

# Next-Generation Aerial Systems

For improved ROI



PHASE **ONE**

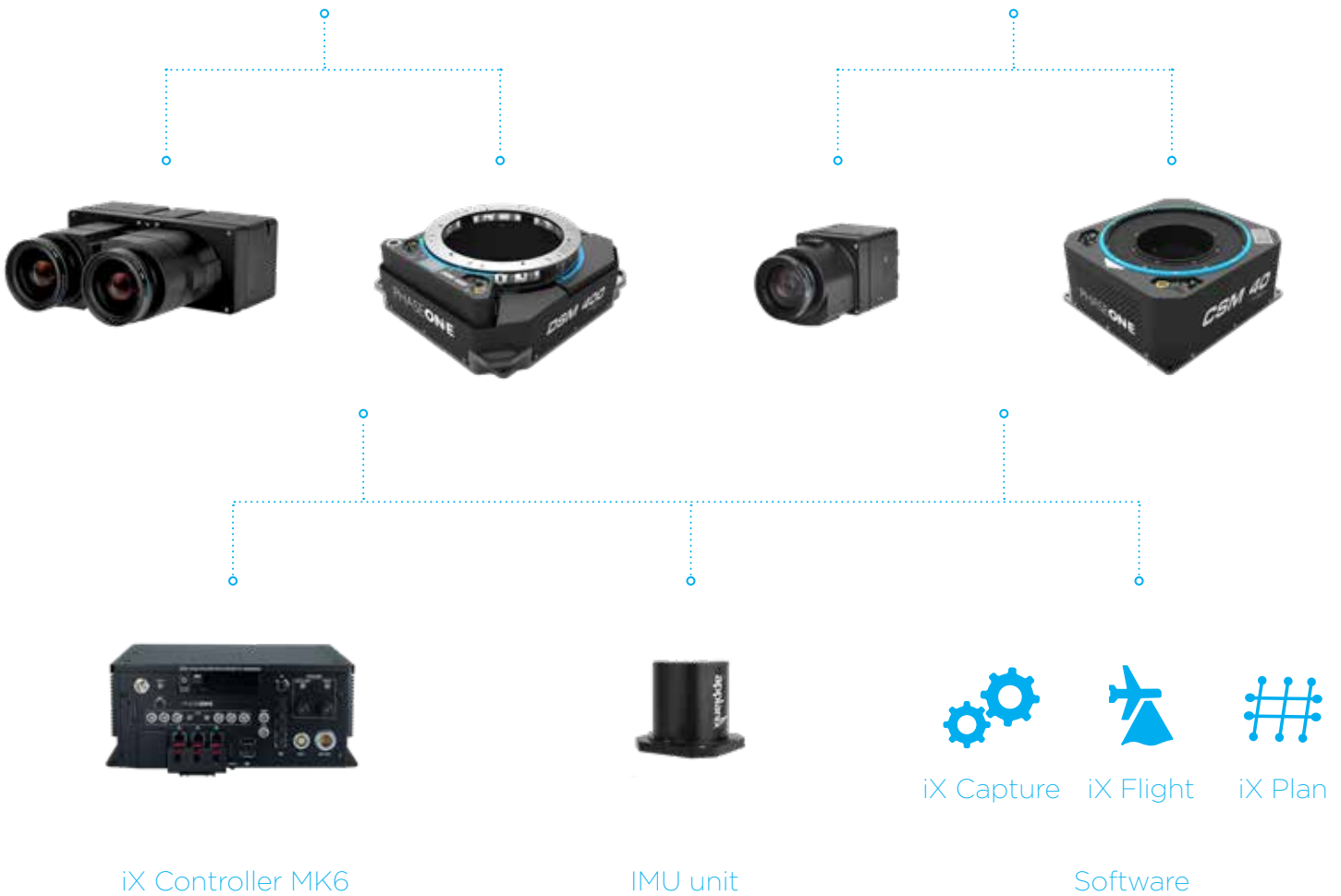
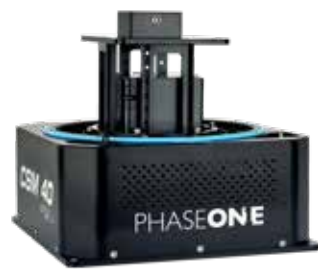
# Next-generation aerial systems for wide aerial coverage

