - Sensor-specific band selection
 - Adjust formulas with variables
 - Preview results in real time
 - RGB Clustering
 - Geophysical Processing converted from ER Mapper
 - Horizon Dip
 - Horizon Azimuth
 - Horizon RTS (real time shading)
 - Pseudo Color
- Terrain analysis
 - Terrain preparation (see above)
 - Anaglyph
 - Recalculate elevation values (including vertical datum transformations)
 - Elevation library

- Route intervisibility
- Slope angle
- Aspect facing
- Painted relief
- Shaded relief
- Level slice
- Raster contour
- Image drape
- Functions
 - Two image mathematical union functions
 - Two image mathematical intersection functions
 - Single image mathematical functions
- Change detection
 - Customizable Change Detection algorithms (detect any changes that are of interest to you)
 - Zonal Change Detection Filter
 - Zonal Change Detection Process
 - Zonal Change Detection Review
 - Discriminant Function
 - Image differencing
 - Delta Cue (requires IMAGINE Expansion Pack)
- Subset
 - NITF chip
 - Mask
 - Dice images
- Generic options
 - Restrict function to Area of Interest (AOI) or rectangular subset
 - Stretch to 8-bit data range
 - Ignore zero values in output statistics
 - Schedule for batch processing
 - Vector to Raster
 - Raster to Vector

Modeling Language

The Spatial Modeling Language (SML) is highly flexible, enabling users to create and run customized models for image processing and GIS analysis. The Spatial Modeler fully supports the input of calibrated imagery and will output it to a specified projection system. The majority of Image Interpreter functions, which use the underlying SML programs, now also support multiple input projection systems and calibrated imagery.

- Model librarian with built-in editor
- Over 80 example SML scripts to customize

- Specify the projection system when inputting two or more images of differing projections into a model
- Function types (over 200 provided)
 - Point
 - Neighborhood (focal)
 - Global
 - Zonal
 - Layer
- Statements
 - Declarations
 - Assignments
 - Show, read, and write
 - Set
 - Macro definitions
 - Quit
 - Flow control
 - Statement blocks
- Object types
 - Scalar
 - Table
 - Matrix
 - Raster
 - Vector
- Data types
 - Binary
 - Integer
 - Float
 - Complex
 - Color
 - String
- Variables
- Windows
- Syntax error checking
- Calibration and reprojection support

Knowledge Classifier

Using knowledge bases created with IMAGINE Professional, IMAGINE Advantage users can classify geographic data with the simple, user-friendly Knowledge Classifier wizard interface.

- Evaluate classification classes
- Automatically identify missing files
- Output fuzzy sets, confidence layers, and feedback layers, as well as classifications

Knowledge bases created by expert users in IMAGINE Professional can be distributed to IMAGINE Advantage users anywhere in the world to apply classification processes to their data. This portability is one of the keys to the strength of the expert systems approach. See the [IMAGINE Expert Classifier™](#) section in the [IMAGINE Professional](#) product description for more details about the IMAGINE Expert Classifier.

IMAGINE SAR Interferometry (Add-On)

- Wizard Workflows for analyzing SAR imagery
 - Coherence Change Detection (CCD)
 - Time-series CCD
 - Mosaic Series CCD
 - E-Z Sentinel Coherence Change Detection
 - E-Z CCD
 - Sentinel Swath Coherence Change Detection
 - Sentinel Swath Processor
 - InSAR DEM Extraction
 - DInSAR Displacement Mapping

IMAGINE Professional

IMAGINE Professional® is a comprehensive geographic imaging package for advanced image processing, remote sensing and GIS professionals. IMAGINE Professional includes all the capabilities of IMAGINE Essentials and IMAGINE Advantage, plus advanced features such as graphical data modeling, advanced image classification, point cloud classification, and extended hyperspectral tools.

ERDAS IMAGINE was one of the first commercial software packages to offer graphical data modeling. Spatial Modeler continues this tradition with an all-new modern interface that supports point clouds and Python scripting, including ArcPy. When used with ERDAS APOLLO, spatial models can be published as OGC web processing services (WPS) or as Spatial Recipes for use in Hexagon Smart M.Apps. Spatial models can also be input as operators into other spatial models.

In addition, IMAGINE Professional customers also receive ERDAS ER Mapper. Together, these products provide the most powerful image processing and raster GIS engine available on the same desktop. See the product pages at hexagongeospatial.com for detailed information on ERDAS ER Mapper capabilities.

Also review the [IMAGINE Essentials](#) and [IMAGINE Advantage](#) product descriptions for the capabilities and features available to all levels of the ERDAS IMAGINE suite.

