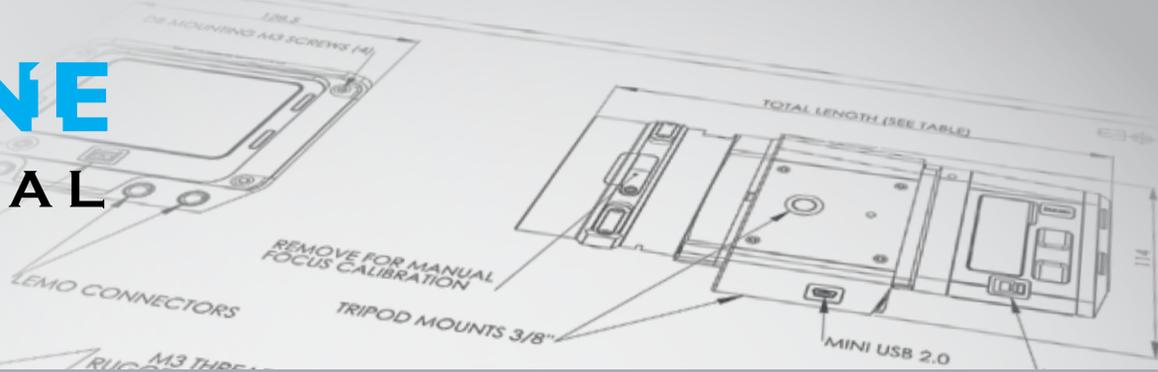


# PHASE ONE INDUSTRIAL



Phase One Aerial Cameras  
Fully Integrated Aerial Photography Solutions

# Phase One Aerial Camera Systems

The Phase One aerial cameras are integrated medium format camera systems that were designed from the ground up exclusively for aerial photography.

Developed with leading experts and engineers in the field, Phase One aerial cameras are built to meet the exacting needs of aerial photography and streamline the entire capture and processing workflow.

The Phase One aerial cameras are easily integrated into existing systems, both onboard the aircraft and in post production. The medium format solution offers exceptional image quality and features that rival large-format cameras at a fraction of the price.

With a product line of nine cameras, nine lenses, controller complete with software, compatibility with leading flight management systems and GPS receivers, Phase One has a solution for everything from mini UAVs to large manned aircraft.

# True Metric Camera

A true metric camera depends on structural integrity. During the processing of images, the software that does the automatic aero-triangulation relies on the consistency and the rigidity of the camera and lens in order to provide metric data. Phase One cameras are designed to use removable lenses but employ mechanisms to secure lenses to the camera body and a system of locking the lens at infinity focus. This keeps the lens in place even though the camera might be exposed to in-flight vibrations and sudden movements during takeoff or landing.

- Rugged and built to last
- Constructed of 6061 aluminum alloy
- Workhorse built with fewer moving parts to reduce unnecessary wear
- Removable parts securely connected to prevent movement or vibration
- Self-locking LEMO connectors
- Mirror-free system
- Camera is bolted to the pod with four M4 screws

# Phase One iXA-R/iXA

Phase One aerial cameras are designed as the central hub in an open aerial data acquisition system, enabling users to choose “best-of-breed” components to complement the Phase One systems. The iXA-R and iXA cameras offer flexibility for users looking for a standalone camera or an array of multiple cameras.

## Phase One iXA-R

The Phase One iXA-R aerial cameras are Phase One's flagship series of cameras and are built with features including, focal plane and central leaf shutters, optional Forward Motion Compensation, scalability to form multi-camera arrays, as well as easy integration with popular flight management systems and GPS/IMU receivers.

The cameras are built with one of three Rodenstock lenses — 40 mm, 50 mm and 70 mm. The interchangeable lenses are individually inspected and factory calibrated for infinity focus.

The three focal lengths cover most uses and are suitable for creating DTMs and DSMs for mapping as well as Orthophotos. The 50 mm lens, with its opening angle of 56.4°, is especially suited for capturing images alongside a LiDAR.

## Phase One iXA

With a choice of 80 megapixel, 60 megapixel and 60 megapixel achromatic models, the iXA aerial camera is designed to easily incorporate into existing or new systems, making it the perfect solution for integrators or end users looking for a rugged, high-quality industrial-grade aerial camera system. The medium format solution offers exceptional image quality and features that rival large format cameras at a fraction of the price.