Phase One continuously expands its offering and designs the exact solutions to meet the requirements of the developing geospatial market. Our new generation aerial systems specifically address the challenges of imaging data acquisition projects, helping you to increase productivity, and reduce time and costs. The new generation Phase One Aerial Systems are integrated with the most advanced iX Controller MK6, including the precision GNSS-inertial unit for even higher efficiency and Ethernet connectors with endless cables for easy installation on different types of aircrafts.

## PAS 280 MK3



## PAS 150/100 MK3



iX Controller MK6

IMU unit

Software

iX Capture

iX Flight

iX Plan



# 280MP Aerial System

## The standard in large format aerial imaging

Large area performance, affordable and accessible,  
for use with a wider range of aircraft

With **over 20,000 pixels across**, compact size, and weight, the 280MP Aerial System provides **higher return on investment** compared to any other large format system available on the market.

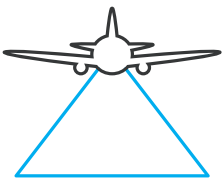
The 280MP Aerial System offers the **highest image capture rate and dynamic range**, increasing the overall quality and accuracy of the final photogrammetric products.

The iXM-RS 280F provides a large format option that easily integrates with the DSM400 gyrostabilized mount, creating a **compact and lightweight** system for use in a wider range of aircraft.

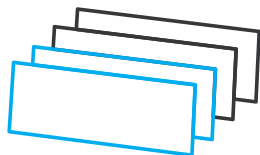
The iXM-RS 280F is a dual-lens metric camera, with 90 mm lenses for capturing RGB information, and providing **superior image quality**. The 280MP camera generates a central projection image from two 150MP nadir images with equal ground resolution.

The aerial system is comprised of our iX Controller MK6 with GNSS-inertial; an IMU unit; a Somag gyro-stabilized mount (DSM 400) and the Phase One flight planning and management software (iX Plan and iX Flight, as well as iX Capture).

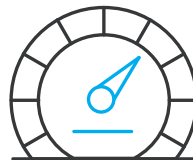
- Backside illuminated (BSI) CMOS sensor
- Wide dynamic range
- Improved light sensitivity
- More flying hours per day and more flights achievable per year
- Maintains object resolution in lowlight conditions



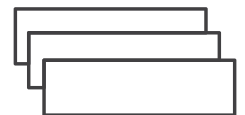
+ 20,000  
pixels across



2 frames  
per second



390kts maximal ground  
speed at 10cm GSD with  
motion blur under 1 pixel



97% forward  
overlap on 10cm  
GSD at 150kts

# iXM-RS 280F: Pure Sharpness with Blur Control FMC

Our CMOS sensor eliminates motion blur thanks to short exposure time, enabled by our high speed shutter and a higher sensitivity pixel design. Combined with RS shutter technology, the camera provides extremely sharp images overcoming cameras with other FMC capabilities.



## Flying Height and Swath Width

GSD (cm)	Altitude (m)	Altitude (ft)	Swath (m)
2,5	598	1,963	504
5	1,197	3,926	1,008
10	2,394	7,853	2,015
15	3,590	11,779	3,023
20	4,787	15,706	4,030
25	5,984	19,632	5,038
30	7,181	23,559	6,045
33	7,899	25,915	6,650
35	8,378	27,485	7,053
40	9,574	31,412	8,060
45	10,771	35,338	9,068



*The Phase One 280MP Aerial System gives us assurance in the data we're acquiring. There's now a certain confidence that when the system goes out into the field that we're getting good results every time, the first time.*



**Nathanael Litter**

Associate Vice President, Atlantic - an Aerial Systems customer

# 4-Band Configuration 280MP Aerial System

Phase One expands the **camera's performance** by offering an additional configuration to simultaneously capture **RGB and NIR images**. The 280MP 4-Band solution comprises dual 90mm lenses for capturing RGB information and a 50mm lens for capturing NIR information, which provide 4-Band (R,G,B,NIR), or CIR imagery.