Key Features

Spectral Analysis

Quickly extract material mapping information with minimal effort and knowledge of spectral or hyperspectral image processing theory. Spectral Analysis tools include:

- Standard task-based workflows
 - Anomaly and target detection
 - Material mapping and identification

Hyperspectral Analysis

Hyperspectral Analysis tools include:

- Standard task-based workflows
 - Anomaly Detection
 - Target Detection
 - Material Mapping
 - Material Identification
- Hyperspectral image preprocessing steps
 - Band wavelength/width specification
 - Bad band identification
 - Spectral and spatial subset
 - Atmospheric adjustment
 - Minimum noise fraction
- Spectral libraries
 - ASTER
 - JPL
 - USGS V4
 - USGS V6 Convolved
 - Import new versions of the above libraries
 - Import SITAC libraries
 - Import SPECMIN libraries
- Spectral Analysis Workstation
 - Multi-pane workspace providing access to all the tools and viewers that enable interactive analysis of hyperspectral imagery, spectral signatures, and other data displays
 - Three geospatially-linked views
 - Main view
 - Overview view of the whole image extent
 - Zoom view showing magnified detail of a specific location
 - Embedded spectral plot tools
 - Embedded spectral libraries
 - Drag and drop interaction between the image pixels, plots, and libraries
 - Access to all preprocessing and task processes
- Spectral Analysis Methodologies
 - Orthogonal Subspace Projection (OSP)
 - Spectral Angle Mapper (SAM)

- Spectral Correlation Mapper (SCM)
- Constrained Energy Minimization (CEM)

IMAGINE Expert Classifier

IMAGINE Expert Classifier is made up of two components: Knowledge Engineer and Knowledge Classifier.

While Knowledge Engineer is a standard part of IMAGINE Professional, Knowledge Classifier is a standard part of IMAGINE Advantage. Consequently, expert users who design and test knowledge bases using IMAGINE Professional can distribute them to IMAGINE Advantage users anywhere in the world to apply the classification process to their data.

- Knowledge Engineer
 - A graphical drag-and-drop interface for building a knowledge base
 - Confidence value definition and propagation—the ability to handle uncertainty
 - Use of variables from various sources including images, vectors, scalars, graphical models, and other user-defined programs
 - Ability to include prompts for particular data files for the creation of portable knowledge bases
 - Quick feedback on the results of a classification to aid in developing and fine-tuning a knowledge base
 - Access to other ERDAS IMAGINE tools, such as Spatial Modeler, for defining spectral/spatial operators
- Knowledge Classifier
 - Wizard interface
 - Perform classifications
 - Evaluate classification classes
 - Automatically identify missing files
 - Output fuzzy sets, confidence layers, and feedback layers, as well as classifications

Multispectral Classification

- Image Segmentation algorithms
 - Edge Detecting, Region Growing segmentation
 - Enhanced Full Lambda Schedule segmentation
- Change detection
 - Zonal Image Difference
 - Discriminant Function Change
- Unsupervised ISODATA algorithm
 - Initialize class means from image statistics or optional signature file means
 - Set convergence threshold, maximum iterations and skip factors
 - Classify only the AOI
 - Output a signature set
 - Specify the number of classes range
 - Set minimum size, maximum SD, minimum distance, maximum merges
 - Color scheme in the output cluster file

- Open and modify indices or geophysical processing in the Spatial Model Editor
- Grouping Tool for assigning classes to land cover types
 - Define target land cover classes
 - Interactively select and highlight working groups of classes
 - Boolean operators to compare and separate working groups
 - Highlight similarity/conflict geographically
 - Dendrogram tool visually represents similarity of classes
 - Distance measures
 - Euclidean
 - Mean scaled
 - Divergence
 - Spectral angle
 - Agglomeration methods
 - Simple linkage
 - Complete linkage
 - Simple average linkage
 - Average linkage
 - Centroid
 - Median
 - Save grouped classes to image
- Fuzzy classification, fuzzy convolution filtering and fuzzy recode
- Accuracy assessment through use of ancillary data to measure errors of commission/omission
- Post-classification class editing
 - Chi-square or Euclidean distance class thresholding
 - Threshold interactively on a histogram display
 - Threshold based on statistics or graphic editing
 - Preview threshold results
- Classification accuracy assessment
 - Random or user-defined ground truth locations
 - Automatically generate accuracy reports with Kappa statistics, error matrices, and accuracy totals
 - Supervised classification
 - Control of automatically generated statistical attribute fields in an output classified file
 - Output a distance file for use in thresholding
 - Control the classification
 - Non-parametric signatures may be ignored or classified by parallelepiped limits or feature space masking
 - Pixel overlap rule
 - By parametric rule
 - Classify by order
 - Leave unclassified
 - Unclassified pixels: evaluate by parametric rule or leave unclassified

- Parametric signatures evaluated by Maximum Likelihood, Mahalanobis Distance, Parallelepiped, Minimum Distance, Spectral Angle Mapper (SAM) or Spectral Correlation Mapper rules
- Hybrid parametric/non-parametric classification
- Select, evaluate, and edit signatures
 - Signature creation
 - Automatic region growing
 - Selected vector objects
 - User-defined AOI point, ellipse, rectangle, polygon, or polyline objects
 - Sophisticated feature-space signature editing, extraction, and evaluation
 - Signature evaluation and manipulation
 - Contingency matrices
 - Separability measures
 - Euclidean
 - Divergence
 - Transformed divergence
 - Jefferies-Matusita
 - User-specified bands per combination
- Image alarm, including overlap indication
- Mean per band or histogram plots
- Univariate and covariance statistics
- Feature space (scattergram) plotting
 - User-specified band combinations
 - Signature ellipse plotting
 - Image to feature space linking
- Non-parametric signature extraction
- Signature merge, delete, and replace
- Set layers to use in classification process
- Manual editing of parallelepiped limits
- Set output class values, colors, a priori probabilities, and classification order

Subpixel Classification

IMAGINE Subpixel Classifier characterizes the scene being processed by the amount (fraction) of one specific material, rather than multiple materials, in each image pixel. This allows the classification of objects smaller than the spatial resolution of the sensor.