The Phase One iXA aerial cameras use removable Schneider-Kreuznach fast sync lenses, which are available in focal lengths from 28 mm to 240 mm.



# Phase One iXU

The Phase One iXU aerial cameras are the world's smallest and lightest integrated digital medium format aerial cameras. They are available in 80 MP, 60 MP, 50 MP and 60 MP Achromatic versions. The iXU series, combined with Schneider-Kreuznach fast sync lenses with internal electronically controlled leaf shutters provides the image quality expected from a dedicated aerial photography camera.

## Phase One iXU 180

The Phase One iXU 180 features an 80 MP CCD sensor for an impressive 10,328 pixels cross-track coverage, yet is so small that its body is barely wider than its lens barrel. Weighing in at less than 950 grams (1.45 kg with an 80 mm), the iXU 180 has an optional Forward Motion Compensation feature. The camera can be used as a standalone camera for photogrammetric work or as part of an array of multiple cameras, either to cover a larger swath or as part of an oblique camera system.

### Important component of oblique systems

With a small form factor and medium format resolution, the Phase One iXU cameras offer users a solution for building arrays that can easily be mounted on a gyro stabilization mount and fit in the existing belly holes of many aircraft.

## Phase One iXU 150

The Phase One iXU 150, which is milled from magnesium alloy, is built around a 50 MP CMOS sensor, offering quality images across its 100 - 6400 ISO range. The camera boasts 8,280 pixels in cross track coverage and weighs only 750 grams (1.25 kg with an 80 mm lens).

The CMOS technology makes widened operational hours a possibility during days with deteriorating light conditions.

### UAV ready

Its light weight and small footprint make the iXU 150 perfectly suited for UAV integration. Using iX Link's RS-232 connectivity, internal CF storage and full HDMI output, the iXU 150 can be used for UAV missions, including for inspection.



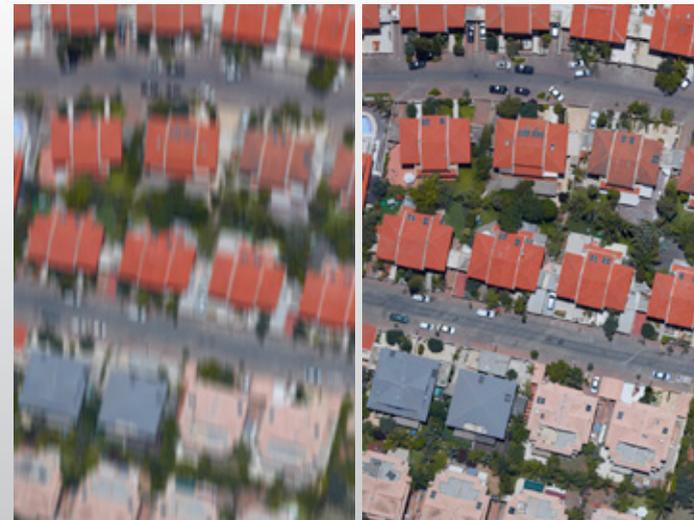


# Forward Motion Compensation

The Phase One FMC solution employs Time Delayed Integration (TDI) to compensate for image blurring occurring as a result of slower shutter speeds, faster flight speeds or higher GSDs. This enables more flexibility when determining flight schedules and enhanced image quality under low light conditions.

The FMC option enables increased profitability through the ability to fly more days and under less optimal light conditions, compensating for issues with blurring and smearing.

The Phase One FMC feature is sold either as an option on a new system or as an upgrade to an existing camera. It is available on our 80 MP and 60 MP iXA-R, iXA and iXU cameras.



Without FMC

With FMC

# Applications

Phase One camera offer reliability and versatility for users looking for a full-featured medium format aerial camera. Easily integrated into existing or new setups, the camera offers maximum connectivity with systems for:

- Mapping
- Oil and gas pipelines monitoring
- Critical infrastructure inspection
- Power line monitoring
- Coastal surveillance
- Wind turbine blade inspection
- Disaster site monitoring and mapping
- Iceberg monitoring
- Forestry, vegetation identification, agriculture crop monitoring
- Hydrometric mapping
- Asset management
- 3D modeling
- Entertainment and game market
- Crowd monitoring

## Highest resolution oblique systems

With a small form factor and medium format resolution, Phase One cameras offer users a solution for building arrays that can easily be mounted on a gyro stabilization mount and fit in the existing belly holes of many aircraft.