The integrated **iX Capture software** automatically generates distortion-free 4-Band images by performing **accurate matching of NIR image to an RGB images**, creating precise and reliable output data.

iX Capture outputs:

- TIFF and JPG formats
- 4-Band RGB+NIR (RGBN)
- 3-Band CIR (Color Infrared)
- NDVI (Normalized Difference Vegetation Index)
- Distortion-free / corrected RGB
- Distortion-free / corrected NIR



*The acquisition of our own aerial system led to an increase of orders for aerial survey missions by 2.3 times compared to the year before.*

**Pavel Anashkin**

Director, Uralgeoinform - an Aerial Systems customer



RGB image taken with Phase One 280MP Aerial System



CIR image taken with Phase One 280MP Aerial System

Image courtesy of GGS

# Technical Specifications

	iXM-RS 280F 4-Band	iXM-RS 280F
Frame geometry	Central projection	
Resolution	284MP 20150 x 14118	
Image formats	PhaseOne RAW, IIQ-L, IIQ-S	
Output formats	Distortion-free RGB, NIR, CIR, RGBN, NVDI in TIFF 8 and 16 Bit or JPEG	Distortion-free RGB in TIFF 8 and 16 Bit or JPEG
RGB/NIR ratio	1:1.8	N/A
Frame width for 10cm GSD (m)	2015	
Frame height for 10cm GSD (m)	1412	
Frame area for 10cm GSD (sq.km)	2.84	
Typical image size (MB) for TIFF (8 Bit)	1100	833
Lenses type	Rodenstock	
Number of lenses	3	2
Focal length (mm)	90 & 50	90
FOV - across flight (°)	45.7	
FOV - along flight (°)	32.9	
Aperture range	f/5.6 - 11	
Exposure principle	Leaf shutter	
Shutter speed (sec)	Up to 1/2000	
Capture rate (fps)	2	
Light sensitivity (ISO)	50-6400	
Dynamic range (dB)	83	
NIR range (nm)	720 - 1000	N/A
Events synchronization speed (µsec)	100	
	<a href="#">Sensor Specifications</a>	
Sensor type	CMOS	
Sensor number	3	2
Pixel size (µm)	3.76	
Array (pixel)	14204 x 10652	
Analog-to-digital-conversion (bit)	14	



	iXM-RS 280F 4-Band	iXM-RS 280F
	<b>Flight Specifications</b>	
Maximal ground speed for 10cm GSD with motion blur under 1 pixel (knots)	390	
Maximal forward overlap for 10cm GSD at 150 knots (%)	97	
Maximal orthophoto angle for 20% side overlap (°)	37	
Flight altitude for 10cm GSD (feet)	7853	
	<b>Operating Conditions</b>	
Power input (VDC)	12-30	
Maximal power consumption (W) - camera only	48	32
Humidity - non-condensing (%)	15 to 80	
Temperature (°C)	-10 to 40	
Approvals	FCC (Class A), CE, RoHS	
	<b>PAS 280 MK3 Specifications</b>	
System weight (kg/lb)	33.5 / 72	32 / 68.5
System size (mm/in)	460 x 430 x 440 / 18.1 x 16.9 x 17.3	
Pilot monitor for navigation (in)	7	
Operator monitor for camera management (in)	15	
Gyro-stabilizer SOMAG	DSM400	
Power consumption	6 Amp at 28V	
	<b>iX Controller MK6</b>	
Interfaces	USB3, power and control ports for camera, GNSS and mount	
Storage capacity (TB)	Dual 2.0 and dual 4.0	
Storage type	SSD	
Storage exchangeability	Yes	
GNSS/IMU configurations	AP180 (IMU - 69)	
	AP310 (IMU - 82)	
	AP510 (IMU - 91)	
	AP610 (IMU - 57)	