- Train the classifier
- Perform environmental corrections
- Develop training signatures
- Combine signatures
- Perform quality assurance

Point Clouds

- Classify point clouds as bare earth, buildings, noise, or vegetation.
- Perform Volumetric analysis
- Convert to Height Above Ground

Area Frame Sampling

A statistical approach to estimating landcover extent within a given region based on interpretation of higher resolution imagery samples.

- Project manager and wizard
- Stratum file definition
- Sampling grid generation
- Graphical sample selection
- Dot grid analysis to label samples
- Polygon analysis to label samples
- Calculate estimates and error tolerances

Model Maker

The first object-based graphical geospatial data modeling tool.

- Based on Spatial Modeler Language (SML)
- Over 50 prepackaged models
- Use graphical flow charts to quickly perform sophisticated GIS analysis
- Combine GIS and image processing functions in the same spatial model
- Combine raster, vector, and attribute data in a single model
- Apply a model to new data or a different geographical area at the push of a button
- Double-click to define objects
- Function object
 - Access to over 200 separate functions
 - Function syntax “prototypes”
 - Use and output attribute information
- Set operating geographic window and resolution
- Accepts calibrated images
- Reproject input data on-the-fly
- Quickly modify and rerun the model
- Run a model directly or generate an SML script for integration with EML

Spatial Model Editor

The new generation, object-based graphical geospatial data modeling tool. Includes all the functionality of the legacy Model Maker, and adds:

- All new, modern interface
 - Real time preview
 - Ability to run only selected parts of the model
 - Integrate submodels, external models, and command line executables
 - Option of using Python scripts, including ArcPy
 - Execution progress for each model component
 - Greatly improved error reporting
 - Send to Word / PPT / JPEG from Spatial Model Editor
 - Annotate the model for ease of interpretation
- Over 300 additional operators, including
 - Machine and Deep Learning operators
 - GeoMedia feature (vector) and grid operations
 - Many Photogrammetry operators
 - Many Terrain operators
 - Point cloud operators enhanced to support real-time streaming
 - Band Math
 - Classification operators
 - Unsupervised classification
 - Image segmentation
 - Dodge Plus for spatially-adaptive local brightness and contrast correction
 - Stretch operators
 - Contrast Limited Adaptive Histogram Equaliation (CLAHE)
 - Many Feature Extraction operators
 - Grey-Level Co-Occurrence Matrices (GLCM)
 - Softcopy Image Processing Standard (SIPS) algorithms
 - String handling
 - Radar (SAR) algorithms
 - Atmospheric operators
 - Measurement
 - Create Geospatial PDF
 - Create Map Composition
 - Render Map Composition
 - Model Flow Control
 - Rapid Atmospheric Correction
 - Generic Atmospheric Correction
 - Create Color Ramp
- Simplified publishing to ERDAS APOLLO as a Web Processing Service (WPS)
- Upload spatial models to Hexagon Smart M.App

Unlimited ECW / JPEG2000 Compression Capability

- Create an unlimited number of ECW and JPEG2000 images of unlimited size with export, direct-write, and MosaicPro

Machine Learning Layout

In support of performing Deep Learning in Spatial Modeler, a Layout is provided for efficiently collecting training chips and object footprints from geospatial imagery. Tools include

Image Chip and Object footprint Collection

- Choice of:
 - Image Chips only
 - Object footprints only
 - Object footprints with Image Chips
- Automatic sorting into directory structure
- Fixed or variable size footprints
- User-definable Chip size
- Class name and color definition
- Tile based Image Classification
- Define tile size
- Train Deep Learning algorithm
- Classify images per tile
- Review and export results

IMAGINE Photogrammetry

IMAGINE Photogrammetry is a separate bundle that contains a complete suite of photogrammetric production tools for triangulation, generating terrain models, producing orthomosaics, and extracting 3D features. It supports panchromatic, color, and multispectral imagery with up to 16 bits per band. Projects can be completed in hundreds of different coordinate systems and map projections.

IMAGINE Photogrammetry maximizes productivity with automated algorithms, fast processing, and a tight focus on workflow.

IMAGINE Photogrammetry increases accuracy through state-of-the-art photogrammetric and image processing algorithms for automatic point measurement, triangulation, automatic terrain extraction, and subpixel point positioning. Accuracy reports, built-in data quality checks, and editing tools help users achieve the high standard of quality they demand.

The power and precision of IMAGINE Photogrammetry stems from Hexagon's Geospatial division extensive experience developing the world's leading photogrammetric, remote sensing, and geospatial imaging software.

