Phase One

Aerial Solutions

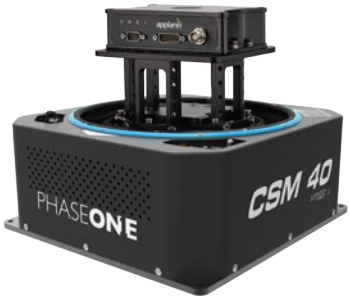
PHASEONE

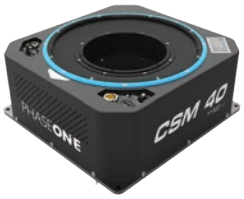
A Line of Aerial Cameras and Solutions for Wide Aerial Coverage

We at Phase One Industrial continuously expand our offering and design the exact solutions that meet the requirements of the developing industrial and aerial imaging market. Our solutions specifically address the challenges of imaging data acquisition projects, helping our customers to increase productivity and reduce time and costs. We are proud to add to our line of products the 280MP Large Format Aerial Solution.

280MP

150MP/100MP





Controller

GNSS/IMU

iX Capture iX Flight iX Plan

Software

280MP Aerial Solution
The New 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 Solution provides **higher Return on Investment** compared to any other large format system available on the market.

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

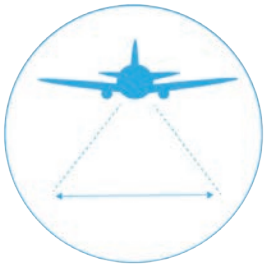
The iXM-RS 280F provides a large format option that easily integrates with DSM400 gyrostabilized mount creating a **compact and lightweight** system for use in a wide range of aircraft.

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

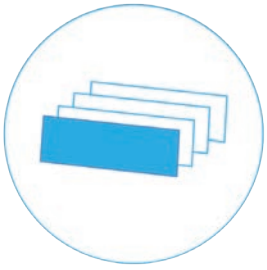
The Aerial solution is comprised of iX Controller, GNSS/IMU receiver (POS AV series), Somag gyro-stabilized mount (DSM 400), the Phase One flight planning and management software iX Plan and iX Flight as well as iX Capture.

"The iXM-RS 280F provides accuracy and image quality"

- 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 low light conditions

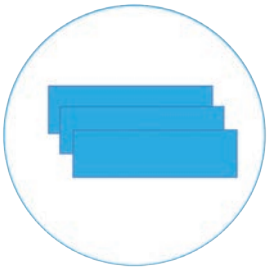


+ 20,000 pixels across



2 frames per second

390 kts Maximal ground speed for 10 cm GSD with motion blur under 1 pixel

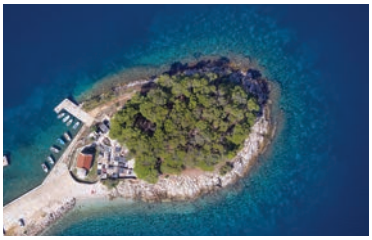


97% forward overlap for 10 cm GSD at 150 kts

iXM-RS 280F: Pure Sharpness by Blur Control FMC

The new generation of CMOS sensor eliminates the motion blur thanks to short exposure time, enabled by using high-speed shutters (up to 1/2000 sec) and higher sensitivity pixel design. Combined with RS shutter technology, the camera provides highly sharp images overcoming cameras with other FMC capabilities.



Flying Height and Swath Width

GSD (cm)	Altitude (m)	Altitude (ft)	Swath (m)
3	718	2,356	605
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