# Phase One 150MP/100MP Aerial Systems

Phase One 150MP and 100MP aerial systems are **fully integrated solutions** based on our iXM-RS150F and iXM-RS100F high-resolution metric cameras. Each aerial system comprises the camera and additional components such as: our iX Controller MK6, integrating Applanix GNSS; a Somag stabilizer, an Applanix IMU unit; and the Phase One flight planning and management software (iX Plan; iX Flight and iX Capture).



- Fully integrated Phase One Aerial System
- Large image coverage
- Exceptional accuracy and image quality
- Optional 4-Band aerial system with dual-frame sensors for RGB and NIR imaging
- Light weight & low power

## iXM-RS150F Camera

Equipped with a **full-frame sensor** (14204 x 10652), and a **3.76 micrometer pixel** that enables higher ground resolution from higher flight altitudes, and provides larger aerial coverage, resulting in higher aerial survey productivity.

The camera comes with one of **eight RS lenses** ranging from 32 mm to 180 mm focal length, and the 300 mm **RSM lens**, all equipped with a **central leaf shutter** to ensure geometrically correct aerial images.

Designed and built for aerial photography by Rodenstock and Schneider Kreuznach, the lenses are factory **calibrated for infinity focus** and equipped with a central leaf shutter with a speed to up to 1/2500 sec. The 150MP camera offers high capture speed of 2fps for an array of flight conditions. The RS lenses opening angle is specially fitted for oblique and lidar systems.

- BSI CMOS sensor
- High dynamic range of 83 dB
- Fast image capture rate of two frames per second
- Recommended for high quality 3D city models



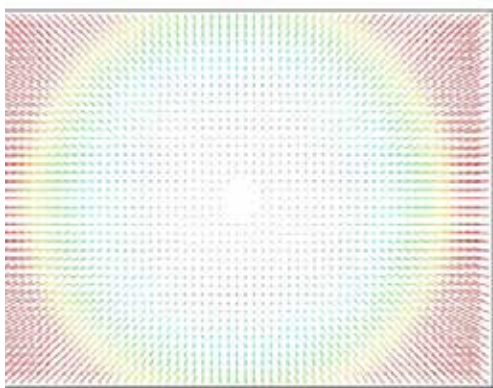
*The Phase One Aerial System provided us with a complete turnkey aerial imaging solution, compact in size, light in weight, and flexible enough to use with our current fleet of aircraft, to improve productivity, and bid on bigger projects.*

**Don Cummins**

President, Air Data Solutions - an Aerial Systems customer



## Camera Distortion Model



Distorted image

200 pix



Undistorted image

1 pix



The distortion model of the camera corresponds to a standard Brown-Conrady symmetric radial distortion model.

Images captured with the camera may be easily transformed to an undistorted image with a maximal residual of less than 1  $\mu$ m.

## 4-Band 150MP/100MP Aerial System

Our 4-band system comprises our RGB and achromatic camera models. Images are captured in RGB and NIR bands simultaneously, and are then automatically processed to generate distortion-free images and perform fine co-registration of the pixels from the NIR to the RGB images. The 4-Band system includes two synchronized cameras (RGB and NIR); our iX Controller MK6 integrating Applanix GNSS, a Somag stabilizer, an Applanix IMU unit, Phase One flight planning and management software (iX Plan, iX Flight and iX Capture).

iX Capture software generates distortion-free images and performs accurate matching of the NIR image to the RGB image.