Key Features

Project setup and management

- Automated management of images, terrain files, and feature files
- Visual display of project status
- Add multiple data assets to the project at once
- View data assets in their georeferenced positions
- Take data assets off-line from the project/block, then easily reattach for further processing
- Input and output of ground control, GPS data, triangulation data, imagery, vector data, scanned paper maps, and terrain files in a variety of popular formats
- Manipulate data and track progress in Project Manager
- Store key operator preferences between sessions
- Export image, DTM, and orthophoto footprints along with project GCPs, check points, and tie points to KML

Data import and export

- Supports a wide range of ground control data, GPS data, triangulation data, vector data, scanned paper maps, digital orthophotos, and terrain files in a variety of popular formats
- Gray scale and color raster image formats are supported, including 8 to 16 bits per band per pixel and virtually unlimited numbers of bands per image

Coordinate systems

- Supports numerous horizontal and vertical datums, coordinate systems, and map projections, including user-defined systems and coordinate conversions

Tracking devices

- TopoMouse™ or TopoMouse USB™ 3D Hand Controller
- Z/I Mouse
- System Mouse
- Immersion 3D Mouse
- MOUSE-TRAK
- Stealth 3D (Immersion), S3D-E, serial port
- Stealth Z, S3-Z, USB versions
- Stealth V, S3-V type (added as a serial device)
- 3Dconnexion SpaceMouse Pro
- 3Dconnexion SpaceExplorer Mouse
- Hand Wheels (EK2000, EMSEN)

Image viewing

- Works with both stereo and monoscopic hardware
- Full 3D stereo imagery can be viewed using either passive polarized or active LCD stereoscopic viewing systems
- Drag and drop images and point clouds into the viewer
- Display multiple vector and raster layers
- Display and project multiple images in a single view

- Load and view entire blocks of images as a virtual mosaic
- View any combination of sensor types
- Apply dynamic range adjustment
- Open multiple views and link them
- Continuously roam and zoom
- Reproject on-the-fly
- Use subpixel cursor positioning and measurement
- Apply image enhancements
 - Rotation
 - Brightness and contrast
 - Histogram manipulations
 - Filtering
 - Palette of more sophisticated image processing tools
- Read out ground and image coordinates, 2D and 3D measurements
- Distance, azimuth, slope
- Area of polygon
- Length of polyline
- Build image pyramid (minification)
- Use multithreading when multiple processors are available
- Create richly annotated output maps

Interior orientation

Define the internal geometry of imagery using measured fiducial marks.

- Both automatic and semi-automatic processes available, with interactive quality control
- RMS error represented in pixels and microns
- Flexible color code assignments for fiducial marks
- Automatically drives to estimated fiducial mark positions

Camera definitions

Calibrated cameras and lenses can be defined and saved.

- Camera name and description
- Focal length
- Principal point offset in the X and Y direction
- Number of fiducial marks and their calibrated positions
- Pixel size for digital and video cameras
- Lens distortion
- Extended parameters can be imported directly from ORIMA, Australis, and SMAC camera calibration files

Automatic tie point measurement

Automatically determine the corresponding image positions of ground points appearing on multiple overlapping images.

- Point pattern selected by operator
- Adaptive strategy cross-correlation with feature-based matching
- Automatic transfer of points between images
- Simultaneous processing of imagery collected within normal and crossing flight lines
- Interactive graphical view of tie point patterns
- Shadow avoidance algorithm

Classic Point Measurement

Measure ground and image points in monoscopic single or pair-wise view modes.

- Display and edit
 - Point IDs and description
 - GCP, tie point, and check point coordinates, and their residuals
 - Image coordinates and their residuals
 - GCP type (full, horizontal, vertical)
 - Point usage (tie, check, or GCP)
- Imagery within a strip can be toggled for display during point measurement
- Automatic drive to estimated X and Y image locations of GCP positions
- Undo GCP, tie point, or check point measurements and edits
- Project image points into new ground points
- Projecting ground points into corresponding images

Stereo Point Measurement

Measure ground and image points in single-image and multi-image monoscopic and stereo modes, supplemented by automatic point correlation. Additional capabilities beyond the Classic Point Measurement interface include:

- Stereo viewing capability
- GCP collection from multiple sources, including orthorectified imagery
- 3D pointing device support with button mapping capability
- Automatic point correlation functionality
- Support for multiple viewers, which is beneficial for measuring multi-ray points
- Map display for image selection and loading, as well as point distribution review
- Ability to drive to next and previous points
- Various image selection options
- Improved image radiometric adjustment capabilities, with Dynamic Range Adjustment
- Cursor tracks in images simultaneously based on sensor model and ground position for easy identification

- Maintain constant ground or pixel scale in all windows
- Rotate images North-Up

Triangulation

Tie imagery together and to ground reference points. Once images have been triangulated, additional data processing such as DTM extraction, terrain editing, orthorectification, and feature collection can be performed.

- Block definition
- Support of post-processed airborne GPS to define sensor position
- Support of existing aerial triangulation results in the form of exterior orientation from analog, analytical, and digital photogrammetric workstations, and common triangulation program interchange formats
- Rigorous triangulation for frame, digital, terrestrial, and orbital sensors with a variety of models
- Graphical display to enable users to identify and resolve blunders, including image footprints and residuals
- Bundle adjustment of multiple images from one or more sensors (with the same sensor model type)
 - Fully weighted least squares solution with GPS
 - Automatic blunder detection with user selectable modes
- Statistical models provided for weight constraint of observations include:
 - X and Y image coordinates
 - X, Y, and Z ground control points
 - Exterior orientation parameters
 - Interior orientation parameters
 - Additional parameters accounting for systematic errors
- Five additional parameter (AP) models provided for determining the extent of systematic error associated with the photogrammetric network of observations and the sensor models used in the project
- Self-calibration techniques used to determine focal length, principal point offset in the X and Y direction
- Triangulation can be processed without ground control if the exterior orientation parameters are available
- Pseudo free-network triangulation can be processed by fixing appropriate parameters from two of the images
- Auto-detect lack-of-ray convergence for automatically measured tie points (satellite workflow assistance)
- A summary report is provided for the display of global solution quality
- Point Review option is provided to analyze the point and block triangulation quality
- An advanced triangulation report provides a comprehensive output list of the adjusted and estimated parameters and their accuracies, precisions and photo-coordinate residuals
- Oriented image creation for input into Stereo Analyst® for ERDAS IMAGINE

