

Digitization Solutions

Cultural Heritage



PHASE**ONE**

“We are not
makers of history.
We are made
by history.”

Martin Luther King Jr.

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The World of Cultural Heritage

The Cultural Heritage world is diverse, with many different needs and challenges. For this reason Phase One offers modular and configurable solutions, which can be tailored to specific needs.

The need for digitization is rapidly growing, with increasing focus on public access, research and preservation of information for the future. Many museums and libraries with valuable collections are expanding their digitization efforts, with exciting possibilities, made available by the rapid growth of internet-access for everyone.

The history of Cultural Heritage photography is as long-standing as photography itself. Historic collections in museums and libraries have often had a dedicated photographic studio for creating photographs of sensitive material or for producing paper copies for researchers and scholars, protecting the original objects from wear or even damage.

Changing from analog based film processing to digitally based media has introduced a completely new range of applications and the possibility to share the material with a much broader



Melk Abbey Library, Melk, Austria
© Will Pryce

audience, while significantly increasing the reproduction quality. Preserving the past for the future is often a race against time as much of the material has a limited lifespan before it is gone forever. Thus solutions that enable rapid capture are not only necessary but often crucial.

Cultural Heritage Collection Types and Applications

All Cultural Heritage collections are unique and diverse, but due to the nature of collections, they often fall into distinct categories.

In order to address the diverse nature of collections, Phase One invests in developing, implementing and delivering specialized and tailored solutions, designed to produce the best output quality, while ensuring material safety and efficient workflow.

The main collection categories are:

- Archives and Manuscripts
- Rare Books Archiving
- Transparent Material and Film Scanning
- Fine Art Reproduction



Image courtesy of the Royal Danish Library.
Multi-spectral capture of note sheet by Danish composer Niels W. Gade.

Archives and Manuscripts

Documents, drawings, maps, manuscripts, photos, newspapers, musical scores, letters, post cards, and other flat objects in all sizes and shapes.

This type of work often requires a “set and forget” workflow where the camera and software are set up so that large numbers of flat objects can be recorded quickly while maintaining high resolution and accurate consistent color and luminosity.

The high resolution of the Phase One digitization solutions allows capturing several smaller objects at the same time, thus increasing speed and efficiency.

The requirement for lighting may be divided into two categories:

1. Uniform light over the entire surface with strict requirements to color precision. This is often achieved by photographing the material together with a color chart, as a reference for recreating the correct and exact same colors in the future.
2. Directional light may be used to enhance texture and three-dimensionality of the object. This type of work often leaves artistic freedom to the photographer, as the choices of light will enhance certain features, while diminishing others giving the image an interpreted look or style.



'John Rylands Library Hebrew Manuscript 6, Haggadah f.20 recto'
Image reproduced courtesy of the Centre for Heritage Imaging and Collection Care
© University of Manchester

Rare Books Archiving

A large part of the Cultural Heritage community works on digitization of rare and delicate bound materials, such as books. Digitization of books often requires special attention to the binding, that can be fragile, and will determine how the material can be handled in the process. This fact can sometimes be the limiting factor when looking for fast capture turnaround.

Uniform lighting will typically be the choice of operation here, and will often be the same throughout when working with reflective material.

Using a leveled glass plate with the camera set for fixed focus on a copy stand will accelerate the capture process, and photographing both pages at the same time with one or two cameras will also increase productivity.



Transparent Film and Glass Plate Negatives

Vintage glass plate negatives, medium and large format negatives, transparencies, including 35mm mounted slides, microfilm and all other transparent material.

Uniform illumination of the materials with good color reproduction is mandatory so that all color information may be retrieved during processing, sometimes involving inverting the image from negative to positive.

The conversion process can be open to interpretation, as the base material for the original transparency varies. This is true especially for the earlier glass plates where the specific type of chemicals and processing used is unknown.

Two rolls of film may behave very differently, both in the physical characteristics of the original base material and in their subsequent chemical development.

Traditional scanner solutions work with fixed sizes, such as 24x36 mm, 6x6" or 6x9", thus limiting the versatility of the equipment substantially. Phase One camera based solutions work with all sizes of originals.

There is a tremendous speed advantage in the instant medium format capture over scanning, which may speed up the process by a factor of 300 or more.

Fine Art Reproduction

3D and large flat objects such as sculptures, pottery, decorative arts and paintings, are often captured from a tripod in the photo studio or in the gallery and exhibition halls, ideally with uniform lighting to suit the object's character and the curator's requirement.

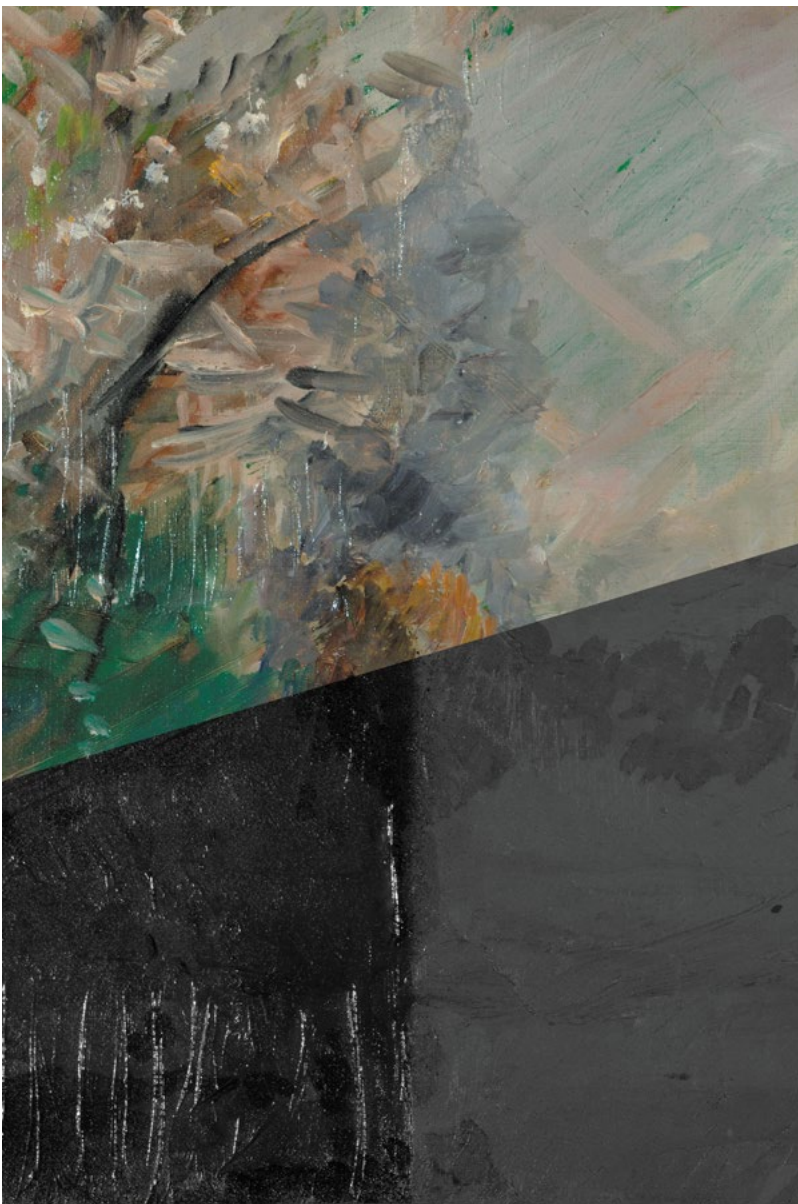
A whole range of different lighting can be used, from flash-based to continuous light to mixed light or even natural daylight. Best results are always obtained by using medium format camera solutions; either based on an SLR-type, or view cameras with tilt & shift movements.

The fastest workflow solutions comprise of a camera system such as the Phase One XF, available with the highest resolution sensors on the market.



Multispectral Imaging (MSI)

Multispectral imaging (MSI) captures light from a range of wavelengths - visible and invisible to the human eye - across the electromagnetic spectrum using special camera technology, light sources, and filters. The resulting “stacks” of images are used to analyze substances and surfaces to determine readability, authenticity, age, material-characterization and distribution. Application areas include analysis of documents, polychrome surfaces, fabrics for purposes of conservation and research into forensics and materials characterization. Phase One offers “Rainbow”: a fully automated 150MP multispectral imaging solution for both Multiband and Narrowband lighting techniques. Please refer to pages 34-39.



Credits Loa Ludvigsen (SMK) & Annette T. Keller (Phase One)



Image credit Fraunhofer IGD



Special Digitization Projects

Many cultural heritage objects that are fragile or sensitive due to various types of damage and decay are often very sensitive to human touch and, require careful handling. Using high resolution and precision cameras and optics allow researchers and scholars to perform non-invasive investigation and analysis with minimal or no exposure to aggressive light rays or chemicals, bringing out data that cannot be retrieved with traditional imaging techniques.

3D scanning combined with advanced photogrammetry, image analysis and calculation tools are used for measuring and evaluation of damage in historical objects. The same technology is used for creating exact replicas of precious sculptures and art work. The high resolution of Phase One cameras and the high quality and precision of the optics provide the basis for systems that are considerably faster than other scanning solutions.

Instant Capture vs. Scanning





Speed

Traditionally, flat objects, such as documents and books, have been scanned using flatbed or overhead scanners equipped with a linear CCD sensor. While some of these devices can produce high resolution and good quality output, the scanning of a single page can take up to 20-30 times longer than using a single-shot instant capture high resolution medium format camera with an area-array sensor and they cannot provide the same level of image quality.

Image Quality

When digitizing cultural heritage objects and materials, it is important to produce and maintain the highest image quality possible in terms of resolution, sharpness, tonality and color. Phase One's 150MP CMOS sensor, Phase One and Schneider-Kreuznach high precision optics, stable automated copy stands, and Capture One's advanced workflow and algorithms enable curators, photographers and digitization technicians to ensure that no detail gets missed and their collections are archived with the highest level of quality for future use, conservation and preservation.

Automation and Ease of Operation

New high precision AutoColumn copy stands paired with the iXH 150MP camera system and Capture One CH deliver AutoPPI - automated camera and column positioning setting automatically the desired capture resolution.

Tools for auto-cropping and for automated inversion of film captures from negative to positive also add to the move towards automation, as does Slipstream, the simplified capturing UI for Windows.