4-Band Configuration 280MP Aerial Solution

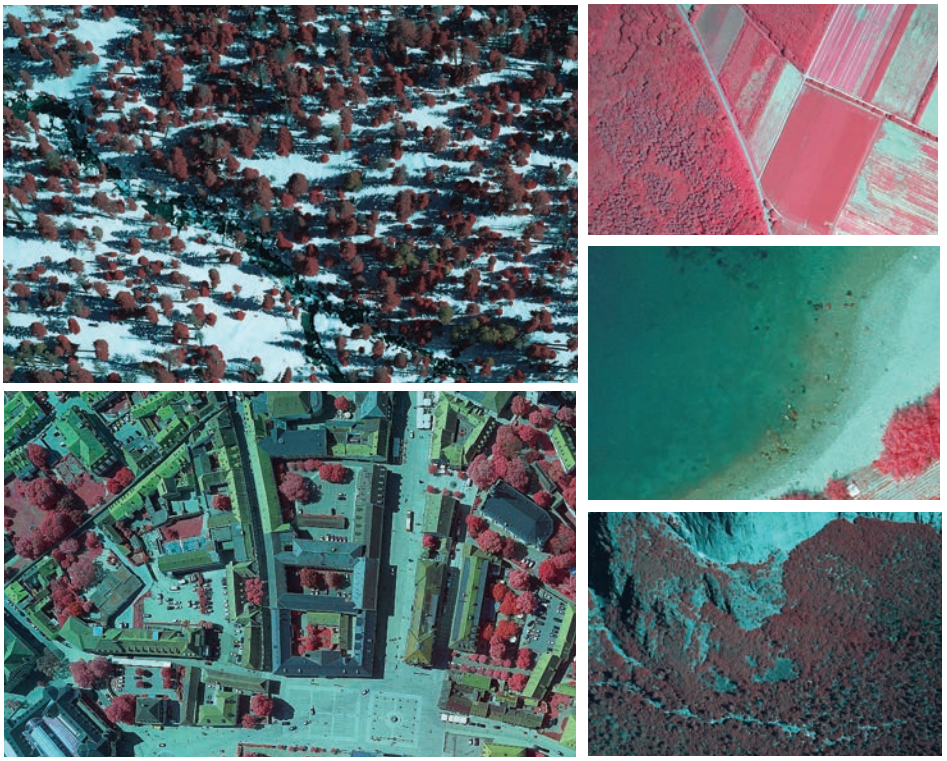
Phase One is expanding the **camera's performance,** offering additional configuration for simultaneous capturing of **RGB and NIR images**. The 280MP 4-Band solution comprises dual 90 mm lenses for capturing RGB information, and a 50 mm lens for capturing NIR information and thus providing 4-Band (R,G,B,NIR) or CIR imagery.

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

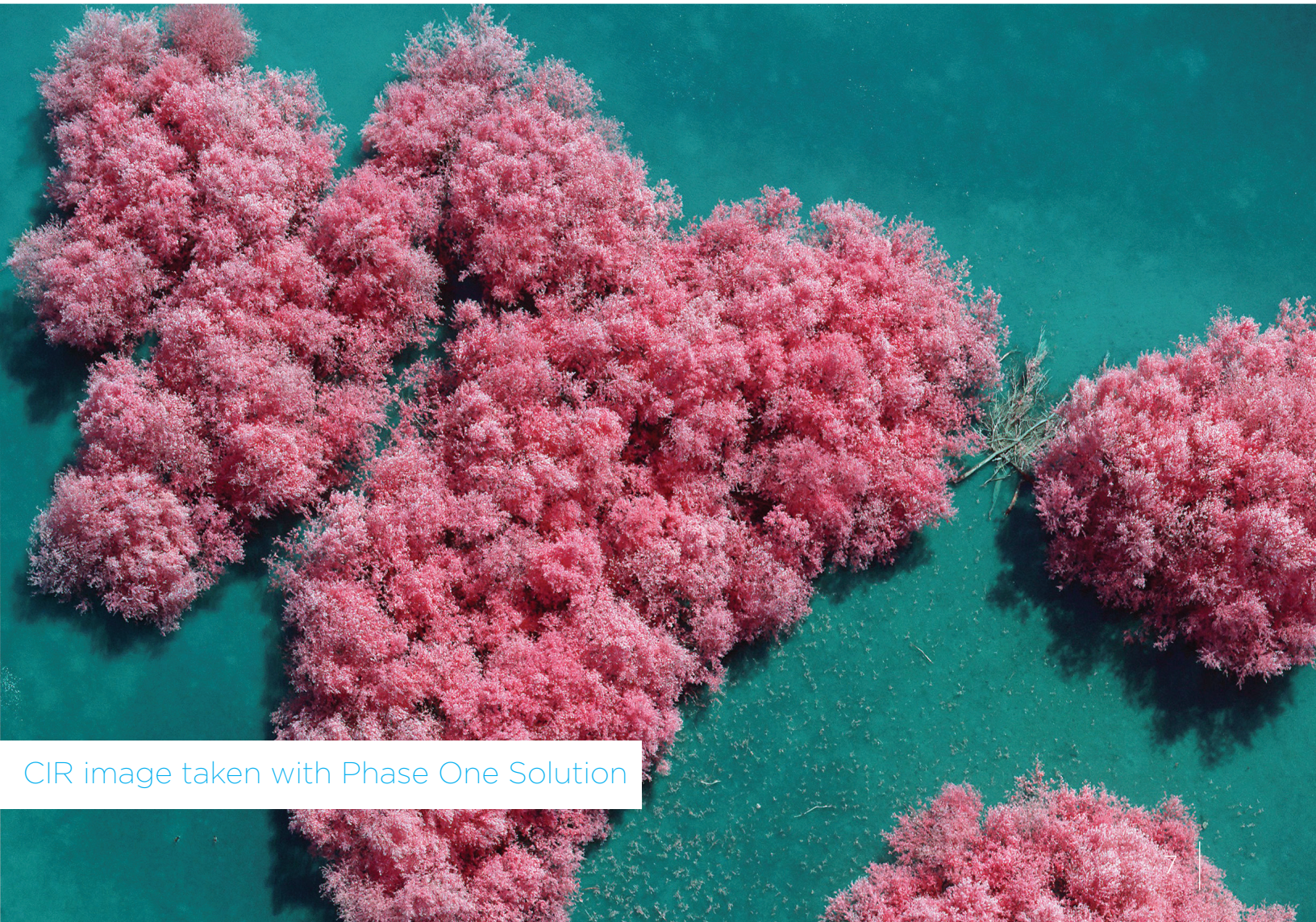
iX Capture outputs:

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

"Expanding the camera performance with many configurations"



RGB image taken with Phase One Solution



CIR image taken with Phase One Solution

Technical Specifications

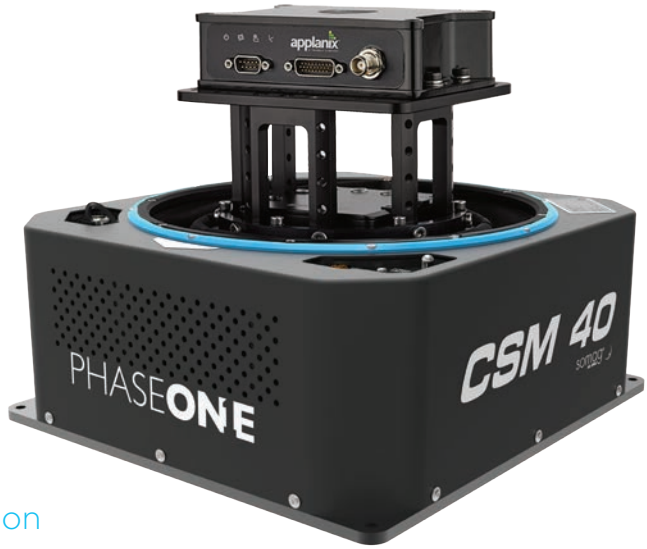
	iXM-RS 280F 4-Band	iXM-RS 280F
Frame geometry	Central projection	
Resolution	284MP 20150 x 14118	
Image formats	PhaseOne RAW, IIQ-L, IIQ-S	
Output formats	Distortion Free RGB, NIR, CIR, RGBN, NVDI in TIFF 8 and 16 Bit or JPEG	Distortion Free RGB in TIFF 8 and 16 Bit or JPEG
RGB/NIR ratio	1:1.8	N/A
Frame width for 10 cm GSD (m)	2015	
Frame height for 10 cm GSD (m)	1412	
Frame area for 10 cm GSD (sq.km)	2.84	
Typical image size (MB) for TIFF (8 Bit)	1100	833