The increasingly popular high-resolution 3D city models require medium format cameras that can be integrated into small oblique systems that fit inside a gyro mount. Owners of ultralight planes or gyro copters are now able to build oblique systems and insert them into smaller belly holes with less interaction with the hull of the aircraft, which means an easier path to obtaining a supplemental type certificate (STC).

## Nadir imaging

Whether you are operating a single camera or multiple cameras covering a large swath, Phase One aerial cameras are built to be flexible and the central hub in any aerial data acquisition system.

## Achromatic cameras

To complement the RGB cameras, Phase One offers achromatic versions of the iXA-R, iXA and iXU cameras. The 60 MP sensor is optimized for aerial photogrammetric applications and offers high sensitivity to visible light, including UV and IR ranges. Achromatic cameras can be used in single camera configurations or in dual-camera configurations in conjunction with an RGB camera. The achromatic camera captures NIR images which can be combined with RGB images to create co-registered four-band (RGBN) imagery.

# Software Solutions

Phase One offers a choice of software solutions to enable the integration of the camera with your existing workflow.

## iX Capture

iX Capture is an aerial capture, control and RAW conversion application that was created exclusively for shooting with Phase One aerial camera systems. iX Capture was designed with an intuitive interface that displays key information such as exposure settings, histogram, GPS data and frame count. The image display can be paused at any time to enable operators to inspect images by zooming to 100 percent or to set white balance. iX Capture enables operators to track each capture and utilize real-time feedback to be confident that each image has been captured correctly.

Used together with Phase One aerial cameras, this professional capture and RAW converter software enables full control over one or multiple cameras, so that an operator can easily monitor and control every aspect of aerial data acquisition.

## iX SDK

The iX SDK provides the tools for you to build your own custom application. Using the SDK, you can control the camera as with iX Capture. With the iX SDK you have a high degree of control of which parameters to apply while capturing or processing images.

## Image processing

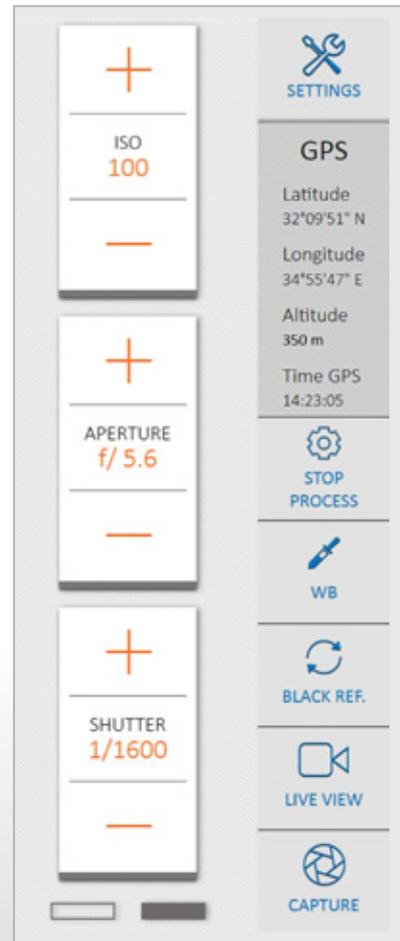
Phase One also offers a choice of software solutions for image processing:

## Capture One software

Capture One is the raw converter for ultimate image quality. It contains all the essential tools, in a single package, to enable you to organize, edit, process and convert images to industry standard formats, such as TIF and JPG.

## Capture One Processing Engine

Capture One Processing Engine (COPE) provides components for you to automate image processing with your settings. Batch process files with specific parameters including lens correction and save images in industry standard formats. Using COPE, post-processing can happen in parallel to the capture process, saving valuable time on the ground.



# iX Controller

Phase One offers a choice of hardware and software solutions to enable the integration of the camera with your existing workflow.

## Ultimate speed and control

Phase One introduced the iX Controller as the perfect companion for the iX Capture application or SDK-based application.

Designed to provide the ultimate in speed, and with the ability to control multiple Phase One aerial cameras, the iX Controller is a rugged, fanless PC, based on the 4th Generation Intel® Core™ i7 Processor.