Orthorectification

Orthophotos are the ideal reference image backdrop necessary for the creation and maintenance of geographic information contained within a GIS database. IMAGINE Photogrammetry creates orthophotos by minimizing the distortion inherent in imagery caused by sensor orientation, topographic relief displacement, and systematic errors associated with imagery, resulting in planimetrically correct images representing ground objects in their true, 'real world' X and Y positions.

- Simultaneous processing and parameterization of multiple orthos in one solution
- Single orthos can be generated independently

- User-defined X and Y ground resolution
- Orthorectification from a constant elevation value or using elevation sources in various terrain formats including Raster Grid, LTF, TIN, 3D shapefile, and ASCII text files
- Ability to trim the outer extents of the output ortho
- Ortho resampling options include Nearest Neighbor, Bilinear Interpolation, Cubic Convolution and LaGrange
- Ortho-calibration techniques associate orientation metadata and terrain files directly with imagery, eliminating the need to create new image files for specific workflows
- Unique map projection and units can be assigned to each output ortho
- Support for batch processing on multiple cores/processors within a system via ERDAS IMAGINE Batch tool
- Support for distributed processing across a network of computer systems using HTCondor

IMAGINE Advantage

IMAGINE Photogrammetry includes the full functionality of IMAGINE Advantage and IMAGINE Essentials. See the product descriptions for [IMAGINE Advantage](#) listed above.

Mosaicking

IMAGINE Photogrammetry includes MosaicPro. See the [Mosaicking](#) section for more details.

Terrain Prep Tool

Create and manipulate terrain datasets. See the product description for [Terrain Preparation Tool](#) found in the IMAGINE Advantage section listed above.

Stereo Viewing

IMAGINE Photogrammetry includes 3D stereoscopic viewing of imagery for the Stereo Point Measurement interface, IMAGINE Terrain Editor, and ORIMA in several modes. The stereo display makes optimal use of recommended graphics cards.

- Moving cursor/fixed image and fixed cursor/moving image
- Smooth, seamless roam in “Moving Image” mode
- Supports active and passive 3D-viewing eyewear
- Single or dual screens supported
- Drag and drop images into viewer
- Fast graphics rendering
- On-the-fly epipolar rectification for comfortable viewing when required
- Automatic Z placement of cursor from a terrain model or image matching
- Multiple stereo views can be opened simultaneously
 - Each view can be monoscopic, stereo, split-screen, or tri-view (stereo and split-screen)
- Cursor displayed in every image
- Continuous zoom in and out, as well as discrete steps such as 1:1 and 2:1
- On-the-fly resampling for subpixel cursor positioning and measurement
- Image enhancements including rotation, brightness, contrast, and dynamic range adjustment

Single Model Dense Matching

IMAGINE Photogrammetry includes the ability to generate high-resolution terrain data from photogrammetric projects that have two images only (a single stereo model).

IMAGINE Photogrammetry Add-Ons

Hexagon's Geospatial division offers some exclusive add-ons to expand the core functionality of IMAGINE Photogrammetry.

IMAGINE Auto DTM

IMAGINE Auto DTM comes with three different automated terrain extraction engines with varying levels of accuracy and speed.

- Sparse Matching
- Dense Matching
- Semi-Global Matching

Sparse Matching

Sparse Matching in IMAGINE Auto DTM rapidly, accurately, and automatically extracts lower-resolution terrain from overlapping images with built-in accuracy reporting.

- A production-oriented, linear workflow:
 - Define general DTM project properties including map projection and file format
 - Select image pairs of interest
 - Define areas for DTM
 - Define exclude areas
 - Input information to calculate DTM accuracy
 - Perform automated DTM extraction
- Automatically extract, subset, and mosaic individual DTMs for an entire project area—possibly encompassing hundreds of images—with one click
- Cross-correlation and feature-based matching with adaptive strategy parameters
- DTM boundary is determined automatically from images or can be user-defined
- Support for aerial frame, Leica ADS, digital, video and non-metric cameras, as well as satellite sensors with stereo capability (ALOS, ASTER, CARTOSAT, DEIMOS, EROS, FORMOSAT, GeoEye®, Göktürk, IKONOS, KazEOSat, KOMPSAT, OrbView, Pleiades, QuickBird, RapidEye, RESOURCESAT, SkySat, SPOT, THEOS, TH-01, WorldView, ZY-3, etc.)
- Specify a clip percentage on input images to remove fiducial marks
- Scalable user interface can be customized for all skill levels, from entry-level GIS professionals to production mapping scientists
- Optionally use seed data (block control points, tie points, and external terrain models) to improve the correlation process
- Provides tools, such as region growing, for semi-automatically defining geographic regions of inclusion or exclusion, or use existing Esri shapefiles, ArcSDE® Vector Layers, or ERDAS IMAGINE AOIs