Lense 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	
	Sensor Specifications	
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
	Flight Specifications	
Maximal ground speed for 10 cm GSD with motion blur under 1 pixel (knot)	390	
Maximal forward overlap for 10 cm GSD at 150 knot (%)	97	
Maximal orthophoto angle for 20% side overlap (°)	37	
Flight altitude for 10cm GSD (Feet)	7853	
	Operating Conditions	
Power input (V DC)	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	
	System Specifications	
System weight (kg/Lb)	32.5 / 72	31 / 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	
GNSS / IMU Applanix	POS AVX 210 / POS AV Series	
Power consumption	6 Amp at 28V	
	iX Controller MK4	
Interfaces	USB3, Power and Control Ports for Camera, GNSS and Mount	
Storage capacity (TB)	1.0	
Storage type	SSD	
Storage exchangeability	Yes	

Phase One 150MP/100MP Aerial Solutions

Phase One 150MP and 100MP Aerial Solutions are **fully integrated systems** based on the iXM-RS150F and the iXM-RS100F high-resolution metric cameras respectively. Each Aerial solution includes the camera and additional components, such as: the iX Controller, Somag stabilizer, Applanix GPS/ IMU unit and the Phase One flight planning and management software iX Plan and iX Flight as well as iX Capture.



- Fully integrated Phase One Aerial Solution
- Large image coverage
- Exceptional accuracy and image quality
- Optional 4-Band Aerial Solution 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 size** that enables higher ground resolution from a higher flight altitude and provides a larger aerial coverage resulting in higher aerial survey productivity.

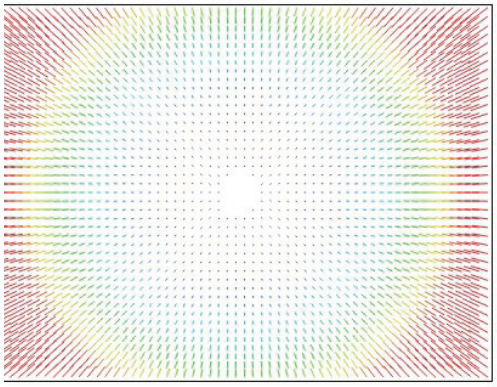
The camera comes with one of **eight RS lenses** ranging from 32mm to 180mm focal length, and the 300mm **RSM lens,** all equipped with a **central leaf shutter** to ensure geometrically correct aerial images.

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 speed up to 1/2500 sec. It offers high capture speed of 2 fps 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 2 frames per second
- Recommended for high quality 3D city models

"The iXM-RS150F is a highly productive 150-megapixel aerial survey camera"

Camera Distortion Model



Distorted Image

Undistorted Image

1. The distortion model of the camera corresponds to a standard Brown-Conrady symmetric radial distortion model.
2. Images captured with the camera may be easily transformed to an undistorted image with a maximal residual of less than 1 µm.

4-Band Solution 150MP/100MP Aerial Solution

The four-band solution is comprised of the RGB and Achromatic camera models, in which images are captured in RGB and NIR bands simultaneously, and then processed automatically to generate distortion-free images and perform fine co-registration of the pixels from NIR to the RGB images. The 4-Band solution includes two synchronized cameras (RGB and NIR) in addition to the iX Controller, Somag gyro stabilized mount, Applanix GNSS/IMU receiver (POS AV series) and the Phase One flight planning and management software iX Plan and iX Flight as well as iX Capture software to control camera during flight.

iX Capture software is also used to generate distortion-free images and to perform 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

"Extremely useful for remote sensing and mapping applications in agriculture, forestry and environment monitoring"

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

Lense 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	54.6	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
	Flight Specifications	
Maximal ground speed for 5cm GSD with motion blur under 1 pixel (knot)	240	
Maximal forward overlap for 5cm GSD at 150 knot (%)	93	
Maximal orthophoto angle for 20% side overlap (°)	27 for 90mm focal lens	
Flight altitude for 5cm GSD (Feet)	3926 for 90mm focal length	
	Operating Conditions	
Power input (V DC)	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	
	System Specifications	
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
GNSS/IMU Applanix	POS AVX 210 / POS AV Series	
Power consumption	6 Amp at 28V	
	iX Controller MK4	
Interfaces	USB3, Power and Control Ports for Camera, GNSS and Mount	
Storage capacity (TB)	1.0	
Storage type	SSD	
Storage exchangeability	Yes	
Weight (kg/Lb)	5.11 / 2.5	
Size (mm/In)	290 x 109 x 225 / 9.8 x 3.4 x 4.11	