### iX Capture Outputs:

- 4-Band combined NIR and RGB (RGBN)
- 3-Band (CIR) combined NIR and RGB (NRG)
- NDVI (Normalized Difference Vegetation Index)
- Original and distortion-free RGB & NIR images

# Technical Specifications

	iXM-RS150F 4-Band	iXM-RS150F
Frame geometry	Central projection	
Resolution	150MP 14204 x 10652	
Image formats	PhaseOne RAW IIQ-L, IIQ-S	
Output formats	Distortion-free RGB, NIR, CIR, RGBN, NVDI in TIFF 8 and 16 Bit or JPEG	Distortion-free RGB in TIFF 8 and 16 Bit or JPEG
RGB/NIR ratio	1:1	N/A
Frame width for 10 cm GSD (m)	1420	
Frame height for 10 cm GSD (m)	1065	
Frame area for 10 cm GSD (sq.km)	1.51	
Typical image size (MB) for TIFF (8 Bit)	600	450

	Rodenstock / Schneider-Kreuznach							
Lenses type	Rodenstock / Schneider-Kreuznach							
Number of lenses	2				1			
Focal length (mm)	32	40	50	70	90	110	150	180
FOV - across flight (°)	79.7	67.5	56.2	41.8	33.1	27.3	20.2	16.9
FOV - along flight (°)	64.1	53.2	43.7	31.9	25.1	20.6	15.2	12.7
Aperture range	f/5.6 - 22				f/6.3 - 22			
Exposure principle	Leaf shutter							
Shutter speed (sec)	1/2500				1/2000	1/2500	1/2000	
Capture rate (fps)	2.0							
Light sensitivity (ISO)	50-6400							
Dynamic range (dB)	83							
NIR range (nm)	720 - 1000				N/A			
Events synchronization speed (µsec)	100							

## Sensor Specifications

Sensor type	CMOS							
Sensor number	2				1			
Pixel size (µm)	3.76							
Array (pixel)	14204 x 10652							
Analog-to-digital-conversion (bit)	14							

	iXM-RS150F 4-Band	iXM-RS150F
	<b>Flight Specifications</b>	
Maximal ground speed for 5cm GSD with motion blur under 1 pixel (knots)	240	
Maximal forward overlap for 5cm GSD at 150 knots (%)	93	
Maximal orthophoto angle for 20% side overlap (°)	27 for 90mm focal lens	
Flight altitude for 5cm GSD (feet)	3926 for 90mm focal length	
	<b>Operating Conditions</b>	
Power input (VDC)	12-30	
Maximal power consumption (W) - camera only	32	16
Humidity - non-condensing (%)	15 to 80	
Temperature (°C)	-10 to 40	
Approvals	FCC (Class A), CE, RoHS	
	<b>PAS 150 MK3 Specifications</b>	
System weight (kg/lb)	31 / 68.5	8.5 / 19*
System size (mm/in)	460 x 430 x 440 / 18.1 x 16.9 x 17.3	290 x 275 x 121 / 11.4 x 10.8 x 4.7
Pilot monitor for navigation (in)	7	
Operator monitor for camera management (in)	15	
Gyro-stabilizer SOMAG	DSM400	CSM40
Power consumption	6 Amp at 28V	
	<b>iX Controller MK6</b>	
Interfaces	USB3, power and control ports for camera, GNSS and mount	
Storage capacity (TB)	Dual 2.0 and dual 4.0	
Storage type	SSD	
Storage exchangeability	Yes	
Weight (kg)	5.4	
Size (mm)	310 x 130 x 230	
GNSS/IMU configurations	AP180 (IMU - 69)	
	AP310 (IMU - 82)	
	AP510 (IMU - 91)	
	AP610 (IMU - 57)	