With a small footprint and easily integrated into any aircraft, the Phase One iX Controller acts as a central hub of your aerial camera system controlling multiple cameras

## Multiple display configuration

The iX Controller can be configured to connect to a display via wireless, network or HDMI cable. Use a touch display to control the cameras with a touch of a button

## Solid state drives

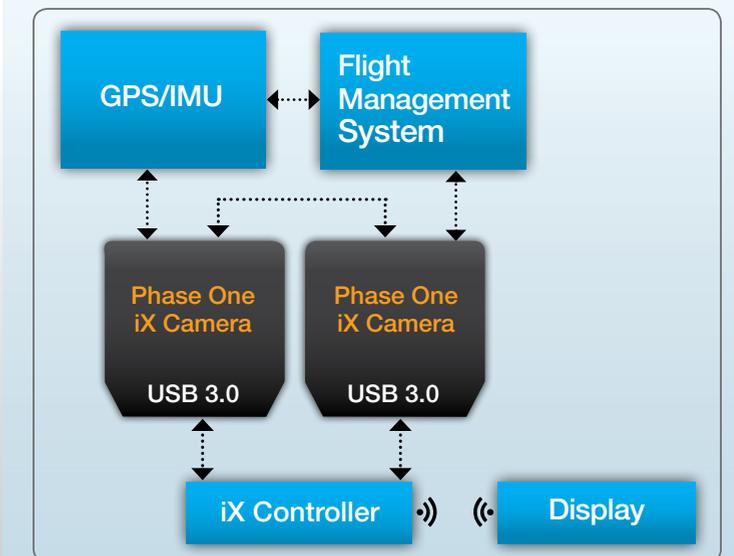
The iX Controller employs two removable SSD drives, which have especially high write speeds to ensure you capture and record every image quickly and reliably. When the mission is over, the compact and light SSD drives are easily removed from the iX Controller and sent for processing.



# Multiple Camera Configuration

Phase One aerial cameras are truly scalable systems, allowing you to adapt to different needs and scale the system to match diverse requirements. Whether the need is a single camera for small area mapping, or a two-, four-, five- or more camera configuration for large area mapping, Phase One cameras are the perfect choice to build your solution.

Use a Phase One camera by itself or in a multiple camera configuration to capture synchronized images and eliminate post production sync issues. The cameras are daisy-chained together to reduce unnecessary cabling and simplify connectivity with the FMS, GPS and iX Controller.





## Rodenstock Lenses

Phase One iXA-R cameras are equipped with Rodenstock lenses. Each lens/shutter combination is adapted for aerial photography and offers low distortion, high MTF and excellent contrast. The opening angles shown below are for iXA-R 180 cameras.

Lenses	Weight	Opening angle (short side)	Opening angle (long side)
Rodenstock 40 mm f/4.0	730 g	53.5 °	67.7 °
Rodenstock 50 mm f/4.0	800 g	43.9 °	56.5 °
Rodenstock 70 mm f/5.6	580 g	32.1 °	42.0 °

## Schneider-Kreuznach Fast Sync Lenses

Phase One's range of Schneider-Kreuznach leaf shutter lenses are fully compatible with both the iXA and iXU camera systems. The opening angles shown below are for iXA 180 cameras.

Lenses	Dimensions	Weight	Opening angle (short side)	Opening angle (long side)
Schneider-Kreuznach fast sync 28 mm f/4.5 Aspherical	90 x 136 mm / 3.5 x 5.5 in	1046 g / 2.31 lb	71.5 °	87.6 °
Schneider-Kreuznach fast sync 55 mm f/2.8	77.6 x 86.5 mm / 3 x 3.4 in	628 g / 1.38 lb	40.2 °	52.0 °
Schneider-Kreuznach fast sync 80 mm f/2.8	64.4 x 86.5 mm / 2.5 x 3.4 in	482 g / 1.06 lb	28.3 °	37.1 °
Schneider-Kreuznach fast sync 110 mm f/2.8	83.3 x 86.5 mm / 3.3 x 3.4 in	633 g / 1.40 lb	20.8 °	27.4 °
Schneider-Kreuznach fast sync 150 mm f/3.5	87.1 x 86.5 mm / 3.4 x 3.4 in	651 g / 1.44 lb	15.3 °	20.3 °
Schneider-Kreuznach fast sync 240 mm f/4.5	173.2 x 104.2 mm / 6.8 x 4.1 in	1600 g / 3.52 lb	9.6 °	12.8 °