(*) Weight of controller 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 10 cm GSD (m)	1161	
Frame height for 10 cm GSD (m)	871	
Frame area for 10 cm GSD (sq.km)	1.01	
Typical image size (MB) for TIFF (8 Bit)	400	300

Lense 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	54.6	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							
	Sensor Specifications							
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
Flight Specifications		
Maximal ground speed for 5cm GSD with motion blur under 1 pixel (knot)	240	
Maximal forward overlap for 5cm GSD at 150 knot (%)	91	
Maximal orthophoto angle for 20% side overlap (°)	27 for 90mm focal lens	
Flight altitude for 5cm GSD (Feet)	3209 for 90mm focal length	
Operating Conditions		
Power input (V DC)	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	
System Specifications		
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
GNSS/IMU Applanix	POS AVX 210/ POS AV Series	
Power consumption	6 Amp at 28V	
iX Controller MK4		
Interfaces	USB3, Power and Control Ports for Camera, GNSS and Mount	
Storage capacity (TB)	1.0	
Storage type	SSD	
Storage exchangeability	Yes	
Weight (kg/Lb)	5.2 / 11.5	
Size (mm/In)	290 x 109 x 225 / 9.8 x 3.4 x 4.11	

(*) Weight of controller not included

Aerial Solution Components

Hardware

GNSS/IMU system

The Applanix' POS AVX 210/ POS AV series enable direct georeferencing of aerial images. By integrating precision GNSS with inertial technology, POS AV enables precise determination of position and attitude, as well as the completion of geospatial projects in a more efficient and cost effective manner. The Phase One 280MP/ 150MP/100MP Aerial Solutions are also compatible with additional GNSS/IMU systems.

Gyro Stabilized Mounts

SOMAG DSM400 - was specifically designed for the Phase One Aerial Solutions. 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 configuration.

SOMAG CSM40 – a small modular stabilization device that was specifically designed for the Phase One 100MP/ 150MP Aerial Solutions. With a low weight of 5.2 kg and a high payload of 15 kg, the special mount system is particularly suitable with ultralight aircrafts.

iX Controller

Designed to enable rapid data transfer, the iX Controller has the ability to control up to six Phase One aerial cameras independently. Built as a workhorse, the system boasts a small footprint and easily integrates into any aircraft. The iX Controller includes a robust removable protective SSD tray for convenient and secure transfer and handling.

Acting as a central hub to Phase One Aerial Solutions, it controls the cameras, the gyro-stabilizing mount, the GNSS/IMU system and runs iX Capture and iX Flight software. iX Controller includes an I/O port to enable accurate activation of multiple cameras by iX Flight, pre-installed on the iX Controller.

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

	IIQ-L Format	IIQ-S Format
Camera	Number of images	
280 MP	3100	4600
150 MP	6000	9000
100 MP	9000	13500

Software Package

iX Capture

The iX Capture is an 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 support the processing of 280MP images.

"Provides real-time feedback and confidence of correct image capturing"

iX Flight

The iX Flight is an interactive and intuitive flight management system for precise execution of a mission, and comes uploaded to the iX Controller. Controlled and operated with ease, iX Flight enables the planning, positioning and sensors' management / triggering. During the flight, iX Flight collects log files that enable post processing, mission analysis, and post-flight reports.

With two display screens for both the pilot and the operator, each has the exact information they need for a successful aerial-image acquisition.

The Phase One Aerial Solutions are also compatible with additional 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. It enables fast import of the digital terrain model (DTM), base map, project shape, 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's costs.

"From flight planning to image delivery"

Explore Our New Interactive Case Studies

https://casestudies.industrial.phaseone.com/

About Phase One

Phase One A/S is a leading researcher, developer and manufacturer of medium format and large format digital cameras and imaging solutions.
Founded in 1993, Phase One is a pioneer of digital photography. Phase One 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. As such, Phase One has grown to become the leading provider of high-end imaging technology across many demanding business segments, such as aerial mapping, industrial inspection and cultural heritage digitization, as well as serving the world's most demanding photographers.

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