- Customized DTM extraction strategy parameters
 - Adaptive modification of strategy parameters
 - Strategy parameters include:
 - Search area
 - Correlation size
 - Coefficient limit
 - Topographic relief type
 - Land cover object type
- Embedded quality assurance, quality control, and accuracy reporting tools
- Quality checks to control points, check points, tie points, text files, or other DTMs
- Accuracy report containing RMSE, CE 90 and LE 90 calculations, mean error, global error, processing time statistics, and general extraction statistical output for each DTM
- Error image for each extracted DTM, indicating geographic regions with excellent, good, fair, poor, and interpolated DTM output
- Extracted DTMs can be output in ERDAS IMAGINE raster formats, LTFs, TINs, 3D shapefiles, or ASCII files
- Use the Terrain Prep Tool or 3D Surfacing Tool to merge terrain and support for MicroStation® DGN files and breaklines
- Support for batch processing

Dense Matching

Dense Matching in IMAGINE Auto DTM generates high resolution terrain information from stereo imagery data types ranging from satellite to airborne frame and digital pushbroom sensors. Features sophisticated algorithms for generating and classifying dense elevation surfaces.

- A production-oriented, linear workflow
 - View the project area, image footprints or render the actual images in an embedded viewer
 - Add or remove images for DTM processing
 - Define Process Engine settings for optimal performance
 - Interactively define strategies, or choose pre-existing strategies from the included library
 - Interactively define exclusion areas and boundaries for different strategies, if required
 - Optionally select seed data
 - Define output settings for density and classification
 - Choose output formats
 - Perform automated DTM extraction via local multi-core batch processing, or distributed processing among a group of computers using HTCondor
- Pixel-by-pixel correlation for high-density output terrain products
- Multi-ray matching increases correlated terrain point reliability
- View image footprints, areas of interest (AOIs), seed data boundaries, and processing element graphics
- XML accuracy report file containing processing statistics and quality-based graphics
- Improve correlation with breakline, point, and DEM seed data
- Customizable strategy parameters for optimizing results across diverse project scenes
 - Correlation method

- Window size
- Correlation coefficient start and end
- Interpolation method for seeding the correlation process (output points are not interpolated for TINs and point clouds), associated point threshold, and search window size
- Blunder removal options
- LAS classification options
- Strategy areas defined by intuitive AOI tools, which can also be used for defining exclusion areas
- Library of commonly-used correlation strategies
- Innovative approach for the RGB-encoding of LAS 1.2 format output product, ideal for visualization applications
- Output support for TIN, Grid, and point cloud terrain formats
- Output options for a merged surface defined by input images or a user-defined bounding box
- Terrain output splitting options, with the ability to define an overlap percentage
- Terrain thinning options allow for a regularly-spaced terrain output; thin out redundant points on planar surfaces
- Optimized performance via multi-threaded processing
- Increase productivity through multi-core processing on a single computer system using the IMAGINE Batch Tool
- Maximize throughput with distributed processing across a network of computer systems using Condor

Semi-Global Matching

Semi-Global Matching in IMAGINE Auto DTM uses a very dense matching capability based on Semi-Global Matching (SGM). SGM uses pixelwise, mutual information (MI)-based matching cost and a smoothness constraint to generate dense surface models. XPro SGM supports digital cameras like the Leica RCD30 and ZI DMC along with UAV sensors. Tridicon SGM supports Satellite imagery (RPC and rigorous) in addition to digital frame cameras.

- Straightforward user interface
 - Image Pair selection tab
 - Manually deactivate images
 - Automatically deactivate images based on overlap percentage
 - User-friendly table structure for criteria, row, or column selection
 - Strategy tab
 - Define strategy parameters to increase the reliability of your output
 - Choose a lower resolution pyramid level for quicker processing
 - Define an urban processing environment
 - Output Options tab
 - Define coordinate extents
 - Optional compression
 - RGB or FCIR encoding
- Simultaneous batch processing
- Distributed batch processing using Condor
- High definition delineation of building edges
- Extensive postprocessing options using Point Cloud tools
 - RGB encode from a secondary ortho image source

- Point cloud operators available in Spatial Modeler
- Multiple viewing options
 - Classification, Elevation, Intensity, Returns, or RGB
- Merge, split, and filter
- Subset

IMAGINE DSM Extractor

IMAGINE DSM Extractor comes with two different automated terrain extraction engines with varying levels of accuracy, resolution, and speed.

- Sparse Matching
- Semi-Global Matching

Sparse Matching

Sparse Matching in IMAGINE DSM Extractor rapidly, accurately, and automatically extracts lower-resolution terrain from overlapping images with built-in accuracy reporting.