RAW Workflow

Unlike scanners, the RAW files coming from Phase One cameras contain the RAW data and all the relevant information necessary for processing and reprocessing the image, ensuring flexibility and a future-proof workflow. Images can be re-processed over time as software performance develops and improves.



Flexibility

Future-proof tethering: With the Infinity platform of iXH, the tethering options of Ethernet and USB-C provide many possibilities for flexible installation and workflow.

Multi-purpose use: Unlike scanners, a camera mounted on a copy stand can be moved up/down and can use different lenses to accommodate different object sizes. It can also be mounted on a tripod allowing photographing large, wall mounted or 3D objects.

Low Maintenance

Collections often include hundreds, thousands, or even millions of items that need to be digitized and reproduced consistently and accurately.

The Phase One iXH 150MP Camera System is designed and tested to withstand the toughest working conditions. It is built with minimal number of moving parts and Phase One's Reliance Shutter, ensuring long life and low maintenance intervals. The design allows for quick and easy swapping of components when it is time for service. The local support provided by a network of trained, value-added resellers ensures continuous uptime and fast turnaround.

23. und sollen auch ihren Teil am Lande haben, ein jeglicher unter dem Stamm, dabei er wohnet, spricht der Herr, **HERR**.

Das 48. Kapitel.

Verteilung des Landes. Umfang der heiligen Stadt und Namen ihrer Tore.

1. Dies sind die Namen der Stämme. Von Mitternacht, an dem Wege nach *Gethlon, gen Hamath und Hazar-Enon und von Damaskus gegen Hamath; das soll Dan für seinen Teil haben, von Morgen bis gen Abend. *R. 47, 15, 17.

2. Neben Dan soll Affer seinen Teil haben, von Morgen bis gen Abend.

3. Neben Affer soll Naphthali seinen Teil haben, von Morgen bis gen Abend.

4. Neben Naphthali soll Manasse seinen Teil haben, von Morgen bis gen Abend.

5. Neben Manasse soll Ephraim seinen Teil haben, von Morgen bis gen Abend.

6. Neben Ephraim soll Ruben seinen Teil haben, von Morgen bis gen Abend.

7. Neben Ruben soll Juda seinen Teil haben, von Morgen bis gen Abend.

8. Neben Juda aber sollt ihr einen Teil

14. Und sollen nichts davon verkaufen, noch verändern, damit des Landes Erstling nicht wegkomme; denn es ist dem **HERRN** geheiligt.

15. Aber die übrigen fünf tausend Ruten in die Breite gegen die fünf und zwanzig tausend Ruten in die Länge, das soll gemein Land sein zur Stadt, drinnen zu wohnen, und zu Vorstädten; und die Stadt soll mitten drinnen stehen.

16. Und das soll ihr Maß sein: vier tausend und fünf hundert Ruten gegen Mitternacht und gegen Mittag, desgleichen gegen Morgen und gegen Abend auch vier tausend und fünf hundert. Offenb. 21, 16.

17. Die Vorstadt aber soll haben zwei hundert und fünfzig Ruten gegen Mitternacht und gegen Mittag, desgleichen auch gegen Morgen und gegen Abend zwei hundert und fünfzig Ruten.

18. Aber das übrige an der Länge neben dem Abgesonderten und Geheiligten, nämlich zehn tausend Ruten gegen Morgen und zehn tausend gegen Abend, das gehöret zur Unterhaltung derer, die in der Stadt arbeiten.

19. Und Arbeiter aus allen Stämmen



Phase One iXH 150MP
Medium Format Camera System



Phase One XF IQ4 150MP
Medium Format Camera System



Phase One RS 72mm MkII lens
Schneider Kreuznach RS 120mm lens



Schneider Kreuznach lenses
from 45mm to 150mm

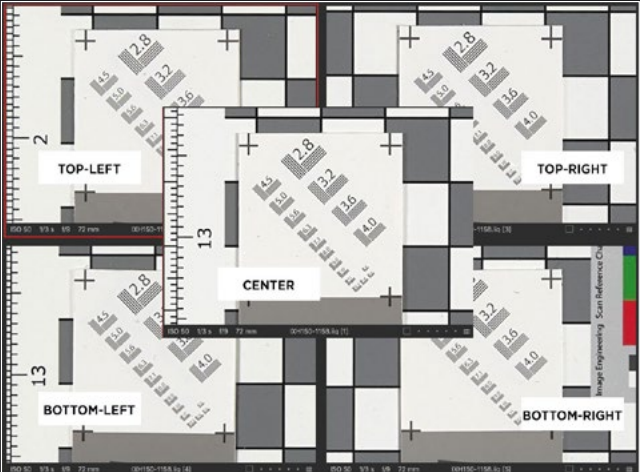


Copy Stand solutions
from Cambo, Kaiser,
Digital Transitions and Phase One



Capture One
Cultural Heritage

Phase One Flat Copy Digitization Solutions



A0@300ppi with AutoColumn

The Phase One iXH 150MP system gives the highest levels of resolution and flexibility allowing the capture of large objects such as drawings and maps, as well as smaller objects such as books and manuscripts. The 150MP sensor delivers imaging resolutions of up to A0 @300ppi, fitted for the most demanding digitization projects.

AutoColumn and AutoPPI are available with iXH 150MP and all Phase One RPS copy stand models. With the Phase One and Schneider Kreuznach lenses, both sharpness and detail are maintained across the field of view.

Components

Digitization Solutions - General Purpose

- Phase One iXH 150MP
- Phase One AutoColumn RPS 1600, 2300XL (floor/ wall-mounted), or 2300XXL copy stand
- Capture One CH

Features and benefits

- Solid, reliable and durable build
- Easy, fool proof operation
- Maximum adjustability
- 2-speed, self-limiting worm gear for accurate positioning
- Electro-mechanical top and bottom safety stops
- Max. camera load of up to 10 kg
- Flexible and modular design
- Consistent, reliable Autofocus with AutoPPI and excellent manual Live View adjustment
- Up to 400 times faster than traditional scanners



Phase One iXH 150MP
Medium Format Camera System



Phase One RS 72 Mk II
Schneider Kreuznach LS 80 mm MkII f/2.8 lens
Schneider Kreuznach RS 120mm lens



Phase One RPS 2300XL AutoColumn copy stand/
Phase One RSP 2-Motion motorized copy stand



Capture One Cultural Heritage

Phase One Film Capture Solutions



Digitizing Transparent Film and Glass Plate Negatives

With a capture rate of up to one image per second, the Phase One Film Capture Solutions are up to 400 times faster than flatbed, drum or virtual drum scanners.

Regardless of the density, size of the original glass plate, film negative or transparency, it provides a consistent and reliable workflow ensuring the highest levels of image quality and accuracy are met. The Phase One Film Capture Stage provides an adjustable, geared support mechanism and is compatible

with a range of carriers for glass plate negatives and most popular film strip and sheet formats.

It can be easily adjusted to position the object directly under the camera. Made of high-grade aluminum, it ensures longevity and reliability for many years.

The film carriers, also made from aluminum, are designed to maintain film flatness with a minimal amount of stress and offer easy mounting and dismounting.

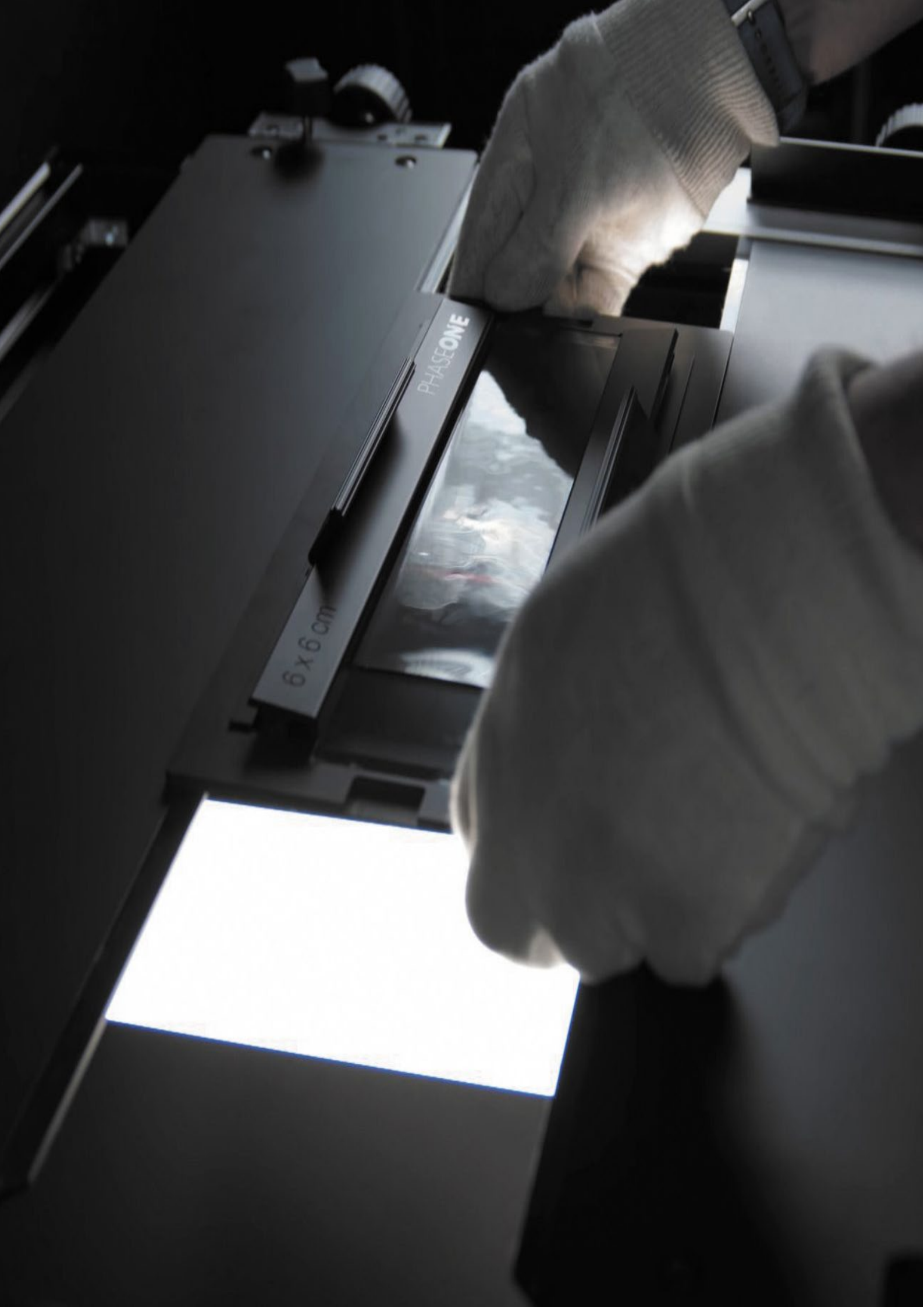


The glass plate carriers support most common and odd plate formats and are equipped with an optically optimized ANR glass base. These too are made of high-grade aluminum and are built to last, providing an economical solution for almost all types and sizes of plates.