(\*) Weight of controller and GNSS are not included







# Technical Specifications

	iXM-RS100F 4-Band	iXM-RS100F
Frame geometry	Central projection	
Resolution	100MP 11608 x 8708	
Image formats	PhaseOne RAW IIQ-L, IIQ-S	
Output formats	Distortion-free RGB, NIR, CIR, RGBN, NVDI in TIFF 8 and 16 Bit or JPEG	Distortion-free RGB in TIFF 8 and 16 Bit or JPEG
RGB/NIR ratio	1:1	N/A
Frame width for 10cm GSD (m)	1161	
Frame height for 10cm GSD (m)	871	
Frame area for 10cm GSD (sq.km)	1.01	
Typical image size (MB) for TIFF (8 Bit)	400	300

Lenses type	Rodenstock / Schneider-Kreuznach							
Number of lenses	2				1			
Focal length (mm)	32	40	50	70	90	110	150	180
FOV - across flight (°)	79.7	67.5	56.2	41.8	33.1	27.3	20.2	16.9
FOV - along flight (°)	64.1	53.2	43.7	31.9	25.1	20.6	15.2	12.7
Aperture Range	f/5.6 - 22				f/6.3-22			

Exposure principle	Leaf shutter				
Shutter speed (sec)	1/2500		1/2000	1/2500	1/2000
Capture rate (fps)	2				
Light Sensitivity (ISO)	50-6400				
Dynamic Range (dB)	84				
NIR Range (nm)	720 - 1000		N/A		
Events synchronization speed (µsec)	100				
	<b>Sensor Specifications</b>				
Sensor type	CMOS				
Sensor number	2		1		
Pixel size (µm)	4.60				
Array (pixel)	11608 x 8708				
Analog-to-digital-conversion (bit)	14				



	iXM-RS100F 4-Band	iXM-RS100F
	<b>Flight Specifications</b>	
Maximal ground speed for 5cm GSD with motion blur under 1 pixel (knots)	240	
Maximal forward overlap for 5cm GSD at 150 knots (%)	91	
Maximal orthophoto angle for 20% side overlap (°)	27 for 90mm focal lens	
Flight altitude for 5cm GSD (Feet)	3209 for 90mm focal length	
	<b>Operating Conditions</b>	
Power input (VDC)	12-30	
Maximal Power consumption (W) - camera only	32	16
Humidity - non-condensing (%)	15 to 80	
Temperature (°C)	-10 to 40	
Approvals	FCC (Class A), CE, RoHS	
	<b>PAS 100 MK3 Specifications</b>	
System weight (kg/lb)	31 / 68.5	8.5 / 19*
System size (mm/in)	460 x 430 x 440 / 18.1 x 16.9 x 17.3	290 x 275 x 121 / 11.4 x 10.8 x 4.7
Pilot monitor for navigation (in)	7	
Operator monitor for camera management (in)	15	
Gyro-stabilizer SOMAG	DSM400	CSM40
Power consumption	6 Amp at 28V	
	<b>iX Controller MK6</b>	
Interfaces	USB3, power and control ports for camera, GNSS and mount	
Storage capacity (TB)	Dual 2.0 and dual 4.0	
Storage type	SSD	
Storage exchangeability	Yes	
Weight (kg)	5.4	
Size (mm)	310 x 130 x 230	
GNSS/IMU configurations	AP180 (IMU - 69)	
	AP310 (IMU - 82)	
	AP510 (IMU - 91)	
	AP610 (IMU - 57)	

(\*) Weight of controller and GNSS are not included



## Additional Hardware



### iX Controller MK6

A robust command center onboard the aircraft designed for smooth operations of geospatial projects. With the precision GNSS-Inertial integrated inside the iX Controller, the setup of Phase One Aerial Systems is simplified. The iX Controller MK6 supports a range of orientation accuracies and offers you time-saving during installation.

The controller comes with custom cables and a number of ports to quickly connect with up to four cameras, three monitors, a gyro-stabilizer, the Applanix IMU unit, and standard aircraft power supply. The high-capacity data storage SSD trays can be easily accessed or removed for rapid download of image and telemetry data.