- Production-oriented, linear workflow:
 - Define general DTM project properties, including map projection and file format
 - Select image pairs of interest
 - Define areas for DTM
 - Define exclude areas
 - Input information to calculate DTM accuracy
 - Perform automated DTM extraction
- Automatically extract, subset, and mosaic individual DTMs for an entire project area—possibly encompassing hundreds of images—with one click
- Cross-correlation and feature-based matching with adaptive strategy parameters
- DTM boundary is determined automatically from images or can be user-defined
- Support for aerial frame, Leica ADS, digital, video, and non-metric cameras, as well as satellite sensors with stereo capability (ALOS, ASTER, CARTOSAT, DEIMOS, EROS, FORMOSAT, GeoEye®, Göktürk, IKONOS, KazEOSat, KOMPSAT, OrbView, Pleiades, QuickBird, RapidEye, RESOURCESAT, SkySat, SPOT, THEOS, TH-01, WorldView, ZY-3, etc.)
- Specify a clip percentage on input images to remove fiducial marks
- Scalable user interface can be customized for all skill levels, from entry-level GIS professionals to production mapping scientists
- Optionally use seed data (block control points, tie points, and external terrain models) to improve the correlation process
- Provides tools, such as region growing, for semi-automatically defining geographic regions of inclusion or exclusion; alternatively, use existing Esri shapefiles, ArcSDE® Vector Layers, or ERDAS IMAGINE AOIs
- Customized DTM extraction strategy parameters
 - Adaptive modification of strategy parameters
 - Strategy parameters include:
 - Search area

- Correlation size
 - Coefficient limit
 - Topographic relief type
 - Land cover object type
-
- Embedded quality assurance, quality control, and accuracy reporting tools
 - Quality checks to control points, check points, tie points, text files, or other DTMs
 - Accuracy report containing RMSE, CE 90 and LE 90 calculations, mean error, global error, processing time statistics, and general extraction statistical output for each DTM
 - Error image for each extracted DTM, indicating geographic regions with excellent, good, fair, poor, and interpolated DTM output
 - Extracted DTMs can be output in ERDAS IMAGINE raster formats, LTFs, TINs, 3D shapefiles, or ASCII files
 - Use the Terrain Prep Tool or 3D Surfacing Tool to merge terrain and support for MicroStation® DGN files and breaklines
 - Support for batch processing

Semi-Global Matching

IMAGINE DSM Extractor uses Semi-Global Matching (SGM) to generate very dense and high accuracy digital surface models. SGM is an algorithm that uses pixelwise, mutual information (MI)-based matching cost and a smoothness constraint to generate dense disparity maps, from which surface modes are generated.

- Support for all Sensor and Raster formats
- Available as a GUI based tool and as an Operator in Spatial Modeler.
- Straightforward user interface
 - Manually deactivate images
 - Automatically deactivate images based on overlap percentage
 - User-friendly table structure for criteria, row, or column selection
- Simultaneous batch processing
- Distributed batch processing using Condor
- High definition delineation of building edges
- Extensive postprocessing options using Point Cloud tools
 - RGB encode from a secondary ortho image source
 - Point cloud operators available in Spatial Modeler
 - Multiple viewing options
 - Classification, Elevation, Intensity, Returns, or RGB
 - Merge, split, and filter
 - Subset

IMAGINE Terrain Editor

IMAGINE Terrain Editor, an add-on to IMAGINE Essentials that works with IMAGINE Photogrammetry, provides extensive, powerful tools for editing raster or TIN DTMs with dynamic graphics updating.

- Display terrain graphics superimposed on stereo imagery for editing and QA purposes
 - Terrain displayed as points, lines, TIN (mesh), or contours

- Terrain display updates on the fly as edits are made
- More than one representation can be displayed simultaneously
- User-selectable display options such as color, weight, size, and style
- Image display settings including fixed image, fixed cursor, continuous roam, contrast and brightness, stereo, mono
- User-activated pyramid display mode reduces display density when zooming out to avoid slow rendering
- Add, delete, or modify terrain using tools operating on points, lines, or selection areas
- Area tools such as smooth, thin, bias, set to constant, fit to surface, interpolate
- Geomorphic editing tools for grids
- Set elevations using current cursor elevation, area boundary, points inside, or points outside area
- Support for smooth contours
- Contour export options
- Import and export breaklines
- Motion devices such as TopoMouse™ used for interactive cursor control and button actions can be set and reviewed interactively
- Multiple undo and redo
- User-defined thresholds for parameters such as snap distance
- Rotate images North-Up
- Post-editor hotkeys allowing user to quickly move through points and edit them in gridded terrain files
- Ground control points panel enables the display of GCPs and tie points associated with the block file
- Terrain following cursor mode
- Ability to load terrain data without imagery as a backdrop
- Import shapefiles to be used as geomorphic paths or breaklines
- Works with a variety of terrain formats including:
 - LTF
 - Terramodel TIN
 - IMAGINE Raster
 - Imported formats including:
 - Terrain pyramid file support with LTF
 - USGS Spatial Data Transfer Standard (SDTS)
 - Digital Terrain Elevation Data (DTED)
- AOI-based terrain editing

ORIMA

ORIMA provides sophisticated production photogrammetry software for block triangulation and analysis.