With sensitive glass and film transparencies and negatives, material handling and its safety are key and Phase One Film Capture Stage offers the ideal solution for a wide range of applications.

The Phase One iXH 150MP Camera System comes with a Phase One 72mm MkII and/ or a Schneider Kreuznach 120mm Macro RS lens. The lenses are equipped with the Reliance Shutter, guaranteed for 1 million actuations and allowing for reliable and consistent capture of the finest detail with the minimum amount of vibration. The camera's build-in electronic shutter means unlimited number of actuations when used with continuous light source.

You can check out the full Phase One portfolio of digitization solutions for Cultural Heritage at the end of this guide.



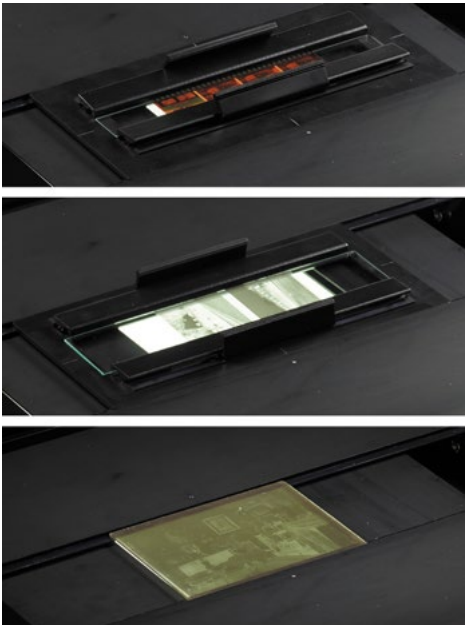
Phase One Film Capture Stage



The newly designed Film Capture Stage provides an adjustable, geared support mechanism and is compatible with a range of carriers for glass plate negatives as well as most popular film strip and sheet formats. It can be easily adjusted to position the object directly under the camera.

Phase One Film Capture Stage

Specifications	Dimensions (WxHxD)	730 x 216 x 700 mm (28.7 x 8.5 x 27.5 in)
	Weight approx.	13.5 kg (29.7 lbs)



Phase One Film Carriers and Glass Plate Holders

The Phase One Film and Glass Plate Carriers are designed to work with the Film Capture Stage, ensuring smooth handling and efficient workflow.

Made of milled high-grade aluminum and using optically optimized glass base, they maintain parallelism and flatness. The Film Carriers work with special designed clamps that carefully stretch and flatten the film strips.

Supported film formats:

- 35 mm strips
- 120 mm strips
- 9 x 12 cm
- 13 x 18 cm
- 18 x 24 cm
- 4 x 5 in
- 8 x 10 in
- Mounted 35 mm slides

The Glass Plate Holders work with special designed “top stop” which ensures accurate and quick positioning of glass plates of the same size.

Supported glass plate formats:

- 9 x 12 cm
- 13 x 18 cm
- 18 x 24 cm
- 24 x 30 cm

Custom size holders and carriers are available on request.

Phase One Book Scanning Solutions



The ever-increasing focus on enabling public access, research and preservation of assets for the future means that institutes, such as libraries and archives, are required to improve, expand and speed up their digitization capabilities. Preserving the past for the future is often a race against time, since many materials are subject to degradation with a limited lifespan. Solutions that enable rapid capture at the highest possible image quality is becoming crucial.

Books are often of fragile nature; hence they require a digitization workflow with the greatest attention to efficiency and careful handling of the object. Phase One's solutions range from more flexible options to a cradle offering an automated and synchronized capture of two book pages at a time. This allows us to serve the needs of various institutions and provide one of the fastest digitization solutions for books.

Following our mantra of simply placing the object, pressing the capture button and subsequent processing of the images, we created a simple and straightforward workflow with very little training required. At Phase One, as one of the leading manufacturers of digitization solutions, we continuously look for ways to expand and improve our offerings, utilizing and adapting the best imaging technology and the highest level of accuracy and consistency to suit large-scale and high-volume digitization projects.



© Dodwell, C. R. Anglo-Saxon Art: A New Perspective. Cornell UP, 1982

Desktop Book Cradle

The new Phase One Desktop Book Cradle is designed as a simple digitization cradle for small and medium size books and bound materials.

Constructed from high-grade aluminum extrusions, its chassis provides a stable, reliable, and long-lasting platform.

Compatible with all Phase One copy stands and cameras, the Desktop Book Cradle supports books of up to A3 page size, with a maximum spine thickness of 17 cm (optional 25 cm).

With an adjustable opening angle (140° maximum) it ensures safe and accurate positioning and alignment of the book and the camera. A removable glass platen holds the page flat. Alternatively, for rare and fragile books the 4 glass fingers (included) can carefully hold most curled pages avoiding unnecessary pressure and unwanted shadows.



Desktop Book Cradle

Specifications

Maximum supported book size (cm)	32 x 42 (A3 book page size)
Maximum spine thickness (cm)	17 (option for 25)
Adjustable angle support	Yes
Adjustable base lifting	Yes, mechanical
Maximum opening angle (°)	130-140
Glass platen size (cm)	32 x 42 (A3 book page size)
Glass fingers	4
Glass fingers size (cm)	2 x 8
Footprint (cm)	50 x 60 x 45
Weight (kg)	15

V-Twin Book Digitization Solution

The Phase One V-Twin book digitization system combines the best imaging sensor technology with a robust, stable construction providing excellent ergonomics, safe material handling and an efficient workflow.

The cradle supports books with a size of A2+, maximum 25 kg weight and a spine thickness of up-to 25 cm. Its 100° opening is optimized for digitization of rare books that cannot be opened flat, as well as other bound material avoiding unnecessary reflections while capturing two pages simultaneously. The quiet, powerful electric motors ensure accurate and safe raising/lowering of the upper and lower platens, while the market-leading D8 R+ LED panels, with CRI of >98, produce even and stable light distribution, essential for meeting the most stringent imaging guidelines.

An optional glassless V cradle allows for the handling of rare and fragile books, and an optional conversion kit converts the V-Twin into a regular A1 sized copy stand for flat art/document reproduction.



The two Phase One iXM-MV100 cameras, fitted with Linos Inspec.X 60mm/f4 lenses deliver high resolution images with accurate, 16-bit color, high dynamic range and low noise, easily adhering to the FADGI, ISO 19264 and Metamorfoze guidelines.

V-Twin book digitization solution

Specifications	Maximum book size (cm)	A2+ (43x61)
	Maximum book weight (Kg)	25
	Maximum spine width (cm)	25
	Imaging sensors	100MP CMOS, Back Side Illumination with Electronic Shutter
	Image capture size & resolution	A2+ @ up to 460ppi
	Color depth	RGB 16-bit or 14-bit per channel
	Camera Interface	USB-C; 10G ethernet (adapter required)
	Approvals	FCC Class A, CE, RoHS
	LED Panels	CRI >98 at 100% brightness, >50,000 hrs durability

Phase One RPS 2300XXL

Floorstanding AutoColumn Copy Stand for Large Format A0+ objects

The gold standard of AutoColumn copy stands, the new Phase One RPS 2300XXL, is designed with motorized AutoColumn technology to enable efficient work with the iXH 150MP camera system and Capture One CH.

The Phase One RPS 2300XXL features high precision camera positioning, and a geared movable camera arm. A camera levelling head secures precise and quick positioning.

A steel baseboard cover is included for applications that require use of magnets. The new base and board provide a stable platform to support the objects as well as the AutoColumn and the iXH 150MP camera; in this case A0 @300ppi can be achieved easily and repeatedly.



[AutoColumn copy stand for Large Format A0+ objects](#)

Specifications

Base board size	130 x 100 cm (51.2 x 39.4 in)
Maximum arm load	10 kg (22 lbs)
Camera mounting plate	Arca Swiss type quick release



Phase One RPS 2300XL

Floorstanding AutoColumn Copy Stand with LED option

The gold standard of AutoColumn copy stands, the new Phase One RPS 2300XL, is designed with motorized AutoColumn technology to enable efficient work with the iXH 150MP camera system and Capture One CH.

The Phase One RPS 2300XL features high precision camera positioning and a geared movable camera arm. A camera levelling head secures precise and quick positioning. An LED baseboard insert is available for transparency digitization.

Wall mount options are available for the 2300XL column as well as upgrades for existing RPS 2300 products in the field.

AutoColumn copy stand with LED option

Specifications	Base board size	100 x 75 cm (39.4 x 29.5 in)
	LED insert plate	42 x 32 cm, 6500K, dimmable
	Maximum arm load	10 kg (22 lbs)
	Camera mounting plate	Arca Swiss type quick release



Phase One RPS 1600

Tabletop AutoColumn Copy Stand with LED option

The Phase One RPS 1600 is designed with motorized AutoColumn technology to enable efficient work with the iXH 150MP camera system and Capture One CH.

The Phase One RPS 1600 features high precision camera positioning and a geared movable camera arm. A camera levelling head secures precise and quick positioning. An LED baseboard insert is available for transparency digitization.