The iX Controller supports triple monitors, one for the pilot and two for the operator, so that both can monitor and observe different views of the set up simultaneously.

#### 4 TB Image storage capacity

Camera	IIQ-L	IIQ-S
280 MP	14,000	21,000
150 MP	26,500	39,750
100 MP	40,000	60,000
50 MP	76,500	114,750

#### 8 TB Image storage capacity

Camera	IIQ-L	IIQ-S
280 MP	28,000	42,000
150 MP	53,250	79,875
100 MP	80,000	120,000
50 MP	153,000	229,500

### IMU unit

There are different GNSS-Inertial configurations. The choice of the configuration is based on your intended application and accuracy requirements. High-altitude flying for direct georeferencing applications will usually require the iX Controller MK6-AP610 configuration while low-altitude flying for aero triangulation applications will usually use the iX Controller MK6-AP310 configuration.

- iX Controller MK6 - AP180 (IMU - 69)
- iX Controller MK6 - AP510 (IMU - 91)
- iX Controller MK6 - AP310 (IMU - 82)
- iX Controller MK6 - AP610 (IMU - 57)

### Gyro Stabilized Mounts

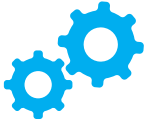
SOMAG DSM400 - was specifically designed for our Phase One Aerial Systems. With a low weight of 14 kg and a high payload of 35 kg, the mount supports the reduction of the angular rate, provides optimal stabilization of the system, and allows efficient and precise image capturing. This stabilizer is also used for 4-band configurations.

SOMAG CSM40 - The smaller modular stabilizer was specifically designed for our Phase One 100MP/ 150MP Aerial Systems. With a low weight of 5.2 kg and a high payload of 15 kg, the special mount system is particularly suitable with light aircrafts.

# Software Package



## iX Capture



iX Capture is aerial capture, control and image processing software with an intuitive interface that displays key information such as exposure settings, histogram, GNSS/IMU data and frame count. The post-processing capabilities and advanced workflow enable the fast production of distortion-free RGB and CIR images, and exclusively supports the processing of 280MP images.

*“Provides real-time feedback and confidence in correct image capturing”*

## iX Flight

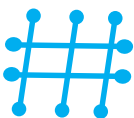


iX Flight is an interactive and intuitive flight management system for the precise execution of aerial missions, and comes uploaded to the iX Controller. Controlled and operated with ease, iX Flight enables planning, positioning, and sensor management/triggering. During the flight, iX Flight collects log files that enable post processing, mission analysis, and post-flight reports. Two display screens for the pilot and the operator provide the exact information each needs for a successful aerial-image acquisition mission.

Phase One Aerial Systems are also compatible with alternative flight management systems.