# Technical Specifications

	iXA-R 180 iXA 180	iXA-R 160 iXA 160	iXA-R 160 Achromatic iXA 160 Achromatic
<b>Camera type</b>	Medium format camera for aerial photography		
<b>Lens mount</b>	- Phase One SK dedicated mount — for iXA cameras - Phase One R dedicated mount — for iXA-R cameras		
<b>Shutter speed</b>	- Focal plane: up to 1/4000 second - Leaf shutter: up to 1/1600 second*		
<b>Shutter control</b>	1/3 f-stop increments		
<b>Interfaces</b>	- USB 3.0 - FireWire 800 - Secured power input (LEMO) - Camera trigger - Mid-exposure pulse - Camera status		
<b>GPS/IMU support</b>	Applanix, NovAtel, IGI, NMEA Devices		
<b>Forward Motion Compensation</b>	TDI controlled		
<b>Data storage</b>	- 1 TB SSD storage (optional iX Controller) - CompactFlash card Type I/II including UDMA 6 and 7		
<b>Synchronization speed in multiple camera configuration</b>	100 microseconds with factory calibrated (FS) lenses		
<b>Resolution</b>	10328 x 7760 (80 MP)	8984 x 6732 (60.5 MP)	8964 x 6716 (60 MP)
<b>Dynamic range</b>	>72 db		
<b>Aspect ratio</b>	4:3		
<b>Pixel size</b>	5.2 micron	6.0 micron	
<b>CCD size effective</b>	53.7 x 40.4 mm	53.9 x 40.4 mm	53.8 x 40.3 mm
<b>Lens factor</b>	1.0		
<b>Light sensitivity (ISO)</b>	35-800	50-800	200-3200
<b>Capture rate</b>			
<b>Full resolution frame</b>	1.5 sec	1.3 sec	1.3 sec
<b>RAW File compression</b>	IIQ large: 80 MB IIQ small: 54 MB	IIQ large: 60 MB IIQ small: 40 MB	

	iXU 180	iXU 160	iXU 160 Achromatic	iXU 150
<b>Camera type</b>	Medium format camera for aerial photography			
<b>Lens mount</b>	Phase One SK dedicated mount			
<b>Shutter speed</b>	Leaf shutter: up to 1/1600 second*			
<b>Shutter control</b>	1/3 f-stop increments			
<b>Interfaces</b>	- USB 3.0 - Secured power input (LEMO) - Camera trigger - Mid-exposure pulse - Camera status - iX Link			- USB 3.0 - HDMI out - Secured power input (LEMO) - Camera trigger - Mid-exposure pulse - Camera status - iX Link
<b>GPS/IMU support</b>	Applanix, NovAtel, IGI, NMEA Devices			
<b>Forward Motion Compensation</b>	TDI controlled			N/A
<b>Data storage</b>	- 1 TB SSD storage (optional iX Controller) - CompactFlash card Type I/II including UDMA 6 and 7			
<b>Synchronization speed in multiple camera configuration</b>	100 microseconds with factory calibrated (FS) lenses			
<b>Resolution</b>	10328 x 7760 (80 MP)	8984 x 6732 (60.5 MP)	8964 x 6716 (60 MP)	8280 x 6208 (50 MP)
<b>Dynamic range</b>	>72 db			>84 db
<b>Aspect ratio</b>	4:3			
<b>Pixel size</b>	5.2 micron	6.0 micron		5.3 micron
<b>CCD size effective</b>	53.7 x 40.4 mm	53.9 x 40.4 mm	53.8 x 40.3 mm	43.8 x 32.9 mm
<b>Lens factor</b>	1.0			1.3
<b>Light sensitivity (ISO)</b>	35-800	50-800	200-3200	100-6400
<b>Capture rate</b>				
<b>Full resolution frame</b>	1.6 sec	1.45 sec	1.45 sec	0.85 sec
<b>RAW File compression</b>	IIQ large: 80 MB IIQ small: 54 MB	IIQ large: 60 MB IIQ small: 40 MB		IIQ large: 50 MB IIQ small: 33 MB

\* 240 mm leaf shutter speed is 1/1000s.