AutoColumn copy stand with LED option

Specifications	Base board size	100 x 75 cm (39.4 x 29.5 in)
	Column Height	160 cm
	LED insert plate	42 x 32 cm, 6500K, dimmable
	Maximum arm load	10 kg (22 lbs)
	Camera mounting plate	Arca Swiss type quick release



Phase One 2-Motion

Maximum flexibility for larger objects

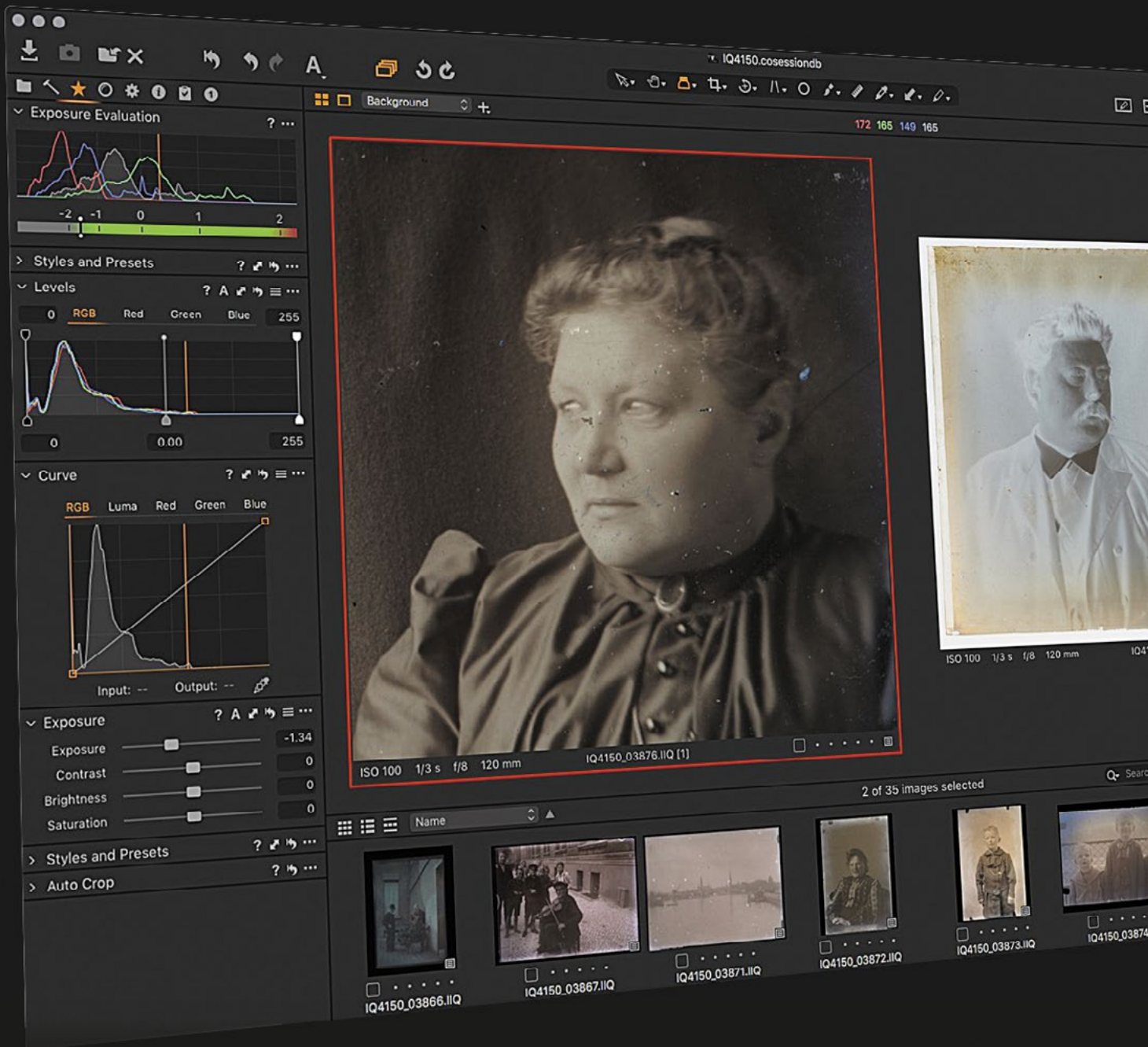
The RSP 2-Motion adds an adjustable motorized 100 x 80 cm base-board allowing for greater flexibility and use of different lenses when scanning larger objects. The baseboard can be fitted with a steel sheet plate up to DINA0 format for magnetic attachment of large drawings, maps etc.

Phase One 2-Motion

Specifications	Total height	227 cm (89.4 in)
	Maximum working span	160 cm (63 in)
	Column cross section	120 x 80 mm (4.7 x 3.1 in)
	Maximum load	on camera carrier: 10 kg (22 lbs) on base board: 15 kg (33 lbs)
	Base board	100 x 80 cm (39.4 x 31.5 in)
	Camera platform	13 x 13 cm (5.1 x 5.1 in)
	Connecting thread (interchangeable)	1/4" / 3/8"
	Required floor space (WxD)	100 x 126 cm (39.4 x 49.6 in)



Capture One for Cultural Heritage Solutions





Capture One CH is a professional Rapid Capture Solution dedicated to the Cultural Heritage community.

Built on the renowned Capture One software, the Cultural Heritage edition offers a highly specialized feature-set that delivers a significantly faster reprographic workflow during both capture and post-production.

The new Slipstream mode - a simplified user interface - enables less-skilled operators to handle the capturing and it speeds up the workflow, especially when working on large collections and large volumes of documents that need digitization.

The ever-evolving Capture One CH offers key features designed to increase productivity and efficiency when working with high-volume collections. With extra specialized tools and automation technology, the software expands on the admin and operator toolboxes to facilitate modern production needs and prevent bottlenecks commonly created in large-volume production.

A Quantum Leap in Productivity

Use Capture One CH to optimize your images. Not only do you get the highest image quality from the advanced image-rendering engine, you also have access to powerful adjustment tools to fine-tune your images for final presentation, digital asset management, archival, retrieval, and much more.

Negative Film Reproduction Tool and Styles

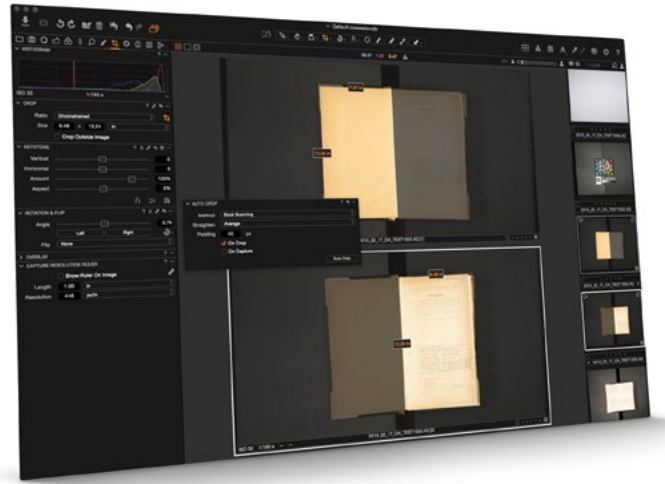
Take advantage of the improved workflow, automating the conversion of negative transparent material in both black & white and colors. Use the intuitive exposure tools to adjust exposure, contrast and colors, and get perfect results for print or further post-processing.

A selection of Cultural Heritage styles allows to quickly choose a set of conversion parameters for different film types.

Auto Crop & Auto Rotate

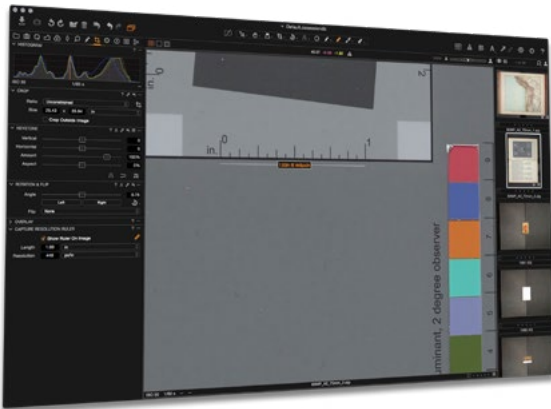
Boost productivity by automating cropping in post-processing. Select cropping options for flat art reproduction or books, including corner or edge alignment with positive or negative padding for all cropping methods.

Save time with On-Capture multi-crop when digitizing books that do not require the full resolution of the camera, where 2 pages can be captured and separated on the fly. Use an advanced auto-cropping setup for film rolls and strips that includes straightening and post-crop auto levels optimization.



Camera Focus with Auto Column and PPI-Assist

In combination with the iXH 150MP, the camera focus tool delivers accurate measuring of distance to object and, based on that, it calculates the capture resolution, magnification and field-of-view. The data is calculated for current camera position and delivers precise data for automated or guided re-positioning of the camera to capture at target ppi, magnification or field-of-view. You can check out the AutoColumn solutions available at the end of this guide.

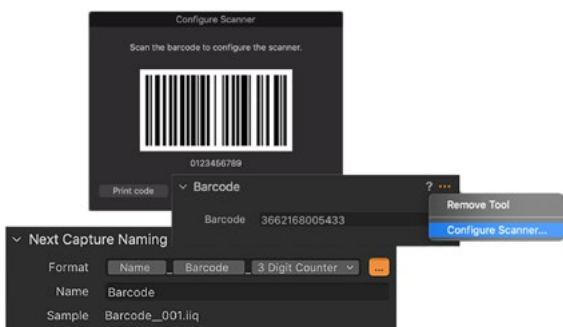


Capture Resolution Ruler

The Resolution Ruler delivers verification of the capture resolution at any given camera position. It allows for marking up a known length in the target subject matter, in inches or centimeters, and calculating the exact capture resolution.