*“Reduces aerial survey operational costs and increasing productivity”*

## iX Plan



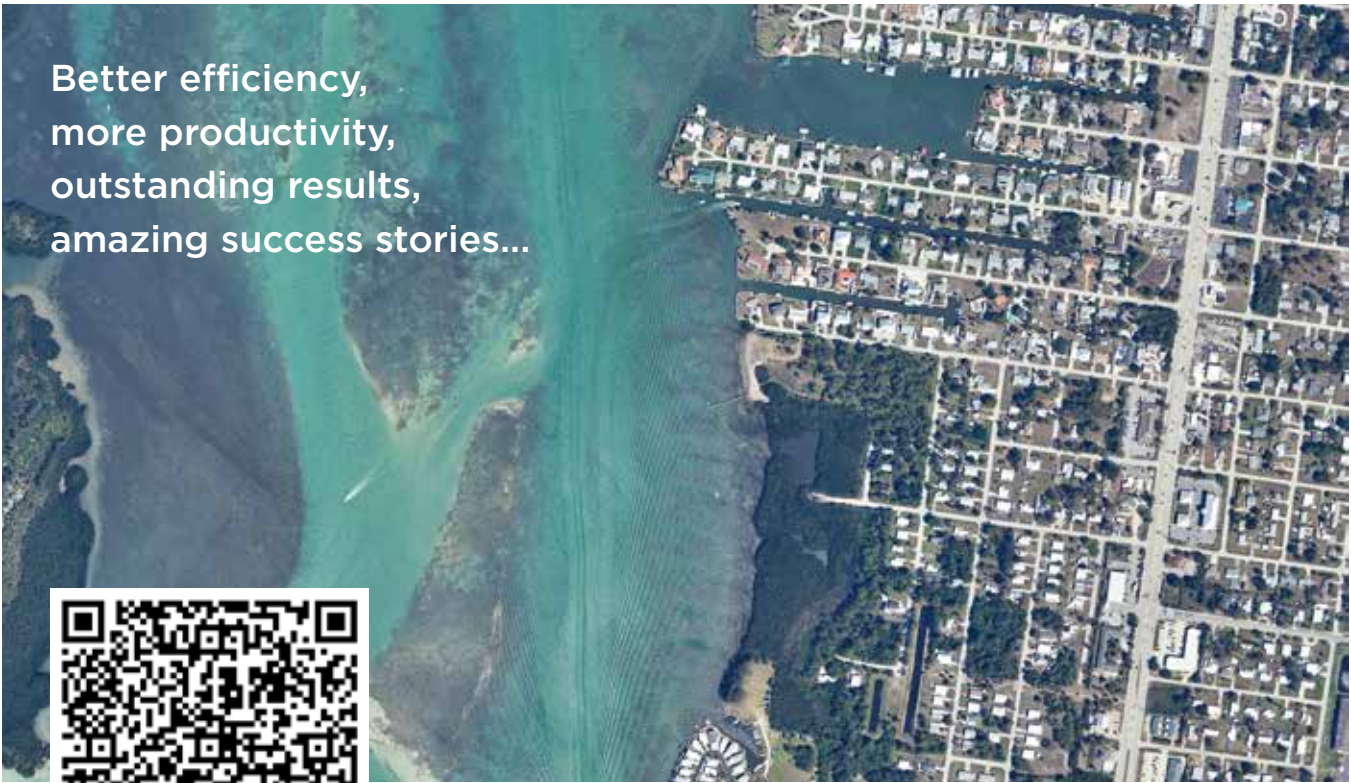
With its intuitive GUI and multiple control functions, the iX Plan application enables users to simply generate flight plans. The software enables the fast import of digital terrain models (DTM), base maps, project shapes, and ground control points. It also includes all Phase One sensors characteristics.

iX Plan automatically calculates flight lines and trigger points, based on sensor parameters, project parameters, and mapped terrain height.

iX Plan displays the planning results used during a flight as maps and tables, which can also be used for calculating project costs.

*“From flight planning to image delivery”*

Better efficiency,  
more productivity,  
outstanding results,  
amazing success stories...



<https://geospatial.phaseone.com/aerial-solutions/>

[Watch PAS 280 video](#)

## About Phase One

Phase One A/S is a leading researcher, developer and manufacturer of medium- and large-format digital cameras and imaging systems.

Phase One has pioneered the development of digital photography technology since 1994. The company has developed core imaging technologies and a range of digital cameras and imaging modules, providing the world's highest image quality in terms of resolution, dynamic range, color fidelity and geometric accuracy. Phase One has grown to become the leading provider of high-end imaging technology across many demanding business segments, such as space imaging, aerial mapping, industrial inspection, and heritage digitization, as well as serving the world's most demanding professional photographers.

Based in Copenhagen, Denmark, and with regional offices in New York, Denver, Cologne, Tokyo, Beijing, Shanghai, and Hong Kong, Phase One nurtures long-term relationships with customers, technology partners and its global network of distributors, often playing the role of digital imaging partner to customers with unique requirements. It is with this passion for service that Phase One continually exceeds expectations and drives the imaging industry forward.

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