- Self-calibrating bundle adjustment for frame and ADS (ADS40, ADS80 and ADS100) imagery
- Economic data organization to manage very large numbers of images
- Display multiple images during point measurement
- Measuring speed is not reduced as projects increase in size
- Specialized math model for ADS sensors

- Allows for combined triangulation of ADS and frame imagery
- Highly automated statistical techniques for blunder detection and elimination and full error propagation
- Fully automatic point measurement (APM) and ground control point transfer
- Multi-threaded APM
- Semi-automatic point measurement in stereo
- Sequential adjustment as points are measured allows easier measurement and early detection of errors
- Interactive graphical tools for analysis of blocks
 - Identification and elimination of blunders or weak areas
 - Error ellipses, error rectangles, ray intersection geometry
 - Image area identification for point-and-click supervised re-measurement
- Grid correction for compensating localized systematic errors
- Graphical output can be directed to printer or plotter
- Complete numeric reports
- Rigorous weighting and incorporation of GPS, with or without drift parameters, and IMU misalignment
- Flexible input formats from GPS and IMU data
- Rigorous transformation from ground to sensor including map projections or use of geographic coordinates
- Context-sensitive help and wizards
- Available in multiple languages
- Several versions with different functionality are available to suit user requirements
- Ability to rotate the block in the three map views for simplifying analysis
- Ability to activate images by camera ID

PRO600 CART

PRO600 products are specially designed to optimize production mapping for organizations that use Bentley® MicroStation®, Bentley Map, and Bentley Map Enterprise. PRO600 CART enables 3D feature collection and editing in those environments.

- Seamless integration with the Bentley environment, reducing the learning curve and maximizing efficiency for novice and experienced Bentley users
- High-performance stereo viewing engine
- Sophisticated data collection and editing tools
- Support for a variety of input devices, including TopoMouse, Z/I Mouse, and more
- Close integration with IMAGINE Photogrammetry
- Symbology settings stored in a feature definition library
- Easy-to-edit feature definition library
- Multiple collection modes and tools to enhance productivity
- Parallel-line generation with up to 20 parallel lines simultaneously
- Button mapping for input devices
- Automatic periodic design file backup
- Undo and redo

- Ground control point utility that allows you to plot ground control points as annotated symbols
- Data editing, including contour rounding and centerline generation

PRO600 DTM

PRO600 DTM provides a variety of tools for terrain modeling. Both PRO600 DTM and PRO600 CART use technology from our IMAGINE Photogrammetry product line, allowing CAD and GIS users to benefit from the robust, high-throughput capabilities that are trusted by mapping professionals worldwide.

- Seamless integration with the Bentley environment, reducing the learning curve and maximizing efficiency for novice and experienced Bentley users
- High-performance stereo viewing engine
- Sophisticated data collection and editing tools
- Support for a variety of input devices, including TopoMouse, Z/I Mouse, and more
- Close integration with IMAGINE Photogrammetry
- Import an IMAGINE Photogrammetry terrain dataset into your Bentley product
- Merge MicroStation design file data into an IMAGINE Photogrammetry terrain dataset
- Interpolate continuously from an IMAGINE Photogrammetry terrain dataset
- Convert 2D design files into 3D
- PRO600 DTM requires PRO600 CART

Stereo Analyst for ERDAS IMAGINE

Stereo Analyst for ERDAS IMAGINE, an add-on to IMAGINE Essentials that works with IMAGINE Photogrammetry, is a Windows-based solution for the collection, interpretation, and visualization of 3D geographic information from imagery. When added to IMAGINE Photogrammetry, collects both planimetric and volumetric features with textures, in 3D.

Interactive Stereo Viewing and Interpretation

Stereo Analyst for ERDAS IMAGINE provides unparalleled image handling for the display and manipulation of 3D digital stereo models

- OpenGL based stereo viewing capability
- Supports various 3D digitizing devices (see full list in the ERDAS IMAGINE 2020 Release Guide)
- Resize, open, and close each interface component at any given time
- Overview stereo window
- Primary stereo window
- Left and right monoscopic window
- Feature class palette containing all of the features to be collected or updated
- Feature attribute tables
- Feature collection and editing tools
- 3D Measure tool and 3D Position tool
- 3D Perspective view to visualize 3D models with automated image texture capabilities included
- Supports anaglyph stereo and hardware stereo

- Supports a 3D floating cursor/mark
- Adjust X and Y parallax
- Adjust the elevation of the 3D floating cursor
- Individually manipulate the left and right images comprising a stereo pair
- Supports image rotation
- Band combinations can be adjusted for color and multispectral imagery
- Hierarchical pyramid layers are used to increase the speed of image handling
- User preferences and options can be set per user and remembered during work sessions
- Continuous zooming
- Automatic panning
- Image roaming
- Fixed cursor mode
- Automated terrain-following cursor
- Graphically select digital stereo models from IMAGINE Photogrammetry block files
- Adjust the color, size, and shape of the 3D floating mark
- Image enhancement capabilities include:
 - Image data scaling
 - Brightness and contrast adjustment
 - Histogram equalization, standard deviation stretch, linear stretch, Gaussian stretch, and many more
 - Piecewise contrast adjustment

Contact Us



<https://go.hexagongeospatial.com/contact-us-today>

About Hexagon

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous — ensuring a scalable, sustainable future.

[Hexagon's Geospatial division](#) creates solutions that deliver a 5D smart digital reality with insight into what was, what is, what could be, what should be, and ultimately, what will be.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 20,000 employees in 50 countries and net sales of approximately 4.3bn USD. Learn more at at hexagon.com and follow us [@HexagonAB](#).