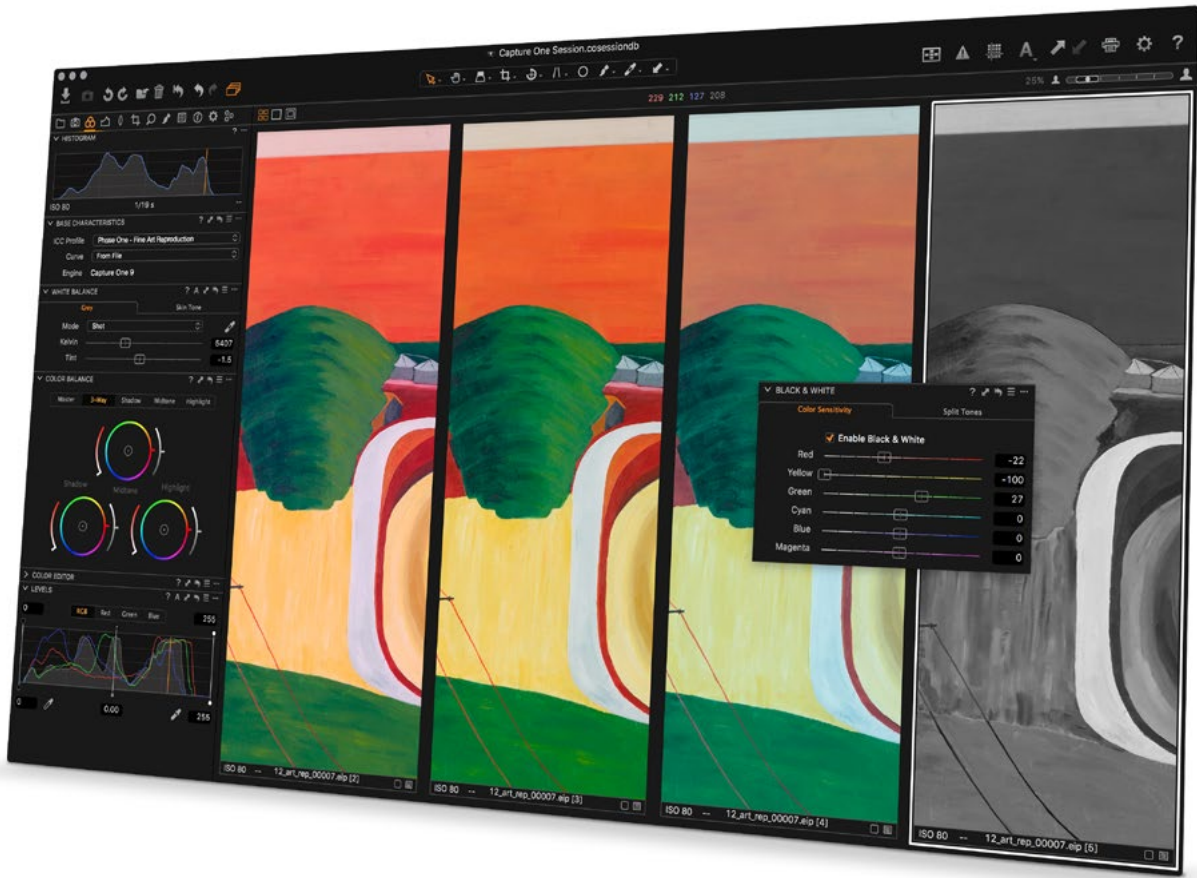
Slipstream Capturing for Non-trained Operators

Slipstream, available for Windows, delivers easy-to-use capturing interface allowing non-skilled operators to handle the capturing process. Slipstream works on top of the Capture One CH platform. This facilitates interfacing and access to the admin tools for camera setup, post processing, and image storage matching the needs of both simple and advanced networking environments.



Barcode Scanner Tool

The integrated Barcode Scanner tool ensures that objects are named and identified correctly as they are captured. Use it together with the Next Capture Naming tool.



CH Workspaces

A Capture One CH workspace is a logical setup with a Collection of tools customized to optimize a given CH workflow. Workspaces may be made for tailoring the user-interface for preparation, production and file storage. It can include the required capture and processing tools for specific Reflective or Transmissive materials. Workspaces can be used by both admin and operator personnel.

Tools Lock

Admins can lock specific tools (individually or as a set) so that they cannot be accidentally altered by operators during capture. Assign pin codes to specific tools to prevent operators from changing important capture properties or settings.

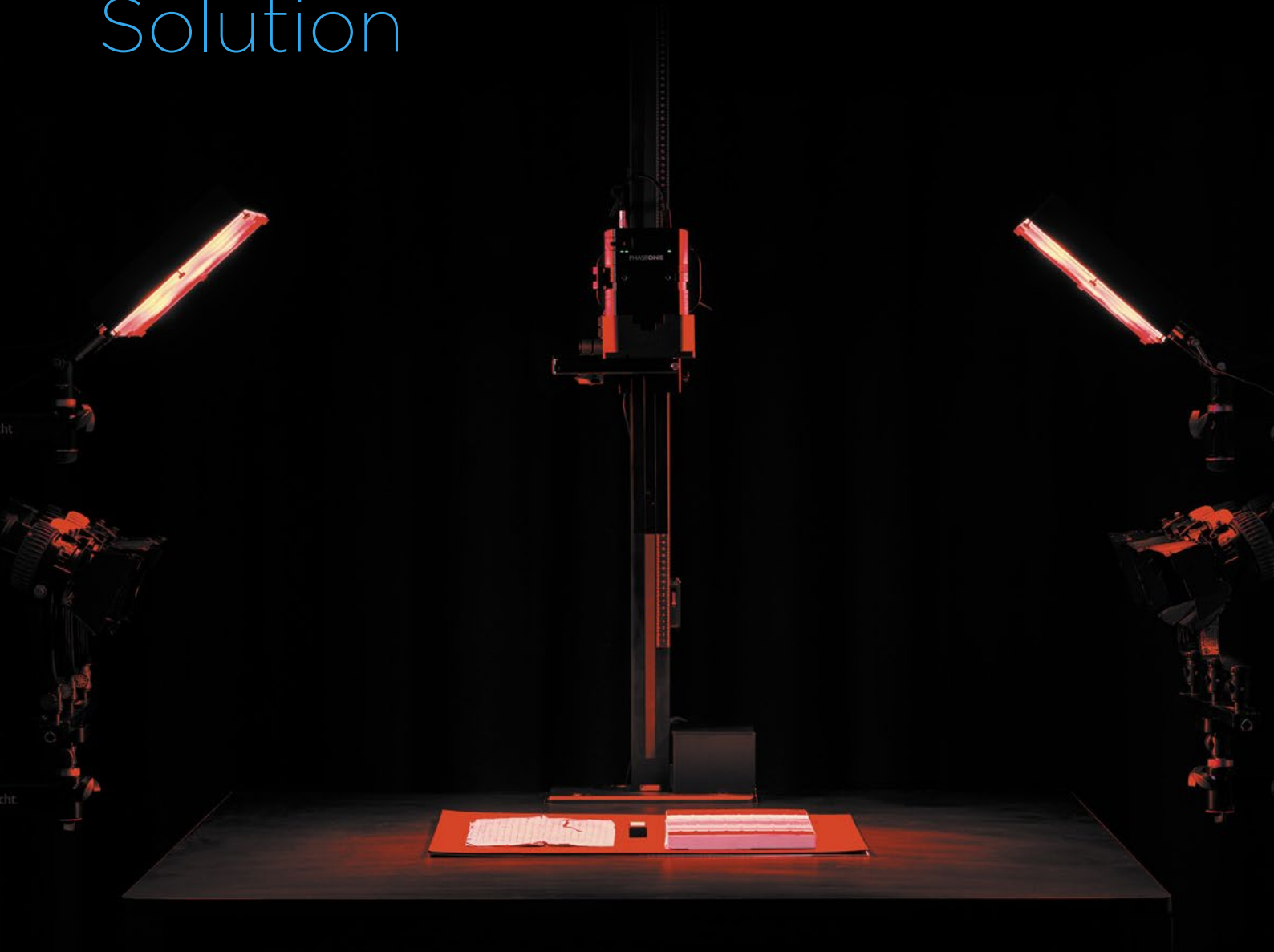
ICC Profiles for Cultural Heritage

Obtain high color accuracy with the specialized ICC profiles optimized to be robust under the slight changes happening to lighting over time. The profiles work for both flat art and three dimensional objects. Available for common studio light types such as flash, LED and tungsten as well as for specific types of film.

Creative Enhancements

Advanced Color Editor can help to achieve monochrome images or to enhance selected colors. In order to achieve the perfect image, Capture One CH offers an Enhanced Color Editor and also a Black & White Tool. Capture One CH offers a vastly improved noise reduction, especially for higher ISO images.

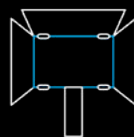
Phase One Rainbow Solution



Non-invasive & Non-destructive
contactless analysis



Quick first step for further
analysis - Do it once do it right



Nondestructive thanks to
low energy LED lighting



Modular & mobile
capturing solutions

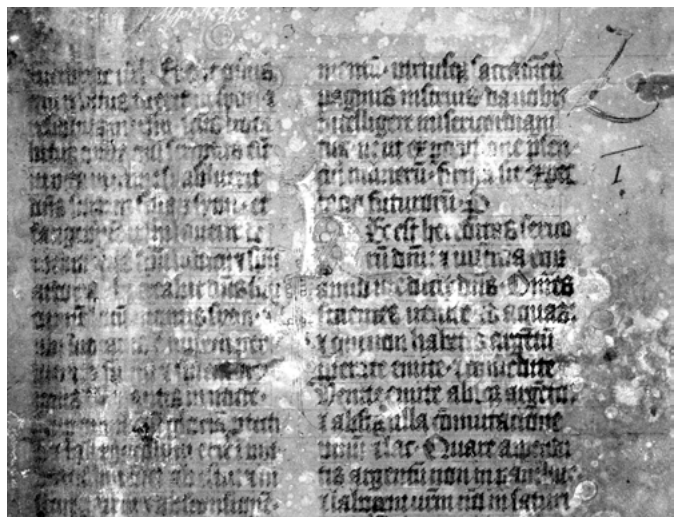
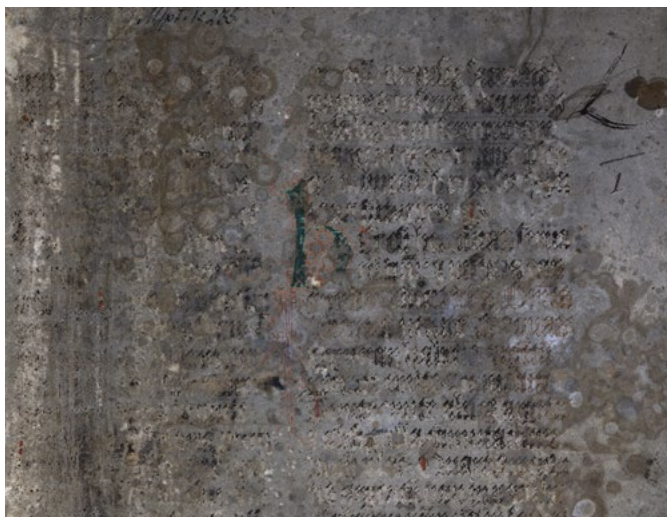
Discovering Multispectral Imaging (MSI)

Multispectral Imaging (MSI) captures light from a range of wavelengths - visible and invisible to the human eye - across the electromagnetic spectrum using special camera technology, light sources, and filters.