# Technical Specifications

	iXA-R 180 iXA 180	iXA-R 160 iXA 160	iXA-R 160 Achromatic iXA 160 Achromatic
<b>Lens + technology optimizes</b>	<ul style="list-style-type: none"> <li>- Color cast</li> <li>- Light falloff</li> <li>- Chromatic aberration</li> <li>- Fringing</li> <li>- Sharpness falloff</li> <li>- Lens distortion</li> </ul>		
<b>Output format</b>	Phase One Raw, TIF and JPG		
<b>Post processing</b>	<ul style="list-style-type: none"> <li>- iX Capture</li> <li>- Capture One Pro</li> <li>- Capture One Processing Engine</li> </ul>		
<b>IR cut-off filter</b>	Camera system available either with or without IR filter		
<b>Connection to pod</b>	Four M4 bolts		
<b>Tripod sockets</b>	Two 3/8 inch		
<b>Power input</b>	12 – 30 V DC		
<b>Maximum power consumption</b>	20 W		
<b>Dimensions iXA (excluding lens)*</b>	132 x 114 x 128.5 mm / 5.2 x 4.4 x 5 in (W x H x D)		
<b>Dimensions iXA-R (including lens 40)*</b>	128.5 x 114 x 190.5 mm / 5.06 x 4.48 x 7.5 in (W x H x D)		
<b>Dimensions iXA-R (including lens 50)*</b>	128.5 x 114 x 199 mm / 5.06 x 4.48 x 7.83 in (W x H x D)		
<b>Dimensions iXA-R (including lens 70)*</b>	128.5 x 114 x 191 mm / 5.06 x 4.48 x 7.51 in (W x H x D)		
<b>Weight (excluding lens)</b>	1.75 kg / 3.86 lb - for iXA cameras 1.73 kg / 3.81 lb - for iXA-R cameras		
<b>Weight iXA-R (camera and lens)</b>	iXA-R 40 2.5 kg / 5.4 lb iXA-R 50 2.5 kg / 5.6 lb iXA-R 70 2.3 kg / 5.1 lb		
<b>Approvals</b>	FCC (Class A), CE, RoHS		
<b>Operating Conditions</b>			
<b>Temperature</b>	-10° to 40°C (14° to 104°F)		
<b>Humidity</b>	15 to 80% (non-condensing)		

	iXU 180	iXU 160	iXU 160 Achromatic	iXU 150
<b>Live View</b>				<ul style="list-style-type: none"> <li>- 1920 x 1080 25p/30p</li> <li>- 1280 x 720 50p/60p</li> </ul>
<b>Lens + technology optimizes</b>	<ul style="list-style-type: none"> <li>- Color cast</li> <li>- Light falloff</li> <li>- Chromatic aberration</li> <li>- Fringing</li> <li>- Sharpness falloff</li> <li>- Lens distortion</li> </ul>			
<b>Output format</b>	Phase One Raw, TIF and JPG			
<b>Post processing</b>	<ul style="list-style-type: none"> <li>- iX Capture</li> <li>- Capture One Pro</li> <li>- Capture One Processing Engine</li> </ul>			
<b>IR cut-off filter</b>	Camera system available either with or without IR filter			
<b>Connection to pod</b>	Four M4 bolts			
<b>Tripod sockets</b>	N/A			
<b>Power input</b>	12 – 30 V DC			
<b>Maximum power consumption</b>	12 W			10 W
<b>Dimensions (excluding lens)*</b>	97.4 x 93 x 110 mm (w x h x l)			
<b>Weight (excluding lens)</b>	.930 kg / 2.05 lb			.750 kg / 1.7 lb
<b>Weight (with 80 mm lens)</b>	1.430 kg / 3.15 lb			1.25 kg / 2.8 lb
<b>Approvals</b>	FCC (Class A), CE, RoHS			
<b>Operating Conditions</b>				
<b>Temperature</b>	-10° to 40°C (14° to 104°F)			
<b>Humidity</b>	15 to 80% (non-condensing)			



## About Phase One

Phase One A/S is based in Copenhagen with offices in New York, London, Cologne, Tokyo and Hong Kong. Phase One Industrial is a division of Phase and is dedicated to research, development and manufacturing of advanced hardware and imaging software solutions that meet the unique requirements of aerial photography users.

To find out more about Phase One products, please visit <http://industrial.phaseone.com> and set up an appointment with one of our aerial photography experts for a demonstration.

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