The “stack” of images produced by the multispectral imaging solution is used to analyze substances and surfaces to determine readability, authenticity, age and material characterization and distribution.

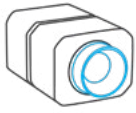
MSI in a wide range of applications

1. Analysis of documents - readability of text on parchment, scrolls, and paper, often in poor condition.
2. Analysis of polychrome surfaces such as paintings - on canvas, wood, stone, and other materials.
3. Applications include non-invasive analysis for conservation work and authentication.
4. Analysis of fabrics of all kinds - such as historic research to determine age and material.
5. Police, forensic and crime scene investigation. Analysis for residue of human fluids on fabric, fingerprints, marks from use of weapons, and crime scene evidence.
6. Materials characterization and sorting. Applications include quality assurance, research and development of new materials, and analysis for machine vision.
7. To differentiate subject matter based on the differentiated response from materials with different chemical compositions.



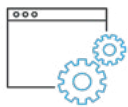
Images credits Aare Vesi / University of Tartu Library

The Rainbow Multispectral Imaging Solution



Rainbow MSI Solution Cameras

The iXH 150MP Wide Spectrum camera employs high resolution, color accurate CMOS sensors and advanced focusing to deliver sharp, reliable and repeatable results through the entire sweep of the light wavelengths involved. The RGB WS sensor, tailored for multispectral imaging, can also be used for highest quality digitization work by attaching the included IR/UV cut filter. You can find out more on the iXH camera on pages 40-45.



Software

The software controls all the elements – focusing the camera, moving the filter carousel on the filter wheel, turning the lights on and off in the correct order and timing, aligning the images, and finally creating the Perfect Stack.

The Rainbow MSI Software includes an analysis module that lets you see results instantly, based on Principal Component Analysis, Independent Component Analysis and Clustering (K-Means).

Additionally, a Spectral Readout tool gives an instant overview of the spectral composition at a given point in the image for narrowband stacks, an extremely useful feature for identification and classification of materials used in the subject.

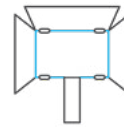


Phase One Expert Team

The Rainbow MSI solution can be tailored for a wide range of applications. The Phase One Expert Team is ready with customer guidance to configure the best solution for a given application. Advice is backed up with online demonstrations and sample imaging from the Phase One MSI demo center in Cologne, Germany.



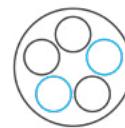
Credits Loa Ludvigsen (SMK) & Annette T. Keller (Phase One)



LED Lights

Rainbow supports two types of LED lights for a wide range of applications:

- Multiband lights, delivering narrowband UV, broadband visible light, broadband and narrowband IR. This light is often used for MSI applications related to Art Conservation and to Police Forensics. Recipes for the capture of images following the CHARISMA guidelines are included.
- Narrowband lights, delivering 16 narrowbands of light from UV, through visible to IR. Narrowband MSI is used for a range of research disciplines, including the analysis of inks, paints, residues, and features in manuscripts, readability of old, damaged or faded documents, objects and artwork.



Filter Wheel

The filter wheel can hold up to five filters. It is configured to support the filtering needs of accurate visible imaging and luminescence imaging, which fits many applications, including following the CHARISMA guidelines.

The carousel which holds the filters is removable and can be configured with any 2" filters for future scientific applications. The factory capture settings can be adjusted to suit different filter configurations.

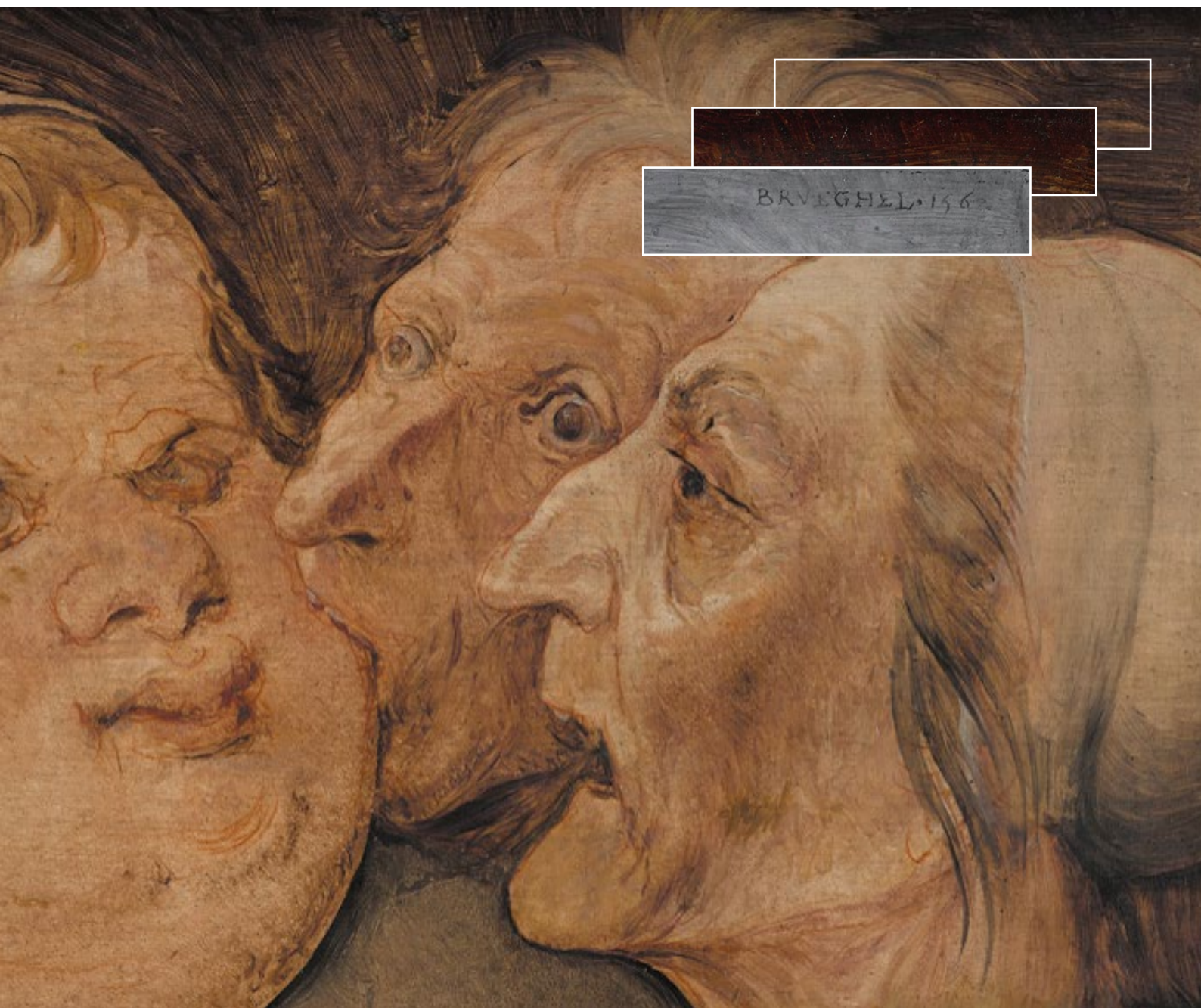
To support different MSI applications, you can simply work with two or more filter carousels.

Multispectral Imaging in Use

1. The National Gallery of Denmark

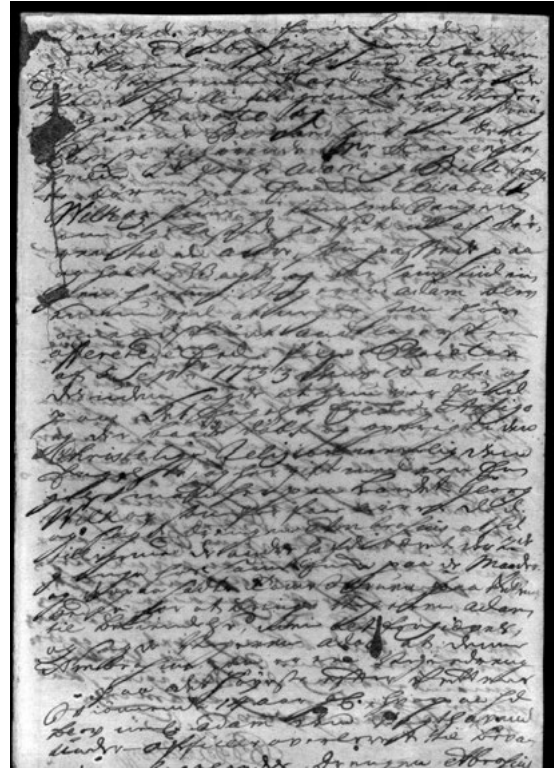
The National Gallery of Denmark owns a painting acquired hundreds of years ago by the Danish Royal Family. The painting has been inspected and analyzed several times to determine its origin and creator without success. In the fall of 2019, the painting was analyzed again by using wide spectrum photography at a high resolution with a sequence of different lighting, including UV light, visible light in reflectance and photo-induced luminescence, and IR light. The IR image disclosed the painted signature "BRUEGHEL 1562" in the upper right corner. Authentication of a Pieter Bruegel the Elder masterpiece was well under way.

Credits Loa Ludvigsen (SMK) & Annette T. Keller (Phase One)



2. The Royal Library of Denmark

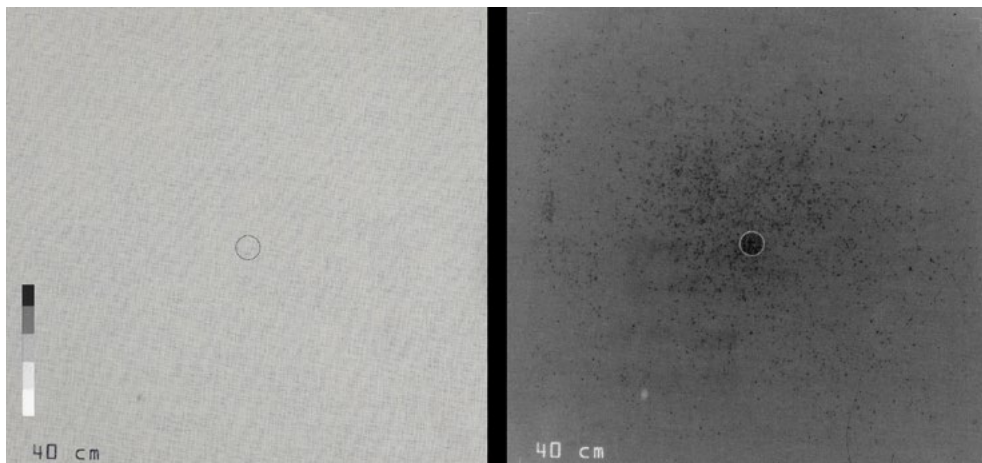
The Royal Library of Denmark holds collections of handwritten letters and records from the former Danish colonies in Tranquebar, India (1620-1845) and St. Croix, the West Indies (1672-1917). Many of these documents are faded and decayed by age, by moisture and from bugs. In 2017 samples from the collections were captured using Multispectral Imaging and the results included the recovery of readability and the appearance of watermarks in the paper.



Copyrights Royal Danish Library - August 2015 & Equipoise Imaging/RB Toth Associates

3. Police and Forensics

Many disciplines of MSI analysis are applied within Police work. Here is an example of gunshot residue - discovered by photo-induced IR luminescence.



Copyright Annette T. Keller Phase One

Technical specifications

iXH 150MP WS

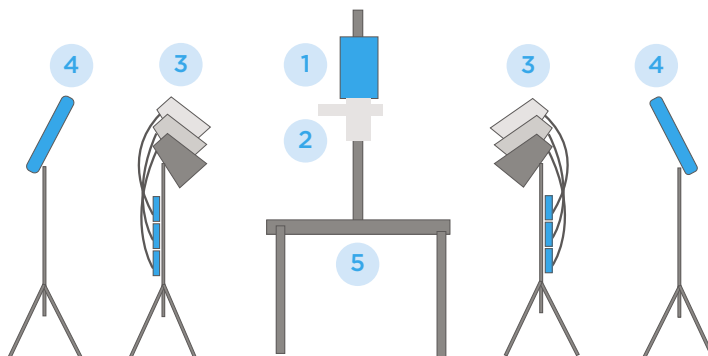
Camera specification

Sensor size	53.4 x 40.0
Resolution	14204 x 10652
Pixel size (µm)	3.76
ISO Range	50 - 800
Data Interface	USB-C/ 10G Ethernet
File Formats	Raw 14bit, Raw 16bit
Lenses	Schneider Kreuznach RS 72mm and/or 120mm
Weight (gr) with 72mm lens	2,500 incl. L - Bracket
Dimension (mm) with 72mm lens	177 x 130 x 130 incl. L - Bracket
Approvals	FCC Class A, CE, RoHS
Operating Temperature (°C)	0 to 40
Operating Humidity (%)	15 - 80 (non-condensing)
Accessories	S8612 filter for normal photography with stepping rings for lenses Custom lens shade suited for the supplied filter wheel

System specification

	Multiband Solution	Narrowband Solution
Included LED lights	2 x UV, incl. UG11 filters (365 nm) 2 x VIS, incl. BG39 filters 2 x IR (860 nm & 960 nm)	Wavelengths (nm): 365, 385, 410, 420, 450, 480, 510, 530, 550, 600, 630, 640, 660, 740, 850, 940
Configuration	2 banks with UV-, VIS-, IR-emission each	2 panels with 16 LEDs in each
Filter Wheel (5- position)	Included, controlled via USB	
Communication with lights and filter wheel	USB via 7 - port powered hub	
Light stands	Light stand and copystand not included	
Workflow Software	Phase One Rainbow MSI software	
Output	8-image stack, according to Charisma Guidelines	16-image monochrome stack, ready for statistical analysis
Output Luminescence	3 channels	15 channels

Solution at a glance



1. iXH 150MP Wide Spectrum camera incl. IR/UV cut filter & hood
2. MSI accessory kit incl. Filter wheel, mounting rail, USBU hub and software
3. Multiband/Charisma Dedolights, including filters, power supplies and USB power switches
4. Narrowband Lights
5. Copystand (desktop/ floor/ wall)



Phase One iXH Camera System

Cultural institutions have the staggering task of achieving perfection in the preservation of their collections. Phase One delivers intelligent capture solutions built to process high volume digitization programs with speed and accuracy. Our specialized research and development team have developed a configurable solution that provides an ergonomic and efficient workflow, resilient hardware, and Phase One's patented imaging capabilities. The efforts have yielded the **iXH 150MP** Camera System, designed with quality, durability and ease of use in mind for a wide range of applications, with complete software integration into **Capture One CH**. These cameras accurately measure distance to object matter and record the resolution

(PPI), field-of-view and magnification, making it easy to position them on any copy stand for a given scanning purpose. We refer to this functionality as **PPI-Assist**. In combination with the Phase One **AutoColumn** copy stands and Capture One CH, the iXH 150MP camera are integral for delivering automated camera positioning for a specified PPI. With the Phase One **Film Capture Stage**, all types of film and glass plates can be readily digitized.

The configuration of the iXH 150MP solution go hand-in-hand with the development of Capture One Cultural Heritage software. Our iXH 150MP Camera Solution is designed with quality, material safety and an efficient workflow in mind.

iXH 150MP

Instant Capture at the Highest Resolution

The Phase One iXH 150MP is a powerful camera system that delivers the highest resolution, achieving the 300ppi benchmark for A0 size flat objects such as maps and drawings.

- Reliable, precise and resilient
- Outstanding dynamic range
- Faster data transfer
- Flexible connectivity

Color Accuracy and Finest Detail

The iXH 150MP camera system uses a CMOS BSI sensor with an outstanding dynamic range of 15 f-stops to ensure the highest resolution, sensitivity and lowest level of noise. It produces the most accurate colors and details thanks to the upgraded electronics and processors which allow high accuracy in the reproduction of Cultural Heritage applications such as artworks and precious books.

The iXH 150MP Achromatic and the iXH 150MP WS (Wide Spectrum) combine the highest resolution and class-leading spectral sensitivity required for specialized scientific imaging applications, research and conservation of manuscripts, maps and drawings.

With its ability to capture in color, UV and IR, the iXH 150MP WS camera is the tool of choice for imaging applications such as paintings, medical and forensics. By simply adding an IR block filter, the Wide Spectrum camera converts to a regular camera.

Industrial Durability with one Million Actuations Guaranteed

The iXH 150MP offers industrial build-quality made with aerial-grade aluminum and the most durable mechanical and electronic components available today. The iXH 150MP's mechanical Reliance Shutter is offered with one million actuations guaranteed. In electronic shutter mode, an unlimited number of shutter actuations can be achieved.



The newly designed housing with its integrated heat sink and cooling fins ensures that the temperature remains low even during long days of running Live View continuously, producing noise-free images and consistent results.

USB-C and 10G Ethernet data interface options both deliver the highest transfer rates and flexibility to suit different configuration needs and workflows.

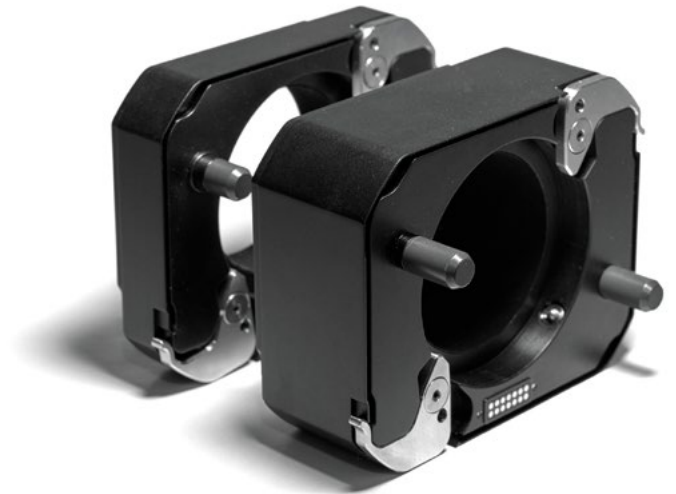
Lenses

Phase One RS 72 mm MkII Lens Schneider Kreuznach RS 120 mm Lens

The Phase One 72 mm MkII lens is designed from the ground up to deliver top of the line performance and optimization. Its floating element increases precision at all apertures and magnification ranges, from infinity to 1:3.

The iXH 150MP Camera is also available with the Schneider Kreuznach 120 mm lens. The 21 mm and 42 mm extension tube accessories, used with the 120 mm lens, are designed with the same accuracy and quality as the camera body and lenses, allowing close-ups at a higher resolution, resulting in accurate capture of small objects and is optimized for film digitization. When combined with the Phase One 21 mm and 42 mm extension tubes, it can reach magnifications of approx. 1:1, maintaining a flat field of view and excellent sharpness across the frame.

The two lenses allow flat copy and film work to meet the demands of libraries, archives, and universities. The lenses keep the color uniformity required for the most demanding reproduction applications.



Technical specifications

iXH 150MP

System specification	Imaging sensor options	iXH 150MP, iXH 150MP Achromatic and iXH 150MP Wide Sprectrum - all with BSI sensors		
	Lens mount	Phase One iXH		
	Shutter type	Reliance (RS) leaf shutter, integrated in lens On-Sensor Electronic shutter (ES)		
	Shutter speed	1/250s – 1hr		
	Focus positions	Close range to near infinity, 21 mm max. extension		
	Focus control	Motorized & encoded, controlled from Capture One CH software		
	Mechanical mounts	VHQ L-Bracket with standard Arca-Swiss dovetail and a 3/8" threaded hole with a dedicated L-Bracket		
	Data Interfaces	USB-c/ 10G Ethernet		
	Other Interfaces	Flash Output, LED light control, remote triggering		
	Cooling	Integrated cooling fins and heat sink		
	Dimensions (mm)	227 x 130 x 130 incl. L-Bracket with 72 mm MkII lens		
	Weight (g)	3,450 incl. L-Bracket with 72 mm MkII lens		
	Operational temp range (°C)	10-35 (office environment)		
Humidity (%)	15-80 (office environment)			

		Phase One 72mm MkII	Schneider Kreuznach 72mm RS-iXG	Schneider Kreuznach 120mm RS-iXG
Lens specification	Magnification range	1:70 – 1:3 (optimal 1:1)	Infinity to 1:0.9 with extension tubes	1:6,9 to 1:1,2 with extension tubes
	Lens thread diameter (mm)	77	40.5	46.0

Phase One XF Camera System





XF IQ4 150MP Camera System

The XF Camera System delivers uncompromised image quality thanks to quality Schneider Kreuznach optics and high resolution full frame medium format sensors. It offers a customizable workflow that seamlessly adapts to changing project requirements, and provides tools built specifically for the demanding requirements of the professional photographer, such as Focus Stacking, Automated Frame Averaging and Dual Exposure +, and delivering the highest image quality and maximum flexibility.

	XF IQ4 150MP Camera System	XF IQ4 100MP Camera System	
Technical specifications	Resolution	151MP (CMOS BSI)	101MP (CMOS)
	Dinamic range	15 f-stops	15 f-stops
	Sensitivity (ISO)	50 - 25600	35 - 12800
	Active pixels	14204 x 10652	11608 x 8708
	Storage	XQD, CFexpress, SD, Capture One	XQD, CFexpress, SD, Capture One
	Tethering	Ethernet, USB-C, Wireless	Ethernet, USB-C, Wireless
	Warranty	5 years	5 years

Phase One Lenses

Schneider Kreuznach Blue Ring Lenses



45 mm LS f/3.5



Providing a focal length that is perfect for almost any application, the Blue Ring 45 mm f/3.5 offers edge-to-edge sharpness and nearly distortion free results.

- Tack sharp wide-angle lens
- Minimum optical distortion
- Flash synchronization up to 1/1600th
- Suitable for both small & large flat copy applications



55 mm LS f/2.8



Minimal distortion semi-wide-angle design provides a normal look, great for general purpose applications.

- Fast aperture, shallow depth of field
- Compact size with flash synchronization up to 1/1600 th

For the full range of available lenses please go to www.phaseone.com



80 mm LS f/2.8 Mark II



A standard focal length lens, suitable for a variety of 2D and 3D applications.

- Edge to edge sharpness
- Fast aperture for shallow depth of field
- Flash synchronization up to 1/1600 th



120 mm LS f/4.0 Macro



Macro lens ideal for close-up product shots, and equally ideal for flat copy and high magnification film digitization.

- Edge-to-edge tack sharp images
- Beautiful out-of-focus bokeh
- Auto Focus and Manual focus

Cultural Heritage Solution Partners

Phase One

Phase One is the world leader in open-platform medium format digital camera systems and solutions designed to deliver the highest image quality for professional photography.

Our products are built by hand using the best materials, highest precision and most advanced quality assurance processes.

Our company was born digital and we have always strived to deliver the highest image quality possible through innovative solutions. Well known Cultural Heritage institutions worldwide

rely on our combined systems to consistently deliver the highest level of quality, performance and safety for demanding collections of objects.

Phase One was founded in 1994 and is based in Copenhagen with offices in Denver, Tokyo, Cologne and Hong Kong.

Phase One is proud to work together with the world's leading value added resellers. In doing so we ensure the highest level of service and support to our customers.

Digital Transitions, USA

The Digital Transitions' Division of Cultural Heritage provides cameras and copy-stand solutions to support the digitization programs of libraries, museums, archives, collectors, service bureaus and other institutions.

Digital Transitions' approach is comprehensive. They work closely with every client to design a complete solution with an

efficient standards-based workflow. This includes careful choice of hardware, integrating our systems into existing infra-structures, and providing ongoing support and training to staff in order to keep the digitization program running efficiently.

For more information, please visit:
<http://dtculturalheritage.com>

Cambo, The Netherlands

Cambo BV, founded in 1946, is based in the town of Kampen in The Netherlands, and today works from a modern 2,000 sq.m. facility with the latest computer controlled design and machine tools, ensuring production to the highest standards.

Cambo produces a range of camera support stands and other studio accessories, including dedicated Reproduction cameras and Reproduction stands.

For more information, please visit:
<http://www.cambo.com/en/>

Kaiser Fototechnik, Germany

For more than 40 years, the copy stands from Kaiser Fototechnik have been chosen by photographers, libraries, and archives for professional repro-graphic work. Together with Phase One's camera solutions and software, we have

created a line of Instant Capture solutions for efficient and high quality digitization projects.

For more information, please visit:
<http://www.kaiser-fototechnik.de/en/>





Phase One Scanning Solutions

CH Product Portfolio

Suitable Resolution (Size@PPI)

Baseboard size (cm)

Flat copy digitization solutions with AutoColumn or 2-motion copy stand		
General purpose digitization solution, Autocolumn 2300XXL, iXH 150MP	Up to A0+ @300 ppi	130x100
General purpose digitization solution, Autocolumn 2300XL, iXH 150MP	Up to A1+ @400 ppi	100x75
General purpose digitization solution, Wall Mounted Autocolumn, iXH 150MP	Up to A0+ @300 ppi	Not included
General purpose digitization solution with 2-Motion, iXH 150MP	Up to A0 @300 ppi	100x80 or optional A0
Film digitization solutions with AutoColumn copy stand		
Film scanning digitization solution, Autocolumn 1600, iXH 150MP	Down to 6x4.5 cm @ 5,500 ppi	100x85
Film scanning digitization solution, Autocolumn 2300XL, iXH 150MP	Down to 6x4.5 cm @ 5,500 ppi	100x75

iXH 150MP Resolution

Magnification - Object Size Reference Table

The below table provides useful information for selecting a configuration suitable for the desired capture resolution and the size of the object that needs to be captured. Note that measurements are rounded to the nearest millimetre and that this table may be updated periodically subject to system updates.

Popular film formats	Dimensions mm	Popular film formats	Dimensions mm	Popular DIN. formats	Dimensions mm	U.S. formats	Dimensions mm
35 mm	36x24	13x18 cm	180x130	A0	1189x841		
645	56x44	24x30 cm	300x240	A1	841x594	11x8.5"	279x216
6x6 cm	56x56	4x5"	127x101.6	A2	594x420	14x8.5"	356x216
6x7 cm	70x56	5x7"	177.8x127	A3	420x297	17x11"	432x279
6x8 cm	80x56	8x10"	254x203.2	A4	297x210	40x28"	1016x711
9x12 cm	120x90	11x14"	355.6x279.4	A5	210x148	36x24"	914x610



Column Type	Column Position	Max Column Height (cm)	Lighting Options
Autocolumn	Floor Standing	300	Phase One D8 R+ LED Panels
Autocolumn	Floor Standing	230	Phase One D8 R+ LED Panels
Autocolumn	Wall Mounted	>230	Phase One D8 R+ LED Panels
2-Motion	Floor Standing	230	Phase One D8 R+ LED Panels
Autocolumn	Desktop mounted	160	41x31cm LED panel insert
Autocolumn	Floor Standing	230	41x31cm LED panel insert

Lens	In-camera extension mm	Extension Tube	Total system length mm	Distance sensor-object (approx in mm)	Magnification	PPI (approx.)	Object WxH Size (approx. in mm)	Popular supported formats	Notes
72 mm MkII	4	N/A	230	1810	1:22.5	300	1204x903	A0+, 40x28"	
72 mm MkII	6	N/A	232	1404	1:16.9	400	902x677	A1+	
72 mm MkII	9	N/A	235	1000	1:11.3	600	601x451	A2+	
72 mm MkII	11	N/A	237	790	1:8.4	800	447x340	A3+, 17x11"	
72 mm MkII	14	N/A	240	595	1:5.7	1200	301x226	A4+, 8x10", 11x8.5"	
72 mm MkII	18	N/A	246	492	1:4.2	1600	224x169	A5+	
72 mm MkII	21	N/A	250	436	1:3.4	2000	180x135	A6+, 13x18 cm, 5x7"	
120 mm	0	N/A	224	112	1:6.9	967	373x280		Min. practical PPI
120 mm	5	N/A	225	964	1:5.6	1200	300x225	A4, 11x8.5", 8x10"	
120 mm	7	21 mm	250	628	1:2.8	2400	149x112	9x12 cm, 4x5"	
120 mm	15	42 mm	282	522	1:1.7	4000	89x67	6x8 cm, 6x7 cm, 6x6 cm	
120 mm	21	21 mm+ 42 mm	370	488	1:1.2	5500	64x49	645, 35 mm	



References

Partial list

USA

American Museum of Natural History
New York, NY

Smithsonian Institution
Washington DC, PA

Library of Congress
Washington DC, PA

Harvard University
Cambridge, MA

Museum of Modern Art
New York, NY

New York Public Library
New York, NY

Walt Disney Studios Burbank
Glendale, CA

Stanford University
Stanford, CAA

The U.S. National Archives
Washington, DC

UK

The British Museum
London

The British Library
London

The Bodleian Library
Oxford

The John Rylands Library
Manchester

Cambridge University Library
Cambridge

The National Gallery
London

The National Museum of Wales
Cardiff

The Netherlands

The National Maritime Museum
Amsterdam

Picturae
Heiloo

GMS
Slidrecht

France

The National Library of France
Paris

Switzerland

The National Library of Switzerland
Bern

Denmark

The Royal Danish Library
Copenhagen

SMK
Copenhagen

Norway

The National Archive of Norway
Oslo

Munch Museum
Oslo

The National Library
Mo I Rana

The National Museum
Oslo

Qatar

Qatar Foundation
Doha

Austria

Vienna University of Technology
Vienna

Germany

Berlin State Museums
Berlin

The Prussian Cultural Heritage
Foundation
Berlin

The Schleswig-Holstein State Library
Kiel

Bavarian State Library
Munich

The House of West Germany
Bonn

The State Conservation Office
Mainz

Linden Museum
Stuttgart

Folkwang Museum
Essen

The Rhien Picture Library
Cologne

Italy

Bucap
Rome

Additional references and customer testimonials can be found on
<https://www.phaseone.com/cultural-heritage/resources/videos-in-action>

The luminous portrait studio of the Alinari Brothers' photographic establishment, in Florence, Italy. On the left is the photographer Gaetano Puccini. 1899, Fratelli Alinari

© Alinari Archives-Alinari Archive, Florence, Italy



For more information, please visit
www.phaseone.com/cultural-heritage

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YouTube @phaseone

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PHASEONE
IMAGING BEYOND IMAGINATION